LIGHT FREIGHT ON THE RIVER THAMES

FEASIBILITY STUDY

PREPARED BY WSP ON BEHALF OF THE THAMES ESTUARY GROWTH BOARD AND THE PORT OF LONDON AUTHORITY

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EXECUTIVE SUMMARY

LIGHT FREIGHT ON THE RIVER THAMES CAN COMPETE WITH ROAD TRANSPORT

The River Thames has enormous potential for handling large-scale light freight. While there is limited activity at the moment, our research indicates that, at the right scale, it could easily be competitive with road freight.

Moving millions of parcel deliveries from the road to the river would deliver new jobs, reduce congestion and push London forward on the path to net zero.

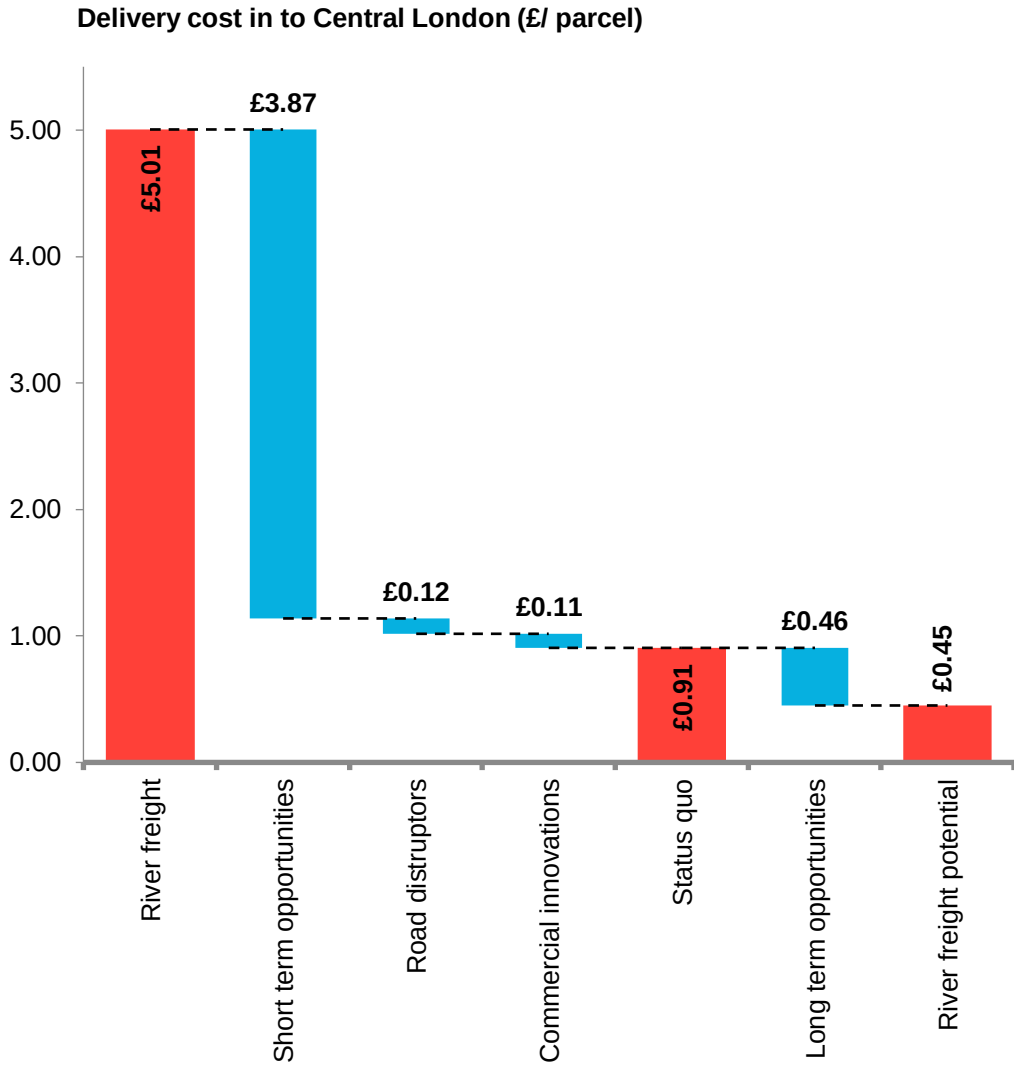
At a small scale, river freight will not be competitive compared to the road. However, our research suggests that handling just 3% of the 700 million parcels destined for London could make river freight competitive. In summary:

- A small scale river operation handling one million parcels per year would be uncompetitive, at around £5 per parcel compared to £0.91 by road;
- Increasing this scale to 20 million parcels, and capitalising on opportunities around social benefits, utilising rail options, sharing infrastructure and identifying new freight flows could reduce costs by £3.87 per parcel;
- Increase congestion in London and the potential for higher road pricing could drive the cost of road transport up by £0.12 per parcel; and
- Commercial innovations that leverage the environmental benefits and flexibility of last mile e-cargo bike deliveries could close the gap to road transport.

Future technological innovations and further disruption to road transport could reduce the cost significantly to nearly half the cost of the status quo.

We have proposed a series of recommendations to capitalise on this opportunity:

1. Establish a coordinating body with political backing that can put pressure on stakeholders to help facilitate riverside developments;
2. Show how operations at the key points – loading, unloading and last mile – can work seamlessly and efficiently to attract anchor customers;
3. Develop detailed options for pier development that minimise costs and maximise market access;
4. Realise the social benefits of River Freight through revenue support mechanisms and understanding of customer willingness to pay for environmentally friendly deliveries;
5. Push for limited increases in road pricing to facilitate an enormous reduction in van traffic;
6. Enter in to discussions with large, innovative online businesses that can become the potential anchor clients that will achieve the 20m parcel target; and
7. Support the development of proof of concept trials, including those currently underway.



1. INTRODUCTION

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INTRODUCTION
STUDY CONTEXT

In 2020, the Thames Estuary Growth Board, adopted their Action Plan 'The Green Blue' which sets out the board's two year plan and strategic vision for the Thames Estuary over the next 10 years. The Thames Estuary Growth Board's vision is to deliver the world's greenest, most productive Estuary.

The Action Plan identifies a number of infrastructure initiatives which will help to deliver sustainable growth across the Thames Estuary. One of these foundational infrastructure initiatives is to ***"improve and increase use of the river and rail to carry more passenger and freight of all types"***. A key part of this is to explore how the River Thames can be better used for freight, moving it off London roads to ease congestion and air pollution, whilst also supporting regeneration and boosting economic growth.

The Port of London Authority (PLA) set out its ambitions for a safe and sustainable future in its Thames Vision launched in 2016, and updated in 2021. This 20-year development framework sets six targets for maximising use of the river from trade, travel, sport and recreation, alongside embedding the Thames at the heart of the city's cultural offer. The Vision strategy is integrated into the London Plan, various other Mayoral strategies and borough polices.

The purpose of this jointly commissioned study is to provide an objective assessment of the potential for increasing river freight movements on the Thames in the near term. The study defines what a commercially viable river freight solution might look like, alongside a well costed business case and concrete next steps for the development of river freight on the Thames.

The River Thames has significant potential for driving low carbon freight. It is showing signs of resurgence, with the support of organisations such as the Port of London Authority (PLA) and the use of the river for parcel trade (by DHL for example) and more recently hospital supplies (Guys and St Thomas NHS Trust). River freight has the potential to drive forwards the net zero agenda within London, helping to decarbonise freight movements into London. This will generate enormous environmental and social benefits through the removal of freight vehicles from the road. It also presents an opportunity to push forward innovation through incubation of new marine technologies in green power such as hydrogen and electricity propulsion.

The challenge for this study is that any proposed river freight model needs to be a viable option for supply chains. It needs to prove, for new flows, that it can compete on cost, quality of service, reliability and efficiency compared to traditional road based flows. Additionally, changes to legislative and regulatory policy as well as the pace of technological change will effect the relative costs and prices of river freight compared to road fright, in different ways over time.

To date, the vast majority of freight movements utilising the river have been focused on bulk goods including construction materials and waste flows, with very limited transportation of light freight goods. A key objective of this commission therefore is to explore and elaborate the commercial feasibility of modal shift within the light freight sector from road to river and how this can be scaled over time.

For the purpose of this study, light freight is defined as the following product types and these form the focus sectors for this study.

Defining Light Freight

1. Parcels

2. Food

3. Beverages

4. Retail Goods

INTRODUCTION
STUDY PRIORITIES AND OBJECTIVES

The main priorities of this study are as follows:

- **Cost**: the overriding issue is cost. In freight transport, each additional transfer from one mode to another increases the cost of freight, increased delays and risk of damage or pilferage. Using the river automatically adds transfers at each end of the river journey. On top of this, establishing the Thames as a path for freight transport will require investment in river freight handling wharves at the London ports and points of destination and, to achieve significant scale, investment in a new fleet of river vessels or potentially adaptation of existing vessels. This capital cost needs to be recovered from river freight users over the lifetimes of the assets. Alternatively, the value of the wider environmental and social benefits can be recognised through subsidy or incentives. These costs have been captured as part of our economics benefits assessment.

- **Economies of Scale**: the way to reduce the impact of this capital cost is spreading it over a higher volume of freight. The study explores innovative mechanisms through which economies of scale can be achieved through commercial providers and delineates spatially where those opportunities lie with regards to the key points of origin and destination of existing sector flows.

- **Stakeholders**: there are a wide range of engaged stakeholders including port operators, river users, government at all levels and potential end customers of a river freight solution.

- **A Case to Government**: the study develops a case to Government for investment or policy support to ensure that the untapped potential of the River Thames and the wider Estuary economy is realised in line with the Thames Estuary 2020 vision, Blue Green Action Plan and Thames Freight Servicing Action Plan. This study provides a robust basis for articulating the wider public benefits of investment in light freight modal shift along the Thames including the range of environmental and social value benefits which could accrue by investment in river freight; and

- **A Case to Business**: business will be the ultimate users of the river. Attracting investment on the river will require strong support and understanding from business. The purpose of this study is to outline the ‘end to end’ solution which is attractive to end customers and which will realise the economies of scale required to make this a commercial viable proposition.

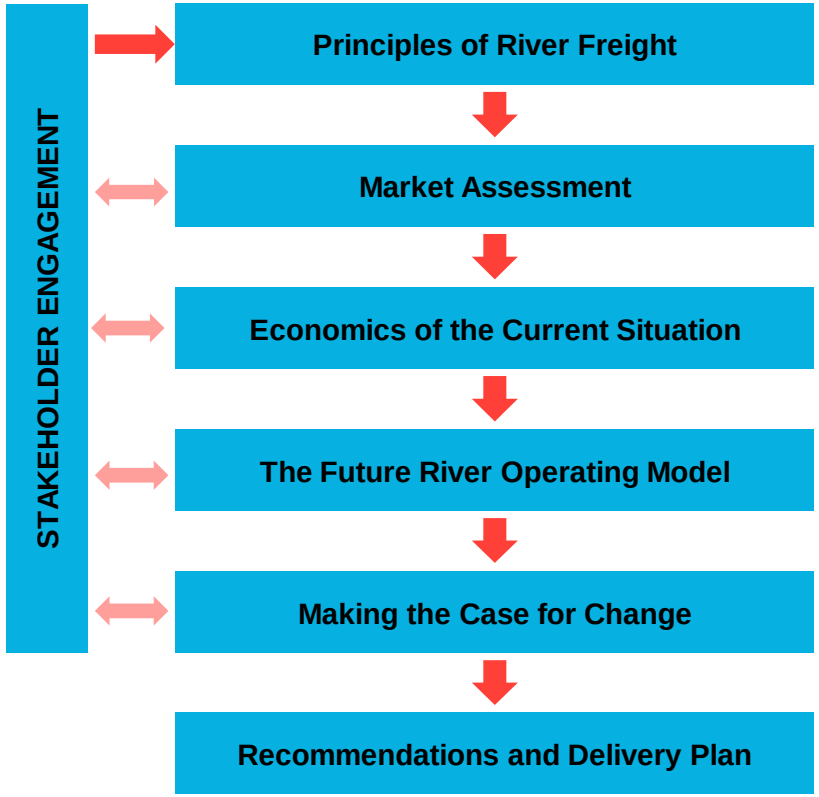
INTRODUCTION
STUDY APPROACH

Approach

The graphic opposite sets out the approach WSP has undertaken in developing our assessment of the commercial feasibility of river freight. The approach taken has largely been an iterative one, with the proposed river model being tested throughout the study process through engagement with key stakeholders, potential freight customers and operators. Below is an explanation of each aspect of the approach.

1. **Principles of River Freight** provide the framework around which a viable river model can be developed and tested. These principles are informed through consultation with stakeholders;
2. **Market Assessment** defines which segments of the light freight market are best suited to river freight. This section also identifies how river freight can provide an alternative to traditional last mile flows via road transport;
3. **The Economics of the Current Situation** sets out the Business as Usual (BAU) scenario with regards to cost, using parcels are the target product flow for river freight. This is the cost scenario against which river fright will be compared to assess its viability from a commercial perspective;
4. **The Future River Operating Model** provides the proposed 'end-to-end' solution for a viable operating model for river freight. Along with costed estimates for capital expenditure, this has allowed WSP to test the extent to which river freight can be competitive with road;
5. **Making the Case for Change** details the type and scale of wider public benefits which could accrued through modal shift of light river movements from road to river as well as the outline case for investment and public intervention; and
6. The final section include the **Recommendations and Delivery Plan** which set out concrete next steps for TEBG to move forward the river freight agenda. This includes recommendations on the timing of potential interventions.

Figure 1.1 – WSP Approach



2. KEY PRINCIPLES OF A LIGHT FREIGHT MODEL ON THE RIVER THAMES

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KEY PRINCIPLES
STAKEHOLDER ENGAGEMENT

This study has drawn on a range of interviews with key stakeholders in order to inform our understanding of the key principles upon which a viable river freight solution will need to be drawn from. As part of this work we have engaged with:

- River operators;
- Freight operators including last mile operators;
- Port operators;
- Potential end customers within the retail, parcel and food and beverages sectors;
- Statutory authorities with vested interest and control over the river; and
- Pan London organisations such as the Cross River Partnership and London Councils who coordinate strategic initiatives related to net zero, logistics, freight, air quality and decarbonisation agendas.

The figure opposite provides an overview of the range of stakeholders engaged as part of this study. As previously stated, the engagement process has been iterative throughout the study process.

This engagement has informed the development of the key principles as set out in the following section.

Figure 3.2 – Stakeholder Consultation

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KEY PRINCIPLE 1
RIVER FREIGHT MUST CAPITALISE ON ITS CONTRIBUTION TO NET ZERO TARGETS

The UK Government is committed to net zero by 2050. Decarbonisation of the transport system will play a significant part in getting the UK to net zero, and river freight can play a part in this process. River journeys can remove road based journeys carried out via 3.5 tonne vans and similar vehicles. Combining this with final mile E-cargo solutions creates a net zero transport mode in to high demand, hard to access areas of London.

The positive environmental impacts which modal shift from road to river can generate are also a strong part of this proposition. These benefits include reduced carbon and particulate emissions as well as congestion benefits alongside associated improvements in air quality, noise and safety. These benefits will be key to the creation of a coherent business case for any public intervention and/or subsidy in a river freight model.

The environmental and sustainability credentials of a river freight solution will need to stack up under scrutiny from businesses who will be adopting these services over road based solutions which may well be cheaper on a cost per parcel / tonne basis. The primary driver for a business will be know that a river based service is able to meet operating cost and customer service expectations. However, a significant secondary driver is the potential for river freight to be greener and more sustainable than road based methods.

The articulation of environmental benefits should be considered in the context of the future decarbonisation of road transport however. Whilst the relative scale of carbon benefits will likely be eroded as the uptake and innovation in electric and hydrogen powered vehicles becomes more widely adopted, impacts on air quality (due to reduced particulates emissions) and congestion will likely remain part of the core proposition for river based transport. In the face of technological advances in road freight transportation therefore, river freight cannot stand still and will need to progress to ensure that the relative gap between the environmental benefits generated by river remain valid.

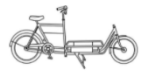
The focus needs to be on utilising green fuels and emissions reduction measures on all vessels involved in river transport trials. In the short term the focus is likely to be on biofuels (HVO), such as those being used in the Livett's CEVA trials, but in the medium to long term the focus will be on alternative fuels such as hydrogen (HFC) and electric vessels charged by renewable power.

A 'green' and sustainable river solution must also integrate with green last mile deliveries. This is an area where London is already well advanced in, and the majority of the major freight operators such as DPD, DHL, FedEx and UPS already have strategies for electrification of their last mile fleets (including E-Cargo bikes). There are also a number of innovative smaller couriers such as Zedify, Pedal Me, Absolutely and EcoFleet which offer zero carbon last mile solutions.

ecofleet
mindful **delivery**

"Deliver 8,000 parcels per month by E-cargo bike"

pedal me

 **4.5** g/km
Pedal Me cargo bike

 **49** g/km
Electric van

Emissions of electricity usage compared

Source: https://pedalme.co.uk/carbon-emissions/, https://ecofleet.co.uk/

KEY TAKEAWAYS

The policy and regulatory environment created by the transition to net zero will be significant in driving the private sector towards decarbonisation of the transport network

A 'green' end to end solution for River Freight will be critical in generating consumer interest and helping to offset potentially higher price points in the short to medium term

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KEY PRINCIPLE 2
THE SOLUTION MUST BE LAST MILE READY

The interface between the river, waterborne infrastructure and the associated landside infrastructure necessary to provide off-take of goods from vessels is one of the key limiting factors for a viable river freight solution.

Developing an off-take location for light freight on the Thames requires a jetty, wharf or drawdock that meets very specific requirements, including:

- A commercially appropriate location – located in accessible proximity to concentrations of demand;
- Set up to manage tidal restrictions so that access can be maintained at all tidal states; and
- Viable development in the face of objections, planning restrictions, pier licenses etc.

When landside infrastructure requirements are overlaid, the restrictions are even more severe given the critical lack of freely available riverside land adjacent to existing river infrastructure. Anecdotal evidence from stakeholder interviews indicates that river freight trials have failed because of an inability secure landside space for development of storage and consolidation sites.

A freight model that **limits new river and landside infrastructure** will help to overcome these challenges. A simple way to achieve this will be to focus on smaller cargo consignments which don't require large capital investments in quay or jetty reinforcement or cranes. These constraints also indicate a need to utilise e-cargo bikes and other smaller scale electric vehicles for last mile delivery which can be flexibly deployed to service river based infrastructure.

The key to this solution will be to have consignments which are 'last mile ready' having been pre-sorted at the point of origin and which are 'customer ready'. This model therefore doesn't require large investments in land-side consolidation / picking space at the final destination of the river service. Additionally, effective use of space on existing or extended piers could offset land side requirements and help to address any minor consolidation or packing requirements at the point of destination prior to last mile delivery.

KEY TAKEAWAYS

Smaller, last mile ready cargo will minimise infrastructure requirements and allow access to high-demand areas of central London

Use of space on piers could reduce demands for landside infrastructure

CASE STUDY

Ceva Logistics are utilising Butler's Wharf, adjacent to Tower Bridge, to offload medical supplies and equipment as part of their June 2021 trial for Guys and St Thomas' hospital.

Absolutely provide the last mile courier solution and meet the boat on the pier to offload the pre-packed bags by hand and load them onto E-cargo bikes which are waiting to transport the goods to the final customer. The last mile ready solution means that there is no requirement for landside consolidation facilities and the parcels can be efficiently transferred onto the cargo bikes via manual handling.

KEY PRINCIPLE 3
CUSTOMERS NEED EQUIVALENT SERVICE

River freight has to **work for customers** if it is going to be a genuinely competitive alternative to road transport.

Whilst our engagement with stakeholders has indicated that the environmental and sustainability benefits of a river freight solution will be key in influencing customers decisions to shift from road to river, it is clear that the environmental and social benefits of river over road alone will not be enough. It will swing the customer towards river freight if service levels are equivalent and costs are comparable, but a poor or expensive service will result in the customer turning away. Cost is the core assessment of this study, but service levels must also be met.

For service, the key to all customers will be reliability. A standard service level agreement (SLA) in a freight services contract will relate to deliveries consistently arriving on time. In the context of the river, this means that deliveries cannot be subject to tides. The solution therefore needs to deliver to a timetable every day. At present, Thames Clippers manages this with passengers services and similar must therefore be achieved for river freight. DHL's SLA with Thames Clippers is based on arrival time and throughout the trial the service has not missed a target. This demonstrates the reliability of the river and the ability of services to work regardless of tides to a timetable.

River freight infrastructure is therefore going to be key to unlocking the potential of river freight and allowing it to compete with road transport on a service and reliability level. This could potentially be achieved with wharves through sufficient dredging of the berth pocket to allow access at different tidal states. This option is expensive however and will require environmental permissions which are unlikely to be approved by the Environment Agency (EA). In addition, there are complex land ownership issues with a number of the safeguarded wharves in Central London not in operational use, and those which are in operational use are currently being utilised for specific purposes such as waste and aggregates handling.

A more flexible solution will be to use piers and shallow draft vessels (i.e. the 'clipper" model') which will bring opportunities to run to a timetable and ensure that a river freight service can be run at scale, meet the demands of customers and ensure reliability of service at all times of the day.

KEY TAKEAWAYS

The priority is to develop a model that works for end customers, to the extent that they do not know they are using river freight

Piers may offer the opportunity to ensure that the model operates to a timetable rather than to the tides

Figure 3.2 – Walbrook Wharf in City of London which is currently utilised as a waste disposal collection point demonstrating constraints with regards to additional freight

Figure 3.3 – Locations of existing passenger piers which could be utilised for river

Source: https://content.tfl.gov.uk/pier-passenger-pier-strategy-action-plan.pdf

KEY PRINCIPLE 4
A TECHNOLOGICALLY PROVEN SOLUTION IN THE SHORT TERM

Our engagement with stakeholders has demonstrated that the river can be perceived as 'difficult' and one of the key barriers to entry is that the reliability and 'known quantities' of river transport are far less known than traditional road based solutions.

The key to gaining traction on the river will be through the delivery of successful test cases and pilot schemes, such as those currently being undertaken by CEVA Logistics and DHL. The river freight model, in the short term, will need to be accessible to customers, based on proven technologies and existing freight models. This is currently exemplified in the CEVA trial which is utilising a simple river freight model based on small scale vessels, HVO biofuels and manual handling at the loading and unloading points.

Over time, new technologies may enable river freight to innovate and potentially cut future costs, this includes:

- Innovation within maritime fuels such as hydrogen and electric vessels as well as autonomous vessels;
- Innovation within last mile delivery solutions including drones, autonomous electric vehicles and other emerging technologies such as Hyperloop and Magway which could integrate with a river freight solution;
- Internet of things which will enable a data driven river logistics service to achieve higher efficiency and better service quality for customers.

KEY TAKEAWAYS

In the short term, the river freight model needs to be based on proven technologies and logistics platforms to ensure the confidence of customers in shifting from road to river

Technology will disrupt the logistics industry over time and will provide opportunities for river freight to innovate and achieve cost savings

Figure 3.4 – Hydrogen Inland Container Vessel – Future Proof Shipping

Case Study: Future Proof Shipping (FPS)

FPS have retrofitted an inland container vessel to a zero-emissions hydrogen propulsion system. The proof of concept project is expected to be zero emissions by December 2021. The internal combustion engine will be replaced by fuel cells, battery packs, eclectic motor and hydrogen storage. The vessel will operate between Rotterdam and Antwerp.

Source:
https://northsearegion.eu/zem-ports-ns/news/future-proof-shipping-s-retrofit-of-the-maas/

KEY PRINCIPLE 5
FIRST MILE MUST BE INCLUDED IN THE MODEL FOR RIVER FREIGHT

A concern from potential customers is the need to get products from their gate to the river freight loading point. Even over a short distance, the addition of a van journey creates requirements for a van-based logistics operations and the additional costs and interfaces that this entails. With the commercial viability of river freight not yet proven to industry, a river freight solution which adds additional handling costs to the movement of goods may deter customers from adopting modal shift.

To minimise the impact on the customer, the first mile must be included in the river transport leg, or replace the HGV to LGV transit leg.

The first requires scale and consolidation around the loading site. In a scenario in which the Port of Tilbury is the point of departure for a river freight service, the tenants of the Tilbury estate, and the wider Thames Freeport could provide the scale required for a dedicated 'pick up' service. This could run between the different clients of the Freeport as part of the river freight solution back to a central loading facility within the Port of Tilbury. The Port of Tilbury currently has available space and vacant warehouse and storage facilities which could be retrofitted to provide a consolidation point for light river freight. The use of a conveyor from the warehouse to the river vessel would be a viable solution to avoid further handling of products and increase efficiency of loading.

The second would require a riverside consolidation centre East of Teddington Lock which provides access to Midlands distribution centres (the 'golden triangle').

There is also the potential to consider the use of rail for the first mile journey, bringing goods from the Midlands straight into a loading site, such as Port of Tilbury utilising the railhead which exists there, thus creating a completely 'green journey' from first to last mile.

KEY TAKEAWAYS

First mile is just as crucial a measure as the last mile. Minimising disruption for the customer is key.

Tapping in to Tilbury Estate and wider Thames Freeport provides strategic fit with proposals to increase river freight.

KEY PRINCIPLE 6
THE RIVER FREIGHT MODEL NEEDS TO BE ABLE TO GENERATE SCALE

Open access across the supply chain is going to be key to the success of shifting freight from road to river. Our consultation has found that there are significant perceived and actual constraints and barriers to operating on the river from both freight providers and customers. Access to the river cannot be another barrier to modal shift if river freight is to achieve the scale of volumes that are required to make it a commercially viable proposition.

Regardless of the final 'end to end' solution, bringing light freight to the Thames will incur significant fixed costs including substantial upfront capital expenditure in infrastructure. Spreading these costs by achieving scale will be the only way to be competitive against road freight. Competition amongst operators is going to be critical to delivering cost efficiency and buy in from statutory bodies. No statutory body or government will want to support the development of a monopoly. Therefore all elements of the river freight value chain need to be open access and multi user:

- Vessels to be accessed by any cargo owners;
- Piers to be used by any vessel;
- Landside infrastructure to be used by any last mile logistics provider; and
- Cargo parcelisation or containerisation to be in a standardised format that lends itself to any last mile carrier (for example [electric] cargo bike, electric van etc.).

A standardised intermodal urban logistics container brings an opportunity to sell the Thames and London as pioneers in urban river freight and the opportunity to export a new river freight model globally. A freight model that allows local and national government to boast of a new "*London Standard*" in green, last mile freight may also be a useful tool in gaining political support and promotion for river freight.

KEY TAKEAWAYS

Open access will bring scale by attracting the broadest possible number of market participants

Opportunity to sell London as an exemplar and to roll out the model to other port-river clusters (Liverpool, Humber)

CASE STUDY

LOADHOG
RETURNABLE PACKAGING

CARLA CARGO

Carla Cargo, a cargo trailer manufacturer has collaborated with Loadhog, a manufacturer of Returnable Transit Packaging, to develop a standardised Euronorm container which could transport heavy loads in urban areas via cargo bike.

The product has been designed to solve the issue of Euronorm containers being difficult to transport by cargo bike and to address growing demand for new urban transport solutions via zero carbon modes.

Loadhog has developed a patented 'Pally Lid System' which makes the transport of the containers very simple once unloaded from the cargo bike, and removes the need for a pallet truck which is typically required for transport of Euronorm containers. These innovative solutions to urban freight management will be critical to ensuring the success of an integrated river freight model.

Source: https://loadhog.com/carla-cargo-loadhog-the-future-of-urban-logistics

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KEY PRINCIPLE 7
EXISTING INFRASTRUCTURE NEEDS TO BE UTILISED TO REDUCE COSTS

Maritime transport has significant fixed costs compared to road which sets it at an immediate disadvantage with regards to incentivising customers to adopt modal shift. Vessels and loading infrastructure cost in the millions rather than the tens of thousands. Scale of operation and volumes are crucial to dilute these fixed costs. However, in the short term as the freight model ramps up, scale will be limited and costs will be higher.

Cost is going to be one of the key limiting factors in enabling modal shift. Utilising existing infrastructure including piers, jetties, wharves, river vessels and landside infrastructure will therefore be critical, at least in the short to medium term, to help reduce barriers to entry and enable innovation to develop the market for river freight.

It should be acknowledged however that cost is likely to be a key factor for small and medium enterprises and that large companies with significant capital reserves and motivation to pursue river freight may well develop bespoke river infrastructure assets given the scale of their operations.

The types of vessel and operator will depend on the chosen river freight model, but include Thames Clipper, Livett's, and Cory Energy across a range of passenger vessels, tugs, barges and marine logistics craft. These operators are already taking part in existing river trials for both DHL Express (Thames Clipper) and CEVA Logistics on behalf of Guys and St Thomas' Hospital (Livett's).

There are many piers in operation that could be used as landing sites to get the river freight model off the ground. The use of piers also aligns with Principle 2 with regards to allowing flexibility and reliability of service at all tidal states. Given the locations of demand, viable landing sites are likely to be located between Isle of Dogs (eastern extent) and Hammersmith Bridge (western extent). In the short to medium term, central London piers are likely to be the primary destinations given the clusters of demand in the West End and the City.

KEY TAKEAWAYS

There is infrastructure on the Thames that could be used to reduce the upfront capital investment costs of a light freight river model

LIVETT'S

CEVA started their river freight trial with Guys and St Thomas' (GST) hospital in June 2021. The service is being run with Livett's utilising their existing vessels and landing at Butler's Wharf pier which is privately owned by Livetts.

No new capital infrastructure has been required to start this service.

CEVA / GST River Freight Trial (2021)

thames clippers

DHL Express started their river freight trial in 2019 in collaboration with Thames Clippers. The service runs daily at 7.30am from Wandsworth Riverside Quarter Pier to Bankside Pier in central London for final mile delivery on DHL courier bicycles.

Since the start of the original trial further stops have been added to the service including Wapping.

DHL Express River Freight Trial (2019)

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KEY PRINCIPLE 8
THE EASE OF DOING BUSINESS ON THE RIVER NEEDS TO BE IMPROVED

There are a number of statutory stakeholders with influence over the Thames and its immediate environs that can facilitate, support or prevent the development of the required riverside and landside infrastructure needed for river freight. This includes, the Port of London Authority (PLA), the Environment Agency, Local Authorities, the Greater London Authority (GLA) and Transport for London (TfL).

We understand from our stakeholder engagement that a common barrier to using the Thames is a difficultly in identifying the right people in each organisation that can provide the necessary support or approvals for operators and customers to start using the Thames. The **'ease of doing business' on the river needs to improve** if innovative river freight models are to be bought forward by the private sector.

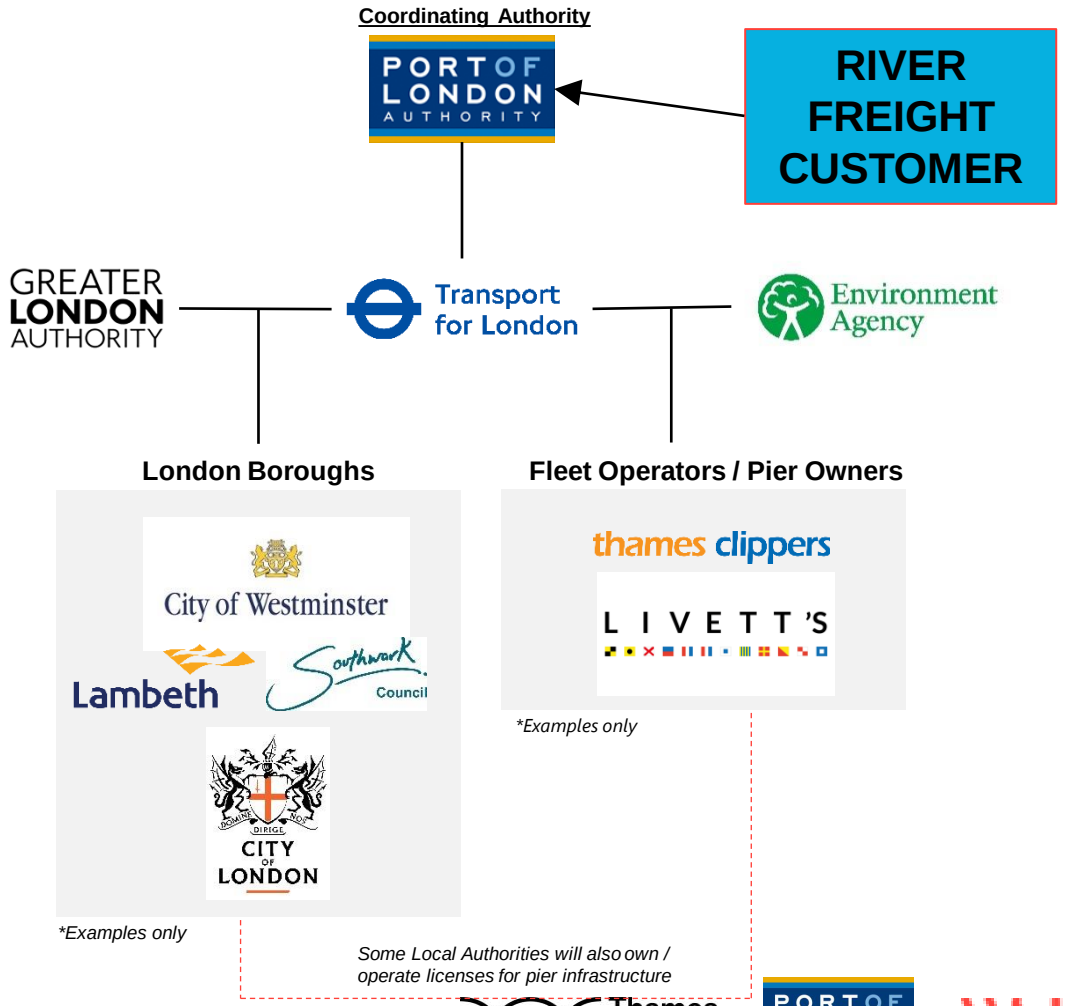
A concept used in Freeport development is a 'one-stop-shop' (OSS), providing a 'single window' service for investors and facilitating all necessary licensing and after care functions for customers. This customer centric approach has proven very successful in attracting investment and facilitating innovation by removing administrative bureaucracy and streamlining permits, licenses and legal processes.

A similar role, potentially facilitated by the Mayor of London or the PLA, could fulfil this role, helping new and existing river users understand how access to the river can be facilitated, acting as the co-ordinating role in attracting and delivering strategic investments in river freight. Giving this body the right political support, and leadership, could put the necessary weight on "difficult" stakeholder or road blocks to facilitate access to and development of riverside infrastructure.

It is important to note that the streamlining of administrative procedures does not entail removing or easing environmental protection for example, but a OSS would bring together the relevant statutory bodies to increase the 'ease of doing business' on the river.

KEY TAKEAWAYS

A single window service which provides contact and responsibility for Thames river infrastructure development and access could help unlock and facilitate innovation on the river



3. MARKET ASSESSMENT

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TARGET MARKETS

THE MARKET FOCUS MUST BE ON LAST MILE DELIVERY

The UK light freight market has many sub-markets. It is divided by first mile, middle mile and last mile deliveries. Goods can be moved in load sizes from a pallet to a 40ft container. Certain commodities have special requirements, such as cold-chain cargo.

The first principle for river freight identified above is that it must focus on last mile ready deliveries. In addition, the geographic location of the Thames limits its access to the typical journeys undertaken in first and middle mile markets.

This focusses our model for river freight on the last mile. This also leverages the huge end-consumer demand that exists in London. It is important to note that the river itself will not be the last mile solution. Once a product is unloaded from the vessel it will need to be transferred to a land based vehicle for the final customer leg. In the context of maximising the green credentials of river transport this will like be in the form of an E-cargo bike or E-van. These options are discussed in more detail in Section 5.

The panel to the right considers the ways that different customers receive last mile deliveries, from the smallest to the largest. This shows the spectrum of last mile markets the river could serve. We consider below how each is suited to a green e-cargo bike or e-van solution as per the principles highlighted above.

Pallets

Pallets are standardised units for moving heavy and bulky items or consolidated packages. A UK pallet measures 1.2m x 1m and has a weight limit of between around 500kg and 1,000kg. They also require specialist powered pallet trucks to move them from the vehicle to the customer's required location. The size and additional equipment requirement means traditional pallets are not suited to e-cargo last mile delivery, unless specialist e-vans with pallet lifts are available.

There are innovative new methods for handling pallets such as the Loadhog / Cara Cargo collaboration. This would allow loading of "Euronorm" and other stacking boxes such as tote boxes on to specialist pallets, and the pallet to be loaded on to a specialist cargo trailer. If the pallet is to be manually loaded or unloaded by the delivery rider it would have a much reduced weight limit. Availability of a pallet truck at the loading and unloading locations would remove this limitation.

Roll Cages

A roll cage is a wheel mounted, mobile container used for moving large volumes of stock around shops and distribution centres typically measures around 0.8m x 0.7m, with varied heights. This size means an e-cargo bike may be able to handle one roll cage with a specialist trailer, and a 3.5 tonne van could fit between 3 and 6 roll cages. End consumers for roll cages are usually large retail. Deliveries are typically made overnight by HGV, which can handle in the region of 48 roll cages. The scale of delivery means it is unlikely that an e-bike or e-van solution could compete economically with an HGV delivery.

Tote boxes

Heavy duty stackable plastic boxes used for distributing loose items and restocking retail. Tote boxes come in a variety of sizes, including smaller 20 and 40 litre boxes that would suit e-cargo bike trailers.

Parcels

Parcels are currently mainly delivered by vans in trips of between 100 and 200 deliveries per day. Depending on capacity and parcel sizes, an E-cargo bike would handle between 20 and 40 parcels per delivery round, but would be able to undertake multiple rounds in a day.

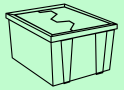
A further advantage is the number of stops required. Congestion and restricted parking opportunities in central London means van deliveries can be slow and incur financial penalties. Data from a 2017 GLA study shows that on average a Gnewt Cargo e-van travelled around 250m per delivery. The size and flexibility of an e-bike could provide significant benefits over van deliveries for multiple, short journeys.

Parcel delivery timings are driven by customer demand, which means deliveries are typically between 9.00 and 17.00. This is a significant contributor to significant daytime congestion and a river freight solution offers an excellent opportunity to reduce congestion.

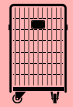
Within the parcels market, we also consider express courier letters and bulk mail.

Types of freight

Parcel



Tote box



Roll cage

Pallet

STUDY FOCUS
PARCELS ARE A HUGE AND GROWING MARKET

The chart to the right shows the growth in online sales, with a noticeable boost from COVID-19 in 2020, which saw a 20% increase over trend growth. Looking ahead, continuing the trend would see an annual growth in online sales of 5.7% to 2030. A more conservative growth estimate, aligned with IMF growth forecasts, would see annual growth of 2.2% per year.

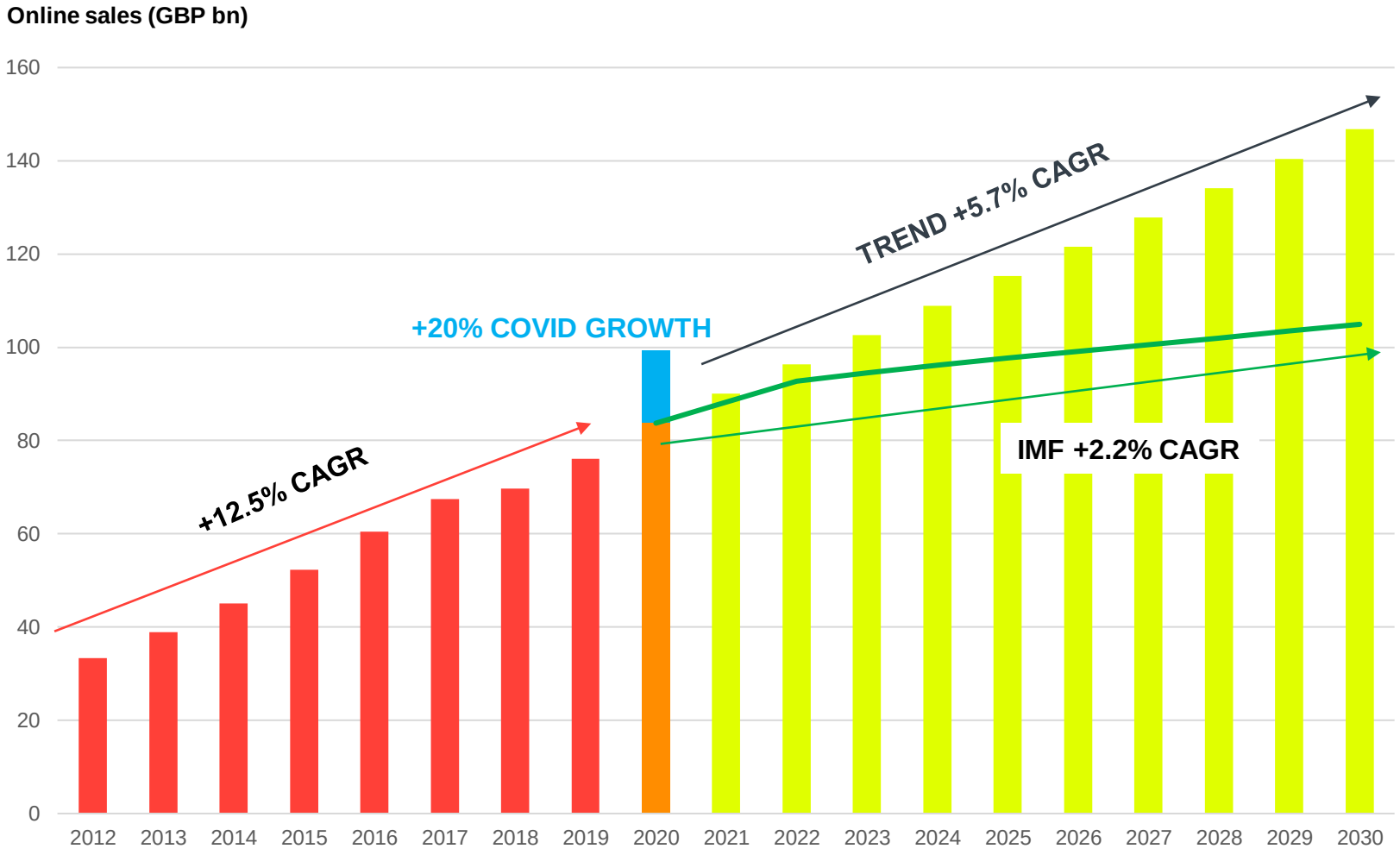
This strong growth in online sales is likely to translate to growth in parcel volumes. Our stakeholder engagement suggests around 700 million parcels are delivered in to London per year. Assuming 150 parcels per van, this is nearly 5 million van journeys per year delivering parcels.

If the number of parcels grows in line with the trend in online sales, this will translate to an additional 3.5 million van journeys by 2030, or 1.2 million under the GDP trend.

This is significant growth which will lead to increased congestion and increased social and environmental costs due to the volume of LGVs required to deliver these parcels.

Given the size of the market, its expected growth and its suitability for river traffic we have chosen parcels as the focus of our study.

Although parcels are the focus of our study, this does not preclude other cargo types and we expect that a thriving river freight market will be able to service a range of markets. However, for the purposes of our cost comparison we focus on parcels.



DIRECT COMPETITION FOR LOCAL MARKETS

LONDON IS JUST ONE ELEMENT OF WIDER JOURNEY

The simplest way that the Thames can be utilised for light freight is by replacing existing flows that start and finish on, or within close proximity, to the River Thames. Likely destinations are in central London, with potential origin points including:

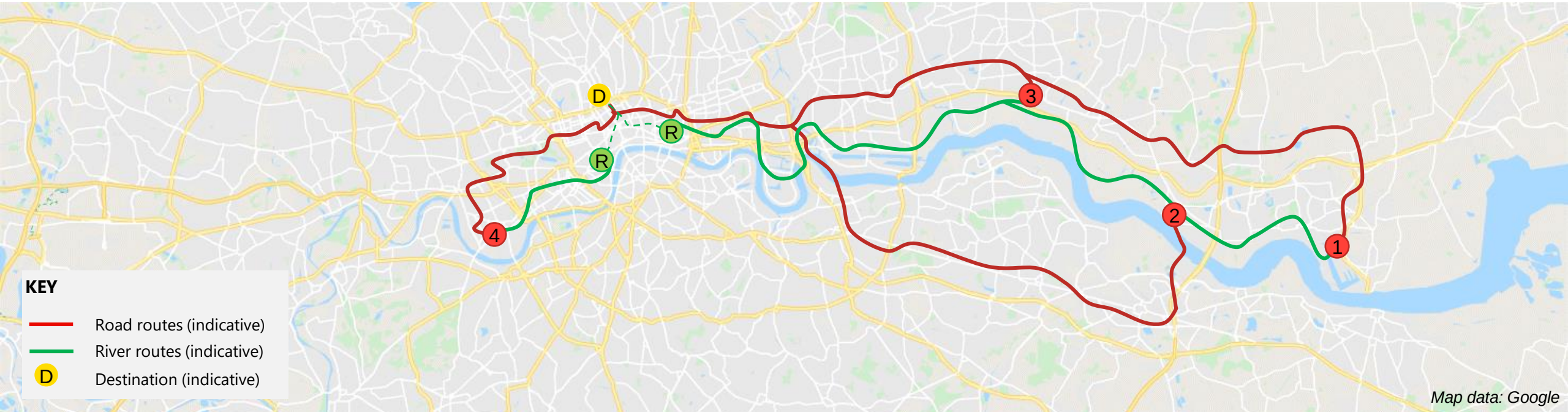
1. The Port of Tilbury;
2. Dagenham International Ferry Terminal (DIFT);
3. The new wholesale markets site in Barking; and
4. A West London pier, e.g. Wandsworth Riverside (which is currently utilised for the DHL trail).

The red lines show potential road routes for journeys from these origin points to an indicative central London customer.

The green lines show an alternative river routes, utilising piers at Pimlico or London Bridge, with a last mile by E-Cargo bike shown by the dotted green line.

In the next section we consider the cost difference between road and river routes for these journeys.

However, this is a limited market. On the next slide we consider a further market to target, which takes in to account the broader GB freight market.



ACCESSING A LARGER MARKET

LONDON IS JUST ONE ELEMENT OF WIDER JOURNEY

We have highlighted that the Thames's role in delivery must be in the last mile. However, the UK freight market involves many steps and market participants. The last mile cannot be considered in isolation. Instead, we need to understand the full logistics chain to determine where the Thames can be competitive.

The map to the right shows an example journey for a product with an ultimate destination as a parcel in London. While this has a focus on parcels, products in tote boxes and other last mile ready containers follow a similar journey.

The steps shown are indicative and not representative of the logistics activities of all cargo or the exact locations of these activities. For example, the fulfilment centre may not be in the Midlands. However, they are a useful framework to test the viability of freight. In this journey:

1. Product arrives in a container at Felixstowe and travels via HGV to East Midlands Gateway;
2. Product goes through fulfilment and is then consolidated with other parcels at a distribution hub;
3. Parcel containing product travels via HGV to local distribution centre in Ealing, West London; and
4. Parcel travels its last mile via van to final destination in Central London.

While the journey is indicative, and actual locations may vary, a significant volume of the UK's freight travels via the midlands "Golden Triangle". This is the centre of the UK's distribution activity with its strong logistics links and central location, including access to London via the M1. The Golden Triangle holds 36%[1] of all of the UK's warehousing, and over 50% of warehousing in proximity to London[2]. To capture significant scale, it will be crucial for the Thames to be able to be competitive in this market.

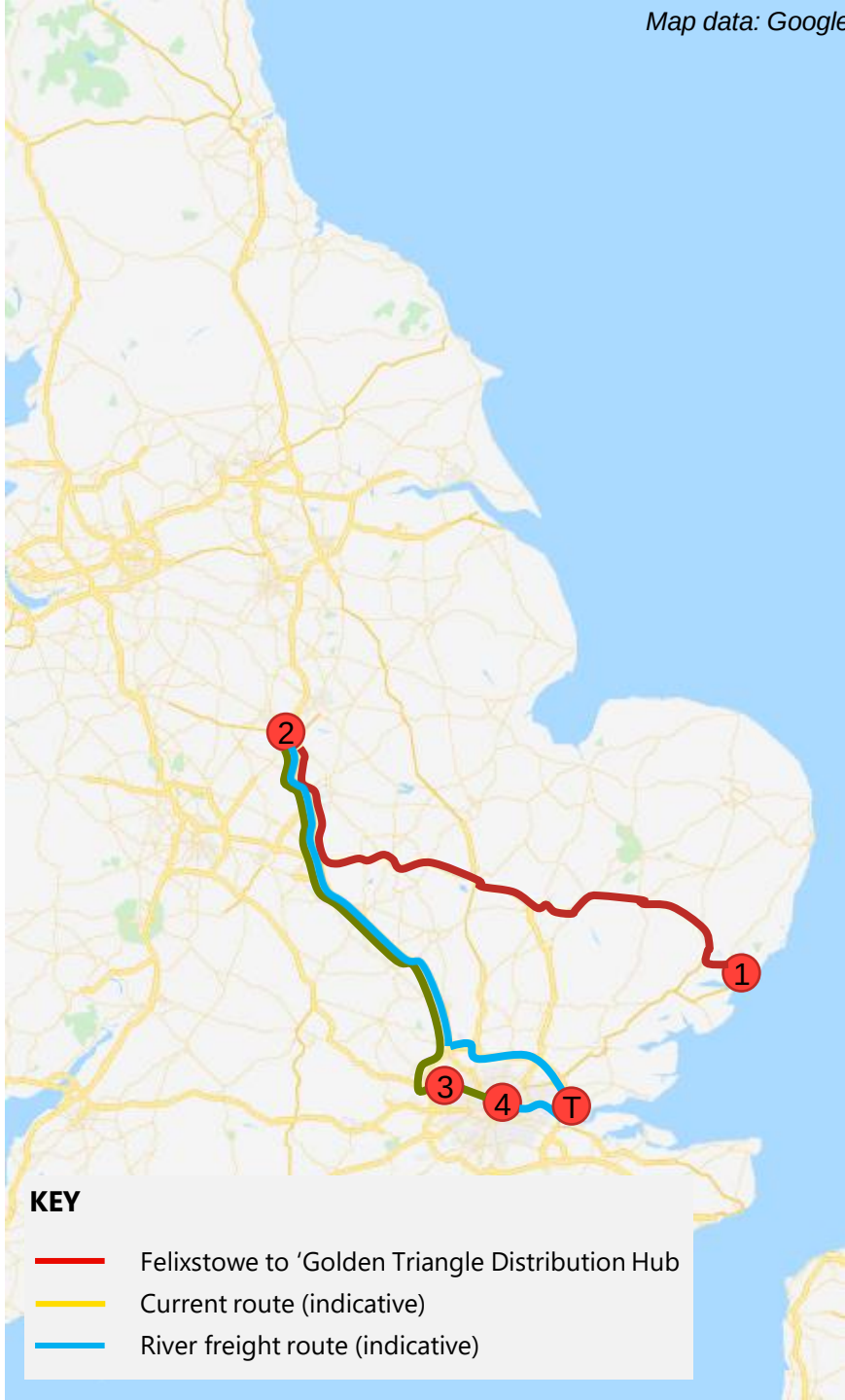
There are other, smaller centres of logistics activity with similarly strong access to London, including in the South East, and the M40, but the purposes of this analysis we consider the largest "Golden Triangle" market.

The geography of this journey does not provide a clear opportunity for river freight in this journey. The Thames must instead offer a new, alternative route.

The opportunity for the Thames is to replace the local distribution centre and provide part of the last mile leg. This alternative is shown in blue, with steps 3 and 4 being replaced as follows:

T. Parcel containing product travels via HGV to new local distribution centre on the Thames. This is pictured on the East of London, but could also be in the West.
4. Parcel travels along the Thames on a vessel, is unloaded in Central London and travels its last mile via electric cargo bike to final destination in Central London.

Therefore to understand the Thames' economic competitiveness against road we will be considering the traditional 1-2-3-4 journey against a new 1-2-T-4 journey.



4. THE ECONOMICS OF THE CURRENT SITUATION

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ROAD COSTS
A MIDDLE MILE LEG AT £0.10 PER PARCEL

In the road scenario we have assumed an indicative first step journey from Felixstowe to the Midlands. The UK logistics market is well established, with significant investment in warehousing, ports and transport links. It is unlikely that a new proposition for river freight will influence the underlying fundamentals of the UK logistics market. Therefore in the river scenario we also assume the first step is from Felixstowe to the midlands.

The differences lie after leaving the midlands distribution hub. Therefore we do not consider the costs involved in travel from the import port to the distribution hub, or the costs involved in consolidation and fulfilment.

For the existing road journey, the two steps are:

1. Parcel containing product travels via HGV to local distribution centre in Ealing, West London
2. Parcel travels its last mile via van to final destination in Central London.

To calculate these costs we have combined Logistics UK's Manager's Guide to Distribution Costs with in-house data sets, and then validated them against stakeholder information.

Step 1 – Midlands to London Distribution Centres

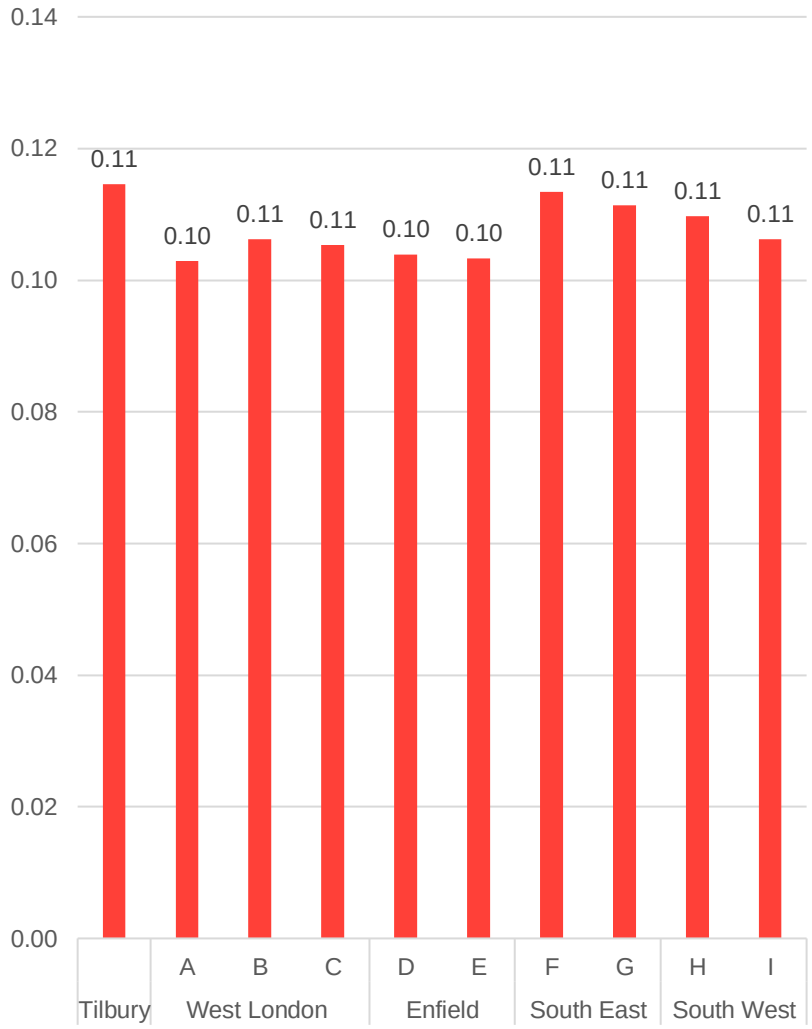
We have estimated a typical journey for this step as an HGV carrying 5,000 parcels from East Midlands Gateway to a sample of nine DPD, DHL and Hermes London distribution centres.

We have not considered any congestion charge, as we expect the deliveries to occur outside the congestion charge window o 07:00 – 22:00. We have not considered any ULEZ charge as we expect operators to ensure HGVs travelling to any locations within the ULEZ zone will be Euro 6 compliant.

This results in the costs shown in the table to the right. A full overview of our assumptions and calculations are in Appendix A.

Overall, this results in a range of £0.10 to £0.11 per parcel. A journey to Tilbury is around £0.01 more expensive per parcel than to the major distribution centres in West London and Enfield that are typically aligned to Midlands distribution hubs.

Figure 4.1 - Road costs from midlands to London DCs (£/parcel)



Source: WSP Analysis (2021)

ROAD COSTS
A LAST MILE LEG AT £0.80 PER PARCEL

Step 2 – Last mile

We have estimated a typical journey for this step as a 3.5 tonne van travelling from the London distribution centres to locations in Canary Wharf, London Bridge, Soho, Westminster and Battersea, then undertaking 150 parcel deliveries over 15 miles. We have then assumed the van undertakes a collection round of 15 parcels, covering around 3 miles before returning to the London distribution centres.

This is based on our understanding of typical delivery schedules, which we have validated in stakeholder discussions. For deliveries to London Bridge, Soho and Westminster we have included the daily congestion charge of £15. For all areas we have included the ULEZ charge, which is due to be extend to the North and South Circulars in October 2021.

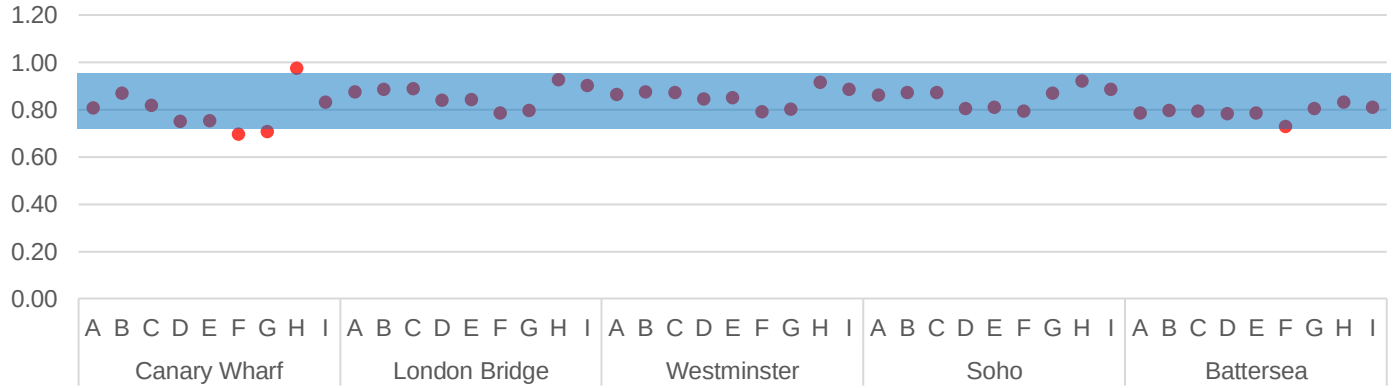
We have assumed all vans meet Euro III requirements, in place as of 2002, and do not need to pay the £100 per day LEZ charge. This would double the daily operating cost of a 3.5 tonne van and become economically unfeasible.

The chart to below shows the cost of last mile delivery trips to each of the four end user locations from each of the assessed distribution centres A to I.

Overall, this results in a range of £0.70 to £0.90 per parcel. We have taken a central case of £0.80 per parcel.

This exceeds some price benchmarks provided by stakeholders, which are as low as £0.50 per parcel. The next slide considers the full costs in more detail and considers where this discrepancy may lie.

Figure 4.2 - Road costs from London DCs to London Demand Sources (£/parcel)



Source: WSP Analysis (2021)

LAST MILE ROAD COSTS
£0.50 IS POSSIBLE BUT NOT SUSTAINABLE

The chart to the right shows the build up of costs for last mile delivery of a parcel from a London distribution centre to a central London location. This has been calculated as follows:

- **Fuel** – we assume operates at 24 mpg, which is lower than average given the stop-start nature of its deliveries. We assume a diesel price of £1.30 per litre, based on current prices.
- **Vehicle** – we assume maintenance and tyre replacement on a per mile basis in line with Logistics UK's Manager's Guide to Distribution Costs. We assume depreciation on a per mile basis based on a replacement cost of £25,000 and a vehicle life of 200,000 miles.
- **Overheads** – we assume insurance, vehicle excise duty and commercial fleet management overheads on an annual basis in line with Logistics UK's Manager's Guide to Distribution Costs.
- **Staffing** – we assume a single driver working a 10 hour day on a minimum wage of £8.91 per hour, a total of £89.10 per day. In addition to this is we consider a 3% pension contribution and a 13.8% national insurance contribution above the £170 per week earnings threshold.
- **Charges** – we assume a congestion charge payment of £12.50 per day for journeys to Soho, Westminster and London Bridge and an additional ULEZ charge of £15 per day to all locations. We have also considered parking fines of £4 per day based on public benchmarks.

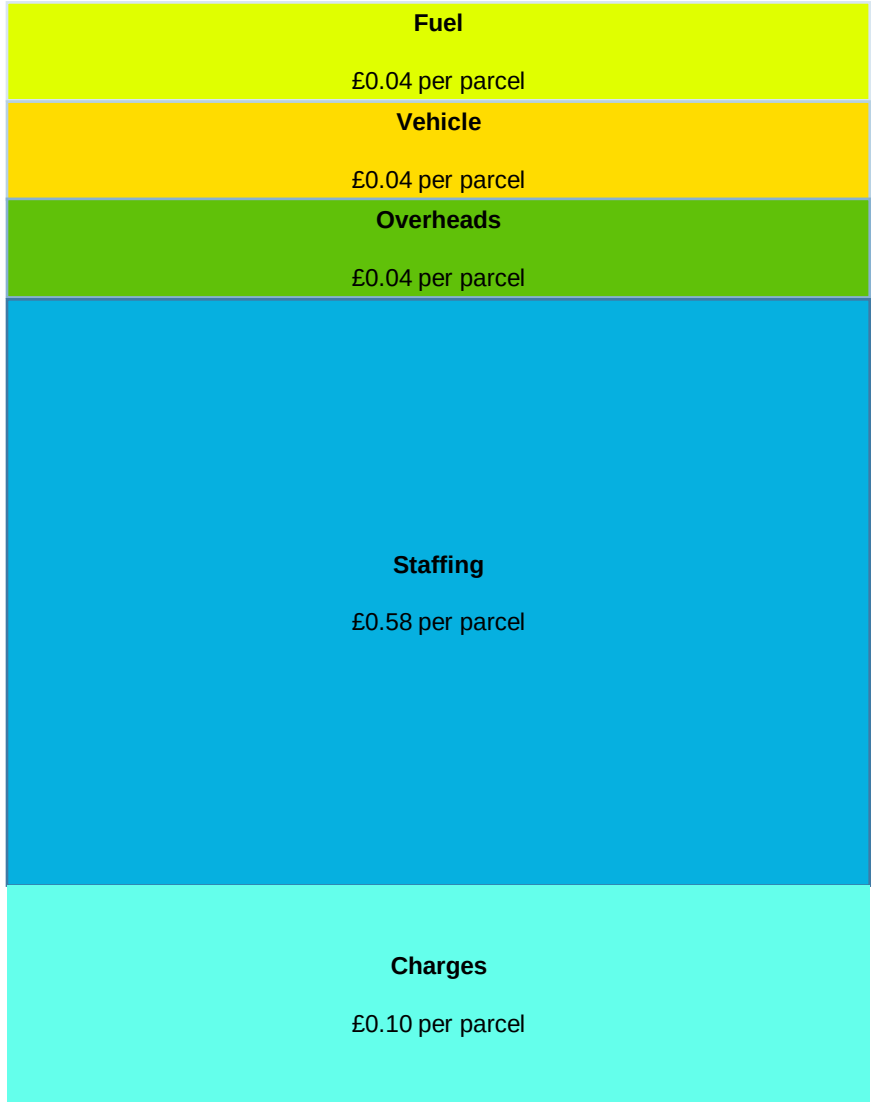
Achieving a last mile delivery cost per parcel of £0.50, in line with some stakeholder feedback, may be possible if certain parameters are changed.

The locations of distribution centres are largely fixed, so it is not possible to significantly reduce overall driving distances. Delivering more parcels will spread the fixed costs. However, more parcels will take more time and the largest driver of cost is the hourly wage. Therefore this is unlikely to make a difference. Fuel, insurance and vehicle excise duty are largely outside of the control of the vehicle operator so cannot be significantly reduced.

This leaves reducing vehicle costs, fleet management overheads and wages. This is possible through a "gig economy" arrangement where private individuals use their own vehicles to deliver packages on behalf of a logistics firm for a given fee per parcel.

However, based on our analysis, a fee per parcel of £0.50 only covers staffing costs. It does not cover fuel, vehicle costs or daily charges. Achieving this rate either means the long term neglect of vehicles, an inability to fund the next vehicle or receiving sub-minimum wage salaries. This is unlikely to be sustainable.

Therefore we consider a van last mile cost of £0.80 per parcel in our comparison with river freight.



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5. THE FUTURE RIVER OPERATING MODEL

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A NEW MODEL FOR RIVER FREIGHT
GREEN RIVER TRANSPORT AND LAST MILE DELIVERY

There is a very limited existing market for Thames light river freight. The market currently comprises two trials:

- DHL operates a daily river service carrying air mail from Heathrow. This loads at Wandsworth Riverside Quarter Pier and unloads at Bankside Pier in central London. Last mile delivery is undertaken by DHL courier bicycles.
- CEVA operates a trial daily river service carrying medical supplies for Guy's and St Thomas's NHS trust. This loads at Dartford International Ferry Terminal and unloads at Butlers Wharf. Last mile delivery is undertaken by bicycle or cargo bike courier, depending on size of consignment.

These are excellent precedents for a new river freight model. We have used the precedents from these and our discussions with stakeholders to inform the development of a river freight solution.

This model could be used by all freight operators sending cargo into London from the main large logistics hubs like the Golden Triangle, as well as managing point-to-point activity along the Thames.

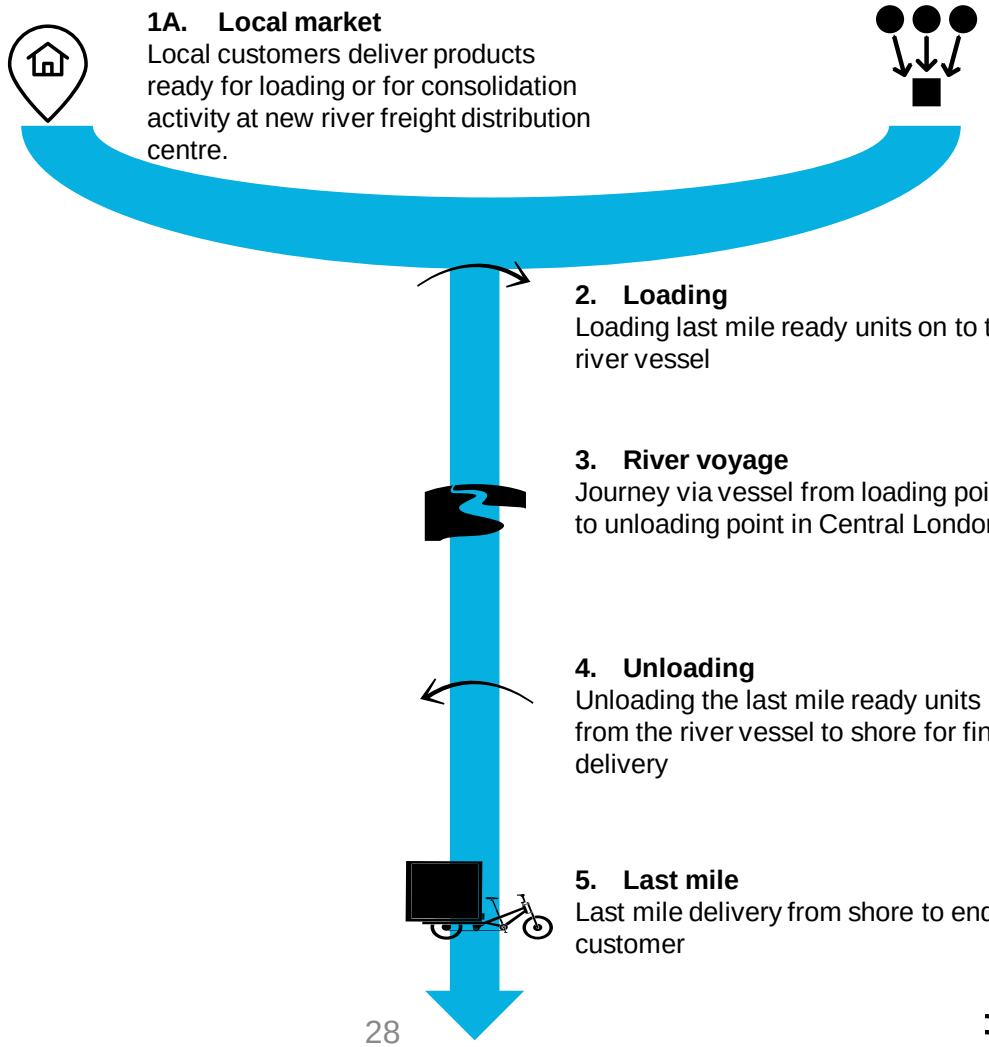
We have previously identified two geographical markets:

A. Local traffic travelling from a riverside location to central London

B. National traffic that would typically travel via main regional distribution hubs

Our proposed model involves the steps highlighted in the flow diagram to the right. The subsequent slides provide more detail on each step.

Figure 5.1 River Freight Model



1. CONSOLIDATION
DISTRIBUTION CLOSE TO THE RIVER

Parcels will need to be delivered and sorted in to last-mile-ready units that are easy to load on to and off of river vessels, and in a form that can be loaded directly on to E-cargo last mile solutions. This should ideally be reusable and standardised so that any customer can use the river freight solution.

Potential options include:

A. *Bags* – for small consignments, this would be designed to drop in to a cargo bike. This could either be a parcel sack holding 20 – 40 parcels for a specified delivery route, or a hold-all bag destined for a single destination. These would be loaded manually or by conveyor.

B. *Boxes* – for small or medium consignments, this would be designed to either drop in a cargo bike or stack in a quadracycle, trailer or powered light vehicle. These would be loaded manually or by conveyor.

C. *Pallets* – for larger consignments, an E-Bike ready pallet system following the Loadhog / Cara Cargo model would load in to a specialist trailer or powered light vehicle. These would be loaded by pallet truck or pallet conveyor.

D. *Trailer* – also for larger consignments, trailers would be pre loaded before loading on to the vessel and hooked on to E-bikes upon unloading. This could be loaded with pallets as per the Loadhog / Carla Cargo model, or with bags, boxes or other loose cargo.

To facilitate this, a river distribution centre is required at or near the loading point. Ideally, this distribution centre would be at the river loading point as this would eliminate the "first mile" move of the cargo to the river vessel. This would be equivalent to a local distribution centre, but it loads consignments on to a river vessel rather than individual vans. When operating at scale, it would accept deliveries from HGVs carrying products from distribution hubs such as the Golden Triangle.

Key activities:

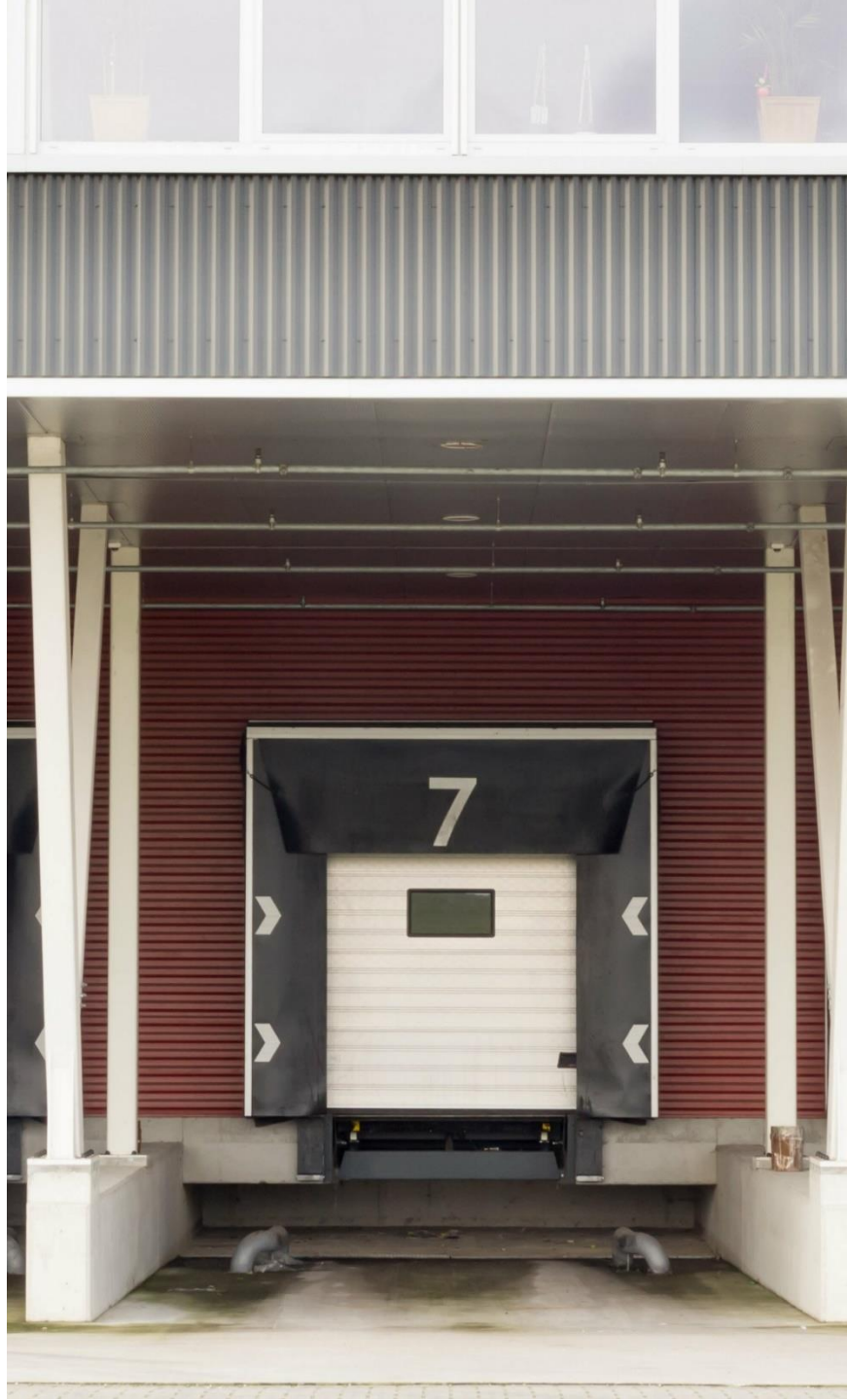
There are several potential activities at the river distribution centre, for example:

- Consolidating smaller products (e.g. parcels, letters) in to the last-mile-ready units;
- Handling and loading larger consignments in to last-mile-ready trailer units; and
- Storing pre-packed last-mile-ready units.

For smaller products we expect the majority to be processed via major distribution hubs, and arriving via HGV overnight. This would be similar to a local distribution centre, but with products loaded on to the river vessel rather than individual vans.

Operators:

The main operators of the distribution centre are likely to be large logistics operators. They may develop and operate individual centres, or lease and operate specific sections of a third party provided centre. Alternatively, they may share use of a third party provided centre in exchange for an operating fee.



2. RIVER INFRASTRUCTURE
THREE POTENTIAL OPERATIONAL OPTIONS

The river infrastructure requirements will be based on the loading and unloading operations.

operational models based on current river vessel models in Europe. These are summarised in the table to the right, with comments on the suitability for Thames freight. These broadly fall in to three options: manual loading, moving e-cargo bikes and geared vessels moving pallets or cages. A further option is to have lifting equipment, such as a crane, at the unloading pier. This would be similar to the geared option, but the crane would be on the pier rather than the vessel

As explained above, for the purposes of this analysis we are focussing just on the parcel market. For parcels, these options would look like the following:

We have considered a range of options for vessel loading and unloading:

Manual

This option would involve manually moving parcels from the vessel to the shore, or using light equipment such as a conveyor. Parcels would be pre-packed in to bags or boxes for specific routes and unloaded ready for last mile transport.

This option is simplistic and could incur high labour costs.

Bikes

This option would involve E-cargo bikes loaded with parcels for the specific route being carried on to the river vessel.

The river vessel is likely to be the highest cost element of the river freight model. Limiting the number of vessels deployed per parcel will help drive down the cost of river freight. as the trailers and bikes take up vessel space that could be used for parcels, which increases the overall cost per parcel.

In addition, moving bikes or trailers from the vessel to the pier could be a complex and time consuming operation, potentially requiring specialist equipment. Therefore we do not consider carrying loaded cargo bikes or trailers for the purposes of this study.

Lifting equipment

This option would involve a crane on board the vessel or at the pier to move pallets or cages to the shore. These pallets or cages would contain parcels, bags of parcels or boxes of parcels ready for last mile transport.

This could face tidal restrictions on operations, require significant capex for lifting equipment and may face planning issues because of noise.

Selected option

Of the above options, we have selected the manual loading option for the purposes of our analysis. While simplistic, it avoids the cost and potential operational issues facing the bike and lifting equipment options

Table 5.1 River Freight Case Studies

Model	Operations	Comments on Suitability
Fludis, Paris	Holds 27 E-trikes, with onboard lift to bring them to quay level, and crane for pallets	On board e-trike operations are well suited to parcel operations. However, 27 e-trikes limits operations to just 810 parcels per journey which could significantly increase costs. Operations are currently at quays and it is unclear whether loading would work reliably at with tidal restrictions.
DHL, London	Air mail loaded and unloaded manually and sorted at unloading point	Sorting operations at the unloading point is unlikely to work at scale given space limitations. Manual operations is possible but will need to be efficiently designed and operated given volumes handled.
DHL, Amsterdam	Holds 21 E-bikes, but there is no lifting infrastructure and loading/unloading is a known challenge.	The canal boat design is not suited to Thames operations. In addition, 21 e-trikes limits operations to just 630 parcels per journey, which could significantly increase costs.
Blue Line Logistics, Antwerp & Paris	A geared, self propelled barge that loads and unloads palletised cargo	A geared barge design may limit operations at piers given tidal restrictions. A new geared barge could also incur significant capex.
Bierboot / EcoBoot Utrecht	A geared, self propelled barge that loads and unloads roll-cages and beer barrels	A geared barge design may limit operations at piers given tidal restrictions. Roll cages could be used to carry parcels for onward distribution. A new geared barge could also incur significant new capex.

Source: WSP Research (2021)

2. RIVER INFRASTRUCTURE
LOADING OPERATIONS THAT AVOID FIRST MILE

The river freight operation has to be as efficient as possible. Therefore, it is crucial to avoid an additional move from the consolidation point to the river loading point. If a parcel is loaded on to a van to get to the loading point, it would be more cost efficient for the van to head directly to final destinations rather than load on to a vessel and then on to last mile transport.

Therefore, we propose an operation that takes parcels directly from the consolidation point to the river vessel.

Options would be either to the West or to the East of Central London. However, there are significant restrictions in West London.

- Any site must be downstream of Teddington Lock to ensure navigability
- Ideally a site should be downstream of Putney Bridge to avoid conflict with recreational vessel users who frequent the Putney-Hammersmith stretch of the Thames.
- Land in this vicinity of London is at a premium; as such, any distribution site selected would be expensive to operate.

Smuggler's Way in Wandsworth and Battersea Power Station pier are potential options. However, given the proximity of these sites to points of demand, it is unlikely to be cost efficient to unload on to river vessels at this point rather than continuing a journey to final destinations.

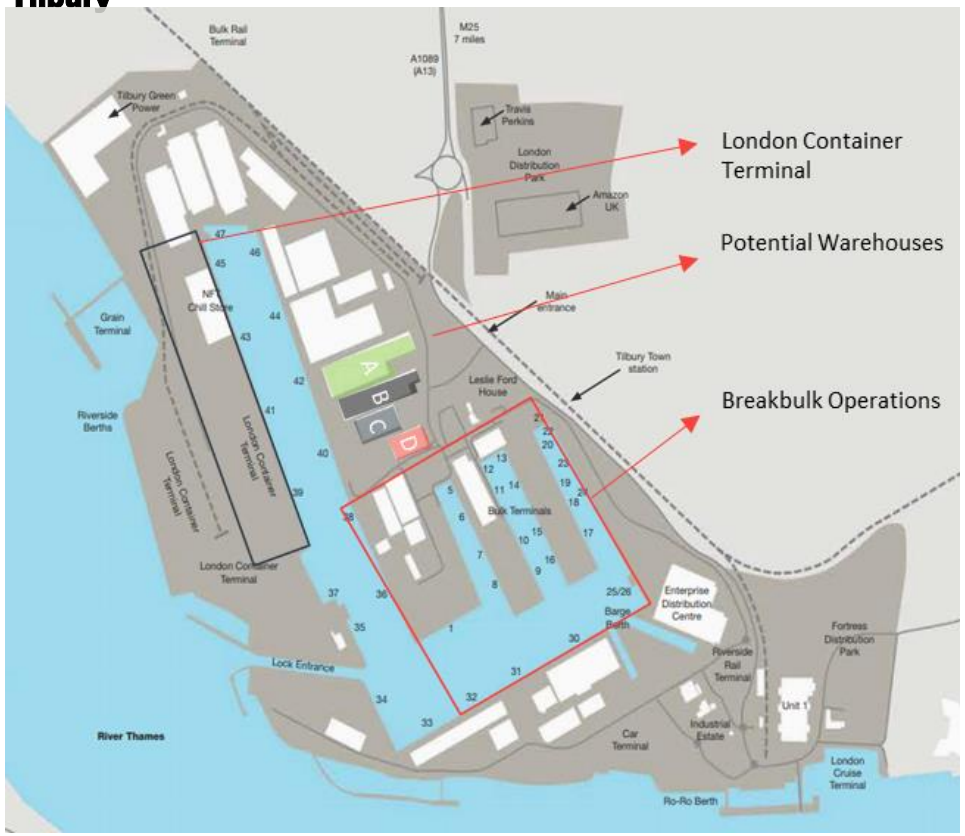
Therefore, we have focussed on East London. For the purposes of our analysis, we have considered a loading location at Tilbury. Similar operations would be possible at other points along the river, such as Dartford International Ferry Terminal (DIFT) and at one of the available piers in Barking. However, the advantage of Tilbury is that it has existing logistics infrastructure, including a rail connection.

Parcels would travel from the distribution centre in pre-packed last-mile-ready units via conveyor directly on to the vessel for transport upriver.

The eastern basin is known to be breakbulk and unsuitable for logistics operations. The western section is operated by London Container Terminal and is one potential location for operations, particularly given its access to a rail connection.

To minimise costs, another potential location is Berths 40/42 where warehouses (labelled A through D on the map) could be converted.

Figure 5.2 Opportunities for Loading Operations at Port of Tilbury



Source: WSP Analysis (2021)

2. RIVER INFRASTRUCTURE

UNLOADING PIERS ACCESSING KEY AREAS OF DEMAND

There are various existing piers across the Thames. To reduce costs, we propose to make use of these existing piers and update the existing infrastructure, rather than developing new piers from scratch.

We have reviewed available Thames piers, and the analysis undertaken by Bearing Point which considers the suitability of Thames piers. Based on this information, we have selected four piers. A two mile radius around these piers provides coverage of all of the Thames between Canary Wharf and Battersea.

We are considering river freight operations at scale. To achieve this, we do not consider it possible to share piers with passenger activity because of safety and congestion. All of our proposed piers would involve either construction of a new pier or extension of an existing pier. These are:

1. West India Dock

This is currently a derelict structure with only the dolphin structures remaining. It was formerly a pier, most recently for passenger services, but has been disused since 1991 when Canary Wharf Pier opened slightly upstream.

2. London Bridge City Pier

This is a central location, serving the South Bank. It is currently served by Thames Clippers along with other passenger services such as Viscount Cruises. An upstream extension would bring it closer to London Bridge and a downstream extension would take it closer to HMS *Belfast*.

3a. Millbank Pier, Westminster

This is an existing operational pier served by Thames Clippers and other passenger vessels. It has a good central location to serve Westminster and Central London.

However, its non-conventional design may prove difficult for an extension for services.

3b. Woods Quay

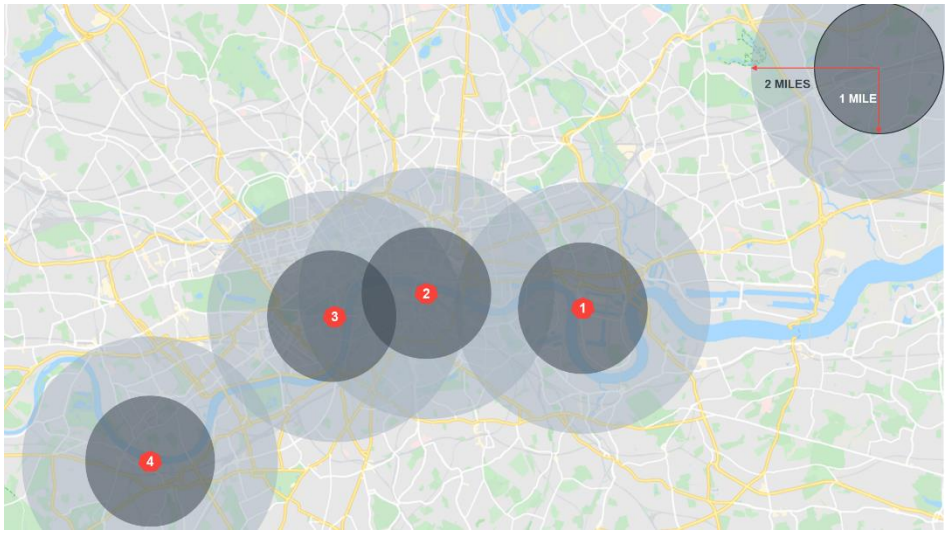
This is a private mooring with a Central London location on the north bank of the Thames with direct connection to the cycle superhighways. However, the reception pontoon may not be suitable for e-cargo bike trade as it is used for leisure events.

4. Battersea Power Station Pier

This is an existing pier with excellent access to the dense residential neighbourhoods of Battersea.

We consider each of these piers in turn on the subsequent pages.

Figure 5.3 Indicative Pier Locations – Central London



Source: Bearing Point (2020) / WSP Analysis (2021)

2. RIVER INFRASTRUCTURE
WEST INDIA DOCK PIER, TOWER HAMLETS

Existing infrastructure (fixed bridges and restraint dolphins) could be reused in the scheme if in an acceptable structural condition to support the new pontoon. Surveys and investigations would be required to determine this.

- New pontoon (proposed two-storey for additional storage space to reduce the no. of vessel trips required) to be installed with linkspan to allow access at all states of the tide.
- Linkspan to have capacity for light cargo access i.e. cargo bikes with trailers.
- Services required for pontoon include power and water which shouldn't be a problem given the proximity to residential network.

KEY CONSIDERATIONS

- Opposition would likely arise from adjacent residential properties regarding noise and lighting, particularly if being badged as 24/7 operations.
- Fairly tight vehicular access to the pier itself from the main road network, which is adequate if e-cargo bikes are being used.
- A number of supporting studies would likely be required for planning purposes, meaning consultant costs would be significant pre-construction: for example, noise & air quality assessment; flood risk assessment; transport assessment; marine ecological assessment; navigational risk assessment; water framework directive assessment; structural surveys of existing infrastructure etc.
- Wide section of the Thames here so navigational risk shouldn't be an issue; however, the intertidal zone is wide on both the north and south sides of the river, meaning that capital/ maintenance dredging costs would be considerable and gaining approvals for capital dredge through the EA would be challenging.
- Using currently derelict infrastructure on the Thames would be beneficial from a life-cycle assessment perspective and would be favourable in terms of planning applications.
- As the existing dolphins look to be timber, consideration would need to be given to whether these are existing ecological habitats and, if so, what biodiversity net gain solutions could be worked into the design.

Figure 5.4 – Side elevation looking upstream

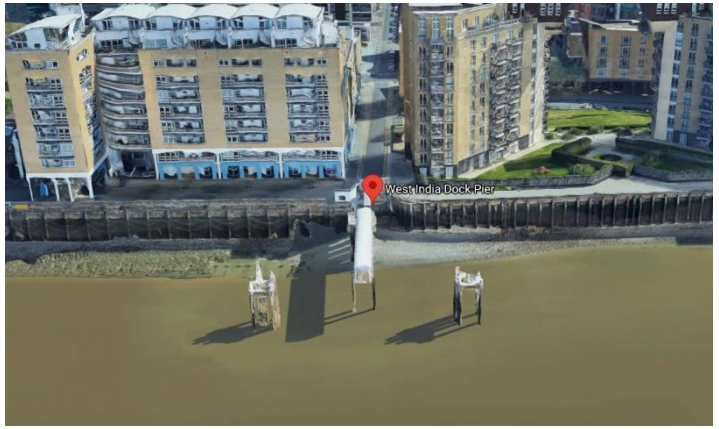
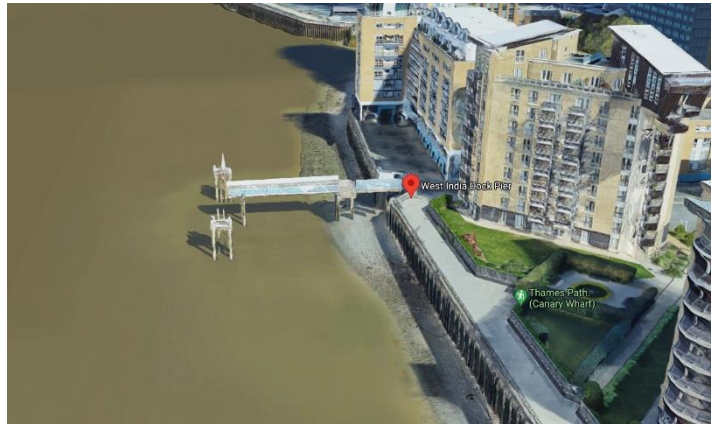


Figure 5.5 - Front elevation



2. RIVER INFRASTRUCTURE
LONDON BRIDGE CITY PIER

- Existing pier is operational and served by Thames Clippers and other passenger vessels. Current pontoon would be difficult to share for multi-purpose given how tailored it is to passenger services; space is limited for laydown/ temporary storage/ e-cargo bikes to manoeuvre and linkspan wouldn't facilitate this easily.
- New pontoon to be installed on the downstream end of the existing facility as an extension. Upstream would likely cause a navigational hazard with southern arch of London Bridge so downstream would be preferred.
- New linkspan, bankseat and fixed platform would also be required.
- Linkspan to have capacity for light cargo access i.e. cargo bikes with trailers.
- Services required for pontoon include power and water which shouldn't be a problem given the proximity to residential network.

KEY CONSIDERATIONS

- Opposition would likely arise from adjacent residential properties regarding noise and lighting, particularly if being badged as 24/7 operations.
- Much office space on the south side of the river, intermixed with residential properties.
- A number of supporting studies would likely be required for planning purposes, meaning consultant costs would be significant pre-construction: of particular importance in this are expected to be: navigational risk assessment, pedestrian modelling and noise assessments.
- Navigational risk is likely to be a significant issue, as it is a busy section of the Thames with HMS Belfast and London Bridge causing the most significant obstructions.
- A new access point onto the Southbank would be required so as not to interfere with existing operations and maintain flexibility; however, this would likely be difficult to obtain planning permission for given the constraints of the site on the landside.
- Given the age of the existing structure, it may be that the restraint pile hoped to be used as part of the extension doesn't have the required capacity and a new structure entirely is required.

Figure 5.6 - Side elevation looking upstream

Figure 5.7 - Front elevation

2. RIVER INFRASTRUCTURE
WOODS QUAY, WESTMINSTER

- Woods Quay is Central London's longest private mooring. It was not considered by the Bearing Point report for analysis as it was not constructed. It would therefore be worth undertaking a further analysis of this location, in a similar manner to the other locations and assessed against the same criteria, to see whether it is a viable option or not.
- Current pontoon length is 140m x 7m and therefore additional pier structures may not be required.
- The reception pontoon may not be suitable for passing e-cargo bike trade as it's bespoke for exclusive events.

KEY CONSIDERATIONS

- Central London location (just upstream of Waterloo Bridge) on the north bank of the Thames and direct connection to the cycle superhighways.
- The existing ponton deck looks to be clear of obstructions which would work well for potential e-cargo bike operations from the vessel; however, manoeuvrability would need to be considered in more detail with a access bridge width of approximately 2m.
- Unlikely that any significant modifications would need to be made to this structure, other than potential shore power upgrades.
- There is no space to extend the pontoon as this stretch of the river is busy with piers; therefore, this option would be viable only if it could be used as-is. If it were suitable, it would undoubtedly be a low-CapEx option.

Figure 5.8 Side elevation looking upstream

2. RIVER INFRASTRUCTURE
MILLBANK PIER, WESTMINSTER

- Existing pier is operational and served by Thames Clippers and other passenger vessels. Current pontoon would not be able to be used by the planned operations as it has a very restricted deck.
- It may be possible to use the existing berth which would result in a smaller (and less costly) extension to be built for storage/ sorting/ freight activity. At this location, given the Grade II Listed status of the Victoria Embankment, existing infrastructure should be utilised as much as possible to avoid having to apply for landside modifications that risk being rejected.
- Existing services for the current pontoon could be used; however, shoreside power modifications may be required depending on the vessel selected for use.

KEY CONSIDERATIONS

- Quite a tight stretch of the river navigationally is on a bend and sits opposite Tamesis Barge. However, the existing pier here would mean an NRA may not be required - especially if berthing at the existing pier and only a small extension was required.
- Not many residential units around the immediate riverfront vicinity, which reduce the concerns surrounding noise pollution.
- This location would allow the cycles direct access onto the cycle superhighway, giving fast, safe access to the surrounding areas.
- The usual environmental studies would be required for purposes of Marine Licence and River Works Licence application.

Figure 5.9 - Side elevation looking upstream

Figure 5.10 - Front elevation

2. RIVER INFRASTRUCTURE
BATTERSEA POWER STATION PIER

- It may be possible to use this pier without requiring an extension on the river itself. The pier is very open with ramp access from the canting brown to berth level, which would suit cargo bikes well. The pier is relatively new and so would have a decent service life for pilot operations.
- Upgrade to services on the pier may be required, depending on the specification of the vessels.
- This pier serves a very densely populated area with a growing number of businesses which would be good for light freight deliveries.

KEY CONSIDERATIONS

- Opposition may arise from adjacent residential properties regarding noise and lighting, particularly if being badged as 24/7 operations. However, it is a traditionally industrial area, which may mean residents are more accepting of operations such as this.
- Consideration should be given to the timetable of the existing river bus and whether there would be enough flexibility for the same berth to be used for light freight deliveries. This would determine whether the existing pier could be used or not without significant modification.
- The pier is very exposed, with no shelter, which may cause problems for the operation in adverse weather conditions.
- The adjacent jetty could also be considered for use, though noting that the berth would likely be accessible only at high tide.
- It is assumed that the freeboard of the pontoon (~1m) is adequate for the vessel used for the deliveries, but this would have to be confirmed following vessel specification.

Figure 5.11 - Rear elevation

3. RIVER VESSEL
GREEN, FLEXIBLE RIVER TRANSPORT

Broadly, vessels on the Thames can be divided in to:

1. Monohulled vessels, which include some of the river cruise, private hire and events boats operating on the Thames
2. Catamarans and other multi-hulled vessels, such as those operated by Clipper
3. Barges, which can either be self propelled or moved by tug boats
4. Smaller vessels such as speed boats and service vessels

For using piers, multi-hulled vessels have a proven track record in operating effectively to a timetable.

Operationally, a key consideration is the vessel's freeboard. In simple terms, this is the distance between the waterline and the deck. Having a freeboard that aligns with the height of the pier will allow efficient operations.

Catamarans and monohulled vessels have proven to operate effectively at piers. Because of the lower freeboard, barges may need additional investment, for example ramps or lifting equipment, or additional labour to operate efficiently.

For the purposes of our analysis, we have considered catamarans given their proven operation to a timetable on the Thames.

A key principle is that the vessels used must, in the medium term, be green. One of the major benefits of river freight is its environmental benefits over road. With road transport becoming electrified, the river vessel has to move away from marine diesel to maintain parity with road. Potential options include:

1. **Electric** motors powered by batteries, for example the PowerTech PowerRack, which is in use on the FLUDIS self propelled barge currently operating on the Seine in Paris. This requires charging infrastructure at the home port.
2. **Hydrogen** based power, either as liquefied hydrogen, ammonia or in fuel cells. This requires refuelling infrastructure at the home port.
3. **Liquefied Natural Gas**, which would reduce SOx and NOx emissions significantly and also reduce carbon emissions. This would not be fully green.
4. **Biofuels**, which provides similar benefits to LNG but is produced from biomass
5. **Emissions** reduction technologies, such as Selective Catalytic Reduction, which reduce Nox and particulate matter emissions but do not reduce carbon emissions
6. A **hybrid** which combines elements of the above, such as a diesel / electric combination.

Of the above, we have eliminated options 3 to 6 as they are not fully green. Of the two green options, we have considered electric propulsion in our cost analysis as electric propulsion is currently used in commercial freight and passenger options in line with our key principle 4.

Electric Fludis vessel

Source: Le Parisien

"Maas" vessel to be converted to hydrogen propulsion

Source: Maritime Executive

4. LAST MILE

INITIAL FOCUS ON E-CARGO BIKES FOR SUSTAINABLE LAST MILE

Existing options for last mile delivery include vans, a variety of electric and standard bikes, small electric assisted vehicles and on-foot deliveries.

Future innovative solutions could include new technology such as drones or autonomous cargo robots. While trials of these technologies are underway, they are not operating commercially on a large scale.

Given the key principle of having a freight model that is “ready to go”, our focus is on the existing options initially. Of these, we consider cargo bikes to be the optimal solution for last mile operation in Central London. The key advantages are set out to the right.

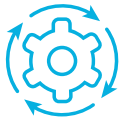
We have considered a number of available options on the next slide. Of these options, we have considered a 3 wheel E-Cargo bike given its balance of flexibility and capacity.

Speed – cargo bikes are up to 25-50% faster than road traffic due to their ability to use cycle lanes and take more direct routes in urban environments.

Reliability – bikes are less likely to be impacted by congestion, accidents and roadworks offering more reliable journey times to customers. The flexibility of a bike to park anywhere within the street environment also offers benefits in terms of reliability and travel times.

Amenity – cycle logistics are suited to deliveries in areas and at times of the day that are unsuitable for motorised vehicles due to amenity issues such as noise, particularly within residential neighbourhoods and urban environments.

Flexibility – the speed and reliability allows greater flexibility in timing of deliveries and the range of delivery services. This allows businesses to offer a greater range of delivery timeslots and routes to their customers.



Operating costs – on average per annum, a cargo van will incur approximately £1,500 in penalty charge notices from parking, road based taxes such as congestion charge or emissions charging and fuel costs.

Capital costs – cargo bikes can be a cost-effective option for capital investment in low / zero emissions cargo vehicles, with a price of between 10% and 25% of an electric van.

Social Benefits – cargo bikes generate significant social and health benefits This includes health benefits for the riders / employees, and removal of traffic from the roads which generates negative externalities such as congestion, air quality, carbon emissions and noise.

Practicality – cargo bikes take up less space and can be stored in Central London, or potentially on the piers or the river. While some last-mile vans are stored at micro distribution centres, there is not significant available space for parking. If vans need to drive in from outside of London to collect river freight then all congestion, environmental and cost benefits are lost.

4. LAST MILE
SUSTAINABLE LAST MILE LOGISTICS

	Name	Features	Range and Capacity	Cost (£)
	Cargo trailer	▪ Fitted to the rear of a cargo bike ▪ Capable of carrying large storage boxes ▪ Can be fitted with electric motors to assist the rider ▪ Can also be used manually by hand to assist deliveries ▪ 48V electric version charges in 4 hours	▪ Dependent on the cargo bike pulling the trailer ▪ 48V Electric assisted version has a range of 80-100km ▪ 150kg load capacity, 1.5m^3 loading volume ▪ Loading area: 1.65m x 0.65m	▪ £2,500 - £5,700 (electric assist)
	E-Cargo Bike – 2 wheel base	▪ Rides like a standard electric bike ▪ Maximum speed 15.5mph / 25km/h ▪ Motor power – 250w ▪ Recharges in 7 hours	▪ Typical range of 68 miles / 110km in urban environments ▪ Maximum loads of approximately 150kg (excluding rider)	▪ £5,000
	E-Cargo Bike – 3 wheel base	▪ Rides like a standard electric bike ▪ Maximum speed 15.5mph / 25km/h ▪ Motor power – 250w ▪ Recharges in 8 hours	▪ Loading area: 1.6m x 1.1m ▪ Loading volume: 1,500 litres ▪ Typical range of 37 miles / 60km (with dual battery) ▪ Maximum loads of 400kg (including rider weight)	▪ £5,000 - 10,000
	Electric Assisted Vehicles (EAVs)	▪ Rides like a standard electric bike ▪ Maximum speed 15.0mph ▪ Motor power – 250w ▪ Recharges in 8 hours	▪ Typical range of 60 miles ▪ Loading area: 1.3m x 1m ▪ Loading volume: 2,000 litres ▪ Maximum loads of 150kg	

Source: https://www.carlacargo.de/ (2021), https://www.eav.solutions/ (2021), https://www.absolutelycourier.com/ (2021

RIVER FREIGHT INFRASTRUCTURE COSTS
HIGH FIXED COSTS MEANS SCALE IS KEY

We have developed costs for each of the elements of the river freight model as below:

Consolidation

We have estimated the capital cost of developing a new distribution centre linked to a river loading point at the Port of Tilbury. We have assumed that this is depreciated over a 25 year period. We have not included any additional opex as we expect the distribution centre opex to be similar to the road equivalent.

Our base case includes the construction of a new distribution centre. This includes a conveyor system within the DC and to the vessel. This costs £10.4m. In a scenario where existing warehousing infrastructure is adapted, we estimate that this would cost £2.0m.

River infrastructure:

We have estimated the capital costs of loading infrastructure at Tilbury and upgrading the four unloading piers we have highlighted. In summary, we estimate the following costs:

- **Tilbury** - £0.57m
- **Canary Wharf** - £4.10m
- **London Bridge** - £4.18m
- **Battersea** - £0.45m
- **Millbank -** £2.50m

We have also estimated operating costs based on a staffing profile, expected O&M and other overheads at c. £5,000 per day.

River vessel: we have estimated vessel costs based on expected day rates based on discussions with river operators. We estimate the return journey time from Tilbury to Battersea to take 10 hours including one hours' operations at each pier. Based on this we assume one journey per day. We assume that the most efficient vessel size is used for each volume scenario. Indicatively, we have estimated vessel costs and capacity as per the table below:

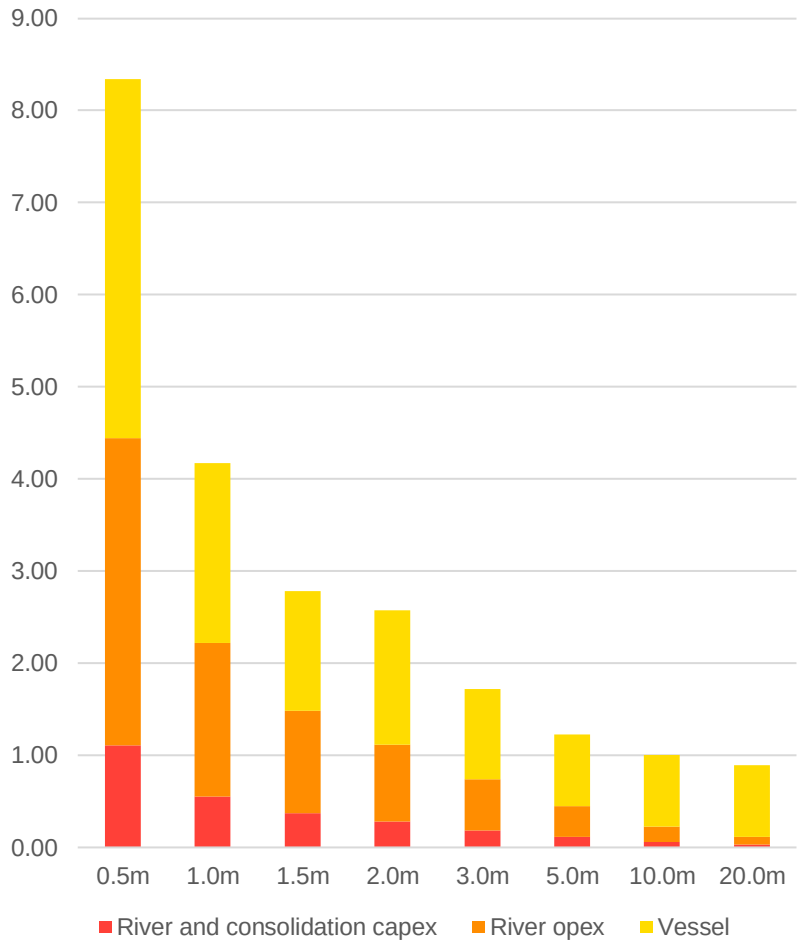
Vessel size	Daily cost (£)	Daily capacity (parcels)
Small	7,500	6,000
Medium	11,250	12,000
Large	15,000	20,000

We have then applied a 25% uplift to represent the additional costs of converting the vessel to zero emissions.

The chart to the right shows how these costs materialise as a cost per parcel in different volume scenarios. Increasing volumes from 0.5m parcels per year to 20m parcels per year would reduce costs from £5 per parcel to £0.92 per parcel. This is driven by sharing the fixed capital and operating costs, and utilising larger vessels.

We expect that initially river freight can be operated on existing vessels, for example small volumes alongside passenger services. This is likely to be for small volumes of high value cargo, such as next day and other urgent deliveries that can absorb additional costs of a first mile delivery to a passenger pier. There is likely to be a "tipping point" where for light freight to operate at scale it needs to be operated independently of existing river use. This is the focus of our analysis.

Figure 5.12 River costs from Tilbury to Central London (£/parcel)



Source: WSP Analysis (2021)

LAST MILE COSTS
STAFFING IS LARGEST COST COMPONENT

Last mile: we have built up last mile costs for E-Cargo bikes in line with the approach to last mile costs for vans. Discussions with stakeholders have indicated that a cargo bike could undertake a delivery round of 30 – 40 parcels. Taking the middle point, we assume that a bike can carry 35 parcels and delivers a parcel every 3 minutes, which is faster than a parcel every four minutes for a van. Including a loading time, initial journey and return journey results in a total round trip of 140 minutes per delivery round meaning the e-cargo bike can do a total of 105 parcels in three full trips over a 7 hour day. We estimate the daily cost as per the below:

- **Electricity** – we assume the E-cargo bike uses 48 Wh per trip, based on a range of 80km and a charge of 500 Wh, at a cost of £0.14/kWh
- **Vehicle** – we assume tyre replacement at £75 per set replaced every two years, maintenance of £175 pr year and an annual service at £150 per year. We estimate the cost of a cargo bike at £7,000, which is depreciated over 15 years. We assume the electrical power component costs £2,000 and is replaced after 7 years.
- **Overheads** – we assume insurance, vehicle excise duty and commercial fleet management overheads on an annual basis in line with Logistics UK's Manager's Guide to Distribution Costs.
- **Staffing** – we assume a single driver working a 7 hour day on a minimum wage of £8.91 per hour, a total of £62.37 per day. In addition to this is we consider a 3% pension contribution and a 13.8% national insurance contribution above the £170 per week earnings threshold.
- **Charges** – we assume no congestion or ULEZ payments and no parking fines.

The chart to the right shows the build up of costs for last mile delivery of a parcel from a London pier to a central London location by E-Cargo bike.

Staffing costs are by far the highest component, at £0.65 per parcel. This is significantly higher than the staffing costs for van last mile deliveries, at £0.50 per parcel. This discrepancy is because of the higher volumes of parcels per day, and existing activity in reverse logistics.

RIVER FREIGHT IS NOT CURRENTLY COMPETITIVE
A NUMBER OF OPTIONS TO CLOSE THE GAP

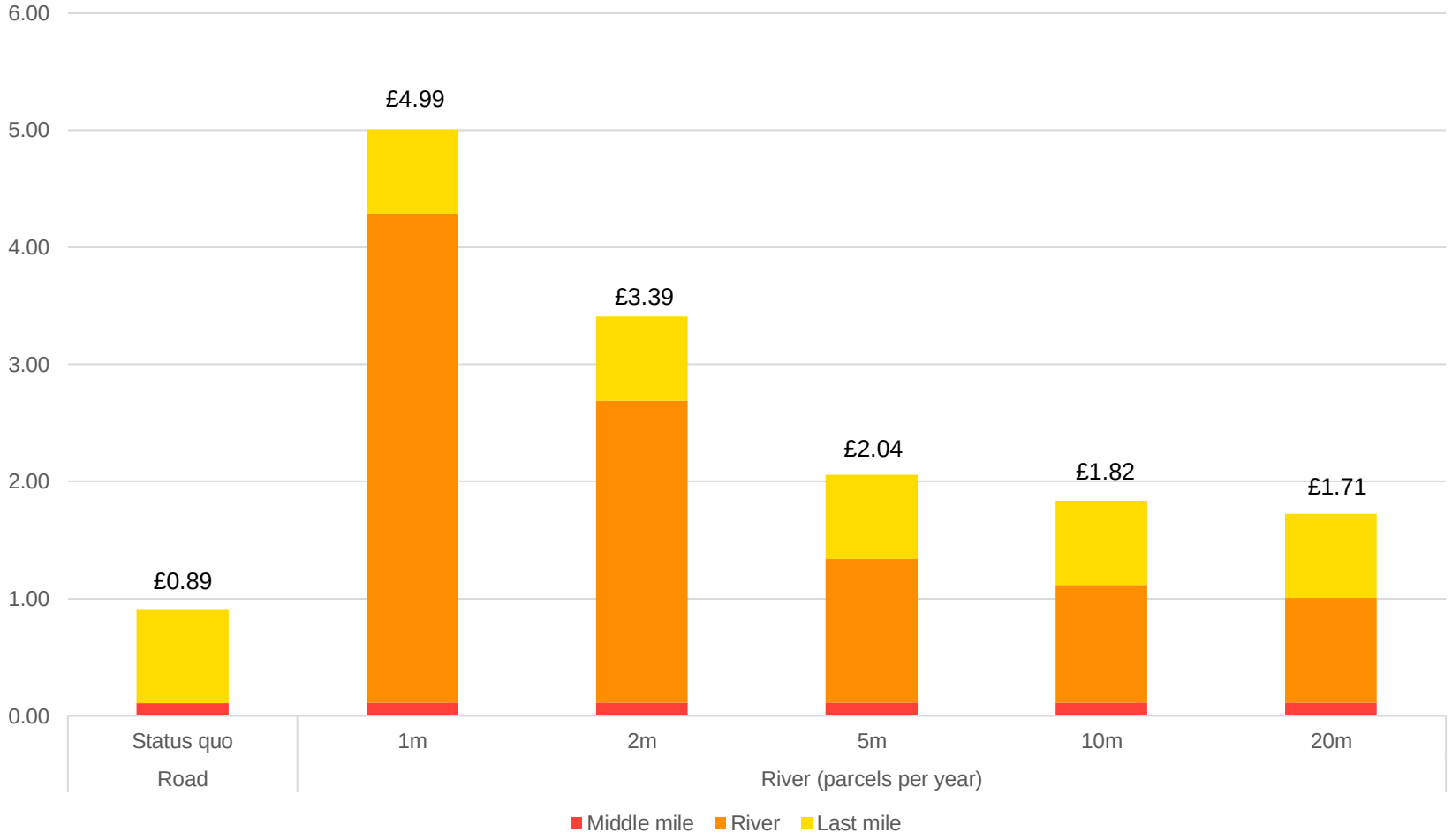
The chart to the right combines the middle mile, river and last mile costs for the status quo road journey and our river model. This shows that the river option is not currently competitive, particularly at low volumes.

The difference is largely driven by the additional river leg, which does not occur in the status quo road journey. This costs between £3.80 with 1m parcels per year, falling to £0.92 with 20m parcels per year. In addition, the middle mile is marginally more expensive, costing an additional £0.02 per parcel because of the increased distance to Tilbury

This is partially offset by the last mile, which is £0.08 cheaper than a van journey. However, this is not sufficient to offset the full gap.

We consider options to offset this cost difference on the next slide.

Figure 5.13 - Transport cost from Golden Triangle to Central London destination (£/parcel)



Source: WSP Analysis (2021)

RIVER FREIGHT CAN BE COMPETITIVE WITH ROAD
KEY IS TO LEVERAGE STRONG SOCIAL BENEFITS AND FLEXIBILITY

At 1m parcels per year, we estimate the cost of moving a parcel from the Golden Triangle to Central London via the river to be £4.75 per parcel. This is £3.74 more expensive than the status quo option.

We have identified the following short term levers to make river freight competitive:

1. **Increasing scale** – increasing scale from 1m to 20m parcels per annum would reduce the cost by £3.36 per parcel. In terms of market share, this would be less than 3% of London's parcel trade.

2. **Capital costs** – receiving funding to cover the capital costs of the river infrastructure would reduce the cost by £0.03 per parcel.

3. **Shared infrastructure** – using existing infrastructure, for example at the Port of Tilbury, for the consolidation and loading set up, could save £0.03 per parcel.

4. **Social benefits** – we estimate the social benefits of moving light freight to the river at £0.37 per parcel. This could be subject to a subsidy akin to the Modal Shift Revenue Support Grant. This is explained in full on slide 68.

5. **Reverse flows** – accessing a market for reverse flows would reduce the cost per parcel. This could involve cargo bikes carrying parcels back from customers to the river, or having separate deliveries of parcels to the river vessel, such as bulk mail.

6. **Rail** – there is a direct rail link from major distribution hubs such as Daventry, East Midlands Gateway and Birmingham. Based on our analysis and stakeholder engagement, we estimate the cost of moving a parcel by rail from the midlands to a new distribution centre in Tilbury to be £0.05 per parcel. This is a saving on the current middle mile cost of around £0.05.

In addition, there are two main factors that could increase the costs of road freight:

7. **Net zero ambitions** – with parcel demand rising and traffic continuing to increase in London up until the pandemic, further changes could be made to **road pricing**. Since 2003, road pricing has increased nearly six fold (see timeline to the right). At this rate, congestion pricing would increase by 50% every three years. An additional 50% on current congestion charging for LCVs would increase the cost per parcel by £0.07.

8. **Increasing congestion** – van deliveries are already experiencing significant congestion and parking fines. As demand for parcels rises, and roads become more congested, the volume of parcels that can be delivered by a van driver each day will reduce. **Every 10 fewer parcels per day would increase the cost per parcel by £0.05.**

This would leave a gap of £0.50. In the short term, we expect that this could be made up by commercial innovations and new service offerings for customers. This could include initiatives such as:

- **Charging a "green" premium** on deliveries, which may be best focussed on specific retail sectors, or large customers that have environmental obligations such as public sector bodies, or to promote **CSR**
- Using the flexibility of cargo bikes to charge a **premium for "direct" deliveries** to locations such as pubs or restaurants; and
- Establishing riverside **click and collect locations**.

Over the longer term, we anticipate further scope for cost competitiveness driven by the pathway to Net Zero. Net Zero will have both a regulatory effect on relative costs (as the freight fleet is forced to decarbonise) and support development of new technologies and innovation through policy support. This could include:

9. **Automation** of last mile delivery, potentially reducing the significant staffing costs. A study on the cost of Amazon's drone delivery plans in 2016 suggested that the cost per parcel of drone deliveries operating for 12 hours a day would be $0.41 per parcel. Adjusting for exchange rates and inflation to Jun 2021, this equates to £0.54 per parcel, a saving of £0.18 per parcel;

10. **Road pricing** could grow even further should van volumes increase further. An additional 50% on current congestion charging for vans would increase the cost per parcel by another £0.07; and

11. **Advancements in green propulsion technologies** could reduce vessel capital and operating costs. We have considered an indicative 20% cost reduction to represent this advancement.

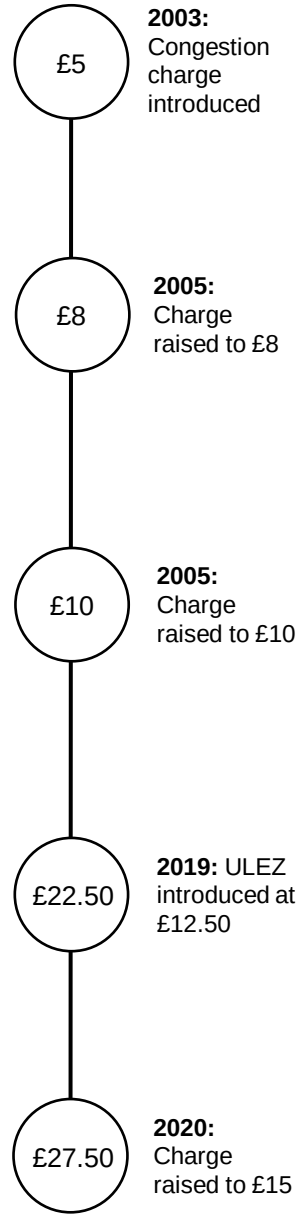


Figure 5.14 Timeline of London Congestion Charge

RIVER FREIGHT CAN BE COMPETITIVE WITH ROAD
KEY IS TO LEVERAGE BENEFITS AND FLEXIBILITY

The chart to the right summarises the opportunities for river freight outlined on the previous page. At a starting point of one million parcels per year, we estimate the cost of river freight at £5.12. This comprises £0.23 for the middle mile, £4.17 for the river journey and £0.72 for the last mile. This is shown in the red bar to the left.

Increasing scale to 20 million parcels per year would reduce costs by £3.28 per parcel. This is less than 3% of London's current parcel trade and, should growth in online sales continue, could be less than 2% by 2030. In addition, there are opportunities to transport other light freight such as tote boxes, roll cages and bulk mail that have not been factored in to the scale analysis.

Beyond this, the other opportunities 1-6 could bring cost reductions of £0.64 per parcel, bringing river freight within £0.19 per parcel of the status quo van delivery solution.

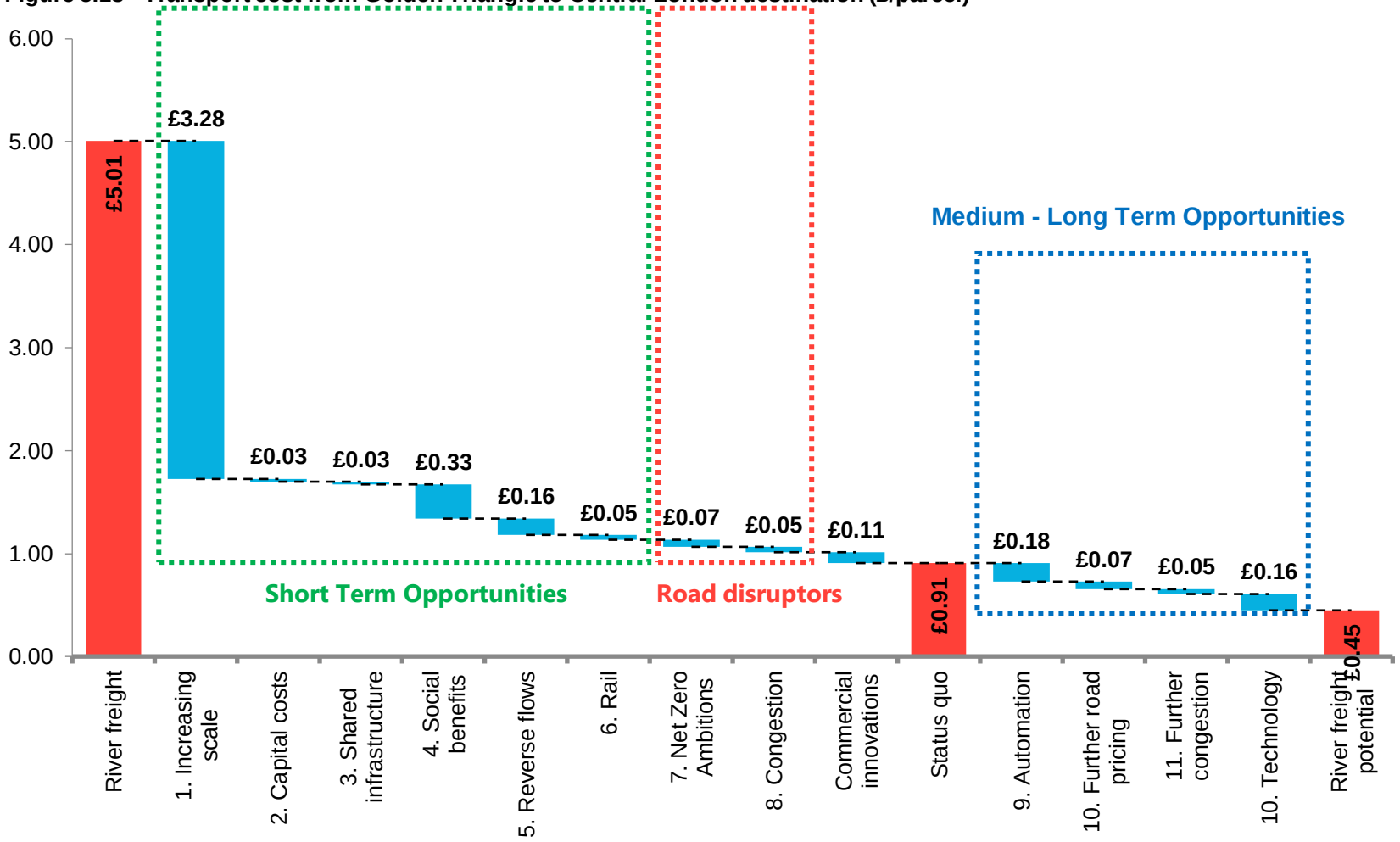
The two short term disruptors of increased road pricing to achieve net zero ambitions and increased congestion could increase the cost of the status quo by £0.12.

This results in a premium of £0.07 per parcel that needs to be achieved in the short term to make the river a viable competitor to road for light freight.

With the right, innovative anchor customers that could bring significant scale, this is a gap that could be closed.

In the longer run, further disruptors and further technological innovations could reduce costs by a further £0.46, making large scale river freight the obvious economical and environmental solution for the parcel trade.

Figure 5.13 - Transport cost from Golden Triangle to Central London destination (£/parcel)



Source: WSP Analysis (2021)

6. THE CASE FOR CHANGE

Thames Estuary

PORT OF LONDON AUTHORITY

WSP

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THE CASE FOR CHANGE
INTRODUCTION

Introduction

Section 5 and 6 have demonstrated that the river is not currently competitive with road for transport of light freight on a cost comparison basis. This is primarily driven by the additional handling costs associated with the river leg which would not typically be borne on a traditional last mile van delivery. It is therefore likely that public intervention in the form of grant or capital funding, or subsidy may be required to achieve modal shift at scale within the Thames Estuary. These interventions will need to align with wider Government strategy and policy regarding Net Zero.

The purpose of this section is to set out the outline case for public investment in river freight. It outlines and evidences the type and scale of wider public benefits which could accrued through modal shift of light river movements from road to river. The outline case for investment has been examined and presented in the following section, with a particular focus on the strategic and economic cases.

1. **The Strategic Case –** sets out the rationale for investment in capital infrastructure and equipment required to facilitate modal shift within the light freight sector and make the case for structural change at the strategic level. This rationale is aligned with the wider policy landscape, political objectives and the associated environmental and social benefits of realising modal shift and removing vehicle movements from the road; and

2. **The Economic Case –** includes the quantification and monetisation of the economic, social and environmental benefits of modal shift from river freight, where it is possible to do so. These benefits are monetised using Department for Transport (DfT) guidance and other adopted methodologies compliant with the Treasury Green Book (2020). Where it is not possible to monetise benefits these are outlined qualitatively; such as social value impacts.

This section will articulate what the 'market failure' is that river freight is seeking to address and why public investment is needed to realise the full potential of river freight for London and the wider Thames Estuary.

Project Scope

Similar to road based freight services, a light freight river service is likely to be brought forward by the private sector such as an established logistics operator or parcel company (such as DHL, UPS, DPD, FEDx etc.) or a large multinational company that generates volumes of a scale which could support a dedicated service. The river mile is likely to be serviced by an existing river operator (such as Thames Clipper or Livetts) or a new entrant to the market (such as Blue Line Logistics).

The scope of this project covers the entirety of the Thames Estuary, however as Chapter 5 has demonstrated, the focus of river freight is likely to cover flows of goods and products via river from Tilbury at the eastern extent through to Hammersmith Bridge at the western extent. Demand is likely to be greatest within Central London and therefore piers, jetties and wharves within this area are likely to be the focus of dedicated freight services along the river.

The creation of a new river service for light freight goods will provide sustainable travel choices for freight operators and end customers through greener, more efficient transport networks for Greater London. The primary benefits of shifting freight from road to river will be the generation of significant environmental and social benefits and the reduction in the associated negative externalities of road traffic such as congestion, air quality and noise.

THE STRATEGIC CASE

Thames Estuary

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THE CASE FOR CHANGE
STRATEGIC CASE

The purpose of this section is to set out the strategic case for investment in a river freight solution for the Thames Estuary. It sets out how any proposed investment fits within the wider strategy for investment and vision for the Estuary. Given the particular focus on the proposed model on London, the Strategic Case demonstrates how modal shift from road to river will further the strategic policy objectives of the Greater London Authority (GLA), Transport for London (TfL), Mayor of London (MoL) and individual London Boroughs.

This section provides a succinct rationale for why investment in river freight is needed now in order to address existing and future problems and capitalise on opportunities for environmental improvements alongside the generation of additional economic growth and development within the river freight sector.

A brief description of the context within which the Thames Estuary sits is given below.

Physical Context

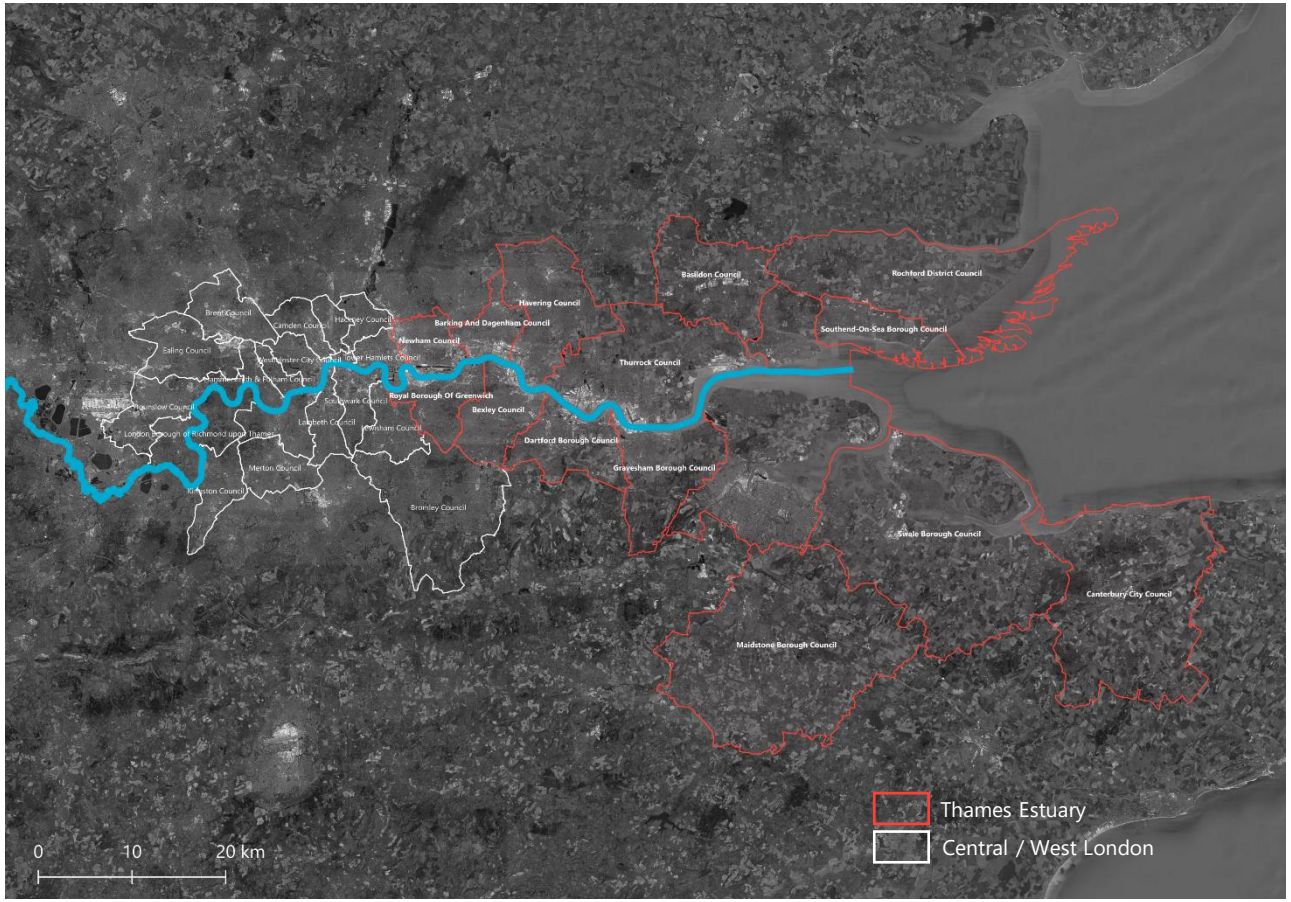
The Thames Estuary is the place where the River Thames meets the North Sea. In the south east of England, it covers North Kent, South Essex, East London, the City of London, as well as the Thames itself. There are 19 local authority areas, these are: Barking & Dagenham, Basildon, Bexley, Canterbury, Castlepoint, Dartford, Gravesham, Greenwich, Havering, Maidstone, Medway, Newham, Rochford, Lewisham, Southend-on-Sea, Swale, Thanet, Thurrock and Tower Hamlets. For the purpose of this study we are also assuming that the study area will extend westwards along the Thames covering Central London and West London up to Hammersmith Bridge.

The extent of the study area is outlined in Figure 6.1 opposite and demonstrates the spatial extent of the 'corridor' within which a river freight service could operate.

Administrative Context

The Thames Estuary is covered by 17 local authorities with statutory responsibilities for the area. In addition, the Thames Estuary Growth Board was established to help the area fulfil its potential of 1.3m jobs and £190bn GVA to UK economy by 2050 through engagement with key stakeholders and working closely with businesses, investors, residents and communities to deliver the Thames Estuary Growth Board's vision - The Green Blue - which was adopted in 2020.

Figure 6.1: Thames Estuary Study Area



Source: https://thamesestuary.org.uk/what-we-do/?tab=estuary-region-map

THE CASE FOR CHANGE
STRATEGIC CASE (CONT.)

Figure 7.2 illustrates the range of benefits that a river freight service within the Thames Estuary could generate. The project will deliver these impacts by facilitating modal shift of light freight movements from road to river, thus providing alternative middle and final mile delivery solutions. This will be supported by Net Zero policy incentives and take advantage of existing and emerging technology in zero carbon transport, both maritime and road based.

River freight takes advantage of existing river capacity within the Thames Estuary to help relieve road congestion, particularly on the major arterial roads into Central London such as the A13 (East to West) and the A4 (West to East).

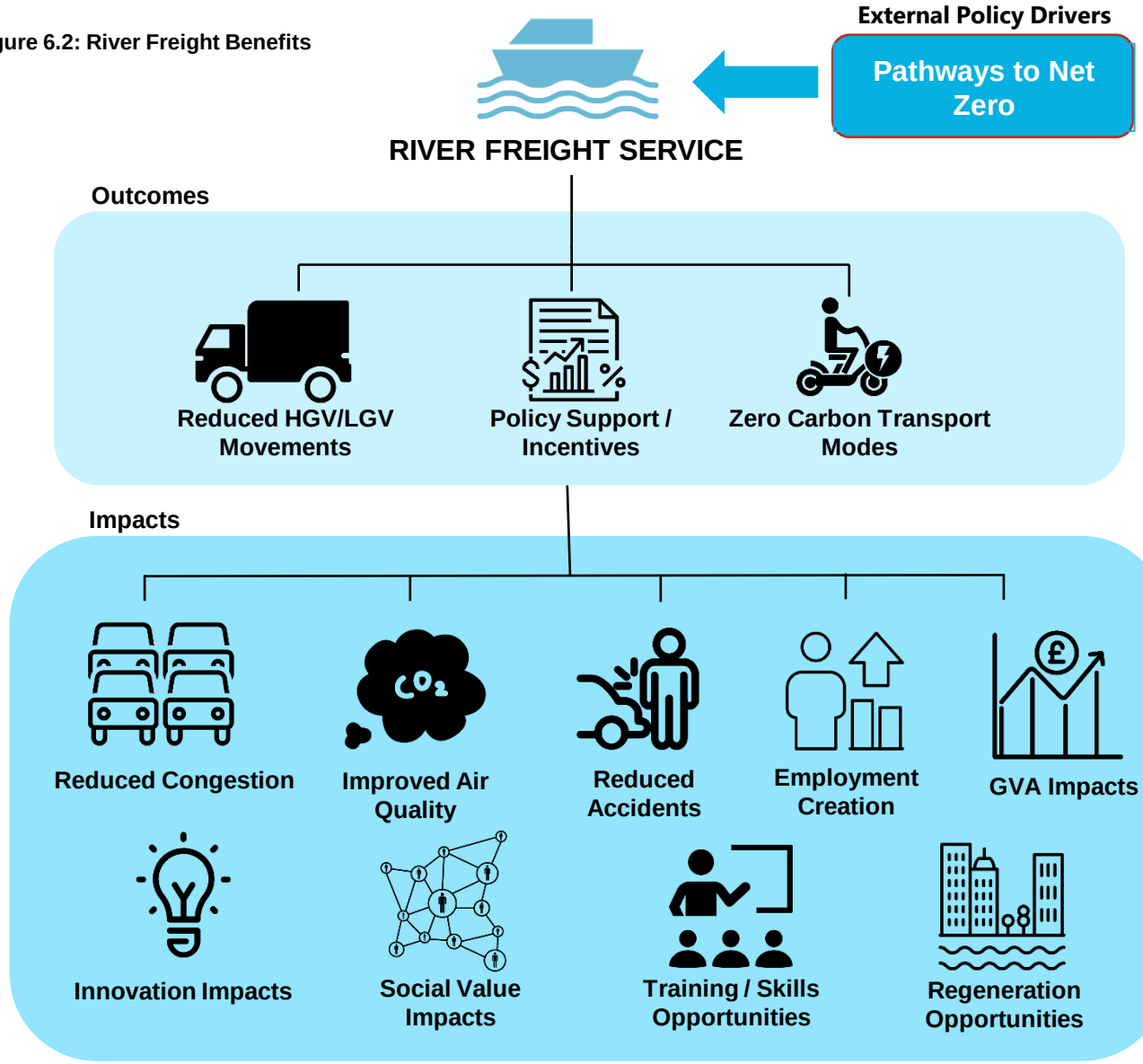
The proposed river freight model will provide alternatives to the use of traditional road based (HGV/LGV) modes of transport to deliver goods into London. An integrated end to end solution built on zero carbon / low emissions final mile delivery (such as E-cargo bike) with clean fuel (such as HVO / hydrogen) vessels will deliver decarbonisation objectives to support Net Zero pathways and generate environmental benefits such as improved air quality and reduced congestion.

The following sections focus on the core themes which comprise the strategic case for river freight, namely:

- **Environment and Carbon Emissions** – including improvements to air quality, decarbonisation of the freight network, impacts of congestion and noise and pollution particularly within Central London;
- **Industry and Economy –** including creation of new additional jobs within the Thames Estuary, alleviation of deprivation and infrastructure to support freight development;
- **Regeneration and investment** – including bringing existing underutilised river assets (such as safeguarded wharves) back into productive use.

A theory of change model is provided overleaf which provides further detail on the links between the activities and inputs, outputs, outcomes and impact of the proposed river freight model to show how it will achieve the benefits outlined in Figure 6.2.

Figure 6.2: River Freight Benefits



THE CASE FOR CHANGE
STRATEGIC CASE- THEORY OF CHANGE

Baseline & Contextual Challenges

The Thames River is underutilised as a freight transport network *and has significant potential to encourage modal shift from road to river for light freight goods such as parcels, retail goods, food and beverages. The context for this project is:*

- National government objectives to decarbonise our transport network via more sustainable modes of transport
- *Research indicating the impact of poor air quality on Londoners including health and wellbeing effects*
- *Evidence which links increased road congestion to lost productivity and other negative environmental externalities*

There is an Opportunity *– to reinstate the river as a major transport corridor whilst generating additional economic activity and creating new jobs within the marine logistics sector. Businesses will also benefit from alternative transport methods which bring their goods straight into customers in Central London via sustainable modes of transport.*

Rationale for Intervention and Market Failure

- *The high capital costs of investment in infrastructure and vessels means that without public intervention the market is unlikely to be able to achieve the catalytic outcomes which will be possible with public subsidy. At present the policy environment does no incentivise innovative thinking around modal shift and 'business as usual' is dominating the agenda.*

Outcomes and impacts act positively upon initial problem/context and associated market failures

Monitoring & Evaluation

Impacts

- GDP/GVA increase and productivity gain
- Reduced congestion on key arterial roads and Central London
- Improved air quality and reduced NO_2/PM_{10}/$_{2.5}$ emissions
- Enhanced innovation within the river freight sector
- Net additional job creation and improved access to economic opportunities

Strategic Response Programme

Exogenous & endogenous shocks

Aims & Objectives

- Enable modal shift from road HGV/LGV movements to river vessels through the development of a commercially competitive river freight model which offers customers a comparable level of service
- Deliver net zero objectives for the Thames Estuary
- Facilitate training and skills initiatives / programmes which provide employment pathways into the marine logistics sector

Inputs

- Public Sector Funding
  - UK Government (DfT)
  - GLA / TfL
  - London Boroughs
  - County Councils
- Private Sector Investment
  - River Operators
  - Freight Operators
  - Customers
- Policy Changes / Incentives

Outputs

- Construction of new river infrastructure / extension of existing infrastructure including pontoons and piers for facilitating unaccompanied RoRo movements
- Landside enabling infrastructure such as EV charging points
- Last mile delivery solutions which are flexible to meet customer demands
- Provision of grant / soft loan support to early stage adopters / operators to kick-start services
- Implementation of pilot models
- Coordinated stakeholder working groups and creation of a One Stop Shop for operators

Short Term Outcomes

- 10,000 LGV movements per annum switched from road to river (1.5m parcel scenario)
- Potential customers have an increased knowledge of the Thames as a sustainable transport corridor and an understanding of key operators and stakeholders to support projects
- Institutional stakeholders are not viewed as a barrier to entry

Medium-Long Term Outcomes

- 130,000 LGV movements switched from road to river (20m parcel scenario)
- Increased confidence and wide spread use of the Thames from the logistics sector across a range of good flows / types
- Economies of scale have been achieved to allow river freight to be cost competitive with road
- Improved regulations and policy support to facilitate modal shift to River
- Increased access to the River at multiple points to ensure flexibility of services
- Zero emission / carbon neutral vessels and last mile solutions are integrated to enable a zero carbon freight solution for the Thames Estuary

Feedback mechanism

Thames Estuary PORT OF LONDON AUTHORITY wsp

THE CASE FOR CHANGE
STRATEGIC CASE- ENVIRONMENT & DECARBONISATION

DECARBONISATION OF THE FREIGHT NETWORK

In addition to having an effect on public health through reduced air quality, road freight produces a significant share of UK greenhouse gas emissions generated through transport. Reducing the climate impact of freight movements will have a significant impact on overall transport emissions.

Context

As of 2018, 91% of UK domestic transport emissions were associated with road transport and, of this, 17% was attributable to Heavy Goods Vehicles (HGVs) with HGV traffic increasing by 10% between 2012 and 2018.

Within London, the share of HGVs on the roads has declined slightly over the period 2012 – 2019 at a CAGR of -0.2%, whilst Light Commercial Vehicles (LCVs) have become increasingly common in London since 2012, rising from 13.0% of all vehicle miles to 16.4% by 2019, growing at a CAGR of 4.5%, significantly faster than the overall for all vehicle types (1.9% CAGR). TfL estimated that this equates to over 7,300 vans per hour during the morning peak, with growth in LGV movements to increase by 43% by 2041 in line with population growth for London.

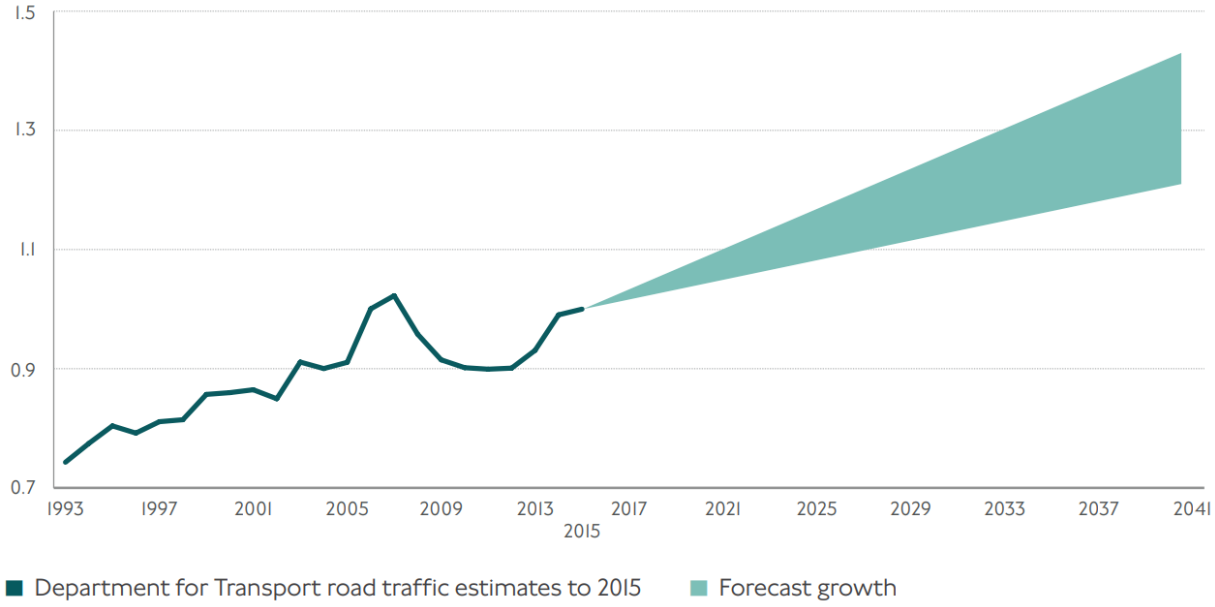
Road freight has made significant progress in terms of emission reduction and efficiency in the past few decades. As set out in Deloitte and Shell's 2021 report "Decarbonising Road Freight: Getting into Gear", 60% of European road freight vehicles are compliant with European regulation and emit less than 0.4 g/ kwH of nitrous oxide as of 2020. As such, given the continued demand for freight, the extent to which technological advancements and legislation on vehicle types can substantively reduce overall emissions without applying modal shift policies is called into question.

There are various alternate ways in which LGVs and HGVs can be decarbonised through modal shift to other forms of road freight. Both in the UK and elsewhere, there have been significant developments in the advancement of car battery technologies which has enabled the development of commercially viable Battery Electric Vehicles (BEVs) for Light Commercial Vehicles and especially for last-mile delivery applications. However, the current vehicle range under a fully charged battery (often between 250km and 350km) and the time it takes to fully charge the vehicle are limiting factors for both the large-scale adoption of this technology and its application to HGVs.

Hydrogen fuel cell technology is considered to be less susceptible to these limitations, with some trial hydrogen fuel cell freight vehicles having a range of up to 1,000km and a 20 minute fuelling time. However, it is widely not considered that such technology will be commercially competitive with diesel vehicles for at least another ten years.

As such, removing the dependence on freight transported by road vehicles through modal shift will continue to be one of the major strategies for reducing freight-based emissions over the next decade. Research by the Port of London Authority (PLA) found that transporting construction goods by river barge generated a third of the greenhouse gas emissions per kilo than an equivalent trip by a lorry. Similarly, every 1,000-ton barge of goods transported along the river removes the need for roughly 100 trips made by lorry. Research to date has focused on bulk goods such as construction material, spoil and waste but there are clear and significant opportunities to shift light freight from road to river.

Figure 6.3: LGV Vehicle Kilometres Growth, normalised to 2015



Source: https://content.tfl.gov.uk/freight-servicing-action-plan.pdf

THE CASE FOR CHANGE
STRATEGIC CASE- ENVIRONMENT & DECARBONISATION (CONT.)

DECARBONISATION OF THE FREIGHT NETWORK

Strategy and Policy Considerations

- **National policies**

In March 2020, Government's Decarbonising Transport agenda, formally set out commitments to freight emissions reductions of 15% by 2025 relative to 2015 levels. Equally, new emissions standards for the production of new Heavy Duty Vehicles (HDVs) were brought into effect in 2019, which bind HDV manufacturers to CO_2 emission reduction targets of 15% by 2025 relative to 2019 levels and 30% by 2030. In July 2021, Government set out a formal plan on how to deliver the emissions reductions set out in their decarbonisation agenda. These actions are formally set out within Decarbonising Transport: A Better Greener Britain (DfT, 2021) and includes commitments to continued support of modal shift from road to water including the Modal Shift Revenue Support Scheme and Waterborne Freight Grants.

In 2019 the National Infrastructure Commission (NIC) published a study on the future of freight entitled, 'Better Delivery: the challenge for freight'. The report found that through the adoption of new technologies and the recognition of freight's needs in the planning system, it is possible to decarbonise road and rail freight by 2050 and manage its contribution to congestion. Achieving this requires government to outline clear, firm objectives, and begin working with the energy sector, freight industry and local areas to ensure that the infrastructure required for alternative fuels and land for efficient freight operations is available when and where it is needed. UK Government endorsed this study and a formal response was provided on 4th August 2021, setting out commitments to decarbonise road freight by 2050. As part of this commitment it has set out targets to ban the sale of new diesel powered HGVs by no later than 2040 and the recognition that movement by inland waterways will be critical to the sector achieving Net Zero by 2050.

- **GLA and Mayoral Policies**

The Mayor's London Environment Strategy (2018) commits London to being a zero carbon city by 2050. It identifies decarbonising transport as a key objective for London.

Proposals 15 through 18 of the GLA's Transport Strategy (2018) set out specific policy proposals for freight in London, some of which were later integrated into the 2021 London Plan. These include a target to reduce the number of lorries entering central London in morning peak by 10% on 2018 levels by 2026 (Proposal 15); improving the efficiency of freight by moving a greater share of freight via rail and waterways and considering a regional freight distribution network (Proposal 16); improving the efficiency of last-mile deliveries, primarily through local distribution centres (Proposal 17); and encouraging DfT and Network Nail to upgrade rail infrastructure surrounding London so that non-London freight can bypass the capital (Proposal 18).

The Mayor's Freight and Servicing Action Plan (2019) directly supports the use of the Thames for transporting light freight from the deep water ports and terminals in the Thames Estuary to urban markets within Central London. The Action Plan proposes to promote the use of water freight through the Water Freight Toolkit and work with the PLA and Canal River Trust to construct new river freight infrastructure.

Strategic Implications and Opportunities for Light River Freight

- There is strong policy support at both national and regional (London) levels to support the decarbonisation of road freight. This is being delivered through a combination of higher standards for the production of HDVs and other road freight vehicles, as well as specific emissions targets for road freight;
- However, given that there are limits in the extent to which new energy efficiency for road vehicles can reduce overall emissions and given that transformative technologies such as BEVs and hydrogen fuel cell freight vehicles are not likely to be commercially viable or competitive in the short-term, there is a strong rationale for emission reduction through modal shift.
- **River freight has the potential to significantly reduce carbon emissions from freight movements through both efficiency in emissions per tonne/kilometre of freight transported and through adoption of zero emission vessels as technology develops.** The adoption of biofuel (HVO) and installation of exhaust treatment equipment in the short term can deliver immediate benefits with regards to carbon emissions and use of river vessels.

AIR QUALITY

Context

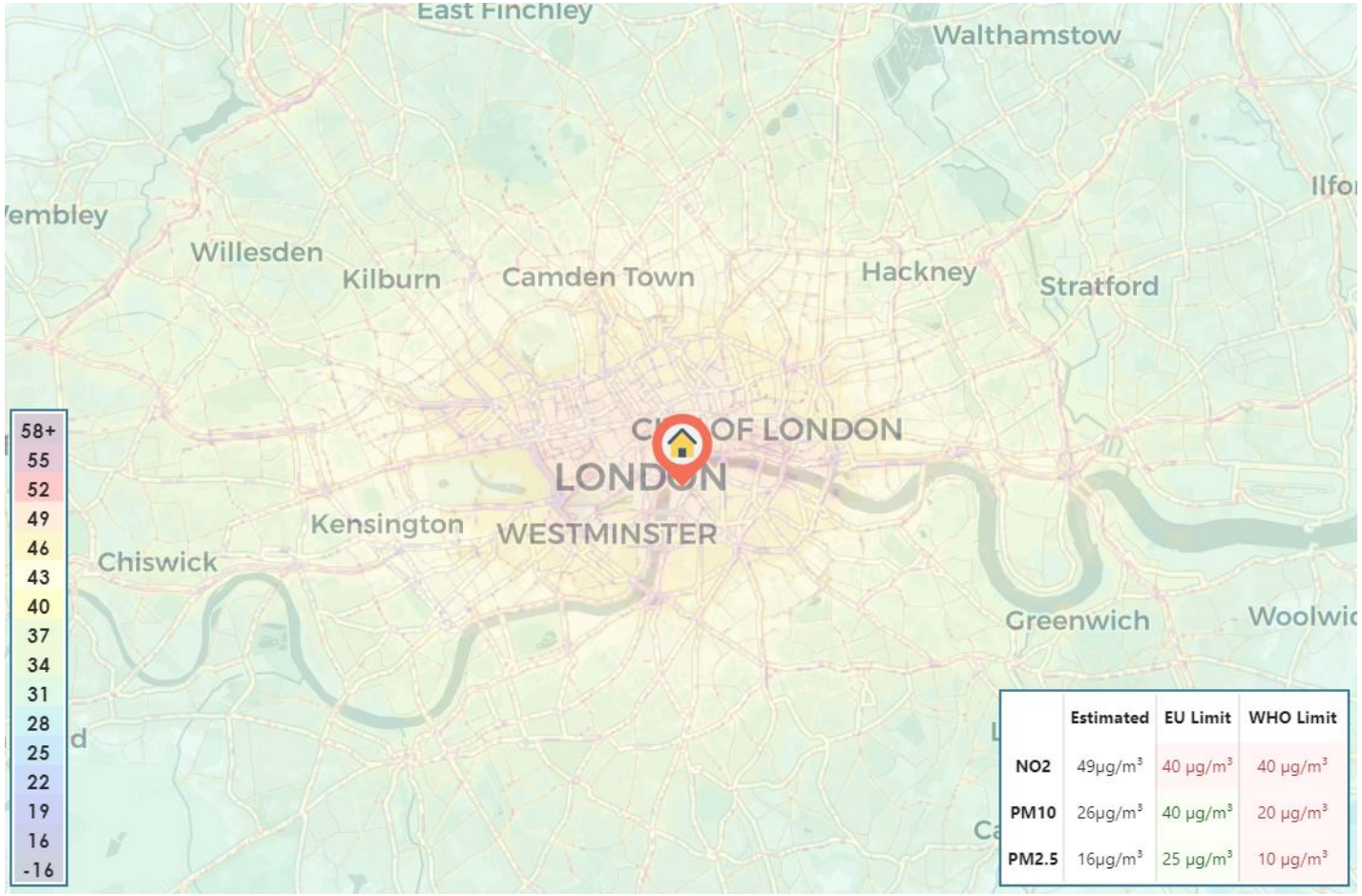
Road transport, domestic shipping, aviation and rail are responsible for a significant proportion of air pollutant emissions. In 2019, road transport alone was the cause of 33% of UK nitrogen dioxide (NO_2), 12% of $PM_{2.5}$ and 12% of PM_{10} emissions.

In London it is estimated that approximately 50% of London's NO_x emissions are from road transport, with 33% of NO_x emissions, 29% of $PM_{2.5}$ emissions and 23%of CO_2 emissions originating from freight vehicles. Additionally, a growing proportion of $PM_{2.5}$ emissions being generated by non-exhaust emissions such as road wear, resuspension of road dust and tyre / brake wear.

Air pollution is a major health issue within the Thames Estuary and within London especially. Data from the 2016 London Atmospheric Emissions Inventory found that 2.1 million out of 8.8 million Londoners (23.7%) lived in neighbourhoods where the annual mean concentration of $N0_2$ was above legal limits, with more than 50% of the residents of Camden, the City of London, Islington, Kensington and Chelsea, Tower Hamlets and the City of Westminster living in such neighbourhoods. Figure 7.3 demonstrates the concentration of high NO_2 levels within Central London as well as the distribution of poor air quality along London's strategic road network.

It is estimated that air pollution in London shortens the lives of Londoner's leading to up to 9,400 extra deaths per year. Air pollution is linked to a number of health conditions, such as respiratory disorders (including asthma), heart disease, stroke, lung cancer, low birth weight with emerging health impacts from PM2.5 Pollutants of Cognitive decline and dementia, Parkinson's disease, as well as mental health effects. In 2019, 3,600 to 4,100 deaths (61,800 to 70,200 life years lost) in Greater London were estimated to be attributable to human made $PM_{2.5}$ and NO_2 emissions. In 2016, 455 London schools were exposed to illegal levels of pollution. This figure has fallen significantly to 14 in 2019, partly as a result of the GLA's School Streets policy which removes vehicles from streets with schools in peak times. Nevertheless, 40% of NO_2 is still attributable to road transport and especially diesel vehicles.

Figure 6.4: Annual Mean Pollution – NO_2 - 2016



Source: https://www.londonair.org.uk

THE CASE FOR CHANGE
STRATEGIC CASE- ENVIRONMENT & DECARBONISATION

AIR QUALITY

Strategy and Policy Considerations

There are a number of extant national and London-level policies which aim to minimise the effects of air pollution and improve air quality for residents and communities.

- **National Policies**

The National Government's 2019 Clean Air Strategy outlines approaches to reducing air pollution across ten chapters, with chapter 5 dedicated to action to reduce emissions from transport. Policies set out in the strategy include funding for electric vehicles, a levy for HGVs which are non-compliant with emissions legislation and more than £3.5 billion in ensuring air quality and cleaner transport.

One section of the chapter on reducing emissions from transport is dedicated to reducing emissions by modal shift. Specific provisions set out including using other methods such as rail and water to move freight instead of via road. This has started to be achieved through the use of freight mode shift grants, which have removed in excess of 800,000 lorry journeys a year on Britain's roads. Further commitments in encouraging modal shift away from road freight also include £235 million in funding for a Strategic Freight Network (SFN), which aims improve the capacity and capability of the UK's rail freight network; as well as enhancing the rail freight connections to and from the Port of Felixstowe- one of the UK's major container ports.

- **Greater London Authority (GLA) Policies**

The GLA has long seen decarbonisation and reductions in air pollution as major areas for reform. Green Infrastructure and Natural Environment and Sustainable Infrastructure both form major policy themes of the authority's primary and most recent policy document, the 2021 London Plan, and **Mayor Sadiq Khan has publicly set out his aspiration for London to have the lowest air pollution of any major global city.**

The cornerstone of the GLA's air quality policy is its three London road charging schemes- the Central London Congestion Charge Zone, the Low Emission Zone (LEZ) and the Ultra-Low Emission Zone (ULEZ). While the Congestion Zone is only partially a measure to reduce pollution, the LEZ which covers much of Greater London and the ULEZ, which covers Central London and will expand from October 2021 to cover the area within the north and south circular roads, specifically target highly polluting vehicles. As part of both the LEZ and ULEZ, diesel vehicles and high-polluting vehicles have to pay an additional fee for entry into certain areas of London irrespective of time of day, with the longer term aim of encouraging users of such vehicles to transition to lower-polluting or electric vehicles. The purpose of these policy measures are to improve air quality in and around Central London through the reduction of older, more polluting vehicles from the road and incentivisation of fleet upgrades for freight vehicles.

Another component of the GLA's broader pollution reduction strategy is the Good Growth Fund. The Good Growth Fund aims to fund projects which are related to increasing air quality. As of March 2020, £3.6m was awarded to 11 projects, four of which are solely dedicated to improving air quality and a further seven of which are regeneration projects with significant air quality measures. Additionally, the Major's Air Quality Fund is a £22 million fund dedicated to supporting projects to improve air quality over a ten-year period. Funded projects have included Clean Air Thames – a project to retrofit 11 river vessels, including tugs and passenger transport, cutting their emissions by up to 90%.

The 2018 London Environmental Strategy lists a range of more detailed actions to improve the environment in London, including air quality, which was later integrated into the 2021 London Plan. Proposals include reducing emissions from freight through encouraging a switch to lower emission vehicles, examining other ways freight can be moved around and making better use of river services, with the GLA expressing support for any proposals that use wharves as freight consolidation centres.

The overall aim of the Strategy is for London to have the best air quality of any major world city by 2050, which it aims to achieve by:

- Reducing exposure of Londoners to harmful pollution across London – especially at priority locations like schools – and tackling health inequality;
- Achieving legal compliance with UK and EU limits as soon as possible, including by mobilising action from the London boroughs, government and other partners; and
- Establishing and achieving new, tighter air quality targets for a cleaner London, meeting World Health Organization (WHO) health-based guidelines by 2030 by transitioning to a zero emission London.

- **Local Authorities**

Given the extent of the study area for this report it is not possible to include analysis of all the policies for the local authorities which cover the interests of the Thames Estuary area. In general however, it can be summarised however each local authority have objectives to improve air quality through establishment of air quality management areas (AQMA), approaches to design and construction, green infrastructure, energy efficiency and sustainable travel and transport.

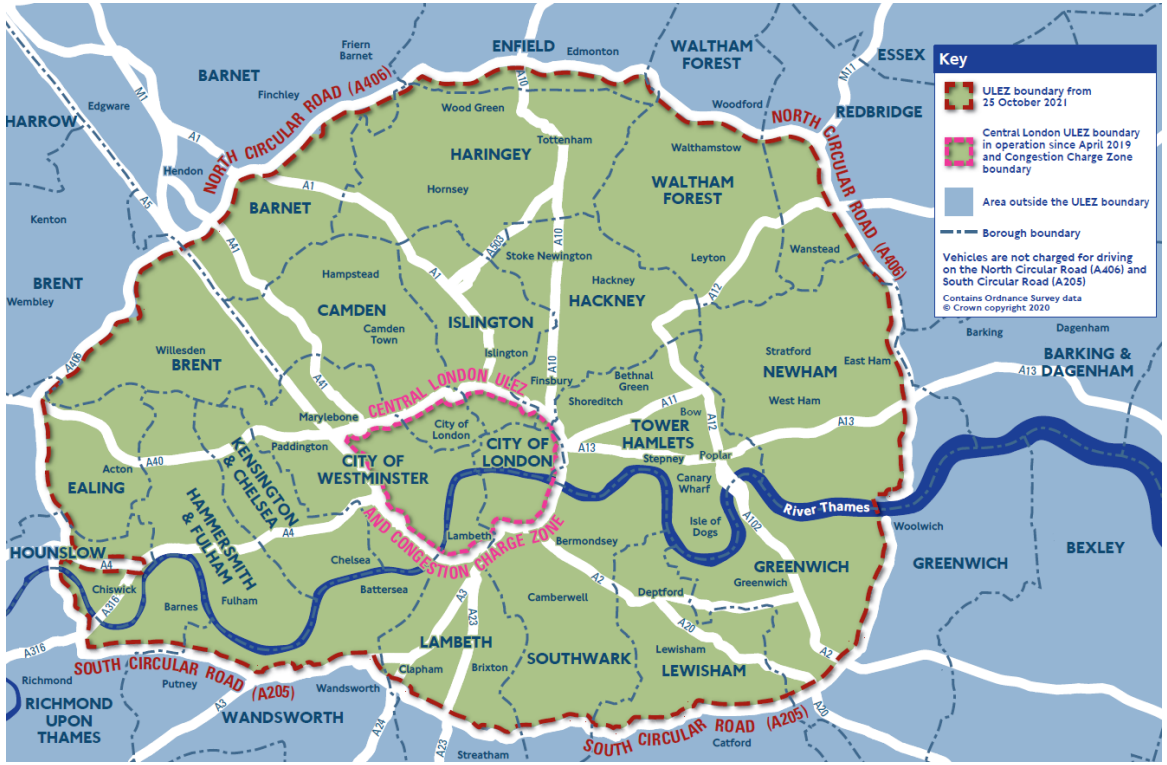
THE CASE FOR CHANGE
STRATEGIC CASE- ENVIRONMENT & DECARBONISATION

AIR QUALITY

Strategic Implications and Opportunities for Light River Freight

- Air pollution is recognised as a major public health issue by both the national government and the GLA, with both outlining policies relating to the use of polluting vehicles and the overall modal shift away from road freight as well as decarbonisation of freight transport methods. River freight can play an important part in providing alternatives to road freight movements into Central London. The extent to which NO_2 and CO_2 emissions are reduced through river transport will depend on the speed at which low emission / zero carbon vessels can be bought to market. However, as the CEVA trial has demonstrated, immediate gains can be made through the use of alternative fuels such as HVO (biofuel). The biggest impact in the short term however is likely to be reduction in non-exhaust PM_x emissions generated through breakdown of brakes, clutches, tyres and road surfaces. These aren't emitted by river vessels, but are a significant contributor to poor air quality in central London.
- There are also opportunities for retrofitting of existing river vessels with an after exhaust treatment to reduce noxious emissions using, for instance, selective catalytic reduction (SCR) or diesel particulate filters (DPF).
- The GLA's measures to combat air pollution are likely to be even more interventionist going forward. The GLA cannot meet a longer term net zero target via means such as shifting London's energy supply more towards renewable resources or imposing conditions on polluting authorities outside London's boundaries, given the inherent constraints on the Mayor of London's policy-making power. As such, road taxing and encouragement of modal shift through transport policy are much more likely policy levers in the medium-term.
- A possible longer-term policy may be further expansion of the Congestion Charge zone to encompass a larger area of Inner London. An expansion of the Congestion Charge was recently tabled as part of the national government's financial bailout of TfL but was eventually removed from the final agreement. The operating hours and cost of the CC zone have been extended however and the zone now operates 7am-1pm, seven days per week, resulting in increased costs for road based logistics operators.
- As vehicular movements from combustion vehicles are increasingly restricted through tax and policy measures, river freight offers a sustainable alternative to van and lorry movements. A move towards greater use of the river to transport freight in London is also both tacitly supported through policies which set out to reduce emissions from road freight and explicitly supported through its inclusion as a policy in certain GLA policy documents, such as the London Environment Strategy (2018).

Figure 6.5: Expansion of ULEZ September 2021



Source: https://tfl.gov.uk/modes/driving/ultra-low-emission-zone/ulez-expansion

THE CASE FOR CHANGE
STRATEGIC CASE- ECONOMIC GROWTH & REGENERATION

ECONOMIC GROWTH AND REGENERATION

The Thames Estuary has a long history of political support to drive economic growth and productivity but the region still fails to capitalise on its potential. It encompasses a number of areas with high unemployment and areas where significant investment needs to be made in skills development- a number of public policies seek to explicitly address this. River freight has the potential to generate new jobs and deliver additional economic activity along the river.

At the same time, increased demand for light river freight infrastructure provides new opportunities to reimagine the mixed use regeneration of key riverside locations including safeguarded wharves to provide additional riverside logistics space and freight infrastructure, alongside the delivery of new homes.

ECONOMIC GROWTH AND DEPRIVATION

Context

The 2019 English Indices of Multiple Deprivation (2019 IMD) provide a detailed overview of inequality and poverty at the local level, accounting for factors such as employment, health, living environment, education and income. In particular, East London and the Thames Estuary encompasses a significant concentration of local authorities ranked among the most deprived in England, including Barking and Dagenham and Newham, which respectively ranked as the 5th and 12th most deprived local authorities. At the neighbourhood level, there are a number of riverside communities within these local authorities which experience especially pronounced levels of deprivation, falling into the top 10-20% of deprived areas in England, such as Canning Town in Newham, Thamesmead in Greenwich and Bexley, Barking Riverside in Barking and Dagenham and Charlton Riverside in Greenwich.

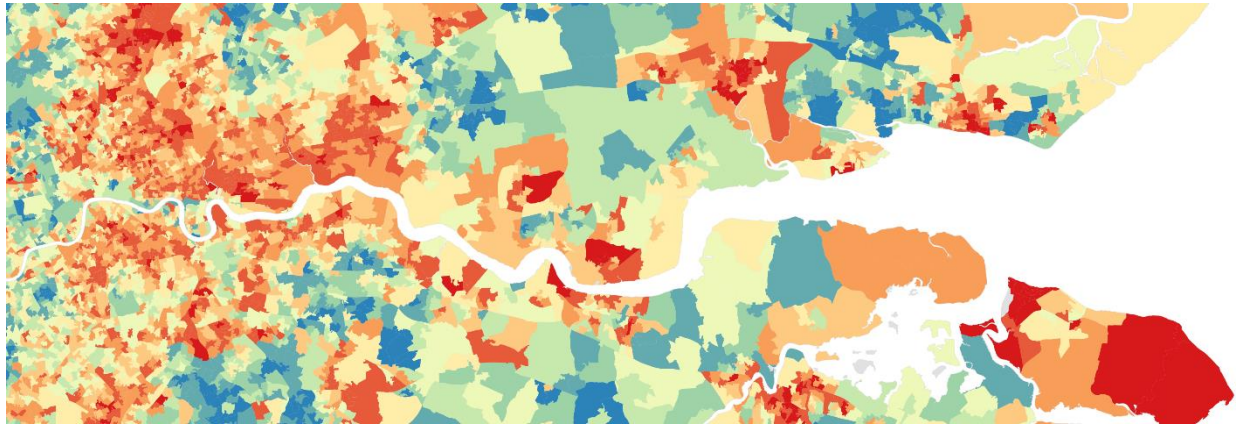
While housing and income deprivation is a major component of deprivation along the Thames Riverside, the area also experiences high levels of unemployment compared to other areas of London. According to the 2020 ONS Annual Population Survey, the share of the economically active population who are unemployed is the highest in Barking and Dagenham (7.9%) of any of the 33 London boroughs, with Newham ranked fourth highest (at 6.8% of the working population).

Concomitantly, many of the boroughs in the Thames estuary have relatively high numbers of working age residents without formal working skills or technical qualifications. As of the period January 2020 to December 2020, Barking and Dagenham and Tower Hamlets had the second and third highest shares of working age residents with no formal qualifications of all London Boroughs, at 9.2% and 8.9% of the working population, respectively. Across the region it is estimated that approximately 8.5% of working age population don't hold any qualifications, which is 1.7% higher than London and 3.3% higher than the South East as a whole.

At the same time, the Port of London Authority represents a major economic presence in the Thames Estuary, with over 48,000 direct and indirect jobs dependent on the London Gateway port, which generates more than £4.5 billion in economic value added annually and is relied on as an entry-point for goods heading to a large number of businesses of different sizes across the capital and further afield. Its influence on the surrounding areas and importance as a local employer is only likely to grow with the Thames Freeport as announced in the national government's Budget 2021.

The port and logistics sector within the Estuary has already generated in excess of £2.5 billion in private investment. In addition, there are over 100,000 jobs related to the river as an amenity and economic activity, generating a value added of over £2 billion.

Figure 6.6: Indices of Multiple Deprivation, 2019 (Red = most deprived)



Source: MHCLG (2019)

THE CASE FOR CHANGE
STRATEGIC CASE- ECONOMIC GROWTH & REGENERATION

ECONOMIC GROWTH AND REGENERATION

Strategy and Policy Considerations

The Thames Estuary 2050 Vision sets out the Growth Commission's vision and delivery plan for north Kent, south Essex and east London up to 2050. It recognises that the Estuary has inherent strengths with regards to its proximity to London, international trade via London ports, higher education offer and research institutions and availability of land to deliver development. However, the Estuary has consistently underperformed across a range of social and economic measures. The Vision sets out that up to 1.3 million new jobs could be created by 2050. This will be driven by strengthening growth in traditional sectors, such as freight, logistics and construction as well as emerging sectors such as health, tourism, creative industries, agriculture and renewable energy and green technologies.

The vision identifies the 'Inner Estuary', including Thurrock, Dartford, Gravesham and the Ebbsfleet Development Corporation as a focus for logistics and freight building on investment in both Port of Tilbury and London Gateway ports.

The Thames Estuary is also a targeted regeneration area as part of the Greater London Authority's London Plan 2019. As part of the London Plan, areas located in the top 20% most deprived areas in England (as per the 2019 IMD) are automatically considered "Strategic Areas for Regeneration". A number of riverside areas are, not uncoincidentally, also designated as Opportunity Areas within the London Plan. This includes Thamesmead and Abbey Wood, Deptford Creek/ Greenwich Riverside, Greenwich Peninsula, Royal Docks and Beckton Riverside and London Riverside (which encompasses the north bank of the Thames east of Beckton). In addition to being focal points for development due to ample development land, these areas are specifically targeted for additional job generation and investment.

Strategic Implications and Opportunities for Light River Freight

- New forms of light river freight activity along the River Thames will create new employment opportunities in riverside areas, including in deprived communities. It will increase the demand for marine occupations such as boatmasters, crew and engineers. This will drive the demand for higher skilled jobs to operate the river freight vessels;
- New skills and employment pathways will need to be created to address the current skills shortages and difficulties in attracting new people to pursue career paths on the river. It will also be necessary to ensure that the new opportunities provided through river freight can be accessed by young people and those who are looking for way back into employment. The Thames Skills Academy (TSA) currently facilitates and delivers training and skills courses for river freight operator members including crew training, engineering training, auditing, health and safety training and soft skills training as well as boatmaster qualifications. This includes the delivery of apprenticeship schemes and the TSA has delivered 51 apprenticeships since 2017; comprised of 2-year boatmaster apprenticeships and 4-year marine engineering apprenticeships.
- The creation of net additional job generation and the enhancement of local skills in deprived areas would align with the strategic objectives of the Greater London Authority and the Thames Estuary Growth Commission as well as local authorities;
- River freight should also be considered in the context of wider modal shift away from road based transport solutions, increasing numbers of electric vehicles (EVs), autonomous vehicles and shift to hydrogen for larger road freight. The drive to Net Zero by 2050 will accelerate these trends and the removal of some vehicles from the road network will lead to more public space becoming available for development or new green infrastructure as parking requirements and road space requirements are reduced. This could have a particularly significant impact in areas like East London, alongside broader regeneration efforts.

OPPORTUNITIES FOR INDUSTRIAL CO-LOCATION & SUSTAINABLE REGENERATION

Context

Greater London experiences significant land pressures, driven by demand for housing and an ever-shrinking supply of major housing sites, with the London Plan setting out a ten-year target of 523,000 additional homes for the period 2019/20 to 2028/29. At the same time, policy measures are in place to ensure that not all of London's strategic industrial and logistics sites are given over to housing, given their role in the functioning of London's economy and servicing of London's population. The London Plan designates certain sites as Strategic Industrial Land (SIL) including the safeguarding of strategic wharf infrastructure along the Thames.

The London Plan currently sets out a policy of 'no net loss' of industrial floorspace capacity across London. The policy is achieved through 1) intensification, 2) co-location or 3) substitution of industrial land for redevelopment and regeneration. As a result, mixed use residential led redevelopment of industrial sites has become more prevalent for broad industrial activities that are compatible with new high density mixed use development.

Recent technological and operational innovations which mitigate the adverse noise effects of traditional freight and servicing activities as well as clean emissions technologies have made mixed use industrial and residential development more feasible. There are increasingly innovative proposals coming forward for mixed use co-location of industrial and residential land uses.

Case Study – Orchard Wharf, Tower Hamlets

Orchard Wharf is a safeguarded wharf located within Tower Hamlets, to the south of the Leamouth Penninsula and on the opposite side of the river to the Greenwich Penninsula. The proposals submitted in December 2020 are for the provision of 800 new homes alongside more than 8,000 sqm of industrial logistics space with wharf access to the River Thames. The proposals envisage use of the site as a last mile logistics hub with the river and wharf being utilised to bring goods from larger ports with last mile delivery vehicles distributing throughout East London. As demonstrated in Figure 7.7, design and separation of residential / amenity land uses and industrial uses would be managed through segregation of activities to different levels and use of a deck over the marine infrastructure to facilitate new areas of open space along the riverfront.

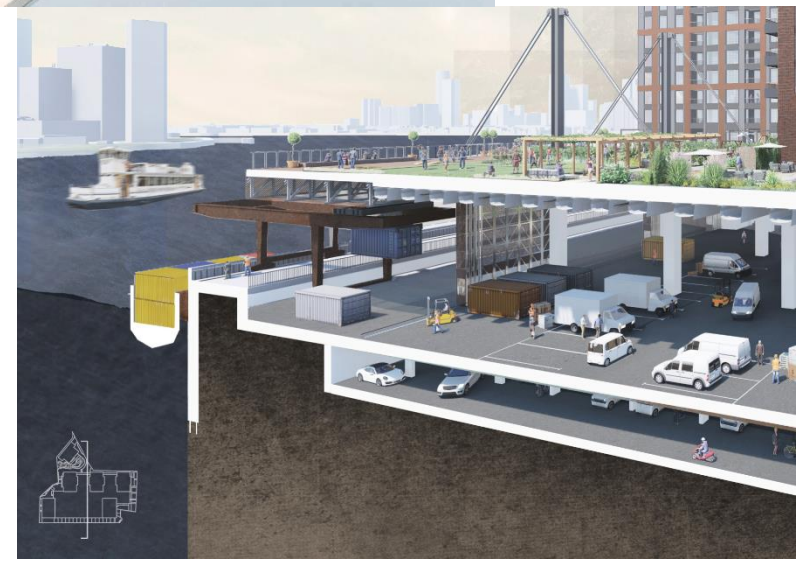


Figure 6.7: Orchard Wharf – Safeguarded Wharf Marine Logistics Proposals

Source: JTP (2020) Orchard Wharf Design and Access Statement

OPPORTUNITIES FOR INDUSTRIAL CO-LOCATION & SUSTAINABLE REGENERATION

Strategy and Policy Considerations

Since 2000, a number of strategic wharf sites within London have been protected from redevelopment under the Safeguarding Directions issued by the Secretary of State for Housing, Communities and Local Government. Policy SI 15 *Water Transport* within the London Plan (2021) sets out that these wharves are safeguarded for the purposes of waterborne freight handling and movement, including consolidation centres. It supports proposals which aim to increase the use of safeguarded wharves for freight transport, particularly those which can be re-activated and which are currently not handling freight by water. Where mixed use development proposals are bought forwards, the London Plan states that the freight handling capacity of the wharf is protected.

The PLA's Vision for the Tidal Thames 2035 strategy sets a target of 4 million tonnes of goods and materials to be carried on the river each year by 2035. This will necessitate the introduction of cargo handling facilities along the river and reactivation of safeguarded wharves which are not currently in operation.

Co-location of industrial and residential uses is however supported by the London Plan (2021) in appropriate locations. Policy E7, *Industrial Intensification, Co-Location and Substitution* sets out that the intensification of B1c, B2 and B8 use classes within designated industrial sites should be encouraged and to innovatively explore opportunities for co-location of light industrial uses with residential. The plan supports that where industrial, storage or distribution floorspace is provided as part of a mixed-use proposal, this would be grounds to not oppose the redevelopment of a Non-Designated Industrial Site.

More specifically, the GLA's earlier 2018 'Practice Note on Industrial Intensification and Co-Location through plan-led and masterplan approaches' sets out guidance for boroughs in drawing up employment land reviews. In the note, considering the potential of industrial land for co-location with residential uses and intensification of uses to enable other uses nearby is explicitly set out as best practice.

In terms of national guidance and on a smaller scale, the October 2017 General Permitted Development Order permits the conversion of small light industrial to residential without a planning application being required, which removed a major stumbling block to delivering co-located residential and industrial development.

Strategic Implications and Opportunities for Light River Freight

- Safeguarded wharves occupy strategic riverside locations along the Thames, with a particular concentration within Central London. Light river freight has the potential to generate additional demand for marine logistics and freight handling capacity along the River Thames, some of which could be met by safeguarded wharf sites;
- The scarcity of space for landside river infrastructure presents opportunities for safeguarded wharves and riverside industrial sites with river access to serve as landing and/or distribution points.
- London has seen an increase in mixed use regeneration schemes which co-locate light industrial and warehousing uses alongside residential led schemes, providing urban logistics and consolidation hubs for urban freight. Traditional river freight activities have typically focused on waste and bulk movements which can generate negative amenity impacts such as noise, HGV movements and smell on neighbouring land uses. A light river freight service which is focused on unitised goods, as compared to traditional bulk, waste and containerised freight, has the potential to offer more compatible logistics and river freight activities which could be integrated alongside mixed use redevelopment of safeguarded wharf sites.

THE CASE FOR CHANGE
STRATEGIC CASE- MAKING EFFICIENT USE OF EXISTING TRANSPORT INFRASTRUCTURE

MAKING EFFICIENT USE OF EXISTING INFRASTRUCTURE

Shifting road freight to the river could represent a more logical and efficient use of existing transport infrastructure without building bespoke facilities. Through rehabilitation of existing wharves along the river, the Thames can be properly utilised as a central transport artery and this shift could enable remaining road freight to travel on less congested roads.

Context

- **An Underutilised Thames**

The Thames has been the primary transport artery for London since the foundation of the city. However, the Thames is still considered to be under-used relative to its potential, given the longer-term shift towards road-based transportation of goods and workers.

River-based trade declined fairly consistently from its peak in 1964. It is only recently that the volume of freight along the river has started to increase. As of 2019, 4.8 million tonnes of intra-port freight was transported along the tidal Thames (which falls only partly within London's boundaries) - an increase on 2.39 million tonnes as of 2015.

The primary forms of river freight in recent years have been the transportation of waste and construction materials, often to and from major riverside construction sites. Prominent recent examples of this include the new Nine Elms Northern line extension and the Thames Tideway project in Bermondsey, the latter of which saw a total of four million tons of materials moved to and from the site. Increasingly, private sector companies are using the river as an efficient means of offering their services. In 2020, delivery company DHL began a high-speed parcel delivering services which utilised Thames clipper logistics boats between Wandsworth Riverside Quarter Pier and Bankside pier in Southwark, with the boat movements coordinated with last-mile delivery via electric vehicles and bicycle.

However, despite the recent uptick, the river is still comparatively underutilised. In 2020, the total volume of freight transported along the Thames fell to 3.4 million tonnes (roughly 2017 levels), although this was largely symptomatic of the trade and construction effects of the global pandemic.

A number of wharves remain underutilised and river infrastructure is not used as intensively as would be expected of a city with a growing population and significant congestion on its roads.

- **An Over-utilised Road Network**

Significant strides have been made to reduce the number of vehicles entering Central London since the introduction of the various GLA road charging systems (mentioned elsewhere in this report). However, London's roads remain congested, with the total number of vehicles on London's roads largely unchanged over the past decade.

DfT data shows that prior to the global pandemic, London experienced year-on-year increases in the volume of road traffic (from all vehicle types) in terms of total vehicle kilometre miles travelled by residents or local businesses in the years 2012 to 2019. All London boroughs experienced an increase in total vehicle miles travelled over this period, with only City of Westminster and City of London experiencing a decline in traffic volumes over the more recent period of 2015 to 2019.

In terms of freight more specifically, traffic levels in central London in the morning peak have remained close to flat since the Mayor's Transport Strategy set out the aim of reducing the number of lorries and vans entering central London, to achieve the aim, the number of lorries and vans needs to reduce by 10% by 2026.

THE CASE FOR CHANGE
STRATEGIC CASE- MAKING EFFICIENT USE OF EXISTING TRANSPORT INFRASTRUCTURE

MAKING EFFICIENT USE OF EXISTING INFRASTRUCTURE

Strategy and Policy Considerations

The Thames Vision is a 20-year framework set out by the PLA that by 2035 aims to achieve 6 goals:

- The busiest ever Port of London, handling 60 – 80 million tonnes of cargo a year;
- More goods and materials routinely moved between wharves on the river – every year over four million tonnes carried by water – taking over 400,000 lorry trips off the region's roads;
- Double the number of people travelling by river – reaching 20 million commuter and tourist trips every year;
- The cleanest river since the time of the Industrial Revolution, with improved habitats and awareness of heritage;
- Greater participation in sport and recreation on and alongside the water; and
- A riverside which is a magnet for ramblers, historians, artists and others, whether living nearby, on the river or travelling from further afield.

The GLA has recently aligned with the PLA's vision of increased freight via the launch of their Freight and Servicing Action Plan in 2019 and their greater commitment to the Thames and London Waterways Forum, both of which are explicitly committed to increased river freight. In addition, the London Plan explicitly sets out the GLA's endorsement for the application of water freight to help boost house-building through the delivery of construction goods and materials. More specifically, the plan sets out provisions for a network of 50 safeguarded wharves which are protected for the purposes of water-borne freight transport. This supports the delivery of sustainable freight transport and the Mayor's ambition to increase the proportion of freight moved on London's waterways.

In 2018/19 a review was taken to make sure this model is still fit for purpose. The recommendations from this review were to:

- Enable safeguarding directions to be removed from eight wharves;
- Enable safeguarding directions to be applied to two new wharves; and
- Enable safeguarding directions to be re-issued for 22 safeguarded wharves to amend the boundaries to reflect site ownership and/or marine infrastructure.

Strategic Implications and Opportunities for Light River Freight

- The river is comparatively under-utilised for freight relative to its capacity and London's roads continue to suffer from congestion despite a number of recent public policies to counter this. Increasing the scale of river freight could help rebalance this dynamic and enable the more efficient transportation of goods both on and off-road.

THE ECONOMIC CASE

Thames Estuary

PORT OF LONDON AUTHORITY

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Introduction

The economic case appraises the proposed river freight model to identify the range and type of economic impacts and benefits which could be generated through modal shift from road to river. The economic appraisal of the model has been undertaken in accordance with current WebTAG guidance including TAG Unit A5-4 Marginal External Costs and guidance included within the DfT Mode-Shift Benefit Values.

The following economic benefits have been considered:

- Modal shift benefits as a result of a reduction in the Marginal External Costs (MECs) associated with road based freight transport;
- Employment creation including the creation of new and higher value river logistics jobs;
- Gross Value Added (GVA) impacts; and
- Skills and training impacts.

These are illustrated in Figure 7.8 and appraised in the following slides.

Options Appraisal

Given the conceptual nature of the project, a formal options appraisal has not been undertaken. Instead, the study has focused on appraising the range of potential routes identified in Section 3 to identify the scale of potential economic benefits which could be generated by a river freight service on the River Thames. As part of this economic appraisal we will assess the river freight intervention against the BAU 'Do Nothing' scenario to demonstrate the net additionality of River Freight. We will also test how technological changes and changes to the policy and regulatory environment driven by the Net Zero agenda could impact the BAU scenario and the impact this will have on the relative benefits of river vs road.

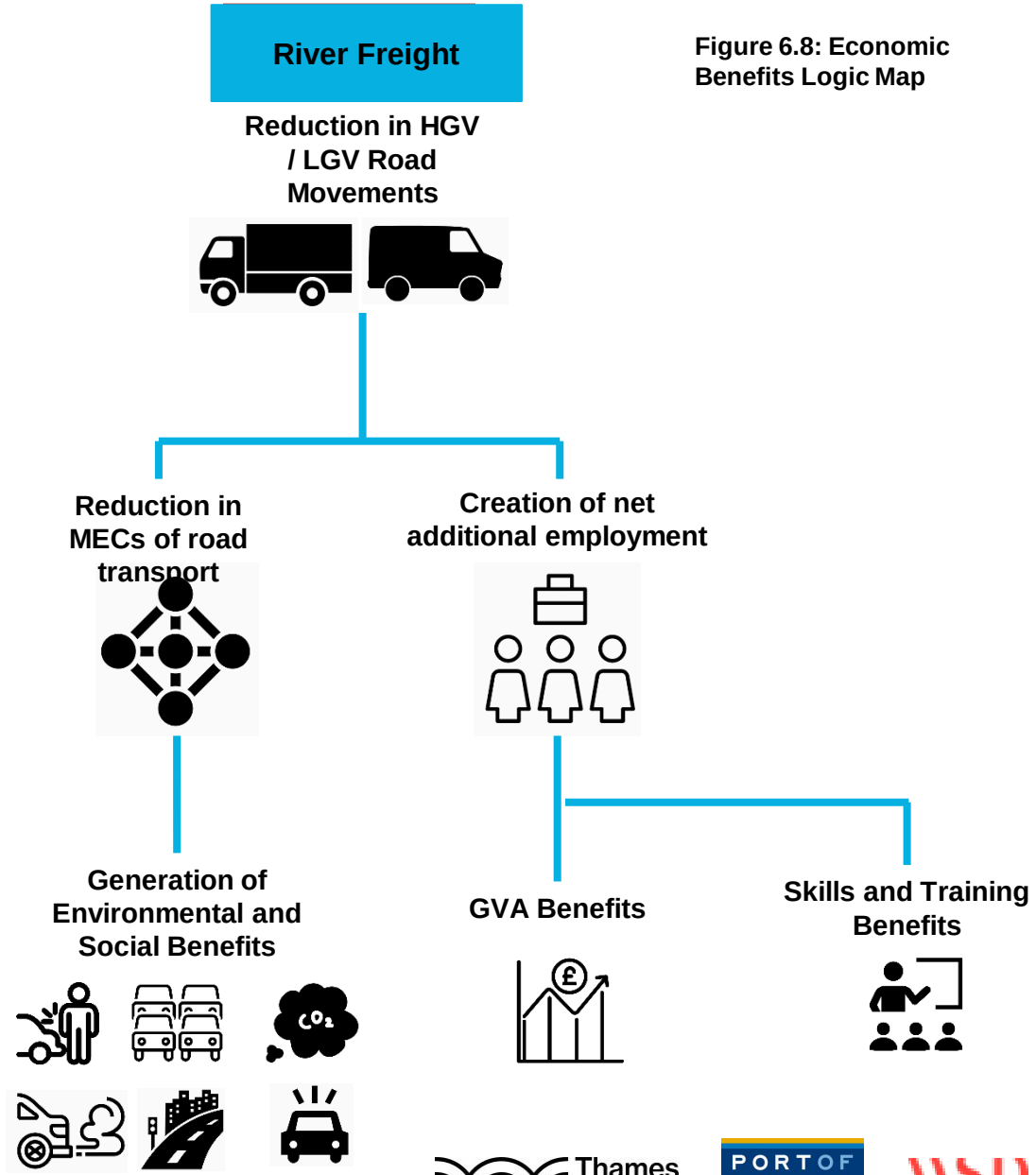


Figure 6.8: Economic Benefits Logic Map

Methodology

The benefits identified overleaf have been quantified where possible, utilising Department for Transport (DfT) guidance and methodologies on calculating MECs. MECs are the impacts associated with the shift in transport modes from vehicles to other modes of transport, including walking and cycling. For the purpose of this analysis we've also utilised the assessment methodology containing within the DfT Mode-Shift Benefit Values Update (2020) to account for the net externalities associated with river transport. Our methodology is set out below.

It is important to note that our methodology has considered the net additional economic benefits which could arise from a river freight service, over and above the Business as Usual (BAU) methods of last mile transportation into Central London markets via road based means (LGVs/HGVs). This is also compared to the 'Do Nothing' scenario.

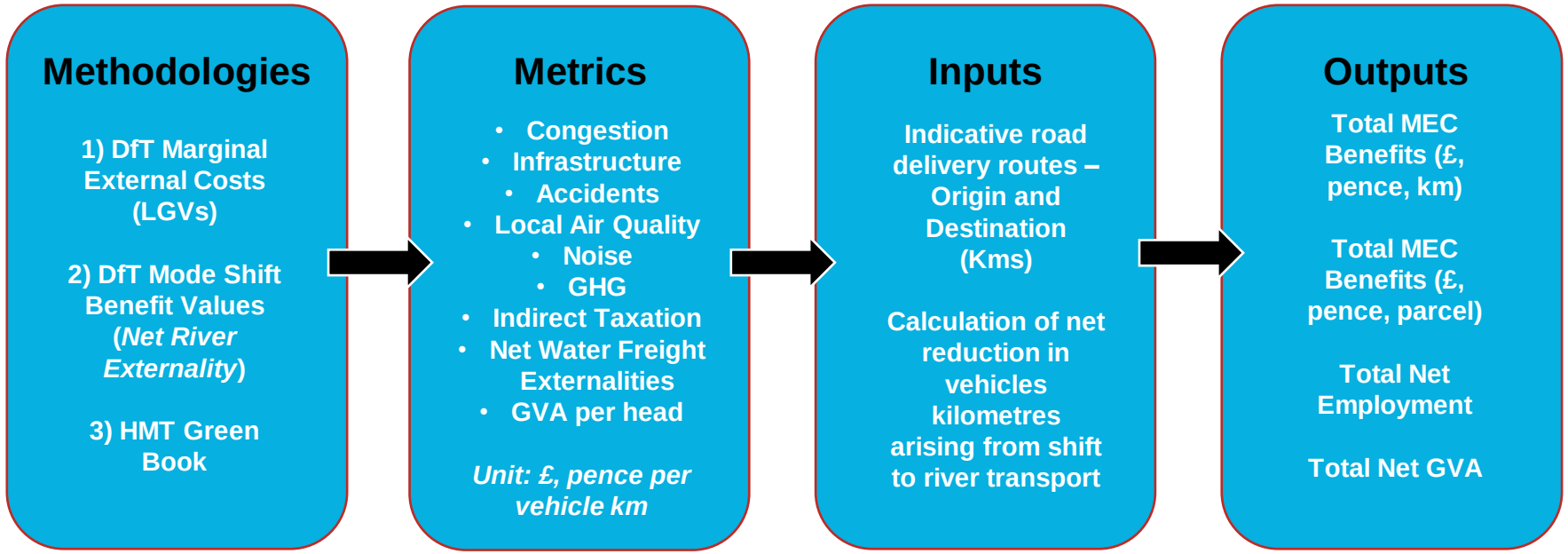


Figure 6.9 Methodology for Calculating the Economic Benefits of River Freight

THE CASE FOR CHANGE

RIVER FREIGHT GENERATES BENEFITS OF £0.37 PER PARCEL COMPARED TO ROAD

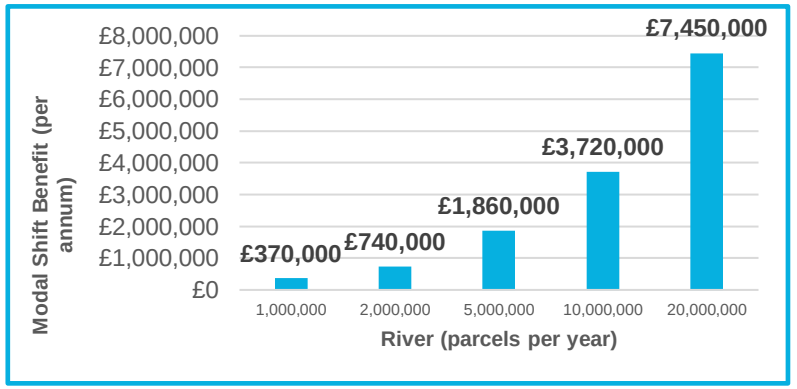
Modal Shift Benefits – River Freight

As set out in Section 5, for the purpose of this study, parcels have been used as an indicative product flow. It is estimated that on average, river freight generates £0.37 pence in modal shift benefits per parcel from the displacement of LGVs from the road network along the indicative routes analysed in Section 4. An illustrative breakdown of these routes and the range of economic benefits are set out in Figure 7.10. As expected, for shorter routes (e.g. East London distribution centres to Canary Wharf), the benefit per parcel is less than those routes from distribution centres on the edge of London into Central London given the benefits are calculated on a per mile basis.

The total reduction in MECs is comprised of the following:

- **Congestion** – Reduction in delays imposed on other vehicles by removal of LGVs from the road network resulting in faster network speeds;
- **GHG Emissions** – Reduction in petrol / diesel consumption and the associated reduction in greenhouse gas and carbon emissions;
- **Air Quality** – Reduction in emissions of NOx and COx from tailpipe emissions, as well as reductions in non-exhaust emissions such as PMx related to brake and tyre wear as well as road abrasion;
- **Infrastructure** – Reduction in damage to road infrastructure and frequency of road repair maintenance which incurs costs for local authorities and agencies responsible for maintenance.
- **Accidents** – Reduction in the accident risk for other road users as a result of reduced LGV movements on the road network. Accidents are related to a wide range of societal costs including medical and healthcare costs, lost economic output, police and fire service costs, insurance and administration and legal and court costs;
- **Noise** – Reduction in engine noise and the associated direct and indirect impacts on human health; and
- **Other External Road Costs** – This includes costs such as soil and water pollution, nature and landscape impacts, driver frustration and stress, fear of accidents, community severance (i.e. restrictions on cycling and walking) and visual intrusion.

Based on the parcel scenarios set out in Section 5 it can be seen that the modal shift benefits of river freight could generate up to £7.45m per annum in modal shift benefits under the 20m parcels per annum scenario.



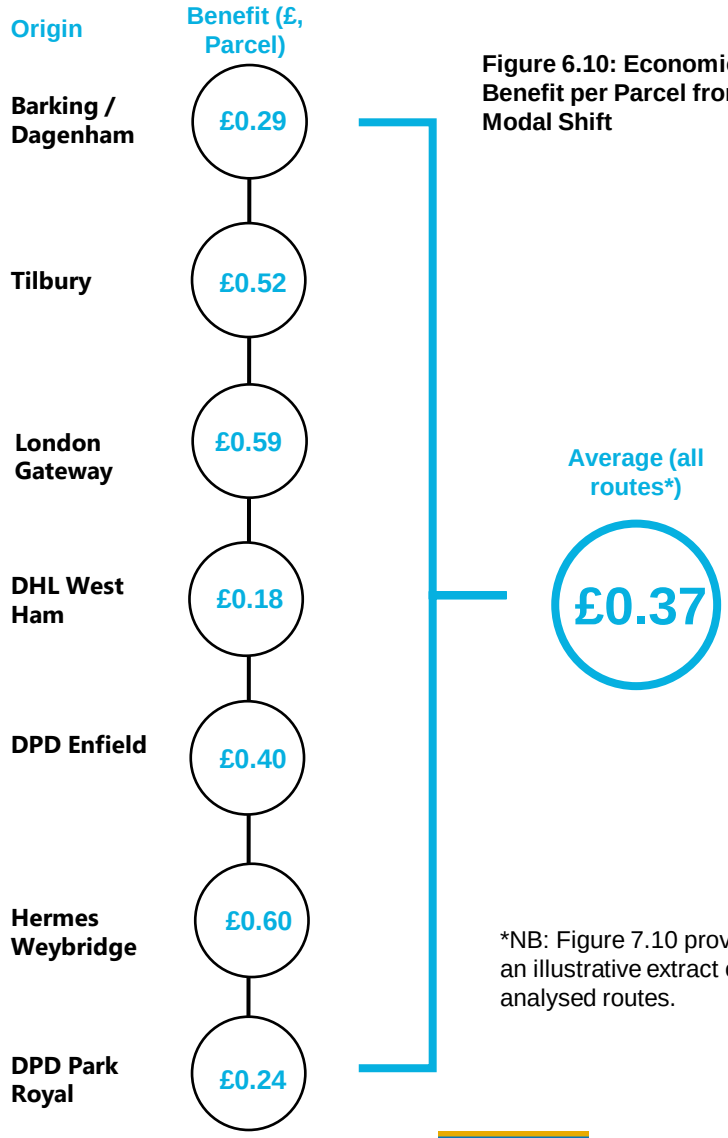


Figure 6.10: Economic Benefit per Parcel from Modal Shift

*NB: Figure 7.10 provides an illustrative extract of analysed routes.

THE CASE FOR CHANGE

RIVER FREIGHT GENERATES BENEFITS OF £0.37 PER PARCEL COMPARED TO ROAD

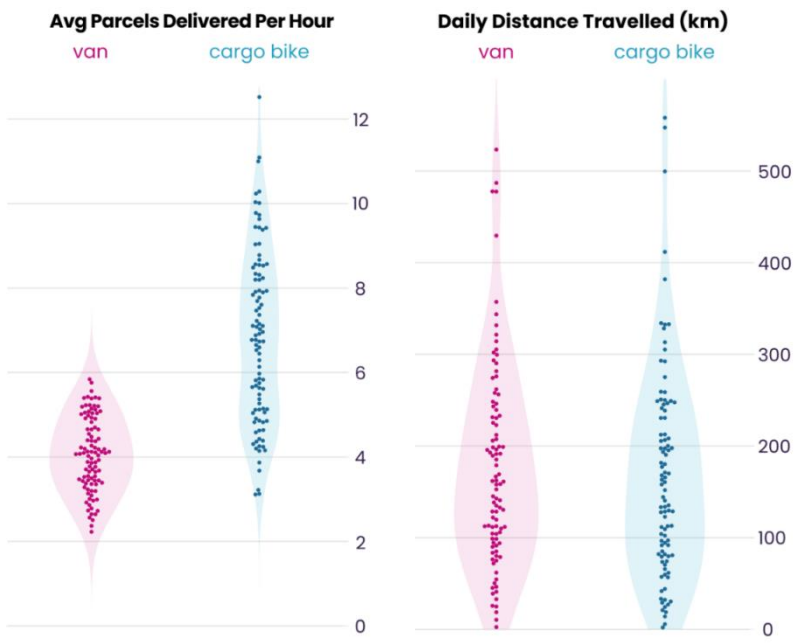
Emissions Benefits (CO_2 and NO_x) – River Freight

This study has focused on parcels, as an indicative product flow with high potential to achieve modal shift between road and river. As previously set out, the model for river freight will be to replace the last mile van delivery with a river leg (target to be zero emissions) and a final mile delivery to be undertaken by E-cargo bike or EAV.

It is well documented that cargo bikes are faster, and more efficient (in terms of parcels delivered per hour) than vans for consignments which are suitable for transportation by cargo bike. This is due to a multitude of factors including flexibility of routing, impact of congestion on van journeys and lack of parking related delays associated with road vehicles. Figure 6.11 presents the findings from a recent study which compared the efficiency of vans and cargo bikes for deliveries in Central London.

Based on the indicative routes analysed in Section 4, we have applied a number of assumptions to calculate the potential emissions savings which arise from utilising river transport for light freight compared to road. Table 6.1, presents the results of the potential carbon (CO_2) and nitrogen oxides (NO_x) savings which could arise from adoption of a river freight model. These calculations account for the carbon emissions which are emitted by cargo bikes; accounting for the extra food needed to power the bike. In total river freight could save approximately 2,300 tonnes of CO_2 per annum, and 4 tonnes of NO_x per annum.

Figure 6.11: Comparison of Vans and Cargo Bikes for Deliveries



Source: Possible (2021) The Promise of Low-Carbon Freight

Table 6.1: Emissions Benefits of River Freight (20m parcels scenario)

Metric	River Freight Model
Cargo Bike : Van Ratio	2.0
Average distance covered (km) by vans (BAU- indicative routes)	21,697km
Average van emissions – CO_2 (gCO2e/km)	245.3
Average cargo bike emissions – CO_2 (gCO2e/km)	22.6
Average van emissions – NO_x (gNOx/km)	0.32
Total average CO_2 savings (tonnes)	**2,284**
Total average NO_x savings (tonnes)	**3.6**

Source: Possible (2021) The Promise of Low-Carbon Freight, WSP Analysis (2021)

THE CASE FOR CHANGE

RIVER FREIGHT COULD GENERATE IN EXCESS OF £13M PER ANNUM IN GVA BENEFITS

Economic Impacts – River Freight

For the shorter term scenarios presented in Section 5 (up to 5m parcels per annum) we have estimated the net additional employment which could be generated by river freight and the associated GVA impacts which could be generated by these jobs.

The calculation of these impacts have been estimated based on:

- The replacement ratio of cargo bikes to vans replacing the traditional LGV last mile leg within Central London. For the purpose of this assessment we have assumed that within Central London, one van would be replaced by two E-cargo bikes, thus generating one additional job (cargo bike rider) per van removed from the road (referred to as 'Net Direct Employment');
- The additional employment associated with river freight services including Boatmasters, crew and vessel engineers;
- The net indirect employment associated with spending in the supply chain and induced spending from employees in the economy (referred to as 'Net Indirect and Induced Employment'); and
- Gross Value Added (GVA) impacts arising from the net additional employment, calculated on a per head basis.

These results are presented in Table 6.2. In the 5m parcels scenario it can be seen that approximately 200 net additional jobs would be created, generating over £13m in GVA within the economy per annum. This increases to £42m per annum in the 20m parcel scenario

Combined with the modal shift benefits presented previously, it can be seen that river freight could generate between 60 and 800 net additional jobs generating between **£4.5m and £60m in net additional GVA per annum** depending on the scale and volume of flows.

Table 6.2: Summary of Economic Benefits – Base Case

		Scenario			
	Impact	**1.5m Parcels**	**3m Parcels**	**5m Parcels**	**20m Parcels**
Baseline Employment Assumptions	BAU - Van Drivers (FTE)	38	77	128	513
	River Freight - Cargo Bike Drivers (FTE)	77	154	256	1,026
	River Freight - River Vessels + Operations (FTE)	12	24	40	160
Employment Impacts	**Net Direct Employment - Cargo Bikes**	**29**	**58**	**96**	**385**
	Net Direct Employment - River Transport	**12**	**24**	**40**	**160**
	Net Indirect & Induced Employment - Cargo Bikes	**14**	**29**	**48**	**192**
	Net Indirect & Induced Employment - River Transport	**7**	**14**	**24**	**96**
GVA Impacts	**Net Direct GVA - Cargo Bikes**	**£1,705,416**	**£3,410,831**	**£5,684,719**	**£22,738,875**
	Net Direct GVA - River Transport	**£709,453**	**£1,418,906**	**£2,364,843**	**£9,459,372**
	Net Indirect & Induced GVA - Cargo Bikes	**£1,193,791**	**£2,387,582**	**£3,979,303**	**£15,917,213**
	Net Indirect & Induced GVA - River Transport	**£425,672**	**£851,343**	**£1,418,906**	**£5,675,623**
Modal Shift Impacts	**Economic Benefit - Modal Shift (£)**	**£558,442**	**£1,116,884**	**£1,861,474**	**£7,445,894**
Summary	**Employment Impacts**	**62**	**125**	**208**	**833**
	GVA Impacts (per annum)	**£4,034,331**	**£8,068,663**	**£13,447,771**	**£53,791,084**
	Modal Shift Benefits (per annum)	**£558,442**	**£1,116,884**	**£1,861,474**	**£7,445,894**

Source: DfT (2020), WSP Analysis (2021)

THE CASE FOR CHANGE

THE 'DO NOTHING' SCENARIO WILL CONTINUALLY EVOLVE IN LINE WITH NET ZERO TARGETS

Do Nothing Scenario

For the purpose of this assessment, the river freight model has also been compared against the *Do Nothing* scenario.

As outlined earlier in the report, the target to achieve Net Zero by 2050 is going to drive significant regulatory and policy changes having an effect on relative costs between river and road freight and supporting development of new technologies through policy support. The below considerations will have an impact on the relative benefits of moving freight by river instead of road:

- **Ongoing modal shift,** particularly the movement of people via public transport which is going to free up road space for freight vehicles;
- The **rate of decarbonisation of the freight fleet** through adoption of new standards and the uptake of alternative fuels. This will include the electrification of road freight vehicles using decarbonised electricity supplies as well as the use of green hydrogen vehicles;
- **Improvements to air quality** over time as standards and technology reduce vehicle emissions in line with air quality standards and Net Zero targets; and
- **Technological innovation,** particularly with regards to freight operations including the fleet management software which can be used to increase the impact of driver training, transport management systems and routing software to maximise the fuel efficiency of deliveries and freight exchanges which can increase efficiencies of vehicle utilisation.

Based on the rate of change, it is likely that over time, the relative benefits of river freight over road freight will change as the marginal externalities of combustion engines are reduced in line with regulatory change and innovation on the part of the private sector. This will largely be driven by the 2050 Net Zero target set by UK Government.

The potential impacts of these changes on the modal shift benefits presented previously have been tested drawing on the guidance included within WebTAG Unit A5-4 Marginal External Costs and within DfT Mode-Shift Benefit Values. These assumptions are overleaf in Figure 6.12.

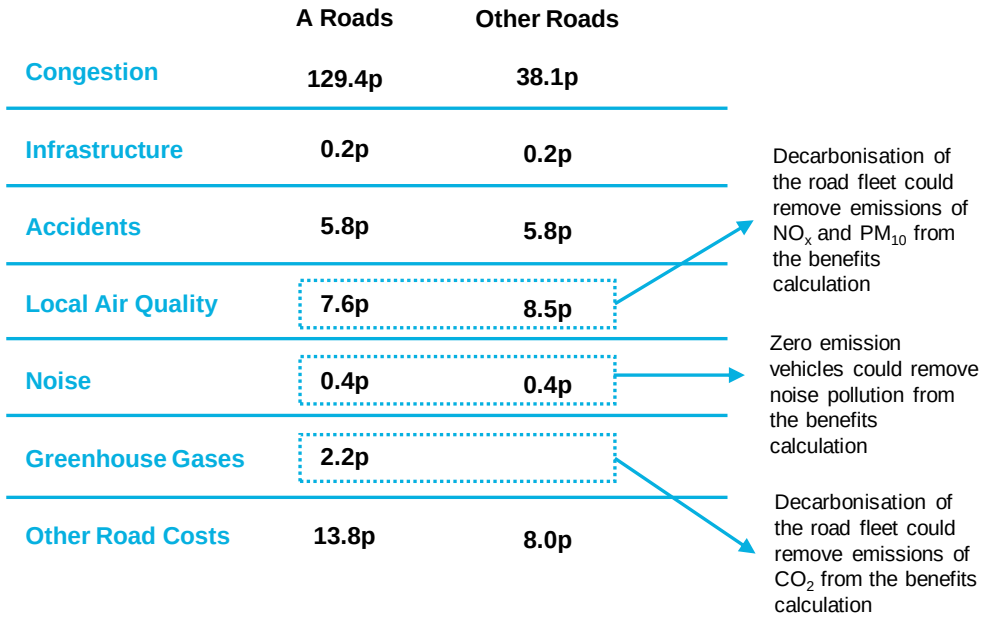
THE CASE FOR CHANGE

THE 'DO NOTHING' SCENARIO WILL CONTINUALLY EVOLVE IN LINE WITH NET ZERO TARGETS

Sensitivity Test 1 – Decarbonised Road Freight Fleet

The potential impacts of these changes on the modal shift benefits presented previously have been tested drawing on the guidance included within WebTAG Unit A5-4 Marginal External Costs and within DfT Mode-Shift Benefit Values. These assumptions are illustrated below in Figure 6.12. Here we test the relative impact on the modal shift benefit calculation as a result of a decarbonisation of the road freight fleet and the associated benefits this would create with regards to noise, local air quality and greenhouse gas emissions.

Figure 6.12 Adjustments to the Modal Shift Benefit Assumptions – Do Nothing Scenario



Source: DfT (2020), WSP Analysis (2021)

It can be seen that under this sensitivity test the economic benefit of modal shift decreases to approximately £6.7m per annum under the 20m parcel scenario. The majority of the economic benefit is generating through the creation of net additional employment associated GVA benefits and these would still be generated under a scenario in which the road freight fleet has decarbonised.

Table 6.3: Summary of Economic Benefits – Sensitivity Test 1 – Decarbonised Road Freight Fleet

		Scenario			
	Impact	**1.5m Parcels**	**3m Parcels**	**5m Parcels**	**20m Parcels**
Baseline Employment Assumptions	BAU - Van Drivers (FTE)	38	77	128	513
	River Freight - Cargo Bike Drivers (FTE)	77	154	256	1,026
	River Freight - River Vessels + Operations (FTE)	12	24	40	160
Employment Impacts	**Net Direct Employment - Cargo Bikes**	**29**	**58**	**96**	**385**
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Modal Shift Impacts	**Economic Benefit - Modal Shift (£)**	**£503,744**	**£1,007,488**	**£1,679,146**	**£6,716,584**
Summary	**Employment Impacts**	**62**	**125**	**208**	**833**
	GVA Impacts (per annum)	**£4,034,331**	**£8,068,663**	**£13,447,771**	**£53,791,084**
	Modal Shift Benefits (per annum)	**£503,744**	**£1,007,488**	**£1,679,146**	**£6,716,584**

Source: DfT (2020), WSP Analysis (2021)

7. CONCLUSIONS AND RECOMMENDATIONS

Thames Estuary

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RECOMMENDATIONS AND DELIVERY PLAN
SUMMARY

A summary of our conclusions are set out below:

- Our analysis has indicated that river is **unlikely to beat road on cost, at least in the short to medium term**. Engagement with potential customers of a future river freight service indicate that it therefore needs to deliver the same level of service and reliability as road transport and a demonstrably 'greener' end to end solution. The future river freight model needs to run to timetables not tides to ensure this reliability and flexibility of service;
- The market opportunity for river freight is to **displace the LGV/HGV last mile leg into Central London**. The river freight model needs to be last mile ready as there are limited opportunities to consolidate within Central London from the riverside;
- With regards to product flows, **parcels are identified as being the target market opportunity** given the size of the market, its expected growth and its suitability for river traffic. Based on current growth trajectories between 1.2 and 3.5 million additional van journeys may be required over the period to 2030 to meet growth in E-commerce and home deliveries. River freight has a significant role to play in removing these additional van journeys from the road;
- There is a significant gap between road and river freight transport on a cost per mile/parcel basis. It has been demonstrated however that **scale is the single biggest element in increasing the cost competitiveness** of river compared to road;
- The funding of infrastructure will not be enough to narrow the gap, there will need to be policy incentives and grant mechanisms to facilitate modal shift. The **UK Government's commitment to achieving Net Zero carbon emissions by 2050** – now enshrined in law – will have a significant impact on the range of regulatory changes and police responses which will be adopted to drive decarbonisation of the freight network.
- The drive to a Net Zero emissions target will both create a **regulatory effect on relative costs and support development of new technologies** through policy support. This will effect the relative costs and benefits of river compared to road freight transport depending on the speed at which decarbonisation of road and river fleets occur.
- There is a strong strategic case for river freight, driven by the drive to Net Zero emissions targets, and the associated **environmental benefits of removing LGVs from London's congested road network**. LGV movements within London's road network have increased exponentially in the last 20 years and the situation is going to get worse as E-commerce grows (driven in part by trends exacerbated by the pandemic). Whilst London's LGV fleet will electrify over time, this will not remove the congestion impacts or non-exhaust particulate impacts on London's air quality. In addition, the marginal external costs of road traffic including accidents, noise and infrastructure maintenance will remain regardless of the fuel type.
- Increased River freight could also drive new opportunities to **repurpose existing riverside infrastructure** including safeguarded wharves;
- There are strong public benefits which will accrue from the adoption of river freight at scale. It is estimated that river freight can generate **net additional economic benefits over and above BAU and 'Do Nothing' scenarios**. The economic benefits of modal shift are significant if the river freight model can displace the last mile van delivery into Central London.
- Using parcels as the indicative product flow it can be seen that river freight could generate up to **£3 in net additional economic benefits per parcel** under a 20m parcel scenario. These economic benefits are comprised of GVA impacts driven by net additional employment creation as well as modal shift benefits through the reduction of MEC's by the displacement of light goods vehicles for river vessels and E-cargo bikes.

RECOMMENDATION 1
A FACE FOR THE RIVER

ACTION / RECOMMENDATION: Establishment of a River Freight Coordinating Body ('One Stop Shop') for the Thames	
Key Issue There is no clear 'face to the river' and this needs to change if the Thames is to reach its full potential. Engagement with freight operators and potential river freight customers have identified significant challenges in navigating the number of regulatory bodies and agencies with control over usage of the Thames. This is deterring rather than enabling use of the river for freight.	**Responsibility / Governance** • The Thames Light Freight Steering Committee could be the basis for building cross organisational consensus on the opportunities and challenges for River Freight. • There needs to be senior political impetus, with either the Mayor or central government designating a champion for river freight. This could potentially be supported through the Thames and London Waterways Forum – Freight and Development Working Group.
Outcome The establishment of a coordinating body would be similar to a 'one stop shop' which river users could utilise to provide clarity on the range of administrational procedures and processes required to operate on the river. This would help to provide certainty on the behalf of those looking to invest on the river as well as helping to streamline the procedural administration of obtaining permits and permissions for operation. It will be important for the coordinating body to cover both river and land side infrastructure and operational requirements.	**Stakeholders** • PLA • GLA • TFL • Environment Agency • Individual London borough / Kent / Essex / district authorities
Next Steps & Timing of Intervention This action should be implemented in the immediate term (<1 year).	**Dependencies** The action is dependent on: • Regulatory bodies – willingness to coordinate and align with the Light Freight Steering Committee • Promotion – the private sector needs to be aware that the coordinating body exists to facilitate access to the river
Thames Estuary Growth Board's Role	
Influencing • The Thames Estuary Growth Board should coordinate with the PLA to table an agenda item at the next steering committee to discuss the operational practicalities of establishing a Coordinating Body for light freight on the Thames. • The Thames Estuary Growth Board should create an outline organisational strategy and proposition for how the Coordinating Body will be administered including reporting procedures and mandate.	**Enabling / Delivery** • Thames Estuary Growth Board should sit within or alongside the Coordinating Body to support the day to day function supporting its engagement with private sector businesses and investors.

RECOMMENDATION 2
FULL OPERATIONAL UNDERSTANDING

ACTION / RECOMMENDATION: Undertake an Operational Assessment of Landside Infrastructure

Key Issue
The landside facilities and access for the transfer for goods to river transport from road transport is currently poor. In addition, there is a lack of strategic coordination between the connection of river assets to landside facilities which can encourage and unlock the use of the river for freight.

Responsibility / Governance
- TfL freight team

Outcome
Further analysis needs to be undertaken to understand the potential traffic implications of cargo vehicle (E-cargo bike / EAV) servicing a river freight service operating at scale. A coordinated approach needs to be taken to ensure that strategic river assets (such as piers) have adequate landside access and servicing provision.

The outcome would be a joined up strategic approach with regards to integration between river transport and last mile delivery modes. As river freight scales up over time there will be an increasing need for landside infrastructure to accommodate the movement of goods from river to road. This could include full understanding of how the following operations would work and how different elements of the supply chain would interface
- Loading – how the consolidation centre would operate on an open access/ third party basis
- Unloading – fully understanding the capacities and operational requirements at the piers
- E-cargo bikes – how the bikes would be stored, charged and maintained

Stakeholders
- TfL
- GLA
- PLA
- Individual London Boroughs
- Pan London Organisations – Cross River Partnership etc.

Next Steps & Timing of Intervention
This analysis should be undertaken in the short term (1-2 years). The analysis should be informed by the river trials currently being undertaken.

Dependencies
The action is dependent on:
- TfL's strategy for river freight
- The ability to deliver additional landside facilities and infrastructure will depend on the land ownership and pier licenses. These interventions may be easier to deliver where the piers are in public operation.

Thames Estuary Growth Board's Role

Influencing
Use the benefits outlined in this report to engage with last mile delivery couriers, customers and freight operators to canvas views on short – long term infrastructure needs to support integration with river transport

Enabling / Delivery
- R&D supporting robust, evidence led policy development. This could be through forward thinking visioning and strategy formulation with organisations such as Cross River Partnership and Deliver London to create conceptual 'test cases' for strategic river assets (e.g. Millbank pier)

RECOMMENDATION 3
DETAILED UNDERSTANDING OF THE UNLOADING PIERS

ACTION / RECOMMENDATION: Undertake further detailed design optioneering for pier development	
Key Issue A number of pier options in Central London have been analysed within this study as potential destination points for river freight to service Central London markets. Various modifications to the identified river assets would be required and there are currently a number of key risks which needs to be explored in more detail to understand the feasibility of utilising these assets for river freight.	**Responsibility / Governance** • PLA
Outcome Design optioneering would be undertaken to consider the following for each identified pier: ▪ Vessel compatibility; ▪ Berth availability; ▪ Green technology; ▪ Commercial availability of infrastructure; and ▪ Consents, permits and permissions.	**Stakeholders** • Pier owners (public and private) • PLA • Environment agency • TfL
Next Steps & Timing of Intervention Immediate term (<1 year)	**Dependencies** • Willingness of private pier owners to engage in dialogue
Thames Estuary Growth Board's Role	
Influencing • Engagement with the PLA who are currently preparing a tender to look at potential pier designs for river freight. The findings of this study should be utilised by the PLA to inform the specification for future commissions. • Promotion of the study findings with pier owners generate interest	**Enabling / Delivery** N/A

RECOMMENDATION 4
REALISING SOCIAL BENEFITS

ACTION / RECOMMENDATION: Identification of grant funding and revenue support mechanisms to address both the capital and revenue costs of river freight. This should include a review of the Mode Shift Revenue Support grant scheme to assess applicability for the Thames

Key Issue
Cost is a key barrier to entry on use of the river for light freight movements. Engagement with the key stakeholders and the market has indicated that the private sector is unlikely to lead the way on river freight and therefore the public sector will need to create the market for river freight through investment. There will be capital costs associated with river infrastructure requirements in the form of new piers, as well as pier extensions and reinforcements to existing structures. Additionally, there are commercial barriers to entry, in terms of the additional costs associated with sending freight via river compared to traditional last mile road deliveries.

Responsibility / Governance
- Thames and London Waterways Forum – Freight and Development Working Group

Outcome
It is recommended that further work is undertaken to assess the eligibility of freight operators to access Mode Shift Revenue Support grant funding to transfer light freight movements from road to river. The focus will be on those priority routes identified within this study including the origins of Port of Tilbury and DIFT, and destinations within Central and West London.

There may be opportunities to incentivise investment by river operators and pier owners in river infrastructure for freight movements. Discussions should be undertaken with the PLA with respect to River Works Licence (RWL) and options for exemptions, discounts or delays to incentivise this investment. Opportunities for public investment in shared facilities should also be explored with TfL and other publicly owned and operated pier facilities.

Stakeholders
- DfT
- GLA
- PLA
- London Boroughs
- National Infrastructure Commission (NIC)

Next Steps & Timing of Intervention
Short to Medium term (1-3 years). Interventions are likely to be adopted on a rolling basis as the market for river freight develops. There will be short term interventions which can help to unlock early investment in infrastructure, whilst revenue support mechanisms will be slower to be adopted.

Dependencies
N/A

Thames Estuary Growth Board's Role

Influencing
- Use the benefits outlined in this report to engage with TfL, DfT and other government bodies

Enabling / Delivery
- Potential further research on "willingness to pay" premiums for environmentally friendly parcel deliveries

RECOMMENDATION 5
SMALL INCREASES IN ROAD PRICING FOR VANS

ACTION / RECOMMENDATION: Introduction of additional charges to discourage road based freight movements by LGV	
Key Issue This study has indicated a number of barriers to private sector adoption of river freight for light freight movements, the most significant of which is cost. To increase the commercial viability of river, the benefits of river as a preferred modal choice need to extend beyond the environmental and sustainability benefits which can be accrued. The cost of road based transport will need to increase to incentivise freight operators to consider modal shift to the river. This is likely to be in the form of increased taxation and road pricing.	**Responsibility / Governance** • GLA / DfT / TfL
Outcome Additional charges and taxes should be levied to discourage vehicle use for freight transport. This includes charging mechanisms such as fuel duties, road pricing and extensions / increases to the ULEZ and Congestion Charging Zones. New zero emissions zones could potentially be introduced to central areas of London to prevent motorised vehicles being used for freight movements. There may also opportunities to promote sustainable freight movements through the introduction of subsidies for river and cargo bike logistics or through the reduction of taxes on operations for these modes of transport. This would help to stimulate demand in conjunction with further restrictions on road based vehicle movements.	**Stakeholders** • DfT • GLA • HMRC • TfL
Next Steps & Timing of Intervention These interventions are likely to occur over the medium – long term as Government regulation and polices are introduced as part of the Net Zero agenda.	**Dependencies** The action is dependent on: • The political will and commitment to increase taxation and road pricing of road vehicles within London. • Appropriate stakeholder engagement and consultation on proposed changes to the ULEZ / Congestion Charge.
Thames Estuary Growth Board's Role	
Influencing • Discussions with TfL on van-focussed congestion charging by demonstrating potential volumes of vans taken off the road from river freight, over and above the pure congestion charging benefits. • Win support from London Boroughs, particularly car-reliant boroughs like Bexley, by demonstrating the volume of vans that could be taken off the road.	**Enabling / Delivery** • The Thames Estuary Growth Board to identify key stakeholders and facilitate discussions.

RECOMMENDATION 6
BUILD THE CUSTOMER BASE FOR RIVER FREIGHT

ACTION / RECOMMENDATION: Identification of anchor clients and customers for river freight	
Key Issue This study has demonstrated that scale is the single largest factor in driving the cost competitiveness of river fright versus road.	**Responsibility / Governance** • River Freight Coordinating Body
Outcome Further testing of the market to generate interest in river freight. This should be targeted at those companies or organisations with clear green agendas and strong Corporate Social Responsibility (CSR) activities. Whilst the market for river freight develops it could be that the public sector leads drawing on internal commitments to decarbonisation and Net Zero targets. This is exemplified in the Guys and St Thomas' hospital trial.	**Stakeholders** • River freight customers (private and public sector)
Next Steps & Timing of Intervention Short term (1-2 years). Market engagement can be proactively scaled over time in line with pilot schemes.	**Dependencies** N/A
Thames Estuary Growth Board's Role	
Influencing • External promotion of river freight trials – communication and event programmes. • Direct engagement with private sector businesses to generate interest for river freight.	**Enabling / Delivery** • Commission research in to largest companies for online deliveries in London.

RECOMMENDATION 7
DEVELOP THE PROOF OF CONCEPT

ACTION / RECOMMENDATION: River freight trials should be promoted and supported to provide proof of concept to the market	
Key Issue The market sentiment from the private sector is that there are significant barriers to use of the river for freight. In addition, 'business as usual' last mile delivery is based on proven transport methods which offer reliability and flexibility of service alongside known costs.	**Responsibility / Governance** • River Freight Coordinating Body.
Outcome A market needs to be created for river freight. The promotion of river freight pilots will help to build market interest and proof of concept that river freight can deliver reliability of service to both the operator and the end customer. Pilots will help to drive innovation, and the use of test cases across different light freight product flows (food, beverages, parcels etc.) will help to build multi-sector confidence in the river. Given the nascent market for river freight, it will not be possible to fully understand the market potential and impact on consumer behaviour which river freight services could generate, without full scale river trials. The public sector could help to drive these trials, drawing on their commitments to net zero by 2050 and publicly demonstrating support for alternative freight models. Public institutions such as hospitals (as demonstrated by the CEVA trail) and Houses of Parliament (which has river access) would be catalytic 'first movers' in demonstrating the value of river freight to the market.	**Stakeholders** • PLA • TFL • GLA • River freight customers (private and public sector) • Environment agency
Next Steps & Timing of Intervention Short term (1-2 years)	**Dependencies** The action is dependent on: • The willingness of early movers to invest in river freight. • Support of the PLA / statutory agencies to help deliver innovative solutions.
Thames Estuary Growth Board's Role	
Influencing • Engagement with the market to generate interest and support the development of river freight solutions to pilot phase.	**Enabling / Delivery** • Provision of cross-disciplinary coordination between parties (river operators, PLA etc.) • Accelerated learning from previous pilot schemes.

THANK YOU.

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