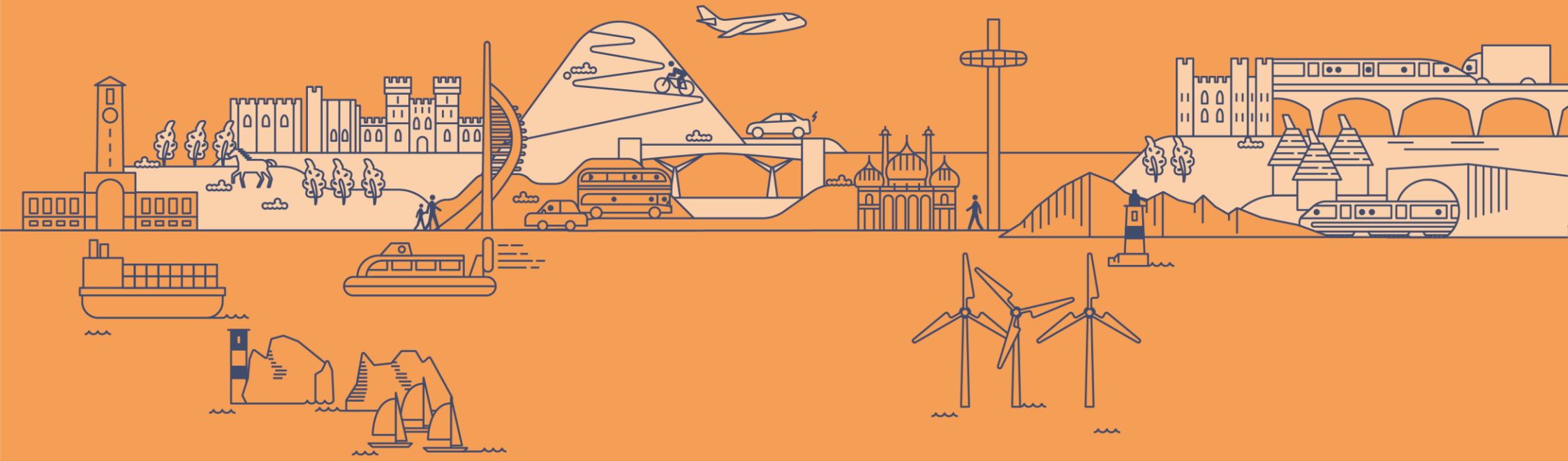
TRANSPORT FOR THE South East

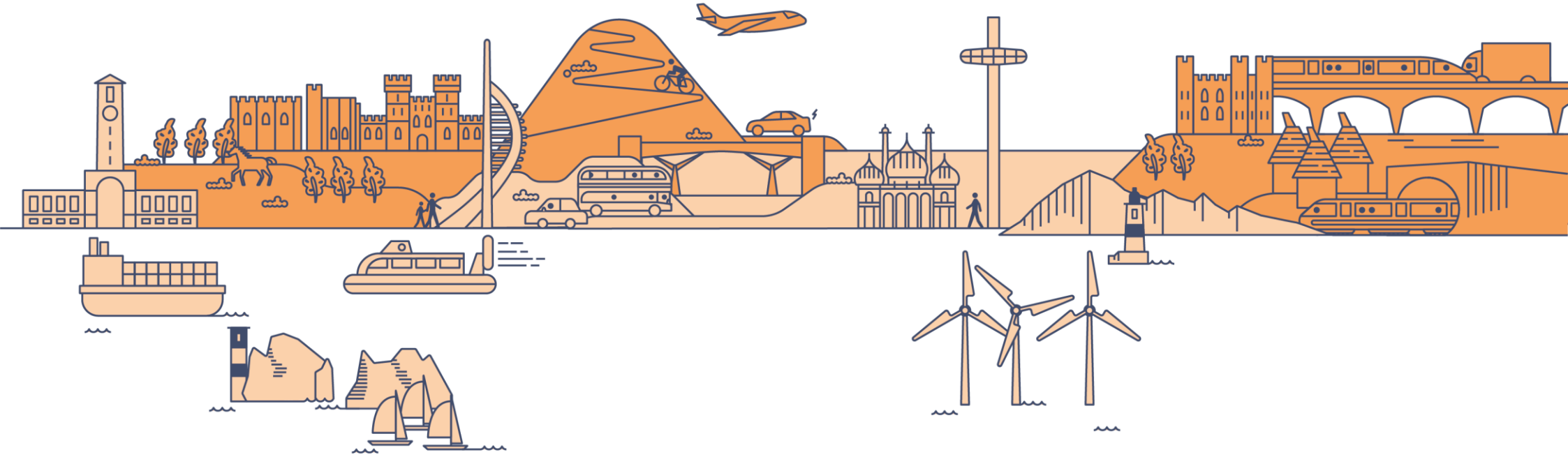


Inner Orbital Area Study
Options Assessment Report

Version 1.0

November 2021

Contents



Part 1

Introduction

Context

Transport for the South East (TfSE), in their role as the Sub National Transport Body for South East England, are delivering a programme of five Area Studies that will prioritise interventions that help deliver TfSE's vision for the South East. This is a key step towards developing a Strategic Investment Plan to secure funding for the South East's transport network.

Geographical Scope

The Area Studies focus on the key transport corridors that serve and connect the South East's Major Economic Hubs and international gateways. They also play an important national role in connecting the rest of the UK to some of the busiest ports in the country.

The areas are defined as follows:

- **Outer Orbital Area Study** – encompassing the strategic corridors that follow the coastline from the New Forest, in Hampshire, towards East Kent.
- **Inner Orbital Area Study** – encompassing the strategic cross-regional rounds around the southern outskirts of London.
- **South Central Radial Area Study** – encompassing the corridors that share the London-Gatwick corridor in the north and fan out in the south to connect much of the Sussex coastline to the capital.
- **South East Radial Area Study** – encompassing the transport corridors connecting the Channel Tunnel and Port of Dover to London, as well as serving Kent, Medway, and East Sussex.
- **South West Radial Area Study** – encompassing the strategic highways between London and the South West, as well as parts of the Great Western Railway and South Western Mainline. It also includes the strategically important cross-Solent links with the Isle of Wight.

Technical Scope

Each of the Area Studies investigate the issues, challenges and opportunities identified within TfSE's transport strategy in more detail. They also identify a shortlist of interventions to make life better for people, for businesses and, for the environment of the South East.

The outcome of these Area Studies will form the 'blueprint' for TfSE's Strategic Investment Plan. This will influence and help shape investment decisions by government and national bodies, such as Network Rail and National Highways, and local bodies, including Local Transport Authorities.

Process

This report provides a summary of the work undertaken in the third of the five stages underpinning the Inner Orbital Area Study (Stage C). **Figure 1.1** below shows the stages and steps that are being delivered for the Inner Orbital Area Study.

The Inner Orbital Area Study comprised five Stages, which in turn are formed of twelve steps.

The first stage, **Stage A (Mobilisation),**was completed in September 2020. This stage helped define the leadership team, partners, Subject Matter Experts, methodology and a Delivery Plan for the technical programme.

This led onto **Stage B (Evidence Base),** which undertook an in-depth review of the current and future issues and opportunities in the Inner Orbital Area. This covered a wide range of economic, social and environmental issues and opportunities.

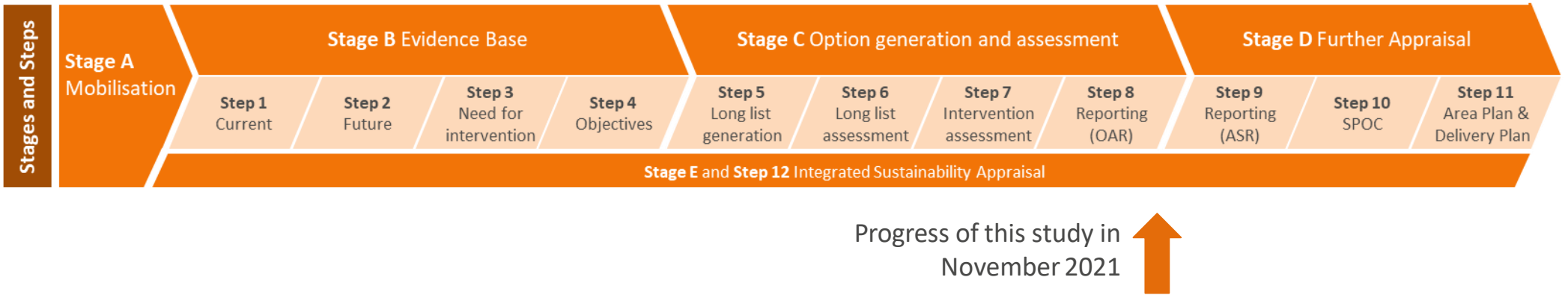
Stage B also identified corridor specific transport issues and defined the study's Vision, Objectives, and Problem Statements.

At the time of writing, the Study has just completed **Stage C (Options Generation and Assessment)**, and this is focus of this report.

Stage C will be followed by **Stage D (Further Appraisal)**, in which a Strategic Programme Outline Case for for the identified options will be developed.

Stage E (Integrated Sustainability Appraisal), which runs concurrently with all stages, will seek to ensure objectives, problem statements and interventions can be achieved through sustainable measures.

Figure 1.1: Overview of the Inner Orbital Area Study process



Structure of this Report

Purpose

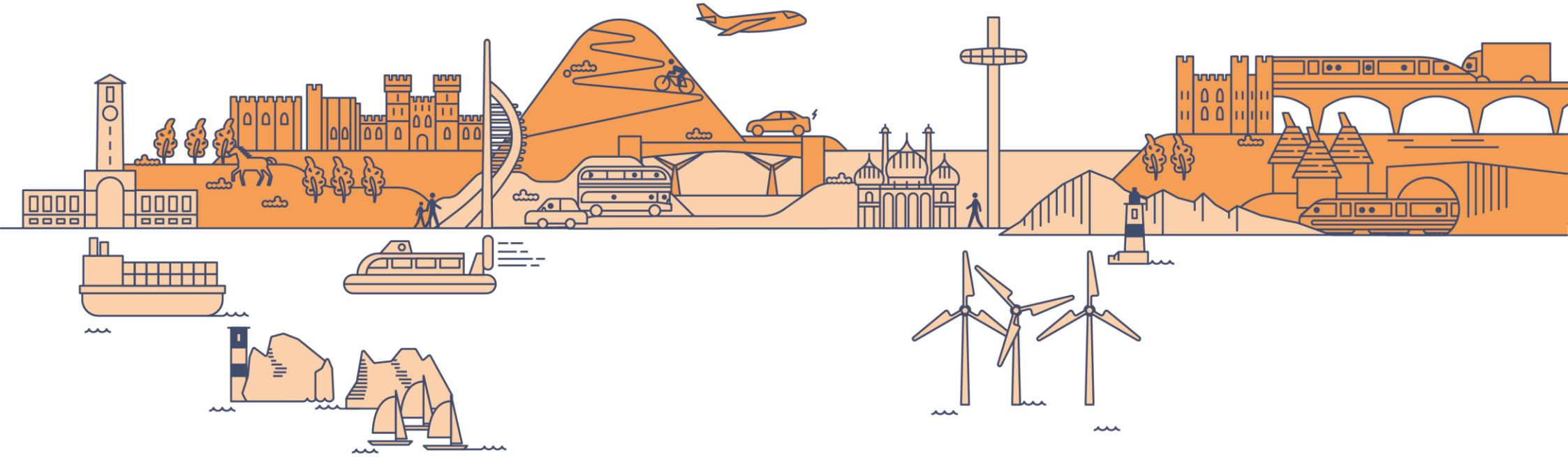
This report summarises the process the Project Team executed to:

- Develop a long list of interventions (and options within some interventions).
- Qualitatively assess each intervention against a set of strategic, economic, and delivery criteria.
- Use the qualitative assessment to outlined above to develop coherent packages of interventions.
- Model these interventions using a land use transport model.
- Quantitively assess the impact of these packages on transport and socioeconomic outcomes for the Inner Orbital Area.
- Understand trade offs and, working with key stakeholders, refine and agree a short list of packages to be taken forward for further appraisal in the next stage of this study.

Structure and Contents

The rest of this report is set out as follows:

- **Part 2** describes the background to this report and how it was developed
- **Part 3** describes the key issues and opportunities the Inner Orbital Area Study seeks to address. These are articulated as a vision and set of objectives the study should seek to achieve, as well as a set of Problem Statements the study should address.
- **Part 4** describes how the Project Team worked with TfSE and their stakeholders to develop a long list of interventions (and options within some interventions). It then describes how these interventions and options were assessed. In summary, each intervention was examined through three assessments. The first focussed on strategic and policy alignment, the second on economic impact and the third on deliverability.
- **Part 5** presents the results of the qualitatively assessment described in Part 4. It then shows how the Project Team grouped the best performing interventions into coherent Packages for modelling.
- **Part 6** describes how the Project Team used a land use and transport model (SEELUM) to model the transport, socioeconomic and carbon impacts of the Packages described in Part 5. This Part presents the results of this modelling exercise, comments on key findings, and discusses some of the trade offs highlighted by the modelling results.
- **Part 7** summarises the final short list of Packages to be taken forward for further appraisal in Part D and describes the next steps for this study. This will include a more detailed examination of the costs and benefits that could be generated by each Package.



Part 2

Background

The Inner Orbital Area

The Inner Orbital Area encompasses the strategic corridors that serve the Lower Thames Valley, communities around the M25 and North Kent. The Local Authorities in this area include Swale and Ashford in the East, Surrey and Crawley in the South and Berkshire and Basingstoke and Deane in the West. The corridor is also home to the two largest airports in the UK, Heathrow and Gatwick, as well as the Medway and Sheerness Ports on the eastern end of the corridor.

Socioeconomic Profile

The Inner Orbital Area is socially, economically, and environmentally diverse. It has some of the highest areas of deprivation in the country as well as areas of high economic productivity and prosperity.

It is home to the two largest airports in the UK, Heathrow and Gatwick, as well as the Medway and Sheerness Ports on the eastern end of the corridor.

The varied strengths and weaknesses of the Inner Orbital Area make planning a challenge. There are complex interdependencies, constraints, and in some cases, conflict, between competing pressures and aspirations in the area.

Despite these challenges, it is this diversity of this area that makes it such an appealing place to live and work. This study will seek to build on this diversity to achieve the ambitions of the people who live here.

Transport Networks

The Inner Orbital area is served by a transport network that, at present, provides better quality infrastructure to and from London, and less developed infrastructure along the orbital corridor.

The Inner Orbital corridor is well-served by Heathrow and Gatwick airport, the two largest airports in the UK.

Urban areas generally enjoy much better access to public transport services than rural areas along the Inner Orbital corridor.

Key Challenges

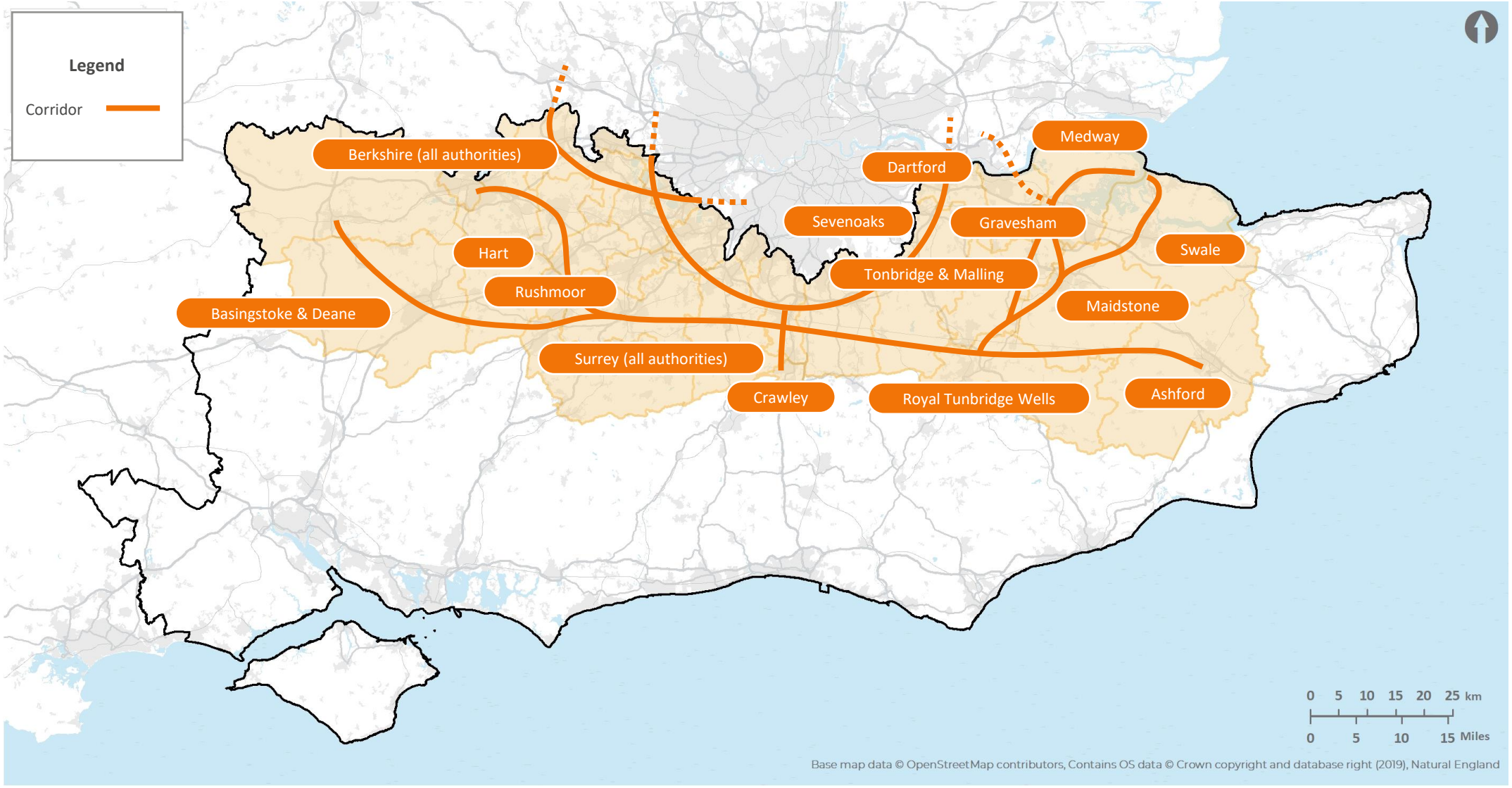
In Stage B (Evidence Base), this study identified several challenges and opportunities that need to be addressed by a holistic transport strategy. These are summarised in **Table 1.1** to the right.

Table 1.1: Challenges and Opportunities

Challenges
The east has higher deprivation but greater housing supply; the west is prosperous but faces supply challenges.
Orbital rail connectivity/journey times is poor from Reading to Gatwick to Ashford, constraining the development and growth of the Gatwick Diamond area and other economic hubs.
Severe congestion on the M25 Orbital Motorway and limited scope for additional highway capacity on this corridor.
Sustainable surface access to Heathrow from the South East is limited.
Opportunities
Rail connectivity enhancements east-west through Gatwick Airport.
Possible missing links between the M3 and M4 motorway, to help alleviate congestion on the M25 and support local development.
Opportunities for demand management.
Potential for Western Rail Access to Heathrow, Southern Rail access to Heathrow, and mass rapid transit solutions.
The need (and associated challenges) to integrate with the proposed Lower Thames Crossing to support strategic connectivity.

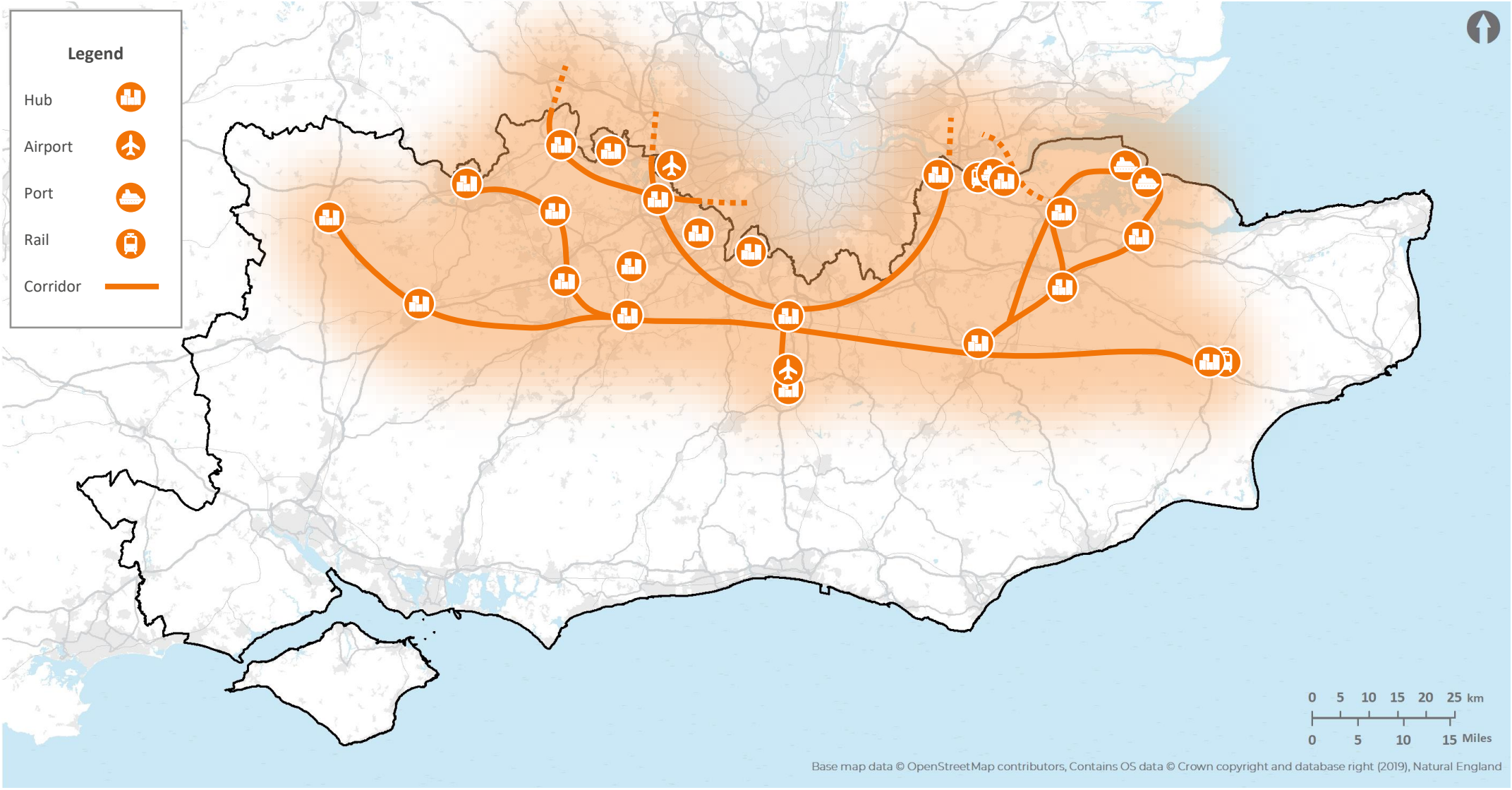
Inner Orbital Area Study Corridors and Planning Authorities

The Inner Orbital Area encompasses the strategic corridors that serve the Lower Thames Valley, communities around the M25 and North Kent. The Local Planning Authorities in this area are listed in the map below. The area is also served by four Local Enterprise Partnerships (running from west to east): Thames Valley Berkshire LEP, Enterprise M3 LEP, Coast to Capital LEP, and South East LEP.



Inner Orbital Area Study Major Economic Hubs and International Gateways

The corridor serves a number of major economic hubs, including Newbury and Basingstoke to the West, and Medway and Maidstone to the East. Other notable centres include Reading, Guildford, Crawley and Royal Tunbridge Wells. The corridor is home to the two largest airports in the UK, Heathrow and Gatwick, as well as Medway and Sheerness ports on the eastern end of the corridor.



Key Actors

Project Team

The Inner Orbital Area Study is led by a TfSE Project Management Office and is supported by a Technical Advisor Team.

The Technical Advisor Team is led by **Steer**, who led most of the Evidence Base development that formed Stage B of this project. Steer is supported by:

- **Atkins**, who led the Options Stages of the project (Stage C); and
- **WSP**, who provide significant support to the Delivery (Stage D) and Integrated Sustainability Appraisal (Stage E) stages.

Most of the technical work and content delivered for Stage C was developed by Atkins and Steer. Atkins developed the Multi Criteria Analysis Framework (MCAF) that was used to qualitatively assess proposed interventions. Steer developed the transport and land use model that was used to quantitively assess the Packages.

For the purposes of this report, TfSE's Project Management Office and the Steer/Atkins/WSP Technical Advisor Team are referred to as the 'Project Team'.

Stakeholders

On mobilisation of this study, TfSE and the Technical Advisor team undertook a stakeholder mapping exercise for the Inner Orbital Area to categorise key organisations and individuals according to their interest and influence.

This exercise enabled TfSE to define four distinct tiers of stakeholder:

- **Tier 1 Stakeholders** have a direct interest and involvement in leading and supporting investment in the Inner Orbital Area Study. These stakeholders include Local Transport Authorities (County Councils and Unitary Authorities), National Highways, Network Rail, Local Enterprise Partnerships and a representative of environmentally protected areas.
- **Tier 2 Stakeholders** potentially have a direct influence over the success of the Area Studies via their development process or contents of the studies. This group includes Local Planning Authorities (Districts and Boroughs) transport service providers, other statutory bodies (e.g. Homes England and Environmental/Heritage bodies), and special interest groups such as environmental groups.
- **Tier 3 Stakeholders** are those parties that may influence Tier 1 and 2 Stakeholders through their activities, including through the media/social media and public affairs. These include Town and Parish Councils, residents' groups, education and health providers, and representatives from youth councils.
- **Tier 4 Stakeholders** are any other stakeholders who have limited interest and/or influence in this work and will therefore not be directly engaged in the Area Study programme.

Stakeholder Engagement

Tier 1 Stakeholders

Most Tier 1 Stakeholders were invited to join the Inner Orbital Area Study Working Group and play a direct role in leading and shaping the study.

These stakeholders have helped TfSE develop the Vision, Objectives, and Problem Statements for the study.

These stakeholders provided significant input into the development of the long list of interventions that were assessed using the MCAF and have moderated the initial results from the MCAF long list assessment.

They also supported the strategic assessment of each intervention and advised on the extent to which each long listed intervention aligns with their organisation's priorities.

Tier 2 Stakeholders

Further (remaining) Tier 1 Stakeholders and all Tier 2 Stakeholders were invited to join the Inner Orbital Area Forum.

At the time of writing, this Forum had met twice and plans to meet one further time.

The first workshop focussed on identifying stakeholder aspirations for the studies and understanding their perceptions of the strengths, weaknesses, opportunities, and challenges of the area.

The second workshop focussed on validating/amending the Vision, Objectives, and Problem statements developed by the Area Study Working Group. It also provided these stakeholders with an opportunity to contribute to the long list of interventions.

A third workshop, which is expected to focus on validating packages and delivery, will be held in Stage D of the project.

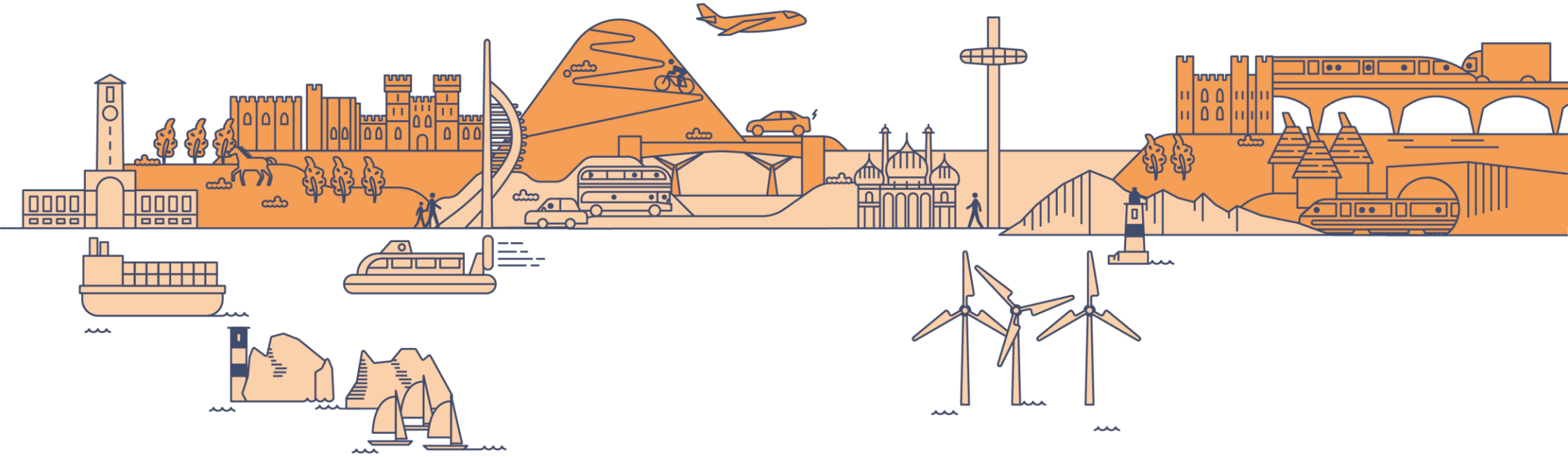
Other Stakeholders

Members of Parliament (MPs) have been further engaged through a bespoke process led by TfSE.

This process engaged MPs on a wider portfolio of topics, including the Area Studies. Any insights drawn from these discussions (e.g., whether an MP supports or does not support a particular intervention) was incorporated into the policy alignment scores.

Tier 3 and Tier 4 stakeholders were not directly engaged in this part of the study.

Any organisation that subscribes to TfSE's newsletter has received regular updates about the progress of each study. These stakeholders will also have an opportunity to engage with TfSE when the Draft Strategic Investment Plan is published for consultation.



Part 3

Vision, Objectives and Problem Statements

Background

Evidence Base

In the previous stage of this study (Stage B), the Project Team and Area Study Working Group developed a comprehensive Evidence Base for the Inner Orbital Area.

This included a presentation and analysis of the socioeconomic context of the Inner Orbital Area, its environment, and its transport networks.

It also explored projections for housing, population, and employment growth, and considered the implications for this growth on future demand for transport.

During this Stage, the Project Team worked closely with the Area Study Working Group and other stakeholders to understand the strengths, weaknesses, opportunities, and challenges facing the Inner Orbital Area.

The insights drawn from this exercise and the Evidence Base was used to create a shared **Vision and Objectives** for the Inner Orbital Area, which articulate the outcomes key stakeholders wish to see realised by 2050.

This exercise also helped the Project Team develop a set of **Problem Statements** for the Inner Orbital Area. These challenges the area faces today that key stakeholders wish to see addressed.

The Vision and Objectives are important to this study as they formed the criteria against which all long listed interventions were qualitatively assessed in the Strategic Sift. Further detail about this process is provided in Part 3 of this report.

The Problem Statements are also revisited in **Part 6**, where they are mapped to Packages to provide assurance they are being adequately addressed by this study.

The Vision and Objectives for the Inner Orbital Area Study are presented on **page 22 and 23**. This is followed by a summary of the Problem Statements on **page 24**.

Challenges and Opportunities

The following seven pages describe the key current and future challenges highlighted in the Evidence Base.

These include:

- Opportunities for **better interurban and intraurban rail services** in the Inner Orbital Area;
- Opportunities for **better mass transit** systems in the largest conurbations in the Inner Orbital area; and
- Long standing challenges with the existing **Strategic Road Network** between the largest conurbations in the Inner Orbital area.

Current Challenges and Opportunities

Inter-urban rail Opportunities

The Inner Orbital corridor has a relatively dense railway network. However, the level of service provided on east-west routes is poorer than on radial routes.

The North Downs Line between Reading, Wokingham, Guildford and Redhill and the Redhill-Tonbridge line provide some orbital connectivity. However, services on this line are geared towards serving the local and the London market with little focus on fast, strategic orbital connectivity.

Figure 3.1 on the following page presents the average speed of rail journeys along rail corridors in the Inner Orbital area and highlights the weaknesses in east-west services compared to radial services.

There are trade-offs in managing capacity between local, longer distance, orbital, and radial journeys.

There is an opportunity to significantly improve journey times and frequencies within some of the largest urban areas in the Inner Orbital Area.

Along the Inner Orbital rail arc, several stations in urban areas have insufficient levels of passenger rail service. For example, along the Blackwater Valley, Farnborough North is only served by one train per hour to Reading and Guildford, whereas Farnborough station on the South West Main line is typically served by four trains per hour to Waterloo.

This corridor is experiencing significant population and employment growth in the medium term and there is an opportunity for rail to unlock further development and support a modal shift to more sustainable modes.

While there are relatively few 'end to end' journeys along the Inner Orbital rail arc currently, many stakeholders believe there is a market for interurban journeys between large conurbations such as Reading, the Blackwater Valley, Guildford, Tonbridge Maidstone and Medway.

Ambition

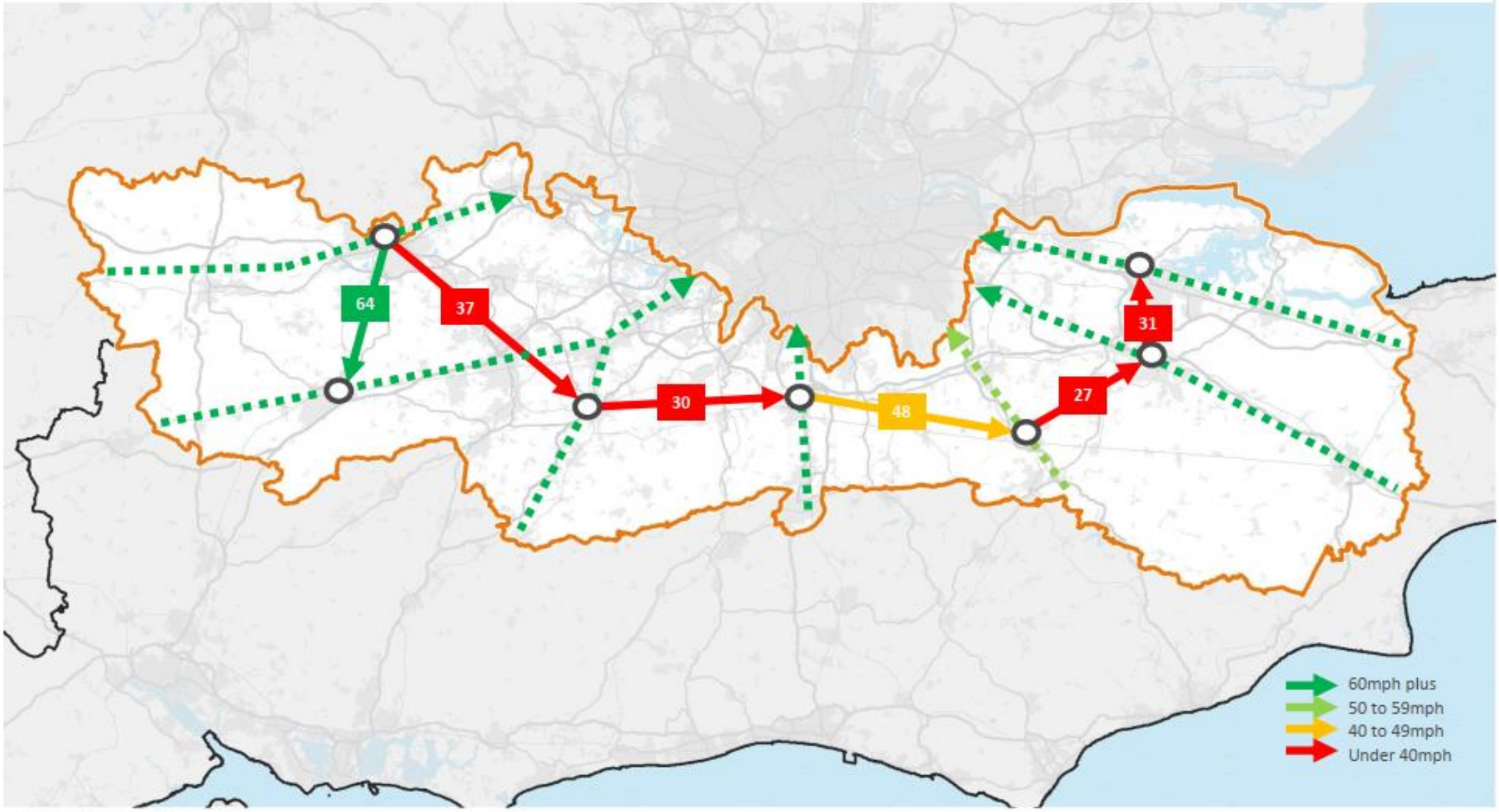
The Area Study Working Group aspires to see an urban rail service comparable to suburban London (or parts of the West Midlands) delivered along the Inner Orbital Rail Arc.

They also wish to realise faster journeys between the largest towns and cities in the Inner Orbital Area as a means of improving the efficiency and productivity of the economy within (i.e., promoting agglomeration benefits).

This will help the Inner Orbital Area reduce its reliance on London and on railways serving London to support sustainable economic growth.

It is therefore a key goal of this study to enable Network Rail and operators deliver faster, more frequent interurban and intraurban rail services between and within the largest conurbations in the Inner Orbital Area.

Figure 3.1 : Railway connectivity in the Inner Orbital Area, and average railway line speeds.



Intra-Urban and Inter-Urban Mass Transit Opportunities

The Inner Orbital Area's largest conurbations are large enough and dense enough to support world class mass transit systems. However, current provision is below the quality of offer provided to other large conurbations in Great Britain.

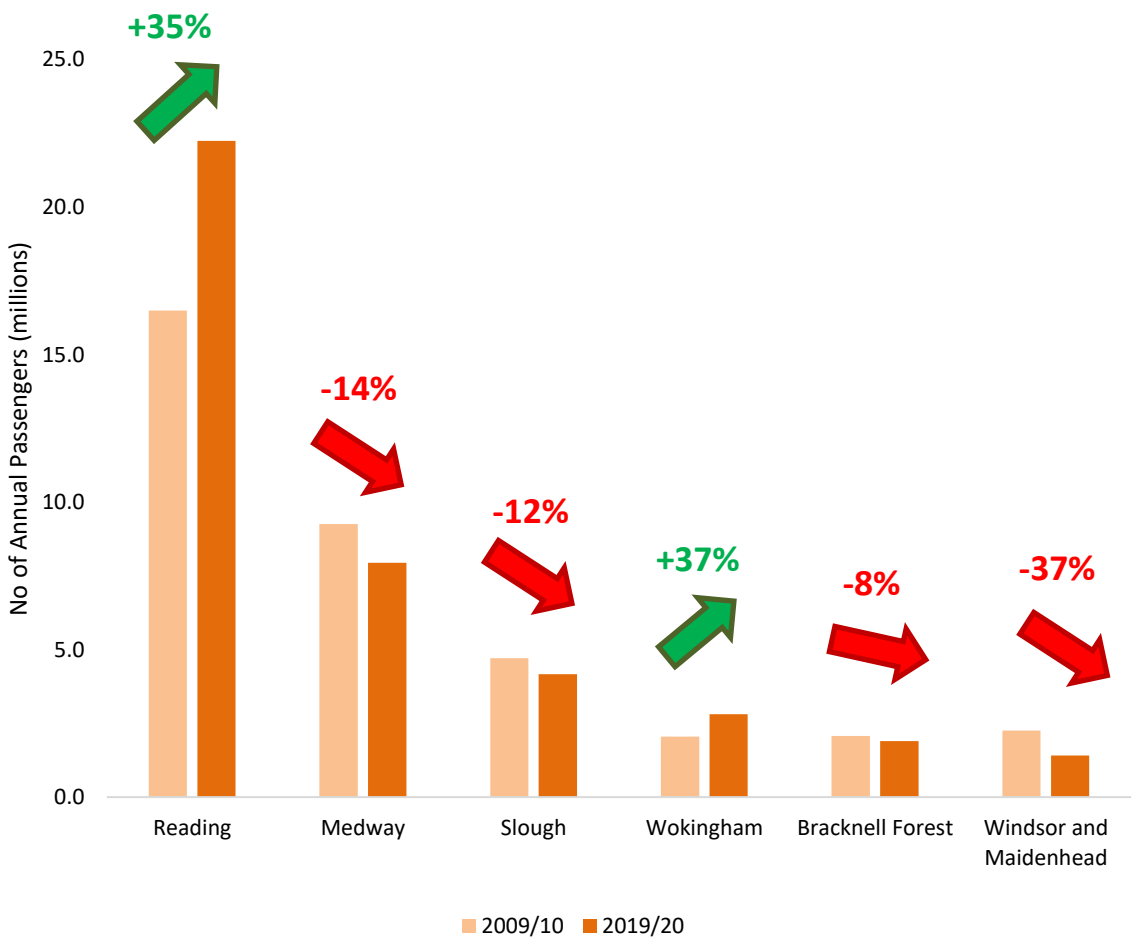
The Inner Orbital Area Study is home to several urban conurbations with a population of over 100,000 people, including Reading (257k), the Blackwater Valley (252k), the Medway Towns (244k), Slough/Windsor (197k), Bracknell and Wokingham (138k), Maidenhead (129k), Basingstoke (108k), Maidstone (108k) and Royal Tunbridge Wells/Tonbridge (107k).

However, despite their size and density, public transport mode share is relatively low. Trips made by bus have fallen in the past decade in most hubs in the area. Reading acts as an exemplar of what is possible if authorities invest in Mass Rapid transit, with Reading developing segregated bus corridors and increasing frequencies to make bus competitive for local journeys.

Many of the conurbations listed above are in proximity to one another. The distance between Wokingham and Sandhurst is only 7km, and Sandhurst to Farnborough is a further 7km.

Short distances between centres present an opportunity for bus based Mass Rapid Transit serving both intra-urban flows within the major economic hubs and inter-urban flows connecting adjacent hubs. Bus-based MRT can serve local populations and complement the North Downs line which can focus on supporting longer-distance strategic journeys between Major Economic Hubs such as Reading to Guildford.

Figure 3.2: Change in annual bus trips in selected Major Economic Hubs (2009-19)



Ambition for Mass Transit

The Area Study Working Group envisions mass transit to embrace solutions being implemented in other parts of the UK delivered along the Inner Orbital Rail Arc.

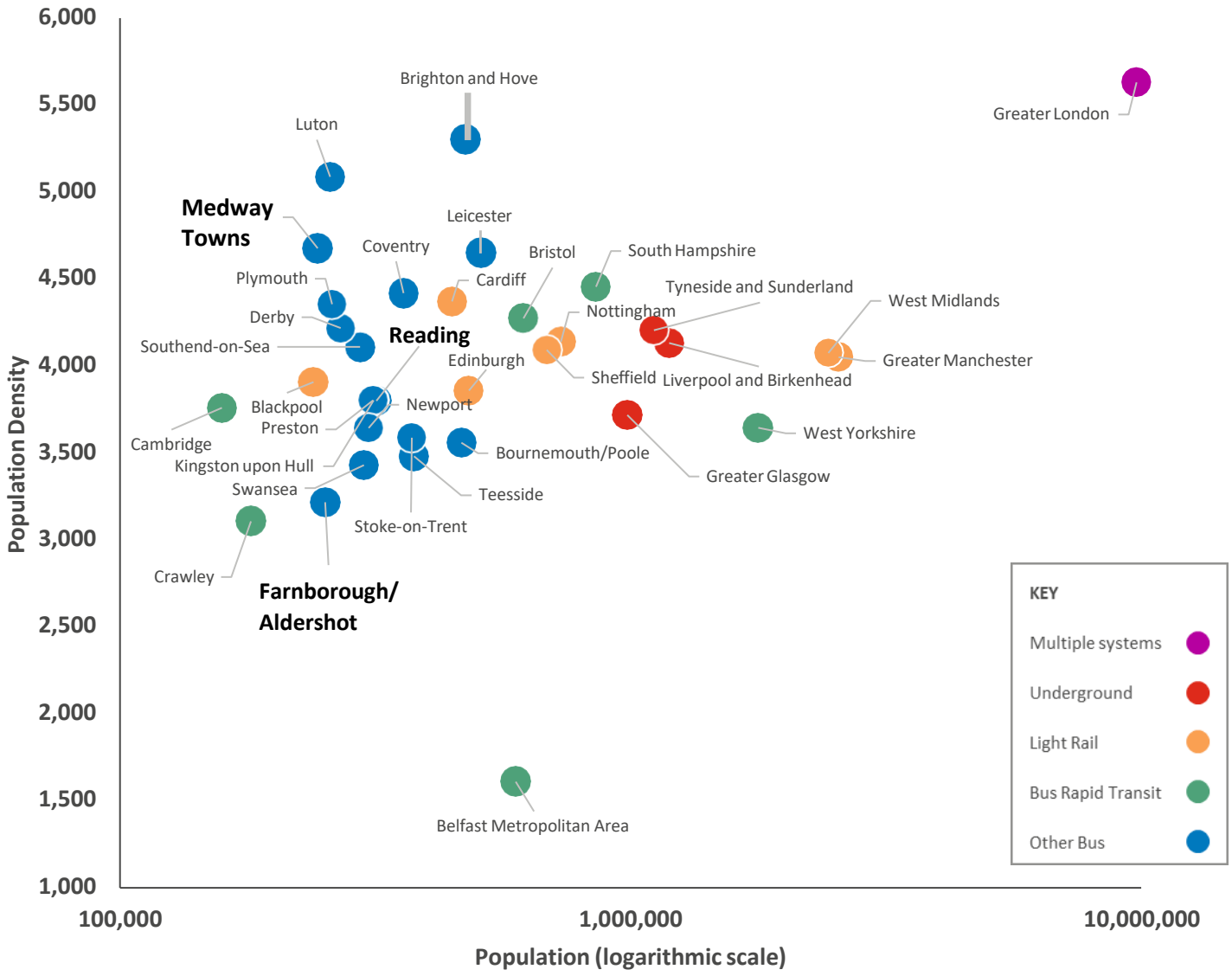
Figure 3.3 presents the largest Built-Up Areas in the UK by population, density, and mass transit system provision.

This shows that the Reading, the Medway Towns and the Blackwater Valley conurbation are comparable to many other conurbations that are served by higher quality mass transit including tramways, bus rapid transit and/or high quality rail services.

Many of the public transport systems shown in this chart – such as Nottingham Express Trams – generate an operational profit (Nottingham Trams Limited generated a 3% EBITDA in 2018/19[4]).

It is therefore a key goal of this study to enable Local Transport Authorities and partnerships in the Inner Orbital Area to deliver world class, mass transit systems in their largest urban areas.

Figure 3.3: Mass transit options in major conurbations in the UK



Current Challenges and Opportunities

Highways

Strategic highway connectivity in Inner Orbital area is good, with the M25 providing good orbital connectivity.

Figure 3.4 on the next page shows the key highways in the Inner Orbital area and highlights several congestion "hot spots" on strategic and major roads.

The M25 is the key motorway that serves longer distance, east-west movements in the Inner Orbital area. It also serves and links traffic to/from other settlements in the South East and London and the rest of England.

To the western end of the corridor, key congested components of the Strategic Road include the A329(M) and A322, which together connect the M3 and M4, and provide strategic connectivity between settlements in Berkshire, Surrey and North Hampshire. To the eastern end, the A229, A228 and A249 provide strategic connectivity between the M2 and M20, whilst also fulfilling a local role of connecting communities in North Kent including Maidstone and Medway.

TfSE's vision of planning for people and places (as opposed to planning for vehicles), means any future highway investment will need to consider sustainable travel patterns and wider objectives, and delivery with great sensitivity.

Gravity Model Evidence

To better understand the strategic challenges of the highways, the Project Team developed a high-level gravity model for Great Britain (GB).

This model was used to identify the largest theoretical latent demand between the 30 largest Built-Up Areas in England and Wales (plus Glasgow and Edinburgh – statistics for built up areas in Scotland differ from England and Wales). The focus was on the relative 'attraction' of large population centres to each other, rather than on observed flows on highways and railways.

The Project Team then identified the routes on the Strategic Road Network that serve the largest theoretical flows and assessed the quality of the highway network that serves each flow. The focus here was on quality (i.e., standard of road defined by grade separation, speed, etc.) and not quantity (i.e., how many lanes are needed to accommodate a theoretical flow). The team also analysed rail journey times between these Built-Up Areas to assess the quality of rail service provided between these areas.

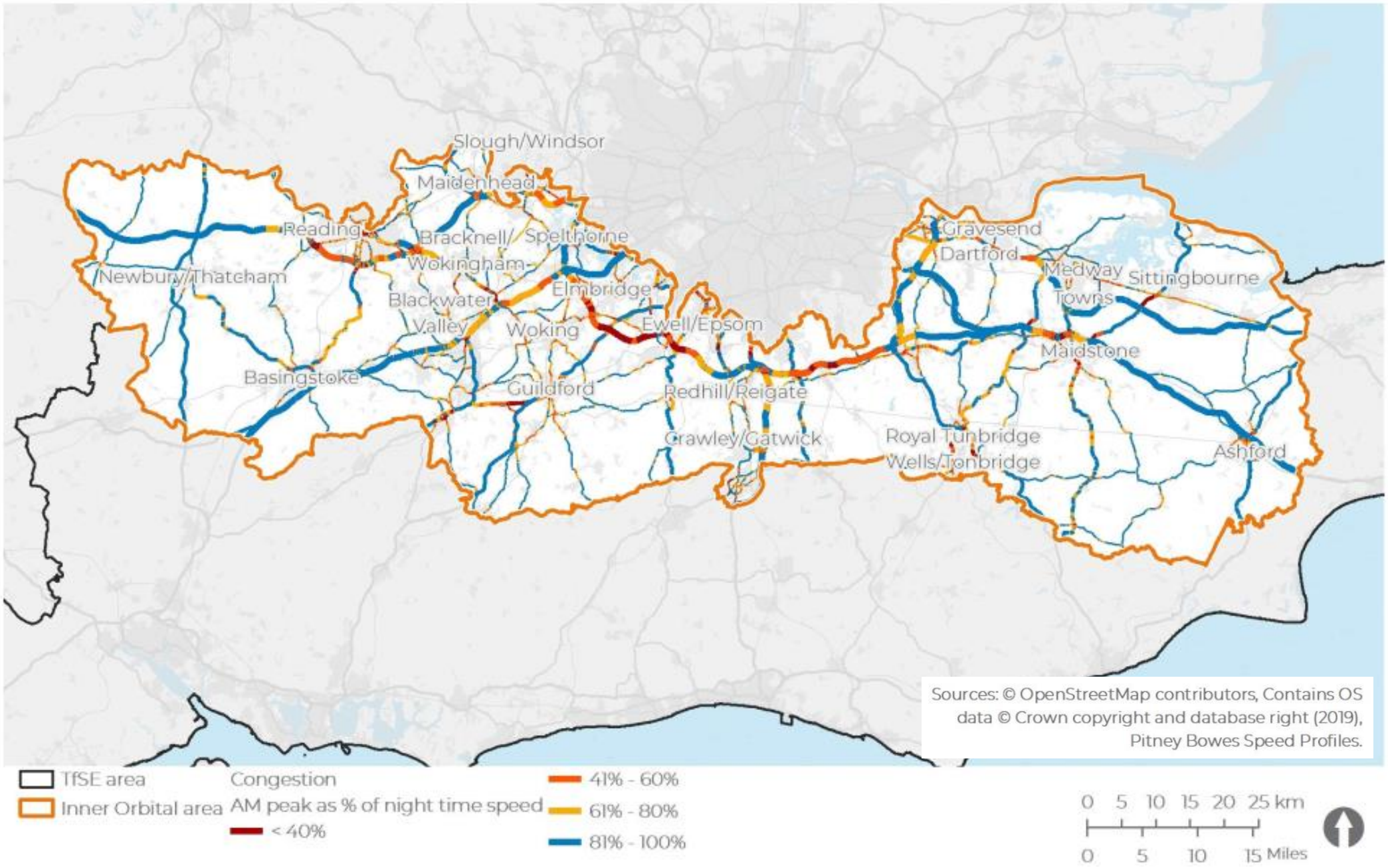
A second Regional Gravity Model was developed focusing on flows within the TfSE area.

The project team identified several population centre pairs that theoretically have a high latent demand, due to their proximity, but are not served by high quality roads. When also accounting for peak journey times, it was noted congestion on roads as you approach major centres were a large issue for several population centres including Reading, Slough, Maidenhead.

Stakeholders in this area desired solutions which made the most of the existing infrastructure.

- **This included addressing outstanding issues along the M25 South West Quadrant by making the most of smart technology. The goal should be to provide resilience and support freight.**
- **This also included re-envisaging the role of A roads connecting the M3 and M4, such as the A33, A332, A329 (M), A339 and A321. They should support long-term multi-modal solutions that deliver a better strategic highway between Major Economic Hubs.**

Figure 3.4 : Highway network and congestion



Future Challenges and Opportunities

Housing and population

The Inner Orbital area is expected to accommodate significant housing growth in the next local plan period (up to 2035).

Future housing growth is expected to be concentrated around Medway, Maidstone, Ashford, Crawley/Gatwick, Reading, Elmbridge, Guildford and Basingstoke. While much of this growth will occur in peri-urban settings, it will be critical that developments are supported with active travel and public transport connections. This will ensure that individuals can travel sustainably to their places of work and residence without relying on private transport.

Employment

Employment growth within the area is expected to be more concentrated within the city centres of the larger urban areas, focussing on Guildford, Elmbridge, Woking and Medway.

Overall, it will be important to provide good public transport and active travel connections from peri-urban locations to city centres and transport hubs. This will ensure that Major Eocnomic Hubs will grow more sustainably, enjoying economic prosperity and an increased quality of life for all residents.

Risk of Imbalance

There is a risk of imbalance between housing and employment locations that may give rise to unsustainable outcomes.

There is a risk that concentrating housing developments in more rural areas, while employment is based within the urban area, may generate more demand by private vehicle. While housing is imperative, and to ensure housing that is both affordable and accessible is built, given the physical and environmental constraints of the area, some areas will be better placed to absorb housing than others.

COVID-19

COVID-19 has significantly altered established working patterns – but the long-term impact is not yet clear.

There may be an emergence of a new pattern of working which will need to be considered. To ensure established employment space is used effectively, good public and active transport connections from peripheral locations to city centres is needed. This will ensure these cities enjoy economic prosperity and improved quality of life.

Need for Intervention

If no plans are made to address the issues in the Inner Orbital Area, then many of the socioeconomic challenges will likely persist.

The current pipeline of highway and rail schemes being delivered through the Road Investment Scheme (RIS) and rail investment programmes should help address short-term capacity and connectivity charges.

However, in the longer term, the focus should shift away from adding highway capacity (planning for vehicles) and instead focus on investing in public transport services (planning for people) and promoting policies such as integrated land use and transport planning (planning for places).

The Inner Orbital Area Study will need to provide a framework for managing the future challenges and leveraging the future opportunities summarised here. The following four pages present the Vision, Objectives, and Problem Statements for the Inner Orbital Area.

Vision

TfSE's Transport Strategy for the South-East sets out an ambitious vision for a sustainable, high performing, net-zero transport system. We have applied this vision to the Inner Orbital area to develop a vision statement for this area.

TfSE Vision Statement

By 2050, the South East of England will be a leading global region for net-zero carbon, sustainable economic growth where integrated transport, digital and energy networks have delivered a step change in connectivity and environmental quality.

A high-quality, reliable, safe and accessible transport network will offer seamless door-to door journeys enabling our businesses to compete and trade more effectively in the global marketplace and giving our residents and visitors the highest quality of life.

Inner Orbital Vision Statement

We will leverage technology and behavioural change paired with the economic assets of high growth, high value industries, international gateways and proximity to London to deliver carbon neutrality, sustainable economic growth and improved opportunities for residents.

We will use integrated transport, digital, and energy networks and technologies to progress interventions that:

- Deliver strategic and local access and connectivity within the South-East and to the rest of the UK to ensure the needs of the Inner Orbital area's residents, businesses, visitors and international gateways are met;
- Facilitate increased interaction between major economic hubs to optimise knowledge sharing and collaboration opportunities;
- Support the creation of healthy, accessible and high-quality places where people are put first; and
- Provide cross-cutting solutions that support the development of sustainable communities, improve socioeconomic and health outcomes and capitalize on the successes of the corridor.

We will use innovative and exemplar delivery models, schemes, investment packages and funding mechanisms that – through tailored governance and funding models – support integrated high-quality, reliable, safe and accessible transport networks.

This will ensure that the businesses will thrive, trade effectively and maximise the opportunities of the corridor for residents, visitors and investors.

Objectives

A high performing, multi-modal transport system will ensure this study helps deliver the following six objectives:

Climate Change

Minimise disruption from climate change and move to net zero carbon by:

- Shifting travel from fossil fuel traction to non-carbon emitting traction;
- Encouraging active and sustainable transport modes;
- Reducing the need to travel; and
- Reducing fossil fuel dependent trips.

Safety

Reduce serious (KSI) collisions, allowing residents to live longer, healthier lives by:

- Embedding a safe systems approach into all planning and transport operations to achieve Vision Zero – zero fatalities or serious injuries; and
- Prioritising vulnerable users over less vulnerable users where there are conflicts.

Health and Wellbeing

Minimise adverse impacts on human health and promote healthy living by:

- Shifting from higher to lower polluting transport options (all modes);
- Minimising the impacts of transport-related air and noise pollution on people and local communities; and
- Creating better places in which to live work and visit.

Economy

Reduce poverty and boost prosperity for all residents by:

- Attracting investment in high growth, high value opportunities;
- Boosting productivity through better skills matching, knowledge sharing and agglomeration;
- Reducing costs for businesses; and
- Improving transport network resilience.

Society

Enable the "levelling up" of socioeconomic outcomes by:

- Increasing access to employment opportunities;
- Enabling residents to access affordable housing and services;
- Improving access for all members of society, especially individuals of reduced mobility; and
- Enabling deprived communities to attract investment and achieve more equitable socioeconomic outcomes.

Natural and Historic Environment

Protect and enhance the natural and historic environment by:

- Adopting the principles of biodiversity net gain / no-net loss;
- Avoiding interventions that adversely impact protected environments;
- Reducing the impact of transport operations on protected and historic environments; and
- Improving public and active mode transport to protected environments.

Problems Statements

Global issues

1. Transport is not decarbonising fast enough
2. Climate change threatens the resilience of transport networks
3. There is substantial economic disparity in the area
4. Housing affordability presents a barrier to achieving social equity objectives
5. There is a need for better coordination between land-use and transport planning
6. Demand for public transport has been negatively affected by COVID-19

Rail

7. Orbital rail journey times are slow
8. Level crossings on orbital railway lines reduce the capability of the service provided
9. Orbital rail connectivity to Gatwick airport is poor
10. Orbital rail connectivity to Heathrow is poor
11. Infrastructure constraints in the area are a barrier to more freight being carried by rail
12. Rail capacity allocation prioritises radial journeys over orbital trips

Active Travel

13. Cycling accounts for a small proportion of commuting and business trips

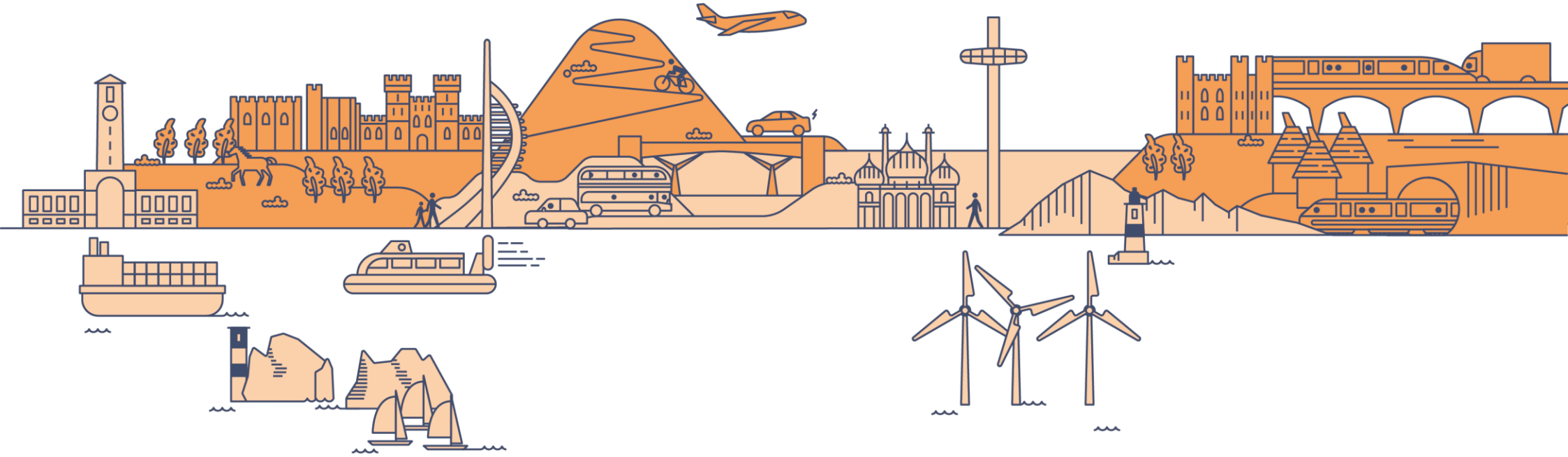
Urban and intra-urban transport

14. Urban highway congestion is a problem in several major economic hubs
15. The current transport network does not adequately provide for strategic local trips
16. In many areas, bus services do not provide a competitive sustainable alternative to cars
17. The benefits of Park and Ride infrastructure in the area could be better optimised

Highways

18. The M25 South West Quadrant is at capacity
19. The Lower Thames Crossing will increase congestion on the local highway network

A detailed description of each Problem Statement is provided in Appendix A



Part 4

Long List Generation and Assessment

Overview of Stage C

One of the key purposes of this report is to summarise the activities that were undertaken to deliver Stage C of the Inner Orbital Area Study.

Stage C comprised the following activities:

- Long List Generation
- Typology Assignment
- Long List Assessment
  - Strategic Assessment
  - Economic Assessment
  - Deliverability Assessment
- Package Development (Part 5)
- Package Modelling (Part 6)

In this Part of this report (Part 4) we describe how we approached and delivered the Long List Generation, Typology Assignment, and Long List Assessment activities listed above.

In Part 5 we outline how the results of the Long List Assessment were used to develop Packages, and in Part 6 we describe how these packages were modelled.

Early Assessment and Sifting Tool

Our approach to delivering this Stage of the Inner Orbital Area Study was developed in line with DfT's WebTAG guidance and Early Assessment and Sifting Tool (EAST).

WebTAG describe EAST as follows:

"EAST is designed to be consistent with Transport Business Case principles. It is a decision support tool that summarises and presents options in a clear and consistent format. It is used to assess and compare all types of transport options, packages, strategies and plans across all modes and geographies and is intended to provide decision makers with relevant, high level information to help them form an early view of how options perform against key criteria relative to each other."

While this is by nature a high-level approach, the Project Team is confident it represents the right level of proportionality for the nature (and number) of interventions under consideration.

Multi Criteria Analytical Framework

A Multi-Criteria Analytical Framework (MCAF) spreadsheet was developed and used as an early assessment and sifting tool for this study.

The MCAF was designed to help TfSE develop viable packages of interventions (groups of interventions based around a geographical area and/or transport mode), that could be tested through modelling for performance assessment.

The MCAF was used to sift out options that perform well on either a strategic, economic or deliverability assessment.

While only high-level information for each intervention is available at this early stage of option identification and assessment, the analysis formed a view on the performance of interventions based on best available data and evidence.

The MCAF tool developed for this study has also been fully quality assured and will be used to support the four other studies in the TfSE Area Studies Programme.

Long List Generation and Typology Categorisation

Long List Generation

An initial Long List of interventions and options was developed from a wide range of sources.

Suggested interventions were drawn from input from the Project Team, desk research, interviews with Tier 1 stakeholders, and a workshop with Tier 2 stakeholders.

Interventions were only excluded from the Long List if they:

- did not primarily address movements relevant to the Inner Orbital Area;
- were not considered to be at sufficient scale to have regional significance (i.e., a specific, small-scale cycle intervention);
- were already under construction; and/or
- did not pass a basic 'common sense' feasibility test (i.e., if they were based on an unproven technology).

In total, 160 options (interventions or sub-interventions) were included in the Long List. These covered a wide range of topics including highway interventions, MRT, rail interventions and strategic mobility hubs.

Typology Assignment

Given the long list of interventions and the evidence available, interventions and options were grouped into typologies.

This approach was adopted to provide a more efficient and transparent scoring and review process. The typology categories – which generally reflect modal and/or infrastructure categories are as follows:

- Highway infrastructure
- MRT Level 1 - Provision of direct bus services of at least 4bph
- MRT Level 2 - Bus service improvements and implementation of infrastructure and priority measure
- New BRT/LRT
- New Highway
- New Railway
- Railway alternative fuels
- Railway infrastructure
- Railway operations
- Road Toll
- Strategic Mobility Hubs

Long List Assessment

Once the long list completed, an assessment of the proposed interventions could be undertaken.

A Multi-Criteria Analysis Framework (MCAF) was developed to provide a qualitative assessment of the strategic fit, economic viability, and deliverability of the interventions included in the Long List. The goal was to use the MCAF to sift out interventions that do not perform well against an agreed set of criteria to produce a 'short-list' of interventions.

The MCAF included three discrete sifts:

- A **Strategic Assessment** that considered the alignment of each intervention with the Objectives of the study, as well as with wider public policy;
- An **Economic Assessment**, based on DfT's EAST framework; and
- A **Deliverability Assessment**, based on a set of criteria developed during the production of TfSE's Transport Strategy.

Strategic Assessment (1 of 3)

Strategic Assessment Typology Scores

The Strategic Case Assessment tests the extent to which each intervention fits with this study's Vision and Objectives.

Government business case guidance sets out the need for strategic cases to demonstrate how spending proposals fit in relation to national, regional and local policies, strategies and plans.

Each typology was assigned scores ranging from 1 to 5, where 1 represents a low fit with this study's Objectives, and 5 shows a high fit. **Table 4.1** shows the results of this scoring for each typology.

The score in the strategic assessment forms the base score for each typology. These are later adjusted to reflect the situational context of each intervention (see following page).

The scores reflect a relatively wide range. For example, Strategic Mobility Hubs do not perform as well under the Climate criteria as railway alternative fuels but do perform better than new highways.

Table 4.1: Typology Strategic Assessment

Typology	Objectives					
	Climate	Safety	Health	Econ.	Soc.	Env.
Road Toll	3	3	4	3	3	4
MRT Level 1	3	3	3	3	3	3
MRT Level 2	3	4	4	3	3	3
Highway infrastructure	1	2	1	2	2	1
New Highway	1	2	1	2	2	1
New BRT/LRT	3	4	4	3	3	3
New Railway	3	3	2	3	3	1
Railway infrastructure	3	3	2	3	3	2
Railway operations	3	3	2	3	3	3
Strategic Mobility Hubs	3	2	3	3	2	2
Railway alternative fuels	4	1	3	2	2	3

Strategic Assessment (2 of 3)

Strategic Assessment Adjustments

In addition to assigning a 'base score' based on typologies, further modifications to some interventions' scores were also made to reflect their characteristics and context.

While many interventions share similarities (and typologies), they are some important differences between them. For example, a new highway in or close to protected areas should receive a lower score for 'Environment' than a new highway in a brownfield site.

To reflect these distances, the Project Team applied modified some scores by applying adjustment factors. These are listed in **Table 4.2** to the right. The 'Adjustment factors' have been developed to enable the typology assessment process to differentiate interventions from each other taking into consideration their impact upon the immediate surrounding environment. The adjustment factors either 'add' or 'remove' a point from the base score. This enables for an accurate representation of the intervention on the surrounding area.

Table 4.2: Strategic Assessment Adjustment Factors

Adjustments applied if the intervention delivers any of the impacts listed below	Objectives					
	Climate	Safety	Health	Econ.	Soc.	Env.
Permanently undermines protected areas						-1
Temporarily undermines protected area						-1
Enhances access to international gateways				+1		
Reduces access to international gateways				-1		
Enhances placemaking	+1	+1	+1			+1
Undermines placemaking				-1	-1	
Supports housing development				+1	+1	
Significantly enhances regional connectivity				+1	+1	
Reduces regional connectivity				-1	-1	
Delivers other climate change benefits	+1					

Worked Example

A 'generic' **Strategic Mobility Hub** intervention would initially be assigned the following:

Typology	Objectives					
	Climate	Safety	Health	Econ.	Soc.	Env.
Strategic Mobility Hubs (Typology Score)	3	2	3	3	2	2

However, if the Strategic Mobility Hub enhanced regional connectivity, its score would be:

Typology	Objectives					
	Climate	Safety	Health	Econ.	Soc.	Env.
Strategic Mobility Hubs (Adjusted Score)	3	2	3	4	3	2

Strategic Assessment (3 of 3)

Alignment with Public Policy

A key component of the Strategic Assessment is to understand the extent to which each proposed intervention aligns with existing public policy.

Each intervention was assessed by the Project Team and members of the Inner Orbital Working Group for the alignment with national, local, and TfSE policy objectives.

Scoring was based on a scale of 1 to 5, with 5 representing high policy alignment and 1 representing low policy alignment. Lowest scoring interventions were typically those that contradicted policy objectives.

Table 4.3. to the right shows an example of the results for policy alignment scores.

National policy alignment scores reflect policies, strategies, and interventions promoted by national government, National Highways, and Network Rail. They also reflect alignment with National Policy Statements. Where MPs were known to hold strong views on an intervention, then this was also reflected in the score.

Local policy alignment scores reflect policies, strategies and interventions promoted by Local Transport Authorities, Local Planning Authorities, Local Enterprise Partnerships, national parks, and other protected landscapes. In some cases, there were differing views between these bodies. In these instances, we agreed an 'average' score to reflect these different perspectives.

Regional policy alignment scoring was developed by TfSE Officials with support from the advisor team. They were informed by the vision, objectives, and priorities set out in the *"Transport Strategy for the South East"* document that was formally adopted by TfSE in autumn 2020. In many cases there was significant variation between national, regional, and local policy alignment.

Table 4.3: Excerpt of Policy Alignment Scores

Intervention	Options	Policy Alignment		
		National	Local	Regional
Lower Thames Crossing	Highways England preferred option	3	2	4
Western Rail Link to Heathrow	New rail alignment to GWML (NR Preferred option)	3	2	5
	Alternative heavy rail options	3	2	5
	BRT/Light rail option from Heathrow to Berkshire	3	2	5
North Kent to South Kent new rail link	Upgrade existing infrastructure and support with small scale interventions	3	2	5
	New rail alignment between Faversham and Ashford	3	2	5
Reading to Basingstoke rail line upgrades	Electrification	4	3	5
	Passing loops	4	2	5
	Grazeley Garden town - new station	4	4	5

Economic Assessment (1 of 3)

Economic Assessment

The Economic Assessment aims to identify the nature and scale of the economic, environmental, and social impacts of each typology and intervention.

Typically, an EAST Economic Assessment uses a three-point Red-Amber-Green (RAG) score system. This approach was adopted in line with DfT's EAST guidance and reflects the high-level nature of scheme level evidence available at this stage of the study.

To align the EAST scoring system with the scale adopted for the Strategic Assessment, the RAG scores are recorded as follows:

- **Red**: poor alignment = 1
- **Amber**: moderate alignment = 3
- **Green**: good alignment = 5

The RAG scores provide a clear visual guide to the potential impact of typologies and interventions as can be seen in the tables in the following pages.

Economic Assessment Typology Scores

As with the Strategic Assessment process, the Economic Assessment involved assigning scores to criteria based on the typology of each intervention.

These criteria are as follows:

- **Economic Growth** – including connectivity, reliability, resilience of the network, facilitates the delivery of housing and provides good value for money in terms of social aspects.
- **Carbon** – including number of carbon units lost, efficiency (fuel consumption reduction), and impact upon embedded carbon;
- **Local Environment** – including impacts upon Air Quality, Noise, Natural Environment and Streetscape
- **Wellbeing and Social Impacts** – including impacts upon severance, physical activity, injuries, access, security and affordability.

Table 4.4. (overleaf) summarises the results of this assessment.

Economic Assessment (2 of 3)

Table 4.4: Typology Economic Assessment

Typology	Economic Growth					Carbon			Local Environment				Health and Wellbeing					
	Connectivity	Reliability	Resilience	Housing	Value for Money	Activity	Efficiency	Embedded Carbon	Air quality	Noise	Natural env.	Street scape	Severance	Physical activity	Injuries	Access	SDIs	Security
Road Toll	1	3	1	1	3	5	3	5	3	3	5	5	3	5	5	3	3	5
MRT Level 1	3	3	3	3	5	3	3	5	3	3	3	3	5	5	3	5	5	3
MRT Level 2	5	5	3	5	5	5	3	1	3	3	3	3	5	5	5	5	5	3
Highway infrastructure	5	5	5	5	5	1	1	1	1	1	1	3	3	3	3	3	3	3
New Highway	5	5	5	5	5	1	3	1	3	3	3	3	3	3	3	5	5	3
New BRT/LRT	5	5	3	5	5	5	3	1	3	3	3	3	5	5	5	5	5	3
New Railway	5	5	5	5	5	5	3	1	5	3	3	3	5	5	3	5	5	5
Railway infrastructure	5	3	5	5	5	3	3	1	5	3	3	3	5	5	3	5	5	5
Railway operations	5	3	5	5	5	5	5	3	5	3	5	5	5	5	3	5	5	5
Strategic Mobility Hubs	5	5	5	5	5	3	3	3	5	5	5	5	5	5	5	5	5	5
Railway alternative fuels	1	1	1	1	3	5	5	5	5	3	3	1	1	1	1	1	1	1

Economic Assessment (3 of 3)

Economic Assessment Adjustments

As with the Strategic Assessment, some 'base scores' for some interventions were adjusted to reflect their context.

The same adjustment factors were used as within the strategic sift. However, in order to receive an adjustment, a more significant step-change was required in some places.

For example: to receive an adjustment for 'enhancing access to an international gateway' the intervention needs to deliver 'step-change' in the quality of access provided. On the other hand, a new highway link that cuts through a national park would permanently undermine a protected area and receive a negative adjustment factor.

A summary of the adjustment factors applied in the Economic Assessment is provided in **Table 4.5** below.

Figure 4.5: Economic Assessment Adjustment Factors

Typology	Economic Growth					Carbon			Local Environment				Health and Wellbeing					
	Connectivity	Reliability	Resilience	Housing	Value for Money	Activity	Efficiency	Embedded Carbon	Air quality	Noise	Natural env.	Street scape	Severance	Physical activity	Injuries	Access	SDIs	Security
Permanently undermines protected areas											-2							
Temporarily undermines protected area											-1							
Enhances access to international gateways	+1																	
Reduces access to international gateways	-1																	
Enhances placemaking						+1					+1	+1		+1	+1		+1	+1
Undermines placemaking												-1	-1			-1		
Supports housing development				+1				-1								+1		
Significantly enhances regional connectivity	+1	+1	+1										+1			+1		
Reduces regional connectivity	-1	-1	-1										-1			-1		
Delivers other climate change benefits						+1	+1		+1									

Deliverability Assessment (1 of 3)

Deliverability Typology Scores

The Deliverability Assessment aims to identify the key attributes that affects the likelihood of an intervention being developed, funded, and delivered.

The criteria used for this assessment is also based on DfT's EAST framework.

Evidence to inform this assessment was drawn from a variety of sources, including existing comparable schemes, national/ regional/local scheme information, Subject Matter Expert opinion, and publicly available information.

Most of the interventions and options included in the long list were at an early stage of development and therefore lacked detailed evidence such as cost estimates. To manage this evidence gap, the Project Team undertook a benchmarking exercise a compared proposed interventions to recently delivered 'similar' schemes. This exercise drew on the expertise of Project Team's Subject Matter Experts.

The Deliverability Assessment scores assigned to the typologies is provided in **Table 4.6** to the right.

Figure 4.6: Typology Deliverability Assessment

Typology	Objectives						
	Capital Cost	Value for Money	Affordability	Timescale	Technical Risk	Acceptability	Evidence Base
Road Toll	4	4	4	5	4	4	4
MRT Level 1	3	3	4	3	3	4	4
MRT Level 2	5	3	4	5	5	4	4
Highway infrastructure	3	3	4	5	4	3	3
New Highway	2	3	3	3	3	3	3
New BRT/LRT	3	3	4	3	3	4	4
New Railway	2	2	3	2	2	4	2
Railway infrastructure	2	2	3	3	2	4	3
Railway operations	3	4	4	4	4	5	3
Strategic Mobility Hubs	2	4	4	3	4	4	3
Railway alternative fuels	4	3	3	3	4	4	3

Deliverability Assessment (2 of 3)

Approach to Deliverability Assessment

Given the range of criteria used for the Deliverability Assessment, the scoring system required a different approach for each criteria.

Capital Costs

Capital cost has been assessed based upon known infrastructure banding as follows:

- £0 – 20m = 5;
- £20m – £50m = 4;
- £50m - £250m = 3;
- £250m - £1bn = 2;
- > £1bn = 1.

Value for Money

In order to assess at a high-level the potential Value for Money of interventions, a decreasing magnitude scoring approach has been applied. Those projects which would cost significant amounts of funding (such as Nationally Significant Infrastructure Projects) score lower than those with smaller budgets.

Affordability

Affordability was assessed against the likelihood that funding can be provided. It considers the attractiveness of project to delivery partners to provide funding, and whether there is a need for additional funds from non-government sources.

Timescales

Timescale bands covered short term (considered those that would be delivered within five years), medium term (delivered within five to fifteen years) ,and long-term (greater than fifteen years beyond the Local Plan end date) in line with Local Plan needs.

As such, these operate on a three-point score system of

- Long term = 1;
- Medium term = 3; and
- Short term = 5.

Technical Complexity

Technical complexity has been assessed and scored based upon existing, comparable schemes and whether it is likely to be 'more' or 'less' complex than other schemes in that typology. 'Riskier' projects were assigned lower scores than less risky projects.

Acceptability

For the base typology scores, it was assumed that those interventions with smaller budgets are more likely to be developed, funded and supported by both the general public and politicians than those of a much greater scale of impact.

Evidence Base

Finally, the Project Team reviewed the evidence base informing the development of each proposed intervention. Those interventions that can cite projects that have been successfully delivered in the UK were awarded higher scores than those supported by 'thinner' evidence bases.

Deliverability Assessment (3 of 3)

Deliverability Adjustments

A different set of criteria were also used to adjust Deliverability Typology Assessments base scores.

Adjustment factors for the deliverability case have been centered around 'high' versus 'low' assessment. They focussed on whether the typology would initially have a higher or lower adjustment (i.e., capital cost, affordability, timescale) than the base-score assigned. For example, a rail tunnel scheme is more likely to have a higher cost overall than rail line improvements.

A summary of the deliverability assessment adjustments is provided in **Table 4.7**.

Adjustments to the Acceptability criteria input score are closely linked with the policy alignment scoring derived in the Strategic Assessment. The base score for this criteria is aligned within how well it performs in policy alignment. It is then adjusted for whether it performs positively or negatively against support from stakeholders, the public and/or politicians.

Table 4.7: Deliverability Assessment Adjustments

Typology	Objectives						
	Capital Cost	Value for Money	Affordability	Timescale	Technical Risk	Acceptability	Evidence Base
Capital cost: High Cost	-1						
Capital cost: Low Cost	+1						
Expected Value for Money: High Value for Money		+1					
Expected Value for Money: Low Value for Money		-1					
Affordability: High affordability			+1				
Affordability: Low affordability			-1				
Timescale: Short Timescale				+1			
Timescale: Long Timescale				-1			
Technical complexity/Risk: High Complexity/Risk					-1		
Technical complexity/Risk: Low Complexity/Risk					+1		
Acceptability: High Acceptability						+1	
Acceptability: Low Acceptability						-1	
Evidence: Good Evidence							+1
Evidence: Low Evidence							-1

Assurance and Moderation

Technical Assurance

The results of each Assessment were reviewed by Technical Experts, TfSE, and key stakeholders at multiple points.

A Technical review of the assessment process was undertaken by the Project Team at several stages of the assessment. This ensured that the assessors were both adhering to the principles outlined within EAST and the Transport Appraisal Process. After assessment has been completed for each sift (strategic, economic, deliverability), the MCAF spreadsheet was audited and reviewed to ensure it was computing and recording results accurately.

The technical review also became an opportunity to discuss any issues in process or decision making and to justify and explain outcomes for interventions where there may have been debate. This information is entered into the MCAF comments log.

Following on from the internal technical assessment, the MCAF was then sent for review and moderation with stakeholders and TfSE.

Stakeholder Moderation

All Assessment Results were reviewed by TfSE and shared with Inner Orbital Area Study Working Group.

The Working Group did not propose any major changes to typologies or adjustments. Some members identified local issues that enabled the advisor team to 'boost' certain interventions. For example: it emerged that some highway interventions also included active travel elements and/or supported local housing developments, which enabled these interventions to be awarded higher scores for some criteria.

The Working Group proposed some changes to the policy alignment scores. This is to be expected, as the draft scores were based on published documents, whereas Working Group Members were able to provide insight on emerging/developing policy.

A high-level summary of the results of the MCAF Economic and Delivery Assessments were also presented to the Inner Orbital Area Study Working Group. No significant changes were proposed at this stage.

Park or Proceed Decision

Once the full outputs from the MCAF have been calculated, a final 'park' or 'proceed' manual assessment was undertaken.

In general, interventions were parked if they receive score of 2/5 or less for:

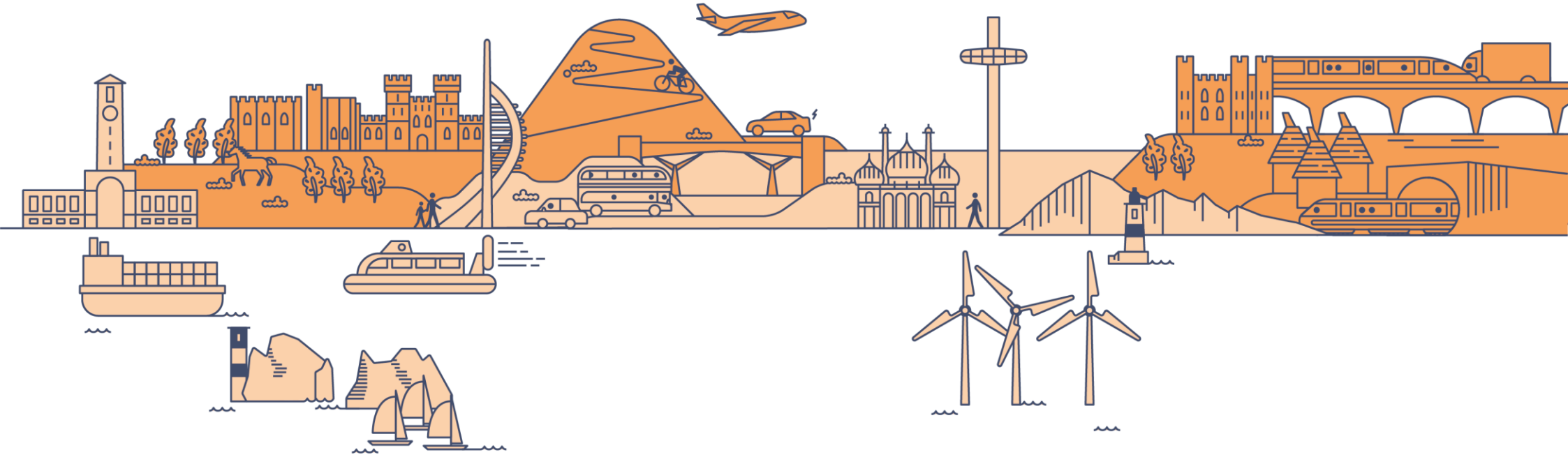
- **Policy alignment** (any score)
- **Strategic Sift** (average score)
- **Economic Sift** (average score)

Interventions with a **Delivery Sift** average score of 2/5 or less were not automatically ruled out at this stage.

For interventions that had multiple options, where one option clearly outperformed the others, the best scoring intervention was set as 'proceed' and all others as 'park'.

Interventions that had multiple options with similar (high) scores were marked as 'proceed (consider all/remaining options)'.

The results of the Long List Assessment are provided in the following Part. This Part also describes how the best performing interventions were combined to create 'Packages' of interventions.



Part 5

Package Development

Combined Approach to Package Development

A Top Down and Bottom Up View

TfSE has worked with key stakeholders and technical advisors to develop a set of coherent Packages that, together, are designed to deliver TfSE's vision and objectives for the Inner Orbital Area.

These Packages have been developed through workshops, discussions, and careful analysis of results of the assessment of the long list of interventions described earlier.

The Packages combine an overarching vision for the Inner Orbital area with the results of the Multi Criteria Analytical Framework.

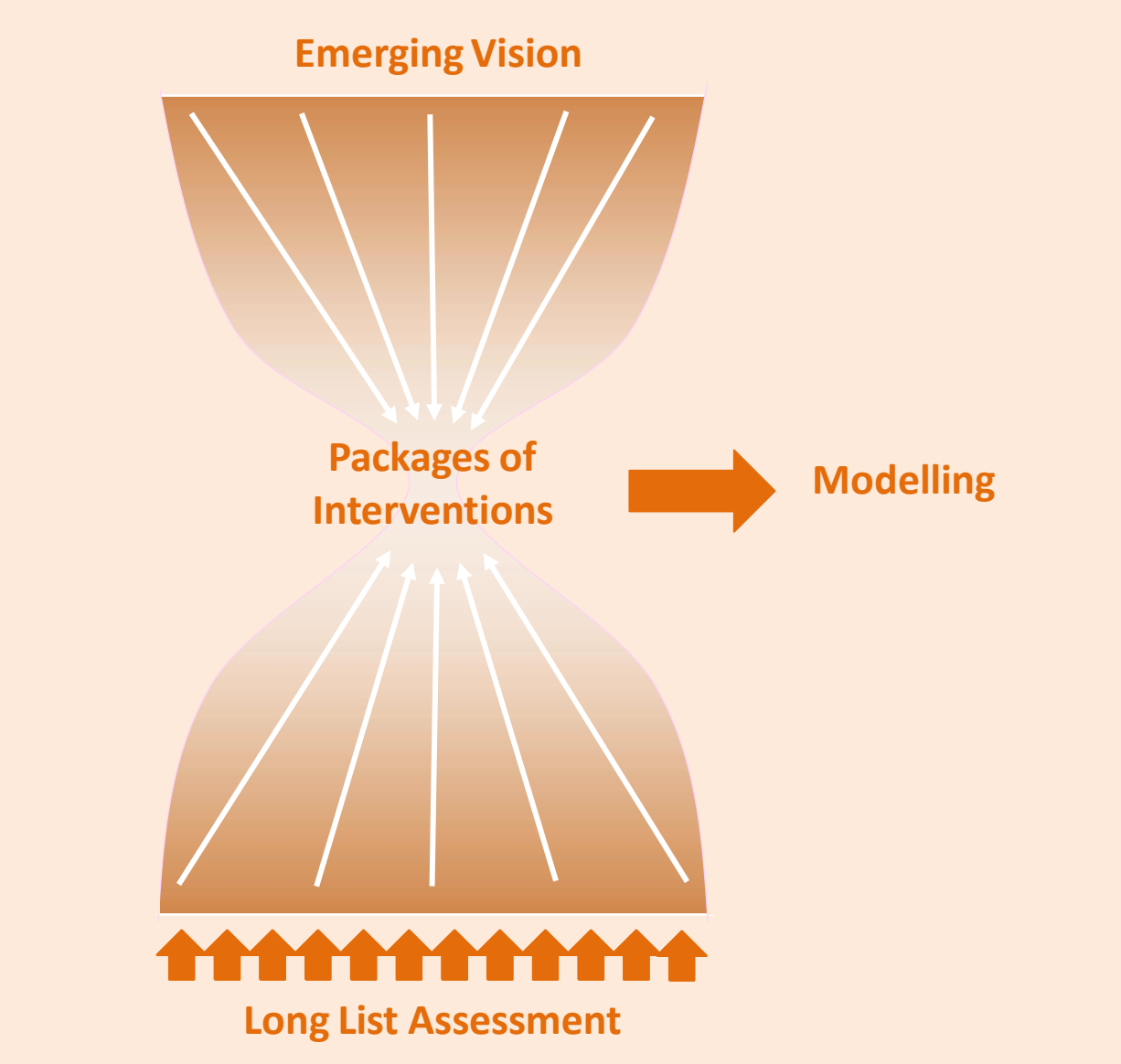
In essence, this reflects both a 'top down' i.e., vision led approach and a 'bottom up' i.e., individual intervention assessment approach.

A diagram in **Figure 5.1** to the right illustrates the essence of this combined approach.

In this Part (**Part 5**), we present both the Vision and Long List Assessment results.

In the following Part (**Part 6**), we present the results of the modelling of the Packages in our land use and transport model.

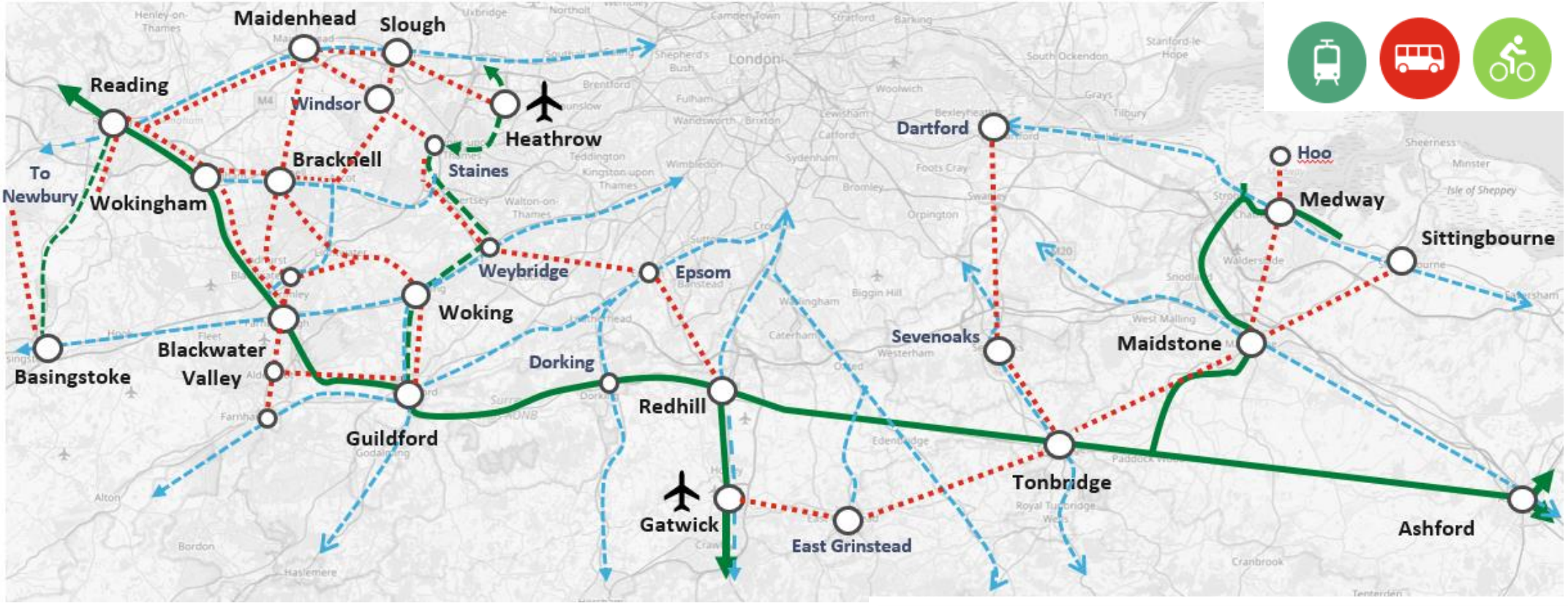
Figure 5.1: Approach to Package development



Vision for the Inner Orbital Area Study

By 2050 all Major Economic Hubs within the area will be quickly and efficiently connected into a high quality, sustainable, public transport network. The Primary Orbital Rail Arc will facilitate swift centre to centre connectivity, strategic mobility hubs will support seamless interchange with radial lines as well as the wider public transport network and bus based MRT and active mobility corridors will sustainably connect Major Economic Hubs into the Primary Orbital Rail Arc.

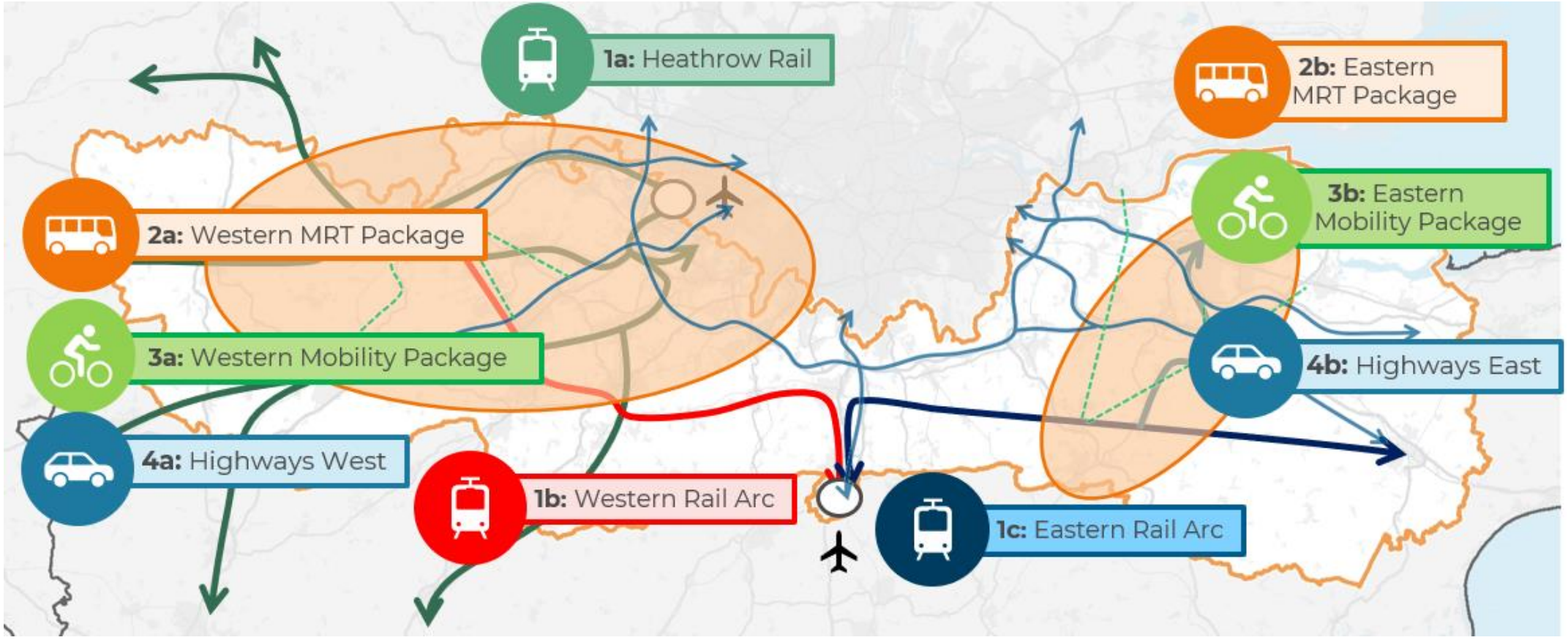
Figure 5.2: Vision for the Inner Orbital Area's transport system



Key Elements in the Vision

To deliver the vision outlined in the previous page, the Inner Orbital area will need to deliver improvements and changes to infrastructure, services, and policies across all transport modes. This will include delivering packages of rail, mass transit, active travel, and highways enhancements. The elements to be included in these packages is shown in **Figure 5.3** below.

Figure 5.3: Key elements supporting the Inner Orbital Area Study vision



Tables 5.1 – 5.7 in the following pages describe the composition of the 10 Packages that have been developed to deliver the vision for the Inner Orbital area. They present the results of the MCAF assessment and list the interventions recommended for further appraisal.

Major Railway Enhancements – Heathrow Rail

The first set of major railway enhancements within the Inner Orbital Area are aimed at improving heavy rail connectivity to Heathrow, providing a new direct rail connection between the airport and the Great Western Main line and South Western Main line.

Alternatives to a new direct heavy rail link and supporting rail infrastructure upgrades to accommodate new services have also been assessed.

As can be seen within Table 5.1, the heavy rail options on the table for a Western and Southern link perform well in Strategic and Economic assessment.

Table 5.1: Major Railway Enhancements Interventions – Heathrow Rail

Intervention	Option	Policy Alignment Scores			Average Assessment Scores			Park or Proceed?
		National	Local	TfSE	Strategic	Economic	Delivery	
Western Rail Link to Heathrow	New rail alignment between Heathrow and GWML (NR Preferred option)	✓✓✓	✓✓✓	✓✓✓✓	✓✓✓	✓✓✓	✓✓	Proceed (consider all options)
	Alternative heavy rail options	✓✓✓	✓✓✓	✓✓✓✓	✓✓✓	✓✓✓	✓✓	
	BRT/Light rail option between Heathrow and Berkshire	✓✓✓	✓✓✓	✓✓✓✓	✓✓✓	✓✓✓	✓✓	
Southern Rail Link to Heathrow	New rail alignment between Staines and Heathrow	✓✓✓	✓✓✓	✓✓✓✓	✓✓✓	✓✓✓	✓✓	Proceed (consider all options)
	Above + extension to Chertsey or Virginia Water	✓✓✓	✓✓✓	✓✓✓✓	✓✓✓	✓✓✓	✓✓	
	Alternative heavy rail options	✓✓✓	✓✓✓	✓✓✓✓	✓✓✓	✓✓✓	✓✓	
	BRT/Light rail option from Heathrow to Surrey	✓✓✓	✓✓✓	✓✓✓✓	✓✓✓	✓✓✓	✓✓	Proceed (consider all options)
	Western + Southern Rail service proposition	✓✓✓	✓✓✓	✓✓✓✓	✓✓✓	✓✓✓	✓✓	
Windsor links Programme	New heavy rail alignment connecting the two Windsor Branches	✓✓✓	✓	✓✓✓✓	✓✓	✓✓✓	✓	Park (difficult to deliver)
	Phase 2 of Windsor Links programme - connection to Heathrow	✓✓✓	✓	✓✓✓✓	✓✓✓	✓✓✓	✓	
	BRT/Light Rail option from Slough - Windsor - Spelthorne	✓✓✓	✓✓✓	✓✓✓✓	✓✓✓	✓✓✓	✓✓	Proceed (consider in package 2 as BRT)

Key to ticks

✓✓✓✓	Very high alignment (Scores above 4.4)
✓✓✓	High alignment (Scores between 3.5 – 4.4)
✓✓	Medium alignment (Scores between 2.5 – 3.4)
✓	Low alignment (Scores between 1.5 – 2.4)
✕	Works against objective (Scores less than 1.5)

Major Railway Enhancements – Inner Orbital Rail Arc

The other major railway enhancements within the Inner Orbital Area seek to improve East-West connectivity by building a fast, frequent and high capacity orbital rail arc which facilitates strategic, hub to hub connectivity.

Another focus was to provide an effective interface with radial rail lines to further induce patronage on the Orbital Rail Arc. Strategic mobility hubs, such as those at Guildford, Redhill, Maidstone, Reading, Ashford and Tonbridge will provide seamless interchanges between the primary orbital arc and the radial lines.

As can be seen within Table 5.2, Redhill Aerodrome Chord, Cuxton Chord and Ebbsfleet Southern Link, along with Passenger services to Hoo all score highly. The interventions that have been parked score poorly across policy alignment and delivery objectives.

Table 5.2: Major Railway Enhancements Interventions – Inner Orbital Rail Arc

Intervention	Option	Policy Alignment Scores			Average Assessment Scores			Park or Proceed?
		National	Local	TfSE	Strategic	Economic	Delivery	
Redhill Aerodrome Chord	Deliver a direct connection between the Brighton Main line and Tonbridge – Redhill line and a new station to serve a new development at Redhill Aerdrome.	✓✓✓	✓✓✓	✓✓✓✓	✓✓✓	✓✓✓	✓✓	Proceed (consider option in more detail)
Cuxton Chord	Cuxton Chord - Medway Valley line to Rochester	✓✓✓	✓✓✓	✓✓✓✓	✓✓	✓✓✓	✓	Park (difficult to deliver)
Medway Strategic Mobility Hubs (Cuxton and Strood)	Strategic Mobility Hubs in Cuxton and Strood to enable orbital rail/multi-modal connectivity between Medway and the rail arc	✓✓	✓✓✓	✓✓✓✓	✓✓	✓✓✓	✓✓✓	Proceed
Ebbsfleet Southern Link	Repurpose existing alignment and add new infrastructure to improve capacity/relief	✓✓✓	✓✓✓	✓✓✓✓	✓✓✓	✓✓✓	✓✓	Proceed in SER study
North Kent to South Kent new rail link	Upgrade existing infrastructure and support with small scale interventions	✓✓✓	✓✓✓	✓✓✓✓	✓✓✓	✓✓✓	✓✓	Proceed in SER study (consider remaining options)
	New rail alignment between Faversham and Ashford	✓✓✓	✓✓✓	✓✓✓✓	✓✓✓	✓✓✓	✓✓	
Passenger services to Hoo	Online Enhancements	✓✓✓	✓✓✓	✓✓✓✓	✓✓	✓✓✓	✓✓	Proceed in SER study
Reading to Basingstoke rail line upgrades	Electrification	✓✓✓	✓✓✓	✓✓✓✓	✓✓✓	✓✓✓	✓✓	Proceed in SWR study (consider all options)
	Capacity enhancement	✓✓✓	✓✓✓	✓✓✓✓	✓✓✓	✓✓✓	✓✓	
	New stations to support development between Reading and Basingstoke	✓✓✓	✓✓✓	✓✓✓✓	✓✓✓	✓✓✓	✓✓	

Western and Eastern Rail Arc

The aim for delivering the above options is to enable a fast and frequent service providing both local and limited stop services between Major Economic Hubs. Service frequency can be improved through increasing capacity, line speeds and journey time reliability (achieved through addressing bottlenecks at key junctions and removing level crossings).

Enabling Rail Interventions

The Inner Orbital programme of Enabling Rail and Station Improvements supports station, capacity and decarbonisation improvements along the Western and Eastern Arc.

Enabling Railway Interventions are aimed at providing environmental benefits through electrification, alternative fuel options and providing service level and line capacity improvements. A programme of Level Crossing Removals is designed to improve safety for both road users and the rail network.

The Railway Station Interventions seek to provide enhancements at each station that will provide a series of measures that include: increasing platform capacity, improved signalling, improved interchange, and timetable reconfigurations to reduce dwell times and to better facilitate orbital rail services.

The MCAF assessment has indicated that the Alternative Fuels option should be parked as it performs poorly within the economic case.

Table 5.3: Enabling Railway Interventions

Intervention	Option	Policy Alignment Scores			Average Assessment Scores			Park or Proceed?
		National	Local	TfSE	Strategic	Economic	Delivery	
Electrification of North Downs Line	Electrification	✓✓✓	✓✓✓	✓✓✓✓	✓✓✓	✓✓✓	✓✓	Proceed (consider remaining options)
	Alternative fuel options	✓✓✓	✓✓✓	✓✓✓✓	✓✓✓	✓	✓✓	Park
Programme of Level Crossing Enhancements	Programme of Level crossing enhancements	✓✓	✓✓✓	✓✓✓✓	✓✓	✓✓✓	✓✓	Proceed
Service level and line capacity improvements	Service level improvements along IO corridor arc	✓✓✓	✓✓✓	✓✓✓✓	✓✓✓	✓✓✓✓	✓✓✓	Proceed (consider all options)
	Line capacity improvements along IO corridor arc	✓✓✓	✓✓✓	✓✓✓✓	✓✓✓	✓✓✓	✓✓	
Guildford station upgrade	Station enhancements	✓✓✓	✓✓✓	✓✓✓✓	✓✓✓	✓✓✓	✓✓	Proceed
Redhill station upgrade	Station enhancements	✓✓✓	✓✓✓	✓✓✓✓	✓✓✓	✓✓✓	✓✓	Proceed
Tonbridge station upgrade	Station enhancements	✓✓✓	✓✓✓	✓✓✓✓	✓✓	✓✓✓	✓✓	Proceed
Dorking Deepdene upgrade	Station enhancements	✓✓✓	✓✓✓	✓✓✓✓	✓✓	✓✓✓	✓✓	Proceed

Station vs Enabling Enhancements

We have explored options that provide discrete improvements at key junctions which would act as strategic hubs and those enabling railway interventions that would provide a benefit across the corridors. Railway Station improvements score highly across policy alignment and on economic business case development, while enabling railway scores less on national policy.

Inter-urban Mass Transit and Mobility

TfSE and the Area Study Working Group believe the Inner Orbital is large enough and dense enough to support world class mass transit systems.

A series of inter-urban corridors connecting adjacent major economic hubs were defined across the Inner Orbital Area.

For each corridor, two levels of intervention were assessed:

- Level 1 – Bus service enhancements, supporting at least 4 buses per hour to enable a metro style turn up and go service.
- Level 2 – Where existing bus service and patronage is strong, consider options for bus priority measures and segregated bus rapid transit where appropriate to further improve the attractiveness of bus in serving inter-urban journeys.

At present, all of these interventions and options score well relative to each other and will be explored in further modelling.

Table 5.4: Mass Transit and Mobility Interventions

Intervention	Option	Policy Alignment Scores			Average Assessment Scores			Park or Proceed?
		National	Local	TfSE	Strategic	Economic	Delivery	
Maidenhead – Slough – Heathrow	Level 1	✓✓✓	✓✓	✓✓✓✓	✓✓✓	✓✓✓	✓✓✓	Proceed (consider all options)
	Level 2	✓✓✓	✓✓	✓✓✓✓	✓✓✓	✓✓✓	✓✓	
Reading – Wokingham – Bracknell – Ascot	Level 1	✓✓✓	✓✓	✓✓✓✓	✓✓✓	✓✓✓	✓✓✓	Proceed (consider all options)
	Level 2	✓✓✓	✓✓	✓✓✓✓	✓✓✓	✓✓✓	✓✓	
Maidenhead - Reading	Level 1	✓✓✓	✓✓	✓✓✓✓	✓✓✓	✓✓✓	✓✓✓	Proceed (consider all options)
	Level 2	✓✓✓	✓✓	✓✓✓✓	✓✓✓	✓✓✓	✓✓	
Maidenhead - Bracknell/Wokingham	Level 1	✓✓✓	✓✓	✓✓✓✓	✓✓✓	✓✓✓	✓✓✓	Proceed (consider all options)
	Level 2	✓✓✓	✓✓	✓✓✓✓	✓✓✓	✓✓✓	✓✓	
Slough/Windsor - Bracknell/Wokingham	Level 1	✓✓✓	✓✓	✓✓✓✓	✓✓✓	✓✓✓	✓✓✓	Proceed (consider all options)
	Level 2	✓✓✓	✓✓	✓✓✓✓	✓✓✓	✓✓✓	✓✓	
Reading - South Reading – Basingstoke	Level 1	✓✓✓	✓✓	✓✓✓✓	✓✓✓	✓✓✓	✓✓✓	Proceed (consider all options)
	Level 2	✓✓✓	✓✓	✓✓✓✓	✓✓✓	✓✓✓	✓✓	

Inter-Urban Active Mobility Corridors

For each of the corridors identified above which stand to benefit from bus-based Mass Rapid Transit, the project team have also considered a series of urban mobility interventions which increase the attractiveness of Active Travel. Innovations such as E-bikes now make cycling longer-distances between centres possible. Through providing segregated cycling infrastructure, there is opportunity to make these cycle trips safer, more accessible and faster for users. Inter-urban mobility corridors can also support cycling for leisure, enabling populations living in urban areas access to the North Downs and Surrey Hills Outstanding Areas of Natural Beauty. Lastly, they can support local placemaking, with new mobility infrastructure acting as the spine which supports a transformation of public places.

Inter-urban Mass Transit and Mobility

Interventions were developed based on existing plans and ambitions from local authorities, with the team generating and evaluating further options to increase the attractiveness of mass rapid transit.

A key aspect of the Inner Orbital Area vision was to ensure MRT interventions are integrated with the Orbital Rail Arc, as well as with other modes including active travel and new mobility choices. Therefore, many of the MRT schemes identified in Guildford and the Blackwater Valley seek to complement the North Downs line, serving local populations and providing interchange onto the strategic rail network.

There was also a focus on delivering MRT interventions where there was no orbital rail, such as along the Elmbridge, Epsom/Ewell and Redhill/Reigate arc. There is no direct road or rail link along this corridor, and Travel to work data reflects low travel demand. There is high potential for this corridor, however a lack of direct road makes delivering an attractive bus-based MRT more difficult than on other corridors.

Table 5.5: Mass Transit and Mobility Interventions

Intervention	Option	Policy Alignment Scores			Average Assessment Scores			Park or Proceed?
		National	Local	TfSE	Strategic	Economic	Delivery	
Blackwater Valley	Level 1	✓✓✓	✓✓	✓✓✓✓	✓✓✓	✓✓✓	✓✓✓	Proceed (consider all options)
	Level 2	✓✓✓	✓✓	✓✓✓✓	✓✓✓	✓✓✓	✓✓	
Wokingham - Blackwater Valley	Level 1	✓✓✓	✓✓	✓✓✓✓	✓✓✓	✓✓✓	✓✓✓	Proceed (consider all options)
	Level 2	✓✓✓	✓✓	✓✓✓✓	✓✓✓	✓✓✓	✓✓	
Bracknell - Blackwater Valley	Level 1	✓✓✓	✓✓	✓✓✓✓	✓✓✓	✓✓✓	✓✓✓	Proceed (consider all options)
	Level 2	✓✓✓	✓✓	✓✓✓✓	✓✓✓	✓✓✓	✓✓	
Woking - Guildford	Level 1	✓✓✓	✓✓	✓✓✓✓	✓✓✓	✓✓✓	✓✓✓	Proceed (consider all options)
	Level 2	✓✓✓	✓✓	✓✓✓✓	✓✓✓	✓✓✓	✓✓	
Woking - Blackwater Valley	Level 1	✓✓✓	✓✓	✓✓✓✓	✓✓✓	✓✓✓	✓✓✓	Proceed (consider all options)
	Level 2	✓✓✓	✓✓	✓✓✓✓	✓✓✓	✓✓✓	✓✓	
Guildford - Blackwater Valley	Level 1	✓✓✓	✓✓	✓✓✓✓	✓✓✓	✓✓✓	✓✓✓	Proceed (consider all options)
	Level 2	✓✓✓	✓✓	✓✓✓✓	✓✓✓	✓✓✓	✓✓	
Bracknell/Wokingham – Woking	Level 1	✓✓✓	✓✓	✓✓✓✓	✓✓✓	✓✓✓	✓✓✓	Proceed (consider all options)
	Level 2	✓✓✓	✓✓	✓✓✓✓	✓✓✓	✓✓✓	✓✓	
Slough/Windsor - Spelthorne	Level 1	✓✓✓	✓✓	✓✓✓✓	✓✓✓	✓✓✓	✓✓✓	Proceed (consider all options)
	Level 2	✓✓✓	✓✓	✓✓✓✓	✓✓✓	✓✓✓	✓✓	
Heathrow/Spelthorne - Elmbridge	Level 1	✓✓✓	✓✓	✓✓✓✓	✓✓✓	✓✓✓	✓✓✓	Proceed (consider all options)
	Level 2	✓✓✓	✓✓	✓✓✓✓	✓✓✓	✓✓✓	✓✓	
Elmbridge - Epsom/Ewell	Level 1	✓✓✓	✓✓	✓✓✓✓	✓✓	✓✓✓	✓✓✓	Proceed (consider all options)
	Level 2	✓✓✓	✓✓	✓✓✓✓	✓✓	✓✓✓	✓✓	
Epsom/Ewell - Redhill/Reigate	Level 1	✓✓✓	✓✓	✓✓✓✓	✓✓✓	✓✓✓	✓✓✓	Proceed (consider all options)
	Level 2	✓✓✓	✓✓	✓✓✓✓	✓✓✓	✓✓✓	✓✓	

Packages and Options Assessment Results (Package 2+3 – Mass Transit and Mobility)

Inter-urban Mass Transit and Mobility

There is a high potential for Integrated, bus-based Mass Rapid Transit in the Eastern end of the corridor, connecting the various centres of the Medway conurbation with Maidstone to the West and new or growing developments such as the Hoo Peninsula development.

With ambitious local plans which aim to greatly increase the number of homes and businesses in the area through new peri-urban developments, there is opportunity to ensure that these new developments are integrated with public transport from the outset, so that new people migrating to the area use public transport as the default option when choosing how they will get around and access urban centres.

Table 5.6: Mass Transit and Mobility Interventions

Intervention	Option	Policy Alignment Scores			Average Assessment Scores			Park or Proceed?
		National	Local	TfSE	Strategic	Economic	Delivery	
Maidstone – Medway – Hoo	Level 1	✓✓✓	✓✓	✓✓✓✓	✓✓✓	✓✓✓	✓✓✓	Proceed (consider all options)
	Level 2	✓✓✓	✓✓	✓✓✓✓	✓✓✓	✓✓✓	✓✓	
Royal Tunbridge Wells - Tonbridge - Maidstone	Level 1	✓✓✓	✓✓	✓✓✓✓	✓✓✓	✓✓✓	✓✓✓	Proceed (consider all options)
	Level 2	✓✓✓	✓✓	✓✓✓✓	✓✓✓	✓✓✓	✓✓	
Sittingbourne - Maidstone	Level 1	✓✓✓	✓✓	✓✓✓✓	✓✓✓	✓✓✓	✓✓✓	Proceed (consider all options)
	Level 2	✓✓✓	✓✓	✓✓✓✓	✓✓✓	✓✓✓	✓✓	
Dartford - Swanley - Sevenoaks	Level 1	✓✓✓	✓✓	✓✓✓✓	✓✓✓	✓✓✓	✓✓✓	Proceed (consider all options)
	Level 2	✓✓✓	✓✓	✓✓✓✓	✓✓✓	✓✓✓	✓✓	
Sevenoaks – Tonbridge - Royal Tunbridge Wells	Level 1	✓✓✓	✓✓	✓✓✓✓	✓✓✓	✓✓✓	✓✓✓	Proceed (consider all options)
	Level 2	✓✓✓	✓✓	✓✓✓✓	✓✓✓	✓✓✓	✓✓	
Winnersh Strategic Mobility Hub	Multi-modal mobility hub	✓✓	✓✓	✓✓✓✓	✓✓	✓✓✓✓	✓✓✓	Proceed
Mereoak (South Reading) Strategic Mobility Hub	Multi-modal mobility hub	✓✓	✓✓	✓✓✓✓	✓✓	✓✓✓✓	✓✓✓	Proceed
Farnborough Strategic Mobility Hub	Multi-modal mobility hub	✓✓	✓✓	✓✓✓✓	✓✓	✓✓✓✓	✓✓	Proceed
Guildford Strategic Mobility Hubs	Multi-modal mobility hub	✓✓	✓✓	✓✓✓✓	✓✓	✓✓✓✓	✓✓✓	Proceed
Maidstone Strategic Mobility Hub	Multi-modal mobility hub	✓✓	✓✓	✓✓✓✓	✓✓	✓✓✓✓	✓✓✓	Proceed

Multi-modal Strategic Mobility Hubs

The Strategic Mobility Hubs concept consist of upgrades to existing Park and Ride schemes and integrating active modes, with another aim of reducing highway trips in urban centres. Some options, such as Farnborough, comprise of a new strategic hub which also seek to integrate rail, improving the interchange between Orbital Rail, Radial Rail and MRT services.

Intra-urban Mass Transit and Mobility

Urban Mass Rapid Transport interventions provide enhanced service provision with optional priority measures and segregation, where appropriate.

A high quality, integrated bus based MRT strategy within each Major Economic Hub (MEH) made up of several local services operating at frequencies of at least four buses per hour will lead to a step-change in intra-urban bus provision, which strongly support the strategic and economic case for these schemes.

A key consideration of these interventions was investigating whether the key access roads into urban centres are appropriate for bus priority measures through re-allocating road space or re-designing junctions; and consider whether these would be well used by several intra- and inter-urban bus routes.

The potential for the proposed inter-urban and intra-urban interventions are being assessed in more detail through the TfSE bus service improvement plan workstream.

Table 5.7: Mass Transit and Mobility Interventions

Intervention	Option	Policy Alignment Scores			Average Assessment Scores			Park or Proceed?
		National	Local	TfSE	Strategic	Economic	Delivery	
Ashford MRT	Enhanced service provision with optional priority measures and segregation where appropriate	✓✓✓	✓✓✓	✓✓✓✓	✓✓✓	✓✓✓	✓✓✓	Proceed
Basingstoke MRT		✓✓✓	✓✓✓	✓✓✓✓	✓✓✓	✓✓✓	✓✓✓	Proceed
Blackwater Valley MRT		✓✓✓	✓✓✓	✓✓✓✓	✓✓✓	✓✓✓	✓✓✓	Proceed
Bracknell/Wokingham MRT		✓✓✓	✓✓✓	✓✓✓✓	✓✓✓	✓✓✓	✓✓✓	Proceed
Crawley/Gatwick MRT		✓✓✓	✓✓✓	✓✓✓✓	✓✓✓	✓✓✓	✓✓✓	Proceed
Dartford MRT		✓✓✓	✓✓✓	✓✓✓✓	✓✓✓	✓✓✓	✓✓✓	Proceed
Elmbridge MRT		✓✓✓	✓✓✓	✓✓✓✓	✓✓✓	✓✓✓	✓✓✓	Proceed
Epsom/Ewell MRT		✓✓✓	✓✓✓	✓✓✓✓	✓✓✓	✓✓✓	✓✓✓	Proceed
Gravesend MRT		✓✓✓	✓✓✓	✓✓✓✓	✓✓✓	✓✓✓	✓✓✓	Proceed
Guildford MRT		✓✓✓	✓✓✓	✓✓✓✓	✓✓✓	✓✓✓	✓✓✓	Proceed
Maidenhead MRT		✓✓✓	✓✓✓	✓✓✓✓	✓✓✓	✓✓✓	✓✓✓	Proceed
Maidstone MRT		✓✓✓	✓✓✓	✓✓✓✓	✓✓✓	✓✓✓	✓✓✓	Proceed
Medway Towns MRT		✓✓✓	✓✓✓	✓✓✓✓	✓✓✓	✓✓✓	✓✓✓	Proceed
Newbury/Thatcham MRT		✓✓✓	✓✓✓	✓✓✓✓	✓✓✓	✓✓✓	✓✓✓	Proceed
Reading MRT		✓✓✓	✓✓✓	✓✓✓✓	✓✓✓	✓✓✓	✓✓✓	Proceed
Redhill/Reigate MRT		✓✓✓	✓✓✓	✓✓✓✓	✓✓✓	✓✓✓	✓✓✓	Proceed
Royal Tunbridge Wells/Tonbridge MRT		✓✓✓	✓✓✓	✓✓✓✓	✓✓✓	✓✓✓	✓✓✓	Proceed
Sittingbourne MRT		✓✓✓	✓✓✓	✓✓✓✓	✓✓✓	✓✓✓	✓✓✓	Proceed
Slough/Windsor MRT		✓✓✓	✓✓✓	✓✓✓✓	✓✓✓	✓✓✓	✓✓✓	Proceed
Spelthorne MRT		✓✓✓	✓✓✓	✓✓✓✓	✓✓✓	✓✓✓	✓✓✓	Proceed
Woking MRT		✓✓✓	✓✓✓	✓✓✓✓	✓✓✓	✓✓✓	✓✓✓	Proceed

Intra-Urban Mobility Corridors

For each of the Major Economic Hubs identified, the project team assessed delivering new mobility innovations such as e-bike sharing schemes and supporting these with dedicated infrastructure which connect key destinations within the hub such as railway stations, schools, hospitals.

Strategic Highways - M25 and Major Orbital Highway Schemes

National Highways have worked with Local Transport Authorities to develop a package of improvements for the M25 and supporting highways.

These M25 schemes prioritised in this study are strategic schemes that best support inter-urban and long-distance journeys. Furthermore, they should look to either accommodate road freight, ensuring reliable movement of freight vehicles between the Channel and Solent Ports with the TfSE area and the rest of the country. Lastly, schemes that unlock new developments have also been considered.

Many of the schemes revolve around improving junctions along the M25. Generally, these highway schemes do not score well. Despite interfacing with the M25, many schemes are not strategic in nature and seek to serve local areas only. This does not align to the priorities of TfSE. Furthermore, many are difficult to deliver, hence they have not been assessed further using SEELUM.

Table 5.8: Strategic Highway

Intervention	Option	Policy Alignment Scores			Average Assessment Scores			Park or Proceed?
		National	Local	TfSE	Strategic	Economic	Delivery	
M25 Junction 1a - Dartford Crossing	Online enhancements	✓✓	✓✓	✓✓✓	✓✓	✓✓	✓✓	Proceed
M25 Junction 1a - Dartford Junction	Online enhancements	✓✓	✓✓	✓✓✓	✓✓	✓✓	✓✓✓	Proceed
M25 Junction 1a - Dartford additional road bridge	New alignment over A282 to support local traffic	✓	✓✓	✓✓✓	✓	✓✓✓	✓	Park
M25 Junction 2 - Dartford improvements	Online enhancements	✓✓	✓✓	✓✓✓	✓	✓✓	✓✓	Park
M25 Junction 5 – East facing slip road at Sevenoaks (Chevening)	Online enhancements	✓✓	✓✓	✓✓✓	✓	✓✓	✓✓	Park
M25 Junction 6/A22	Online enhancements	✓✓	✓✓	✓✓✓	✓	✓✓	✓✓	Park
M25 Junction 8 and A217 access to Reigate	Online enhancements to Juntion 8	✓✓	✓✓	✓✓✓	✓	✓✓	✓✓	Proceed in SCR study (consider all options)
	Above + online upgrades to A217 upgrades	✓✓	✓✓	✓✓✓	✓	✓✓	✓✓	
	Above + removal of Reigate level crossing	✓✓	✓✓	✓✓✓	✓	✓✓	✓✓	
M25 Junction 9 upgrades	Online enhancements	✓✓	✓✓	✓✓✓	✓	✓✓	✓✓	Park
M25 Junctions 10/A3 Wisley interchange	Online enhancements	✓✓	✓✓	✓✓✓	✗	✓✓	✓✓	Park
M25 Junction 11 and A320 North Corridor upgrades	Online enhancements to Junction 11	✓	✓✓	✓✓✓	✓	✓✓	✓✓	Park
	Online upgrades to A320 North Corridor	✓	✓✓	✓✓✓	✓	✓✓	✓✓	
M25 South West Quadrant Road Pricing	Road pricing	✓✓	✓✓	✓✓✓	✓✓	✓✓	✓✓✓	Proceed

Packages and Options Assessment Results (Package 4 – Highways)

Strategic Highways - Kent Strategic Highway Schemes

The proposed interventions in Kent centre around accommodating road freight and supporting ambitions of increasing freight movements between the Channel Ports.

The largest scheme assessed was the Lower Thames Crossing, which is already in an advanced stage of development.

Interventions which did not serve a sufficiently strategic purpose were not evaluated further.

Strategic Highways - M3/M4 Link Highway Schemes

A need for better highway connectivity between the M3 and M4 was identified by stakeholders.

However, poor alignment with national policy and difficulty in delivering a new fixed link meant alternative options were considered. These focussed on improving existing A roads in the area to better accommodate both local and strategic traffic, and support MRT and Active Travel interventions identified in Package 2 and 3.

Table 5.9: Strategic Highway

Intervention	Option	Policy Alignment Scores			Average Assessment Scores			Park or Proceed?
		National	Local	TfSE	Strategic	Economic	Delivery	
A225 Bat and Ball Junction upgrade	Online enhancements	✓✓	✓✓	✓✓✓	✓	✓✓	✓✓✓	Park
A227 road upgrades and A227/A25 and A227/A20 junction upgrades	Online enhancements	✓✓	✓✓	✓✓✓	✓✓	✓✓	✓✓✓	Proceed
A228/A26 upgrades - including Colts Hill roundabout	Online enhancements	✓✓	✓✓	✓✓✓	✓✓	✓✓	✓✓✓	Proceed
A249 Upgrades	Online enhancements	✓✓	✓✓	✓✓✓	✓✓	✓✓	✓✓	Proceed
A229 Blue Bell Hill junction upgrades	Online enhancements to M2 junction 3/M20 junction 6	✓✓	✓✓	✓✓✓	✓✓✓	✓✓	✓✓	Proceed
Lower Thames Crossing	Highways England preferred option	✓✓	✓✓	✓✓✓	✓✓✓	✓✓	✓	Proceed in SER Study
A33 road upgrades (Basingstoke to Reading)	Online enhancements	✓✓	✓✓	✓✓✓	✓✓	✓✓	✓✓	Proceed
A322 and A329(M) road upgrades	Online enhancements	✓✓	✓✓	✓✓✓	✓✓	✓✓	✓✓	Proceed
A339 road upgrades (Newbury and Basingstoke)	Online enhancements	✓✓	✓✓	✓✓✓	✓✓	✓✓	✓✓	Proceed
A321 upgrades (Blackwater Valley, Sandhurst, Wokingham)	Online enhancements	✓✓	✓✓	✓✓✓	✓✓	✓✓	✓✓	Proceed
New M3/M4 Link	New alignment	✓	✓	✓✓✓	✓✓	✓✓	✓	Park

Packages

Informed by the MCAF, the following packages have been developed to be subject to further modelling and assessment.

Package 1a: Heathrow Rail

- Western Rail Link to Heathrow
- Southern Rail Link to Heathrow

Package 1b and c: Western and Eastern Rail Arc

- Redhill Aerodrome Chord
- Medway Strategic Mobility Hub
- Electrification of North Downs Line
- Programme of Level Crossing Removals
- Service level and line capacity improvements
- Guildford station upgrade
- Redhill station upgrade
- Tonbridge station upgrade
- Dorking Deepdene station upgrade

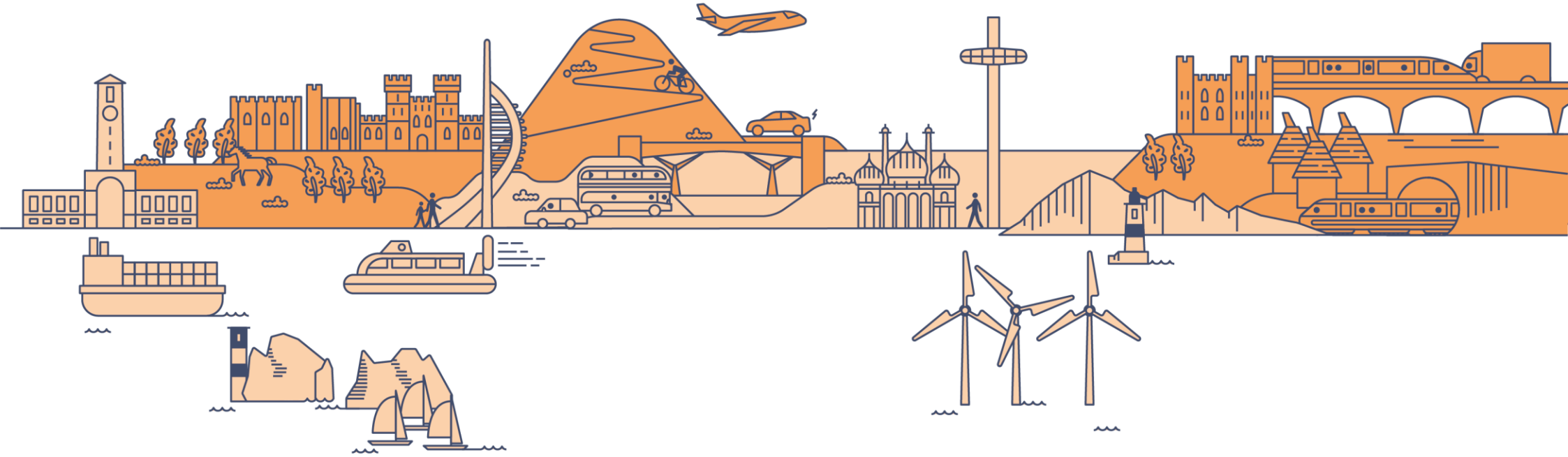
Package 2a and b, 3a and 4b: Mass Transit and Mobility

- Bus service improvements and infrastructure and priority measure where appropriate between all adjacent major economic hub pairs.
- Bus-based MRT networks for intra-urban connectivity in all major economic hubs in the area.
- MRT corridors to be delivered with high quality, segregated cycle infrastructure alongside.

Package 4: Strategic Highways

- M25 Junction 1a and Dartford local network enhancements
- A229 Blue Bell Hill
- Lower Thames Crossing –
- A227 road upgrades
- A228/A26 upgrades
- A249 Upgrades
- A321 upgrades
- A33 road upgrades
- A322 and A329(M)
- A339 road upgrades

Global Policy Package: To be defined separately but likely to include new mobility, rural connectivity, demand management, and accelerated decarbonisation interventions



Part 6

Package Modelling

Introduction to SEELUM (1 of 3)

Introducing SEELUM

In 2018, Transport for the South East commissioned Steer to develop a model to test the impact of the scenarios developed in support of the development of a Transport Strategy for the South East.

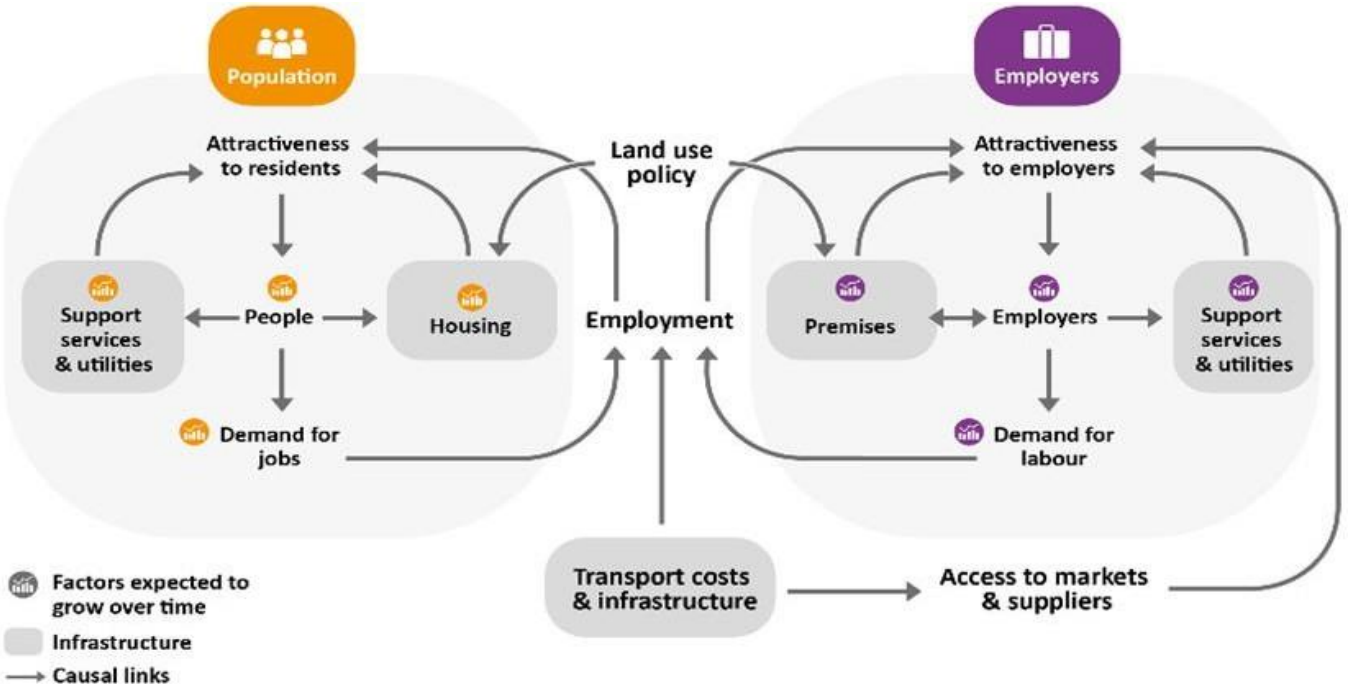
This model, known as the South East Economy and Land Use Model (SEELUM), is a transport and land use model that simulates the interaction of transport, people, employers and land-use over periods of time.

A high-level view of SEELUM is provided in **Figure 6.1** to the right.

Due to the geographical scope and inter-modal nature of the Area Studies, it has been agreed that SEELUM should be used to model the impacts of the Packages developed for this study on transport and socioeconomic outcomes over a 30-year period.

A map showing the zones included in the SEELUM model is provided in Figure 6.2 overleaf.

Figure 6.1: SEELUM

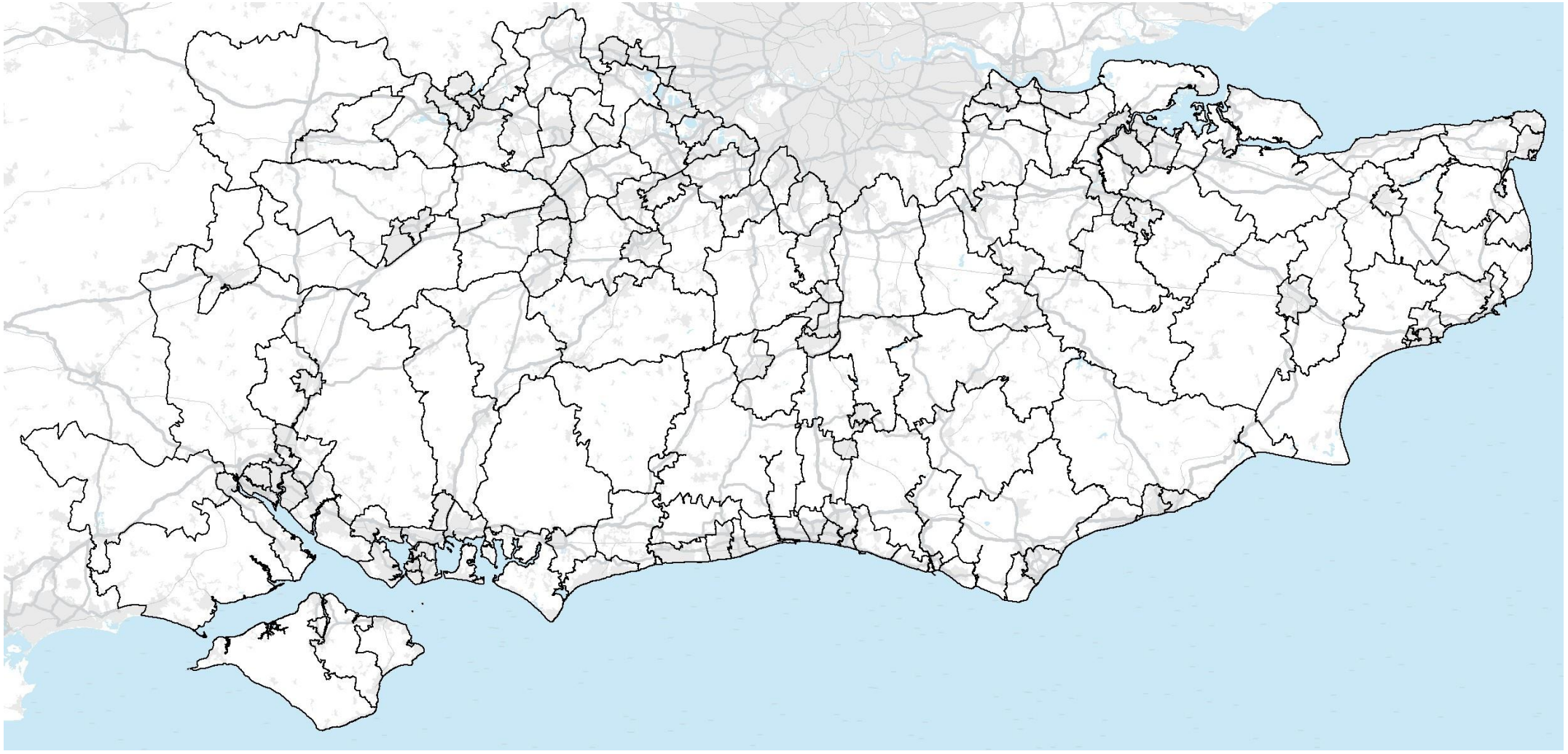


SEELUM produces detailed reports on:

- changes in land-use in each zone (i.e., housing units and employment premises);
- changes in households, population and the workforce in each zone;
- changes in employment (jobs filled) in each zone and the unemployment rates;
- changes on CO_2 emissions from transport activity;
- travel patterns, volumes and mode shares; and
- time savings benefits for appraisal and impacts on productivity and agglomeration.

Introduction to SEELUM (2 of 3)

Figure 6.2: SEELUM Zones



Introduction to SEELUM (3 of 3)

SEELUM's Capabilities and Functions

SEELUM tests how investment in transport, coupled with changes to land-use policy, affects transport outcomes and the economic performance of the South East.

It does this by simulating how changes in patterns of connectivity and access affect how attractive different locations are for employers and/or households to locate in, how they respond to these changes, and what transport patterns arise from these changes. For example, if travel costs rise in a particular area (say, due to highway congestion), depending on the other options available, people may change their mode of travel, change where they live, or change where they work. In the extreme, if there are no other viable options to access work, people can become unemployed. Similarly, businesses can relocate to an area if transport costs reduce, increasing their accessibility to the workforce.

SEELUM also simulates how land use evolves over time. It considers how developers provide new housing, the inward and outward migration of households, and the start-up and closure of businesses.

SEELUM includes internal models of highways, bus and rail services, and walking and cycling networks. These all connect places together and influence their relative advantages as places to live or work.

SEELUM can incorporate planned land-use changes and investment in transport infrastructure or services.

SEELUM produces detailed reports on:

- changes in land-use in each zone (i.e., the number of housing units and number of employment premises);
- changes in households, population and the workforce in each zone;
- changes in employment (jobs filled) in each zone and the unemployment rates;
- changes on CO_2 emissions from transport activity; and
- travel patterns, volumes and mode shares; and
- time savings benefits for appraisal, and the wider economic impacts on productivity and agglomeration.

Modelling Packages in SEELUM

To model each Package in SEELUM, adjustments were made to:

- Generalised Journey Times (GJTs) within and between each zone (by mode); and
- Characteristics of links on the highway and railway network (notably capacity).

For example, to model an improvement in bus frequencies between Chichester and Bognor Regis, GJTs were reduced for bus between each town's respective SEELUM zone. To model an improvement to the Chichester Bypass, the capacity of the highway link in SEELUM that models this part of the highway network was increased.

The Packages were modelled in SEELUM from a base year of 2018 and run for 32 years to 2050. The results are presented as a comparison to a Business as Usual Scenario (BaU), which is based on the Department for Transport's National Trip End Model (NTEM) that also projects employment and population growth to 2050.

The following pages describe the results of this modelling exercise.

1a: Heathrow Rail

This Package is based on the delivery of two new rail links to Heathrow from the West and South. These schemes continue to be considered by Network Rail with support from local authorities within the TfSE area and aim to deliver significantt improvements in journey times to Heathrow through new direct links.

It is important to note how delivering this scheme would impact the current capacity and configuration of services on both the Great Western and South Western Main Lines. The modelling assumes that there is an assessment of existing services and new services can be introduced and optimised to maximise choices of destination and maintain frequency on key sectors of the railway.

It is also worth noting the need of this scheme will strongly depend on the future landscape of Heathrow, when and to what extent planned expansion of the airport is delivered.

Table 6.1: SEELUM Modelling Adjustments (Package 1a)

	Interventions	Impact and Benefits	Modelling Adjustments
Package 1a	**Western and Southern Rail Links to Heathrow**	The delivery of these schemes will vastly reduce the journey time for employees and passengers using Heathrow who currently have no direct rail access and have to typically backtrack via London or interchange with a bus option to access the airport. It is assumed the new links will support both the introduction of new local services from Heathrow to North Berkshire and Surrey, and facilitate direct or competitive interchange for longer-distance journeys between Heathrow and the rest of England.	This intervention has been modelled by applying the following GJT benefits to different types of rail journeys: • **25% reduction in GJT** for residents of North Berkshire who currently have no direct rail link and have to interchange at Hayes and Harlington or Paddington to access Heathrow. • **35% reduction in GJT** for residents of Woking or Spelthorne who have no rail link to access Heathrow. • **35% reduction in GJT** on new competitive rail links that are now possible such as Slough – Heathrow – Woking, better connecting North Berkshire with Surrey. • **25% reduction in GJT** for longer-distance journeys utilising the new Western link such as Heathrow to Bristol or Oxford, whereby passengers currently backtrack from London Paddington. • **35% reduction in GJT** for longer-distance journeys utilising the new Southern link such as Heathrow to Portsmouth or Southampton where there is no direct rail link.

** There are several options still on the table for how to best maximise the value of delivering both the Western and Southern links and would need to be considered in more detail if this intervention is taken forward.*

1b: Western Rail Arc service enhancements

This Package models the combined impact of delivering a number of identified interventions along the North Downs line between Reading, the Blackwater Valley, Guildford and Redhill.

The team are ambitious that there is opportunity to deliver service enhancements of up to 4 trains per hour along the North Downs line should all the interventions be delivered. These include increasing capacity and reliability through removing level crossings, optimising signalling at key junctions, introducing passing loops to enable faster services to overtake slower services, and improving line speeds through on-line infrastructure enhancements.

4 trains per hour would form the backbone of the Inner Orbital area transport vision and provide seamless connectivity between the Major economic Hubs of Reading, Wokingham, Bracknell, Blackwater Valley, Guildford, Redhill, Reigate and Gatwick Airport.

Table 6.2: SEELUM Modelling Adjustments (Package 1b)

	Interventions	Impact and Benefits	Modelling Adjustments
Package 1b	**Western Rail Arc service enhancements**	The modelling reflects a desired frequency of: • 2tph fast between Reading – BW Valley – Guildford – Dorking – Redhill – Gatwick • 2tph stopping between Reading – BW Valley – Guildford – Dorking – Redhill To achieve this service pattern, there are several identified interventions, including the decarbonisation of the North Downs line, level crossing removals, and station/junction improvements resulting in improved passenger interchange and faster crossing of services at Guildford, Redhill and Dorking Deepdene. It is anticipated the above interventions will reduce in-vehicle journey time and improve journey time reliability.	This intervention has been modelled by applying a 15% increase in capacity along the North Downs line between Guildford and Reading, realised through signalling, junction and line speed improvement. Additionally, **10-30% reduction in GJTs** have been applied on flows along the line. GJT improvements have been estimated by comparing the existing timetable of 1tph fast and 1tph stopping service on the North Downs line. These assumptions have been reviewed and iterated based on the nature of the zones which the line run through, for example, larger zones representing rural areas where there is a higher access/egress time have been accounted for when considering the percentage improvement. Other exemptions are applied where the step change in frequency improvement is less pronounced as the existing frequency due to parallel services between Reading-Wokingham and Reigate-Redhill already provide these links with good rail GJTs.

1c: Eastern Rail Arc service enhancements

This Package models the combined impact of delivering a number of identified interventions along the Redhill to Tonbridge, Tonbridge to Ashford and Medway Valley lines.

Currently, the quickest way to travel by rail between Gatwick and most of Kent is to travel via London. This is due to infrequent service along the Redhill to Tonbridge line and the need to interchange at least two times to travel past Tonbridge to other areas of Kent.

There is a vision to have direct, frequent services where possible providing seamless connectivity between Gatwick Airport and the Major economic Hubs of Tonbridge, Maidstone and Medway.

Table 6.3: SEELUM Modelling Adjustments (Package 1c)

	Interventions	Impact and Benefits	Modelling Adjustments
Package 1c	**Eastern Rail Arc service enhancements**	The modelling reflects a desired frequency between 2-4tph on some sections of the Eastern Rail arc which is currently typically served by just 1tph. Furthermore, the modelling reflects in-vehicle journey time reductions through line speed improvements, fewer waits at junctions and the delivery of other supporting infrastructure. To achieve this service increase, there are several identified interventions, modelling will reflect the GJT savings from direct and frequent new services which utilise the delivery of the Redhill Aerodrome. The modelling will also assume services can benefit from level crossing removals along the Medway Valley line, and from station/junction improvements at Tonbridge. This package also models the creation of Strategic Mobility hubs at Strood and Cuxton for quicker access to the Medway towns from the orbital rail line.	This intervention has been modelled by applying **10-50% reduction in GJTs** on flows along the line. The highest reductions occur between Gatwick, Redhill, Tandridge and Tonbridge, where frequency upgrades and the delivery of the Redhill Aerodrome chord will unlock a new direct connection which is significantly faster than the current rail service. Moving further away from Gatwick, the reductions applied are smaller to reflect that the alternative option of travelling via London between Medway and Gatwick will remain attractive even if a direct stopping service was implemented.

2: Mass Rapid Transit Corridors

This Package is based on the delivery of a range of bus-based mass rapid transit interventions that connect adjacent Major Economic Hubs within the Inner Orbital area.

Initially, this was split into two packages focusing on the Western and Eastern ends of the Inner Orbital Area.

There are two levels of intervention modelled, the first being an enhancement in a service offer, and the second level being introducing infrastructure bus priority measures.

Other factors such as strategic mobility hubs improving integration and aspects such as comfort have not been explicitly considered at this stage.

Table 6.4: SEELUM Modelling Adjustments (Package 2)

	Interventions	Impact and Benefits	Modelling Adjustments
Package 2	**Bus Based Mass Rapid Transit – Infrastructure bus priority and bus service enhancements**	Increases the speed, frequency, quality and reliability of bus services along the following flows: West (2a) • Maidenhead – Slough – Heathrow • Reading – Wokingham – Bracknell – Ascot • Blackwater Valley East (2b) • Maidstone – Medway - Hoo	These interventions have been modelled by: • **Reducing bus Generalised Journey Times (GJTs) by 30%** between and within all zones along the flows identified. The assumed reduction in GJTs mirrors those derived for comparable interventions between the Outer Orbital and South Central Area Study.
	Bus Based Mass Rapid Transit - Bus service enhancements	Increases the speed, frequency, quality and reliability of bus services within and between adjacent Major Economic Hubs. West (2a) • Maidenhead, Reading, Bracknell, Wokingham, Slough, Windsor, Reading, Basingstoke, Newbury, Thatcham, Blackwater Valley Woking, Guildford, Spelthorne, Elmbridge – Epsom, Ewell, Redhill/Reigate, Gatwick East (2b) • Tonbridge, Tunbridge Wells, Maidstone, Sittingbourne, Sevenoaks, Swanley, Dartford	These interventions have been modelled by: • **Reducing bus GJTs by 20%** between and within all zones along the flows identified.

3: Active Travel and Mobility Corridors

This Package includes a number of general interventions which aim to improve the quality of walking and cycling infrastructure, supported by a widely accessible cycle hire service. These include developing dedicated, segregated mobility corridors connecting important centres within Major Economic Hubs such as railway stations, schools and hospitals.

What is not explicitly modelled at this stage is the anticipated role of mobility corridors in enhancing local placemaking, which will further increase the attractiveness of active modes and encourage more people to travel for leisure.

These schemes will be implemented in parallel along the corridors identified in Package 2. It also reflects that local highway upgrades outlined in Package 4 will deliver Active Travel benefits where appropriate.

Table 6.5: SEELUM Modelling Adjustments (Package 3)

	Interventions	Impact and Benefits	Modelling Adjustments
Package 3	**Active travel and mobility corridors**	West (2a) • Maidenhead, Reading, Bracknell, Wokingham, Slough, Windsor, Reading, Basingstoke, Newbury, Thatcham, Blackwater Valley Woking, Guildford, Spelthorne, Elmbridge – Epsom, Ewell, Redhill/Reigate, Gatwick East (2b) • Tonbridge, Tunbridge Wells, Maidstone, Sittingbourne, Sevenoaks, Swanley, Dartford	These interventions have been modelled by: • **Reducing active travel GJTs by 10%** between and within zones identified in package 2 to reflect new cycling infrastructure. • Reducing **active travel GJTs by a further 10%** in urban areas where bike sharing schemes have been identified.

4: Strategic Highways West

This package targets a limited number of highway improvements in the Western part of the Inner Orbital area which aim to strengthen resilience, accommodate freight traffic, and better serve strategic hubs and growing developments.

The focus is on improving highway capacity between the M3 and M4 motorways. These upgrades have been proposed as an alternative to a new highway links.

They will facilitate inter-urban journeys between Major Economic Hubs area including Reading, Basingstoke, Newbury, Blackwater Valley, Wokingham, Bracknell and Woking. Therefore, they will unlock active travel and public transport benefits which have been reflected in Package 2 and 3.

Table 6.6: SEELUM Modelling Adjustments (Package 4a)

	Interventions	Impact and Benefits	Modelling Adjustments
Package 4a	**A321 upgrades (Blackwater Valley, Sandhurst, Wokingham)**	Online enhancements to improve regional connectivity between the Major Economic Hubs of Berkshire with North Hampshire and Surrey, providing an M3-M4 link which also supports bus and active travel infrastructure where appropriate (benefits of which are modelled in Package 2 and 3).	Highway link adjustment to reflect a 10% increase in capacity over A321.
	A33 road upgrades (Basingstoke to Reading)	Online enhancements to improve regional connectivity between Basingstoke and Reading, providing an M3-M4 link, also supporting new developments and bus and active travel infrastructure where appropriate (benefits of which are modelled in Package 2 and 3).	Highway link adjustment to reflect a 10% increase in capacity over A33.
	A322 and A329(M) road upgrades	Online enhancements to improve regional connectivity between the Major Economic Hubs of Berkshire with North Hampshire and Surrey, providing an M3-M4 link, also supporting bus and active travel infrastructure where appropriate (benefits of which are modelled in Package 2 and 3).	Highway link adjustment to reflect a 10% increase in capacity over A322/A329(M).
	A339 road upgrades (Newbury and Basingstoke)	Online enhancements to improve regional connectivity between Basingstoke and Newbury, providing an M3-M4 link, also supporting new developments and bus and active travel infrastructure where appropriate (benefits of which are modelled in Package 2 and 3).	Highway link adjustment to reflect a 10% increase in capacity over A339.

4: Strategic Highways East

This package targets a limited number of highway improvements in the Eastern end of the Inner Orbital area, supporting strategic highway movements in Kent. There is a focus on strengthening resilience, accommodate freight traffic (particularly in supporting freight movement from the Channel Ports), and to better serve strategic hubs and growing developments.

These interventions also unlock active travel and public transport benefits, these have been reflected in Package 2 and 3.

Lastly, the LTC was initially modelled in this package for this study, however, this has since been further developed and taken forward in the South East Radial Area study.

Table 6.7: SEELUM Modelling Adjustments (Package 4b)

	Interventions	Impact and Benefits	Modelling Adjustments
Packagee 4b	**M25 Junction 1a and improved access to Dartford Crossing from the South**	Improved access and flow of traffic from the South and across the Dartford Crossing.	Highway link adjustment to reflect 15% increase in capacity, speed and times over the Dartford Crossing.
	A229 Blue Bell Hill junction upgrades	Online enhancements along A229 and upgrades to M2 junction 3 and M20 junction 6 will improve traffic flow, specifically freight traffic between the Channel ports and the rest of England.	Highway link adjustment to reflect a 15% increase in capacity over the A229.
	A227 road upgrades	Online enhancements to improve regional connectivity between MEHs in Kent, improving resilience and reducing GJTs for highway, bus and active travel trips. Includes upgrades to junctions between A227/A25 and A227/A20.	2% reduction in GJTs for highway trips between Gravesham and Dartford and Sevenoaks, Tonbridge and Tunbridge Wells.
	A228/A26 upgrades	Online enhancements to improve regional connectivity between Tonbridge, Tunbridge Wells and Maidstone, improving resilience and reducing GJTs for highway, bus and active travel trips. This captures upgrades to including Colts Hill roundabout.	2% reduction in GJTs for highway trips between Maidstone and Tonbridge and Malling/Tunbridge Wells.
	A249 Upgrades	Online enhancements to improve regional connectivity between Sittingbourne and Maidstone, serving new housing developments and growth, and supporting bus and active travel infrastructure.	Highway link adjustment to reflect a 15% increase in capacity over A249

Modelling Results Overview

The following packages were modelled in SEELUM. A summary of the transport and subsequent socioeconomic outcomes from delivering these packages within the TfSE area generated in the year 2050 vs the business as usual scenario is provided in **Table 6.8**. below. A more detailed commentary on these results is provided in following pages.

Table 6.8: Modelling Results

Indicator	By Package									Combined
	1a Heathrow Rail	1b Western Rail Arc	1c Eastern Rail Arc	2a MRT West	2b MRT East	3a Active Travel West	3b Active Travel East	4a Strategic Highways West	4b Strategic Highways East	All All Packages
Transport Outcomes										
Δ Car Trips	(2,557)	(4,373)	(4,893)	(100,595)	(45,158)	(81,184)	(16,569)	4,398	34,361	**(216,570)**
Δ Rail Trips	9,573	11,212	8,049	(2,704)	(1,120)	(1,149)	(100)	(118)	(1,703)	**21,940**
Δ Bus Trips	(410)	(801)	(523)	181,149	71,825	(7,957)	(2,129)	(377)	(1,030)	**239,747**
Δ Active Trips	(1,864)	(3,017)	(1,501)	(70,549)	(24,300)	91,418	18,822	(1,405)	(4,038)	**3,566**
Δ Total Trips	4,742	3,021	1,132	7,301	1,248	1,129	24	2,499	27,589	**48,685**
Socioeconomic Outcomes										
Δ Population	838	463	291	2,578	470	350	31	(58)	1,152	**6,115**
Δ Employment	1,332	797	402	912	136	28	1	266	1,712	**5,586**
Δ GVA (£m)	298	175	54	152	24	19	1	70	110	**903**
Δ Carbon (KMTCD - Initial)	(6)	(3)	(4)	(52)	(31)	(41)	(9)	21	82	**(43)**
Δ Carbon (KMTCD - 2050)	(1)	(0)	(3)	(46)	(25)	(23)	(5)	19	76	**(8)**

Trips are presented as trips per typical weekday
Carbon is presented as thousand metric tonnes of carbon dioxide equivalents (KMTCD)

Modelling Results Overview

Package 1 (Strategic Rail)

The Rail package performs very well in increasing the number of rail trips along the Inner Orbital rail arc and supports more employees and passengers accessing Heathrow airport via a sustainable mode of transport. The packages combine to increase the number of local and strategic orbital rail trips in the Inner Orbital area by 27%.

The rail interventions perform well in increasing the attractiveness of Major Economic Hubs along the Inner Orbital Rail arc, attracting more employment opportunities which result in a GVA uplift of £527m per annum by 2050.

Many of these trips are abstracting intra-TfSE highway trips and will go a long way to reduce congestion along the M25 South West Quadrant, alleviating capacity for longer-distance strategic freight trips, which in turn will further deliver socio-economic outcomes for the TfSE region.

The SEELUM results provide evidence to pursue implementing the strategic rail interventions identified.

Package 2 (Mass Rapid Transit)

Mass Rapid Transit performs very well in the Western end of the area, where there are several densely populated Major Economic Hubs in proximity within Berkshire, North Hampshire and Surrey. The Eastern end of the area will also benefit from MRT interventions between Maidstone and Medway, supporting sustainable growth of new developments and ensuring connectivity to key services for the population.

The mass transit interventions include transformational, high quality Bus Rapid Transit in some areas, but for most of the area, the gains come from incremental improvement in bus services to four buses per hour along key corridors. Combined, these interventions would boost mass transit patronage by over 50% and remove over 240,000 daily car trips from the area's roads.

Additionally, they are forecast to make Major Economic Hubs across the corridor more prosperous place to live and work, translating to a GVA uplift of £176m by 2050.

Package 3 (Active Travel and Mobility)

This package, which seeks to implement new mobility initiatives such as rolling out shared e-bikes, support local and strategic cycling and enhance local "placemaking" successfully boosts active travel ridership,

However, the modelling does not reflect the full extent of wider economic benefits. The benefits of how cycling can make urban centres more attractive are not captured. The package does not perform well in reducing carbon, as they abstract from short car trips only.

Package 4 (Strategic Highways)

Highway interventions present a direct trade off between economic growth (driven by improved connectivity and resilience) and carbon emissions.

The Package that will likely be taken forward by TfSE will seek to strike a balance between these criteria. TfSE is developing interventions to help accelerate the decarbonisation of road vehicles and mitigate the adverse impacts of this Package.

Modelling Results

Figure 6.3 below presents the change in weekday trips that arise at the end of the modelling period (2050) for each of the Packages and modes in the scope of this study. As expected, rail, bus, and active travel interventions all generate higher demand for their respective modes. Mass transit and active travel are effective in reducing car trips.

Figure 6.3: Change in number of weekday trips by mode

Change in Intra-Inner Orbital Trips vs BAU 2050

BAU Rail trips = 105k

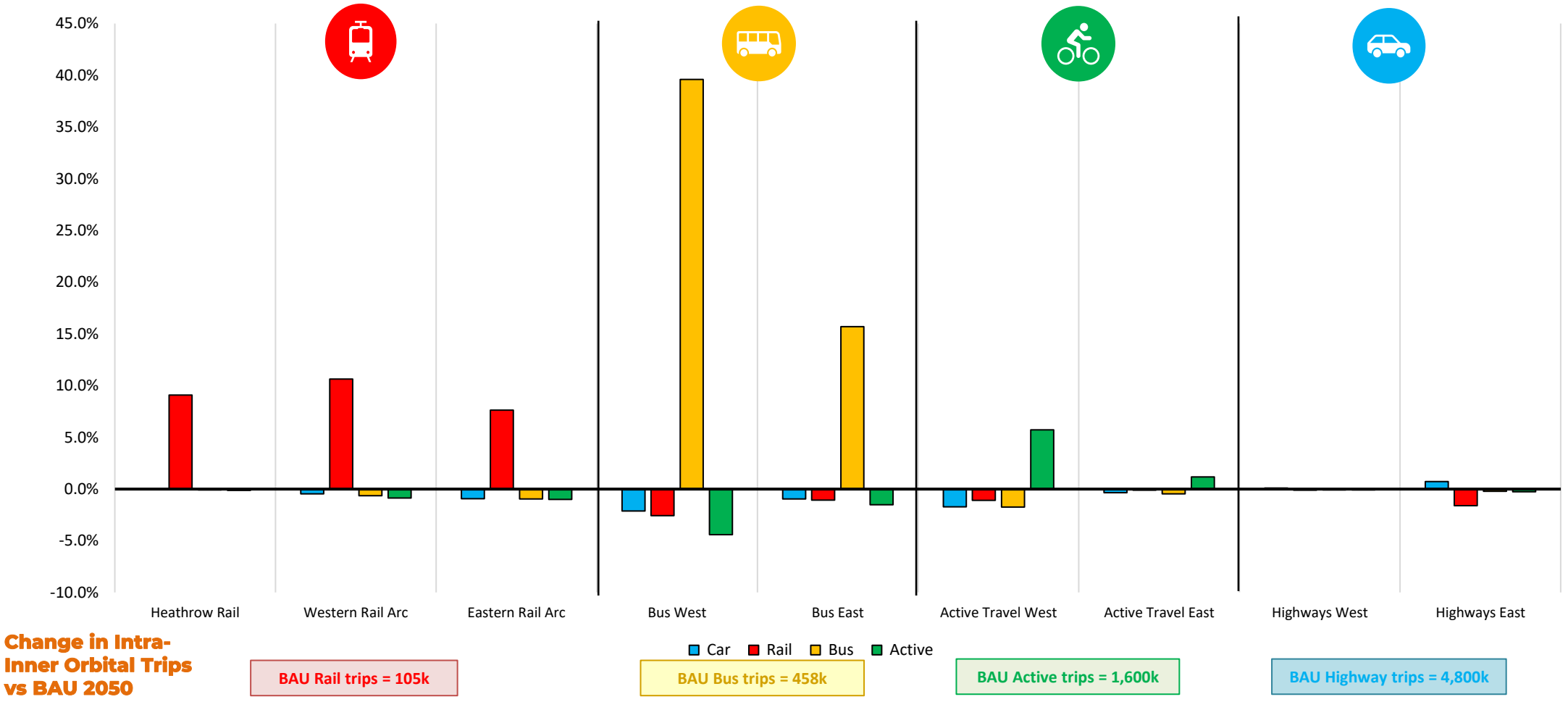
BAU Bus trips = 458k

BAU Active trips = 1,600k

BAU Highway trips = 4,800k

Figure 6.4. presents the same results as Figure 6.3 as a percentage of Business as Usual weekday trips. This highlights the relatively size of growth in rail and bus/mass transit trips that might be achieved if the Packages supporting these modes are delivered. It also highlights that the Strategic Highways Packages appear to have a negligible impact on car trips.

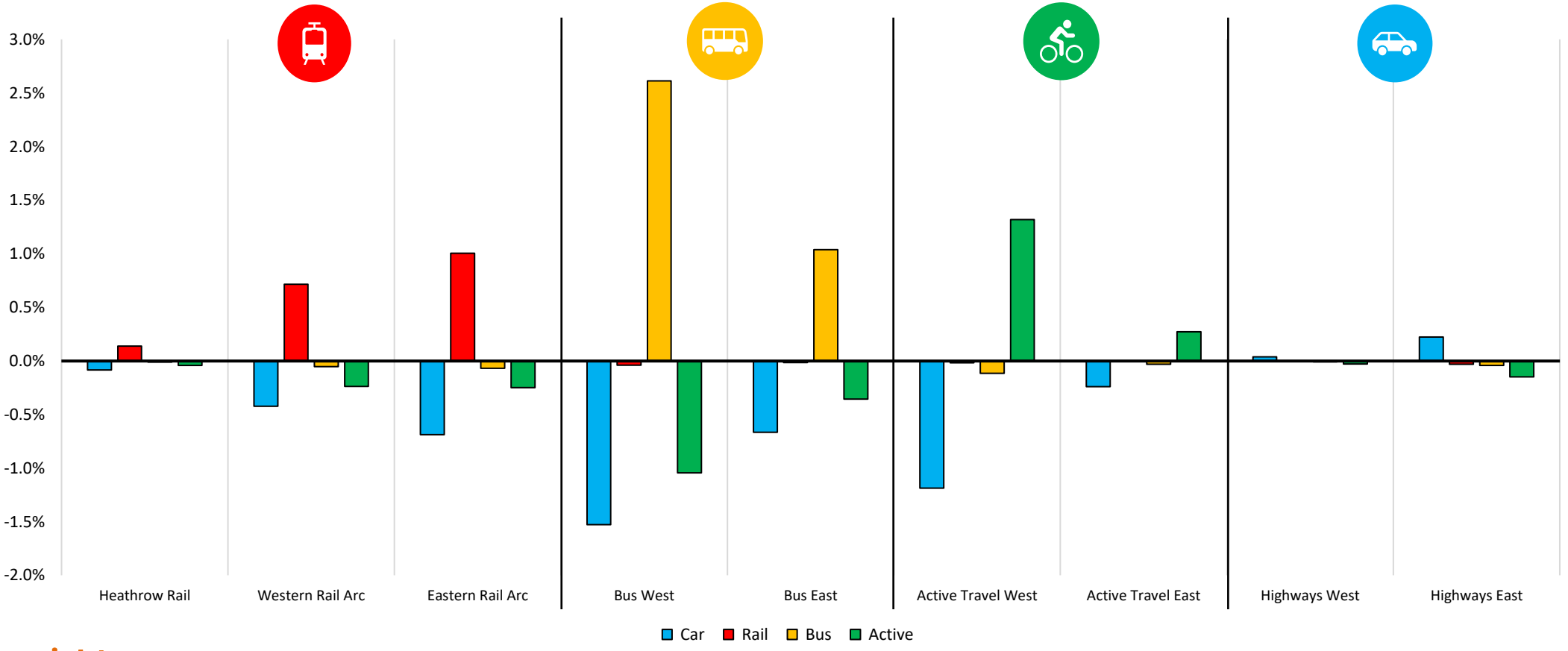
Figure 6.4: Change in weekday trips (%)



Modelling Results

Figure 6.5 presents the travel outcomes from the modelling as a mode share. Together, the Packages generate significant modal shift to mass transit, moderate modal shift to rail, very little (net) change to active travel, and a reduction in car's mode share.

Figure 6.5: Change in mode share (%)



Change in Intra-Inner Orbital Modal Share vs BAU 2050

BAU Rail Modal Share = 1.5%

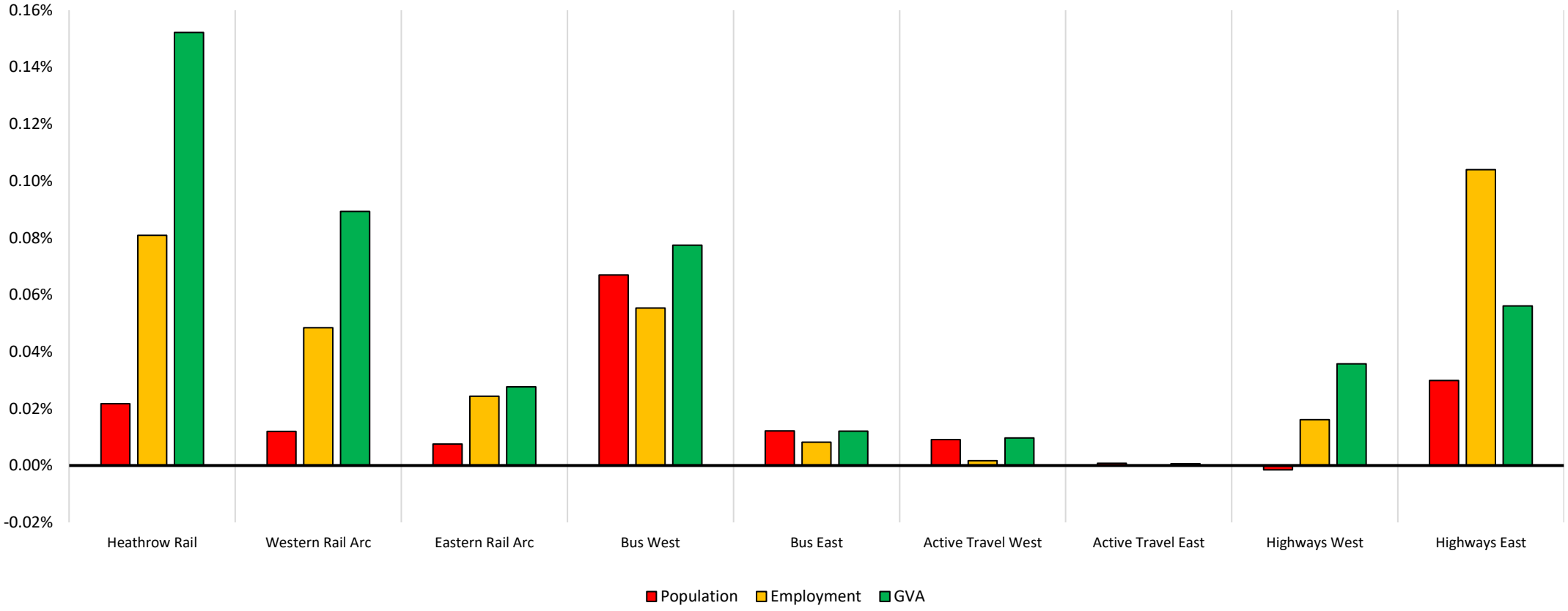
BAU Bus Modal Share = 6.5%

BAU Active Modal Share = 23%

BAU Highway Modal Share = 69%

Figure 6.6 summarises the socioeconomic outcomes forecasted in the year 2050 . Combined, they make Major Economic Hubs across the area more attractive places to live and work, increasing population and employment. This, along with the focus on increasing strategic connectivity between hubs, translates to a significant uplift in GVA.

Figure 6.6: Socioeconomic Outcomes



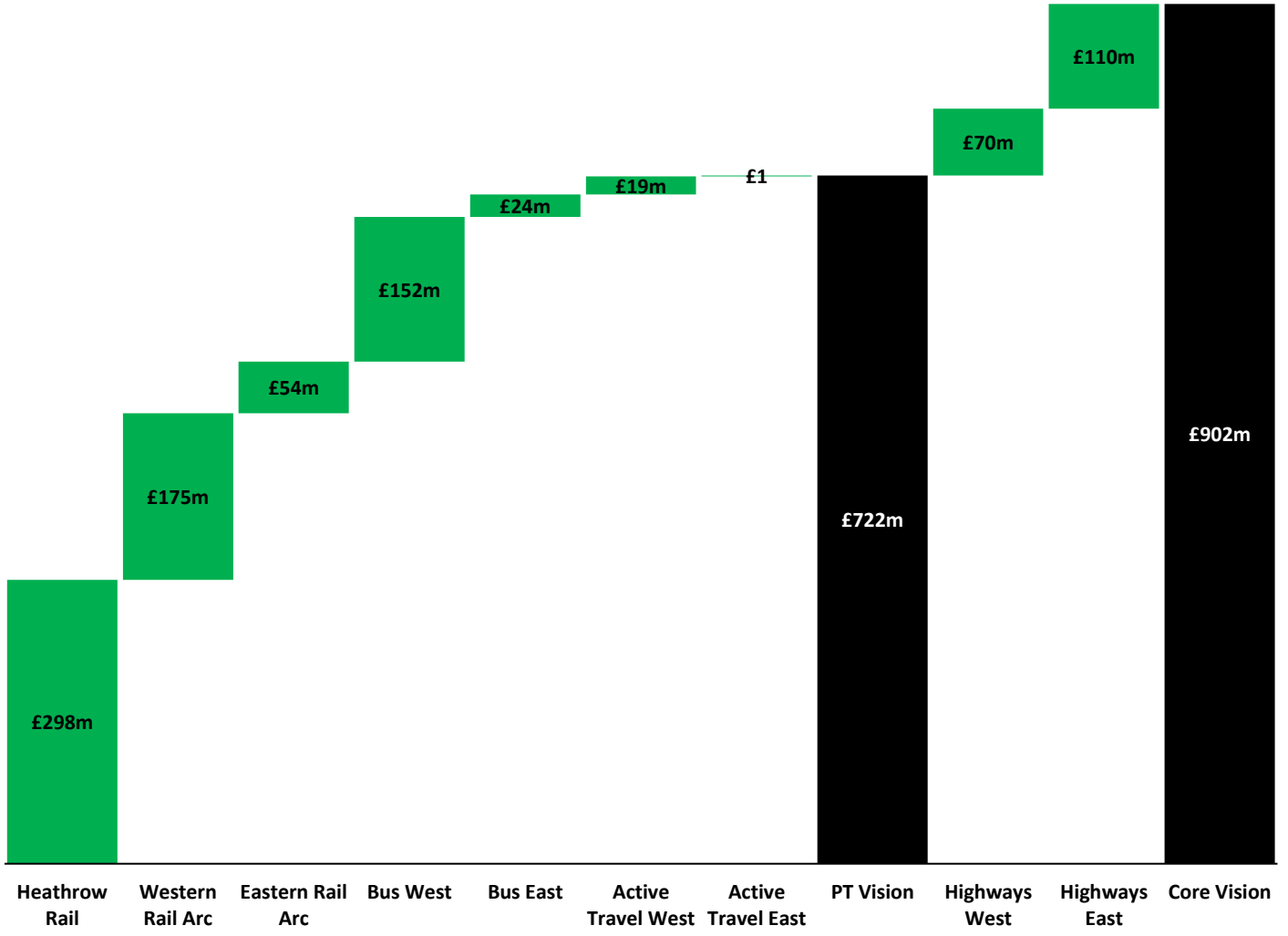
Gross Value Added (GVA)

Figure 6.7 presents the extent to which each of the packages contribute to GVA per annum in the Year 2050.

The largest contributors to GVA growth are the Strategic Rail Packages. This is expected as the rail package connects individually successful Major Economic Hubs together and provides synergies for further growth through increasing the potential catchment for businesses to attract workers, suppliers and consumers.

This evidence provides confidence that some of the more ambitious (and therefore costlier) elements of the Rail Package have the potential to generate significant wider economic benefits by 2050. This should help strengthen the case if/when they are considered through the Business Case framework.

Figure 6.7: Change in GVA arising from Packages (£m per annum in 2050)



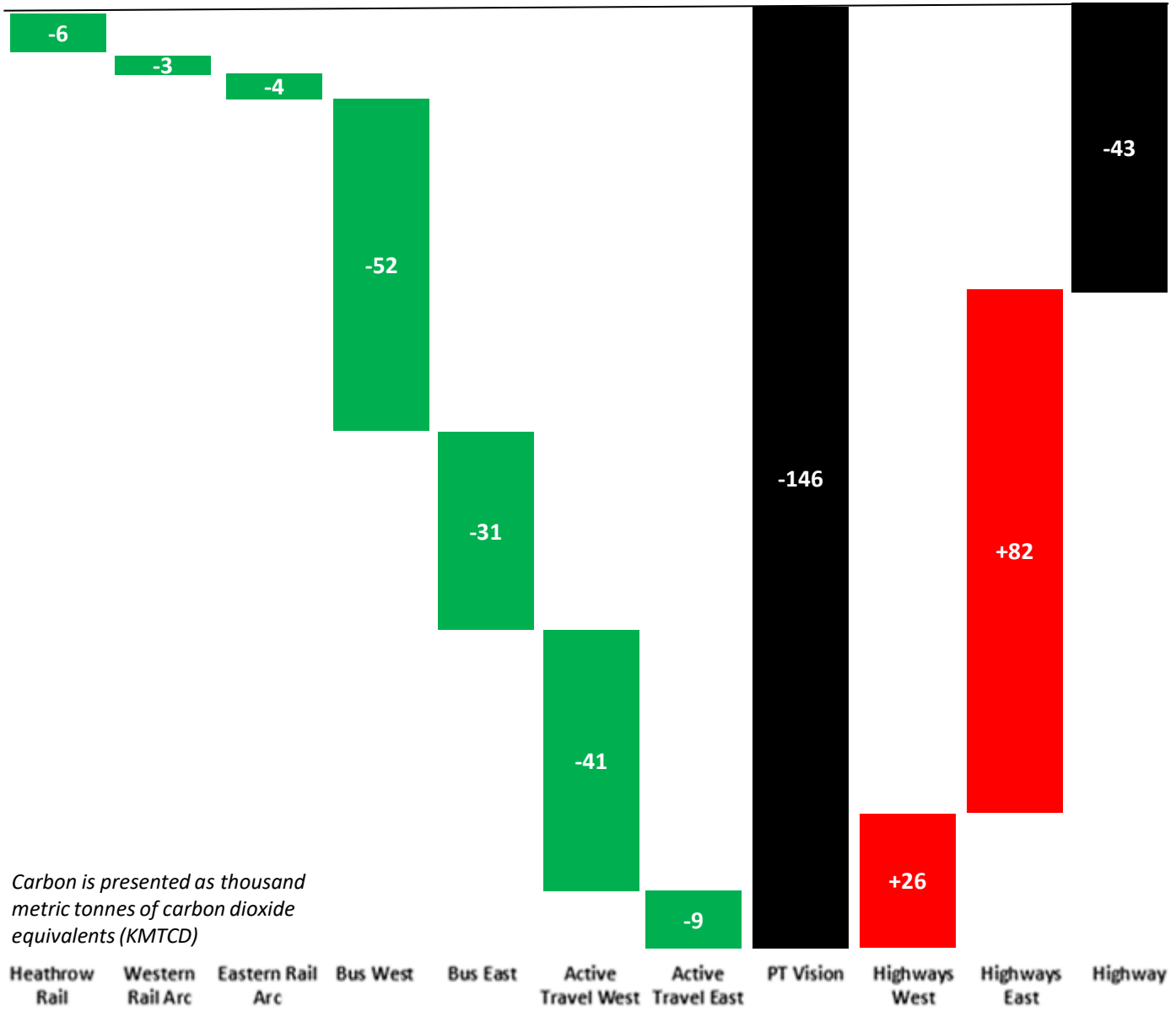
Carbon Emissions

Most Packages contribute to the Inner Orbital Area Study's goal of reducing carbon emissions. However, the Strategic Highways Package reduces most of the gains made through other interventions.

Figure 6.8 provides a breakdown of the contribution of the Packages towards decarbonisation. The greatest impact arises from the mass transit and active trave interventions. Rail has a more muted impact – partly because the interventions induce some longer distance demand, and partly because they generate greater economic activity, which in turn, can generate more carbon.

It is important to note that the model results shown in Figure 6.8 do not reflect global policy interventions that will also be included in TfSE's Strategic Investment Plan. These will be presented in due course. They are likely to include significant efforts to decarbonise highways (faster) and use pricing signals to encourage even greater mode shift towards lower carbon modes. They should help significantly mitigate the impact of the Strategic Highways package.

Figure 6.8: Change in carbon emissions arising from Packages (Initial impacts, KMTDC)



Package Alignment to Problem Statements and Objectives

Alignment with Problem Statements

In Part 2 we listed 19 Problem Statements that the Inner Orbital Area Study aims to address (see page 24).

Table 6.10 on the following page presents a qualitative assessment on the extent to which each package of interventions address each Problem Statement.

This assessment uses a simple scale shown below:

✓✓✓ Fully addresses Problem Statement

✓✓ Mostly addresses Problem Statement

✓ Partially addresses Problem Statement

Table 6.10 includes a column on the right under the heading 'All Packages'. The scores in this column represent the highest score assigned to each of the individual packages. If one package scores two ticks and all other packages score none, then the column 'All Packages' is also assigned two ticks.

Table 6.15 shows that most Problem Statements are fully addressed by the Packages presented in this report.

That said, four Problem Statements are 'mostly' addressed and one Problem Statement is only 'partially' addressed.

The Problem Statements that are not (yet) fully addressed relate to:

- Climate resilience
- Connectivity to Gatwick
- Freight reliance on highways
- Strategic Mobility Hubs
- Lower Thames Crossing.

A number of these Problem Statements are addressed in further detail in separate area studies. (E.g. Lower Thames Crossing in South East Radial and Gatwick Connectivity in South Central Radial).

The Area Study programme will also include a global policy package of interventions that will be applied across all packages and areas.

These policies will be designed to directly address the remaining gaps highlighted in Table 6.10.

Alignment with Objectives

We have also assessed the extent to which the packages presented in this report deliver this study's Objectives.

Table 6.9 below summarises the number of interventions in each Package that have a 'high' or 'very high' alignment with the objectives of the Inner Orbital Area Study.

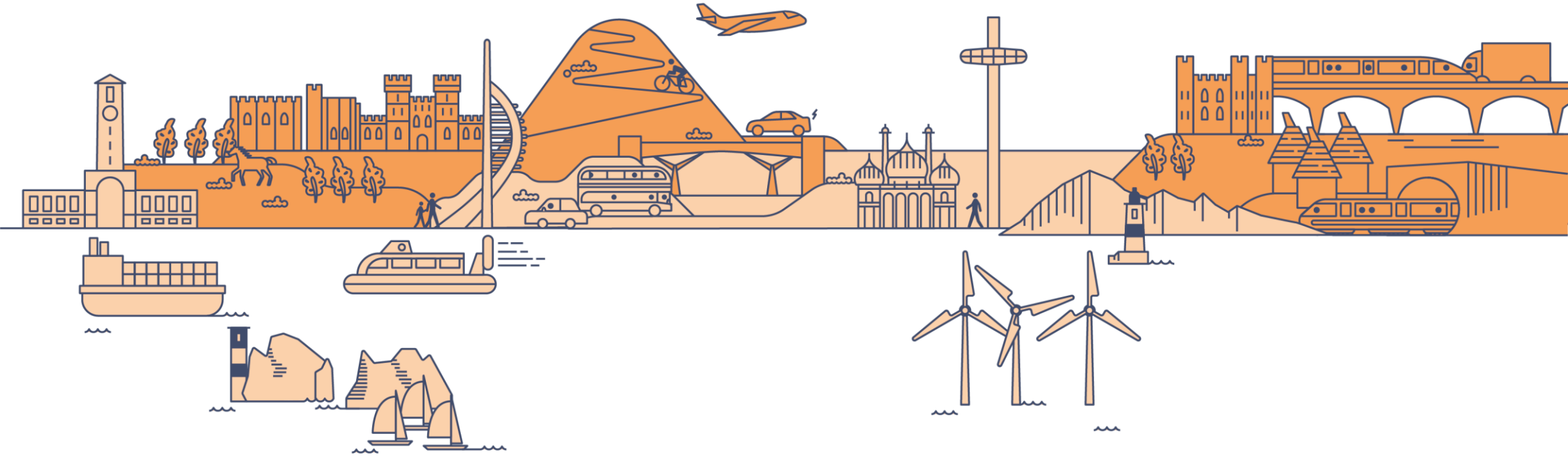
Table 6.9: Interventions and objectives

Objective	Interventions
Economy	52
Society	46
Environment	10
Climate Change	25
Safety	32
Health & Wellbeing	40

Based on this analysis, we are confident that the packages developed for this study and presented in this report can help TfSE and its member authorities achieve the Vision and Objectives described in this study.

Table 6.10: Problem Statement Mapping to Packages

Problem Statement	Heathrow Rail	Western Rail Arc	Eastern Rail Arc	MRT West	MRT East	Active Travel West	Active Travel East	Strategic Highways West	Strategic Highways East	All Packages
Decarbonisation	✓✓	✓✓✓	✓✓	✓✓✓	✓✓	✓✓✓	✓✓✓	✓		✓✓✓
Climate resilience	✓	✓✓	✓	✓	✓	✓✓	✓✓	✓	✓	✓✓
Economic Disparity	✓	✓✓✓	✓✓✓	✓✓✓	✓✓✓	✓	✓	✓✓	✓✓	✓✓✓
Housing affordability	✓✓✓	✓✓✓	✓✓✓	✓✓✓	✓	✓	✓	✓✓	✓✓	✓✓✓
Land use and transport interaction	✓✓✓	✓✓✓	✓✓✓	✓✓✓	✓✓	✓	✓	✓✓	✓✓	✓✓✓
Covid-19	✓✓✓	✓✓✓	✓✓✓	✓✓✓	✓✓✓					✓✓✓
Rail journey times	✓✓✓	✓✓✓	✓✓✓	✓	✓	✓	✓	✓	✓	✓✓✓
Level crossings	✓✓	✓✓✓	✓✓✓						✓	✓✓✓
Connectivity to Gatwick		✓✓	✓✓	✓✓	✓✓					✓✓
Connectivity to Heathrow	✓✓✓	✓✓✓	✓	✓✓✓				✓✓		✓✓✓
Freight reliance on highways	✓✓	✓✓	✓✓							✓✓
Prioritisation of radial	✓✓✓	✓✓✓	✓✓✓	✓✓✓	✓✓✓			✓✓✓	✓✓✓	✓✓✓
Cycling	✓✓	✓✓	✓✓	✓✓✓	✓✓✓	✓✓✓	✓✓✓	✓✓✓	✓	✓✓✓
Urban Highway Congestions	✓✓✓	✓✓✓	✓✓✓	✓✓✓	✓✓✓	✓✓	✓✓	✓✓	✓✓	✓✓✓
Strategic local trips	✓	✓	✓	✓✓✓	✓✓✓	✓✓✓	✓✓✓	✓✓	✓✓	✓✓✓
Bus is uncompetitive	✓	✓	✓	✓✓✓	✓✓✓	✓	✓	✓		✓✓✓
Strategic Mobility Hubs		✓✓	✓✓	✓✓	✓✓	✓✓	✓✓	✓✓	✓✓	✓✓
M25 South West Quadrant	✓✓	✓✓	✓✓	✓✓		✓	✓	✓✓✓		✓✓✓
Lower Thames Crossing			✓		✓		✓		✓	✓



Part 7

Next Steps

Next Steps

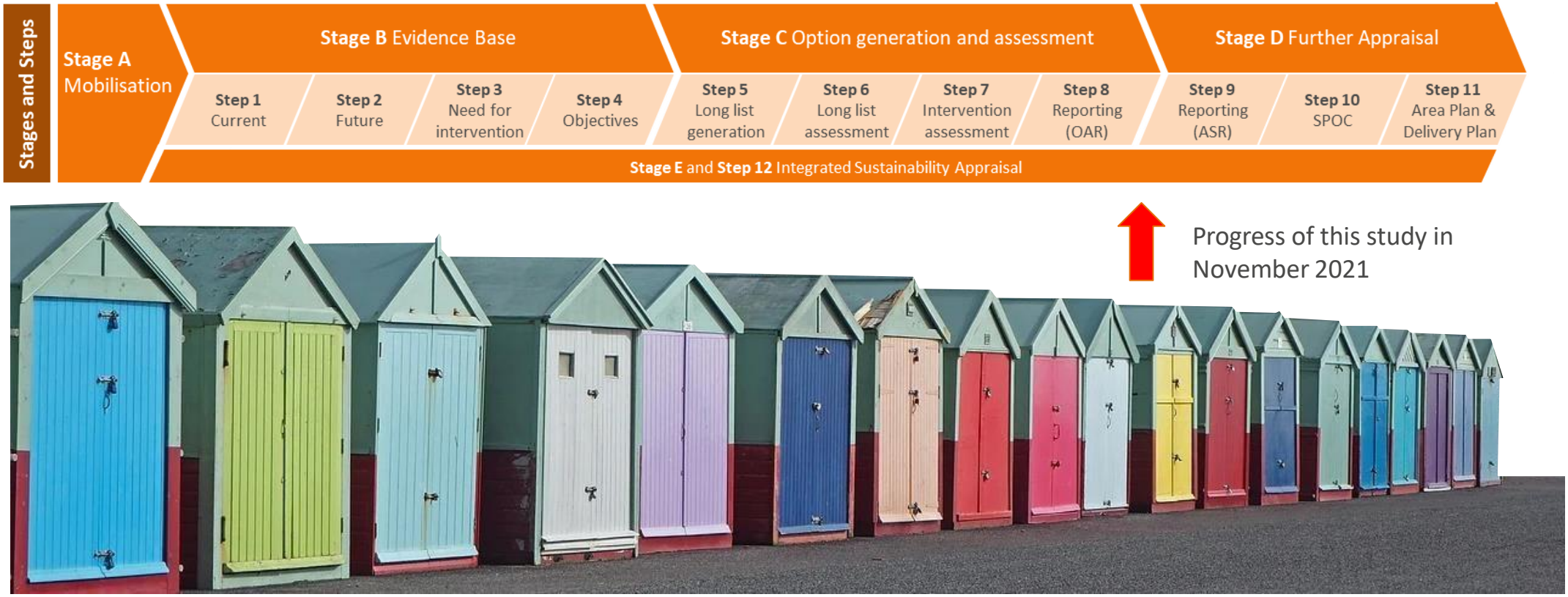
This report has summarised the work undertaken in the third of the five stages underpinning the Inner Orbital area study.

Figure 7.1 shows the stages and steps that are being delivered for this study. This report concludes **Stage C,** which focused on options generation and assessment.

The next stage for this study is **Stage D**. The purpose of this stage will be is to produce outputs to make the case (to government and others) for investment in the South East's transport networks. This Stage will fully mobilise in November 2021.

To ensure that each area study meets the vision, goals and priorities of the Draft Transport Strategy, an Integrated Sustainability Appraisal (ISA) will be developed for each of the five Area Studies – shown below as **Stage E** – which will also report by March 2022.

Figure 7.1: Overview of the Inner Orbital area study stages and steps



For further information please contact

TRANSPORT FOR THE South East

Tiffany Lynch
TfSE Client Project Manager
Tiffany.Lynch@eastsussex.gov.uk

Steven Bishop
Technical Advisor Programme Director
Steven.Bishop@steergroup.com

Edmund Cassidy
Inner Orbital Area Study Project Manager
Edmund.Cassidy@steergroup.com

Rohan McGinn
Inner Orbital Technical and Stakeholder Lead
Rohan.McGinn@wsp.com