

National Transport Authority (NTA)

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# **SUSTAINABLE FREIGHT DISTRIBUTION FRAMEWORK: GREATER DUBLIN AREA (GDA)**

Sprint Report



## National Transport Authority (NTA)

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## Sprint Report

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# EXECUTIVE SUMMARY

The National Transport Authority (NTA) is a statutory body established by the Minister for Transport. It is responsible for the preparation of a Strategic Transport Plan for the Greater Dublin Area (GDA), which comprises the city and county of Dublin, and counties Kildare, Meath and Wicklow. The Strategy's role is to establish appropriate policies and transport measures that will support the Greater Dublin Area (GDA) in meeting its potential as a competitive, sustainable city region with a good quality of life for all. This sprint report has been developed to steer the framework for a Sustainable Freight Distribution Framework and provide an approach towards developing a strategy for the efficient, safe and sustainable movement of goods based around three key themes;

- **Stakeholder Engagement**
- **Freight Data**
- **Infrastructure**
- **Technology & Decarbonisation**
- **Operational & Planning Considerations**

The assessment of the freight and logistics context considered the analysis of freight and transport data and information from a number of core sources, namely:

- National Transport Strategy for Greater Dublin Area (2016-2036)
- Review of the National Transport Strategy for Greater Dublin Area (Issues Report 2020/2021)
- Greater Dublin Area Draft Transport Strategy 2011-2030 (Eltis)
- Ten Year Strategy for the Haulage Sector (2021)
- Regional Spatial & Economic Strategy for Eastern & Midland Regional Assembly (2019-2031)
- Rail Review Report (2016)
- 2030 Rail Freight Network Strategy Review (2011)
- National Ports Policy (2019)
- GDA Strategy (Transport Demand Management Measures (2015)
- Cities Demand Management Study (2021)

In summary, a number of key issues and opportunities have been collated together to set the scene for the role of freight transport across the GDA. This has been balanced against future and emerging trends across the sector to develop a clear list of measures under each of the aforementioned three themes which have been assessed against economic, environmental and social objectives for the freight industry using a Multi Criteria Assessment Framework (MCAF). Detailed dashboards have then been produced for selected measures that show the greatest potential to meet these objectives.

There is a dependency on road freight to move goods around the GDA and a reliance on the primary road network to fulfil this requirement to support burgeoning sector growth and local/national prosperity. The network is vital for servicing the activities of major freight generators, namely Dublin Port and a band of warehousing, business parks and logistics centres around the M50 orbital road which defines the city of Dublin.

Infrastructure investment should look to enhance network resilience and provide viable alternative fuel technologies and options for re-modelling consignments; both for strategic trips and within the confinements of the city of Dublin. This is whilst still supporting the growth of freight and logistics presence and helping unlock future capacity.

There are plentiful measures to help the sector decarbonise, a key priority going forward, that uses technology to optimise trips and improve efficiencies which can cater for both large and smaller fleet operators. An approach must recognise the short-term limitations of alternative fuel technologies and the need to apply a suite of attractive tools to improve fuel efficiency, reduce travel demand and raise standards.

Public authorities and industry must work collaboratively to scale up initiatives that reduce the externalities on society and the environment and support a transition towards a sustainable, safe and efficient freight sector; combining the use of legislation to manage access and influence travel behaviour, with incentives and schemes to nudge industry towards adopting best practice. Generally, a 'think freight' approach needs to be better interwoven into the fabric of local decision making and the public consciousness to realise the freight objectives.

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FLGFF Terms of Reference (ToF)

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## INTRODUCTION

This sprint report has been developed by WSP and Transport Insights for the attention of the National Transport Authority (NTA) of the Republic of Ireland. This commission aims to provide a framework for the future development of a Sustainable Freight Distribution Strategy and informing the emergence of a Transport Strategy for the Greater Dublin Area (GDA) (2022-2042) which lays the foundations for the planning and delivery of transport infrastructure and services over the next two decades.

The current Transport Strategy for the GDA (2016-2036) makes fleeting reference to goods movements and the role of freight across the GDA; which comprises of four constituent local authorities; Dublin, Meath, Kildare and Wicklow covering a major urban centre and its rural hinterlands (Figure x). This report intends to build on prior knowledge and insights to help provide a framework for further investigation into the role of freight transport now and in the future

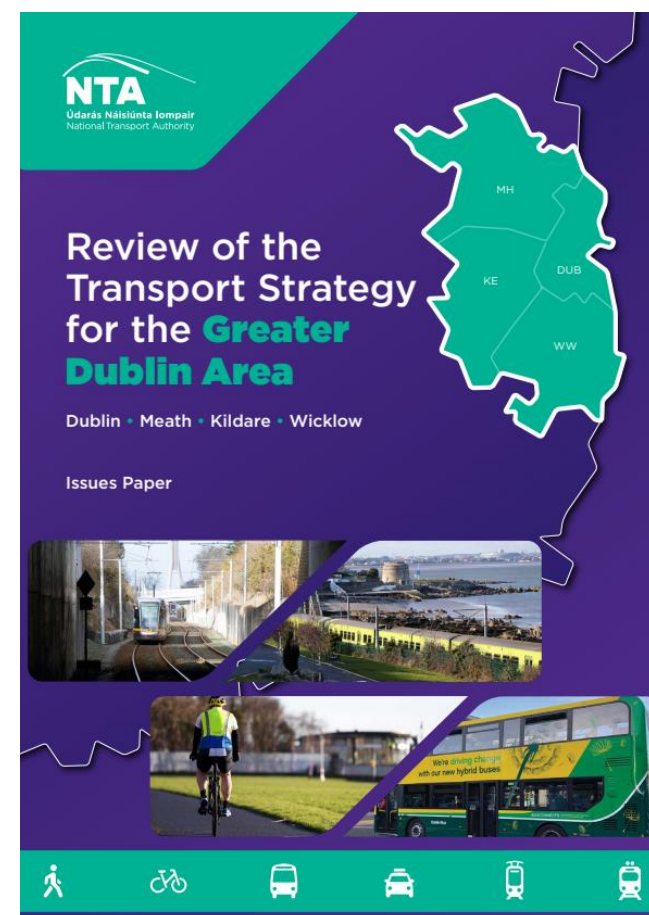


Figure 1 Greater Dublin Area (left) and the review of the NTA led Transport Strategy (right) (NTA, 2021)

## THE ROLE OF FREIGHT

The efficient, safe and sustainable movement of goods is a fundamental part of supporting everyday life. The scale and complexity of movements vary enormously along with the types of goods being transported. Freight transport can often be viewed as the silent network that operates behind the scenes using different forms of travel along a supply chain to support local economies and to help sustain society.

The significance of freight can be understated within transport policy and the public consciousness, but its role is increasingly important to consider and manage, especially in an urban context, to keep up with changes to how we live, work and move. Freight plays an essential role in servicing industry and communities and supporting economic prosperity. It allows residents to have choice as consumers and businesses, to sustain thriving and attractive places and enhance people's quality of life. Future developments depend on the expeditious movement of materials to construction sites by different types of freight transport whilst waste and recycling must be collected and disposed of efficiently with due care and attention.

Effective freight management is crucial for businesses and consumers who depend on access to a range of goods being transported safely and efficiently. The demand for goods is only likely to increase in the future as the local population grows and more development takes place. However, wider changes in consumer behaviours driven by new technology are reshaping what goods are being moved; all of which is catalysing a change in the freight and logistics sector to respond to new expectations.

## FLOWS OF FREIGHT MOVEMENTS

There are different flows of freight movements that will incur across the GDA that will require different types of freight transport and vehicles to move the goods. Consideration must be given to:

- **Business2Business (B2B):** the delivery of goods through the different stages of a supply chain, between the supplier of raw materials to a manufacturer to a retailer. For example, taking containers from Dublin Port to the Airport Logistics Park.
- **Business2Consumer (B2C):** the final stage of the 'forward' supply chain, where goods are moved between a retailer to the final destination for consumption. For example, steel being delivered from a factory to a construction site for erecting as part of a new building.
- **Consumer2Business (C2B):** what is described as 'reverse logistics'; going back up the supply chain after a product has been consumed, such as recycling. For example, requesting an item that has been delivered to be returned back to a retailer.
- **Consumer2Consumer (C2C):** a more informal, fluid and non-transactional movement of goods becoming more commonly associated with the circular, sharing economy. For example, a business group sharing recycled surplus packaging.

## TYPES OF FREIGHT TRANSPORT

Freight transport comes in many forms, especially across an area the size of the GDA and for meeting the demands of a growing, global, capital city such as Dublin. Freight will move along a supply chain interacting with different organisations, modes of transport and addresses on its door to door journey. It is important to acknowledge the different modes of transport that make it possible to keep society functioning and ensure that the networks they run on across the GDA are future ready.

Many supply chains will demand intermodal transport; meaning that goods are moved between different types of transport to continue their onward journey through a supply chain. This is especially the case in larger urban areas, such as the GDA, with the convergence of many local, national and international supply chain activities taking place every day, all day, across the transport network. Freight Transport therefore also covers the way items are handled, stored and processed at different stages of a journey

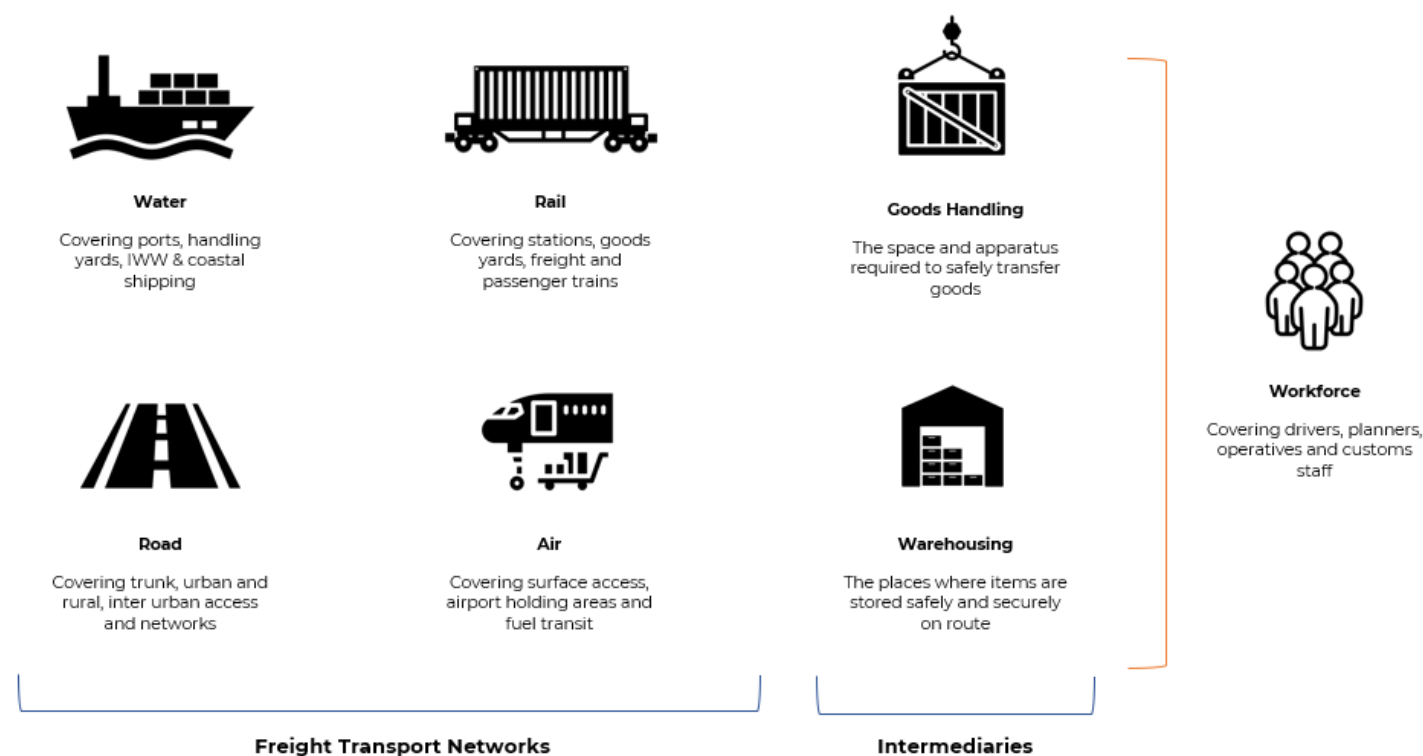


Figure 2 Different types of freight transport applicable to the GDA (Author, 2021)

## FREIGHT OBJECTIVES

A Transport Strategy for the GDA is being developed to lay out plans for the future of the transport network to help manage current and future economic, environmental and social challenges. The plan is holistic in nature; understanding the need to support emerging developments and responding to changes in the way people move, shop and travel generally. This includes the role of freight and logistics, an understated part of the transport system.

A set of objectives have been developed for the purpose of selecting, delivering and monitoring the impact of freight specific measures across the GDA in the future. These are associated with the way in which goods are moved from place to place and based around the three pillars of creating a sustainable, safe and efficient transport system. Future measures and practices should seek to be sustainable by satisfying each of the three pillars.

### Economy

- **Freight efficiency:** Improved journey times, connectivity and integration between modes and reduced impact from and on congestion
- **Industry contribution:** Improved jobs and opportunities to address skills shortages, support for inward investment, land availability, infrastructure provision
- **Connectivity:** Improved connectivity to, from and within international gateways and enhanced access locally between locations.

### Environment

- **Air quality:** Reduce the impact of the sector through air quality improvements and a reduction in other forms of pollution and intrusive activities.
- **Greenhouse gas emissions:** Reduction in greenhouse gas emissions from the sector to achieve net-zero by 2050
- **Externalities:** Minimising the intrusive impact of freight transport on visual amenity and local, protected settings

### Society

- **Safety:** Improve the safety of the sector to reduce the number of accidents involving goods vehicles
- **Community disturbance:** Reduce the impact of freight on communities, noise levels, air quality and informal overnight lorry parking
- **Placemaking:** Better integrate freight into land use planning, development, construction and servicing plans, better freight data

Freight transport shouldn't be considered and viewed in isolation from the rest of the transport mix when developing the Transport Strategy for the GDA. Paying greater attention and respect to the industry and recognising its presence and role locally can help to fulfil the emerging four objectives of the Transport Strategy namely:

1. **An Enhanced Natural and Built Environment:** To meet our environmental obligations by transitioning to a clean, low emission transport system, reducing car dependency and increasing walking, cycling plus public transport use.
2. **Connected Communities and Better Quality of Life:** To enhance the health and quality of life of our society by improving connectivity between people and places, delivering safe and integrated transport options, and increasing opportunities for walking and cycling.
3. **A Strong Sustainable Economy:** Supporting economic activity and growth by improving the opportunity for people to travel for work or business where and when they need to and facilitating the efficient movement of goods.
4. **An Inclusive Transport System:** To deliver a high quality, equitable and accessible transport system, which caters for the needs of all members of society.

## A FREIGHT VISION

The freight objectives identified must seek to tie into a broader vision for the role and future direction of freight transport across the GDA to set the tone for future investment and prioritisation of measures and practices. Ultimately the expeditious movement of goods through a supply chain must come to better the quality of life of local, national and international populations through the consumption of goods. A vision for freight must always fulfill this primary aim but could look to apply the following three principles:

- To be future ready and responsive to emerging trends and behaviours that are changing the way that goods are moved, processed and consumed.
- To ensure that freight and logistics are interwoven within the fabric of key decision making and the public consciousness and to value its contribution towards local prosperity.
- To stimulate a shift in the way goods are moved to help address the climate emergency, create better places and leverage economic activity.

## FREIGHT TRIP MANAGEMENT

The underlying component of this framework and the development of practices to maximise the realisation of the freight objectives, revolves around the principle of managing (and minimising) freight trips; reviewing and developing freight transport in ways in which people, businesses and organisations are encouraged to make optimal use of locally available transport resources to improve efficiencies, reduce costs and mitigate the impact of travel on society. Ultimately this is the lens through which freight objectives can be satisfied with the 4Rs approach being a useful way in which to assess the role of new infrastructure, technology and planning/industry considerations.

- **Remode:** To change how goods are moved from A to B; associated with reducing the most polluting and inefficient forms of road transport.
- **Reduce:** To lower the number of trips that are made and ultimately helping to reduce the demand to travel.

- **Reroute:** To recalibrate the way in which items are delivered and for planning and optimising journeys to avoid sensitive areas or navigate busier travel corridors.
- **Retime:** To change the point in time when goods are being delivered; with the primary aim of travelling outside of peak periods.

## WHAT IS THIS EXERCISE?

The aim of this report is to guide the development of a Sustainable Freight Distribution Strategy and content for the emerging Transport Strategy for the Greater Dublin Area (GDA) (2022-2042) due out for public consultation in 2021. This document intends to provide a high level, 'sprint' overview of five identified work packages that can guide the future focus of a strategy and ultimately the expeditious, safe and sustainable movement of goods.

The structure of this document follows the order of the identified work packages with key desirables being outlined in each case to help steer the focus of discussion and final outputs:

1. **Stakeholder Engagement:** To develop a database of key industry partners, local authorities, interest group and businesses who can contribute towards the development of the strategy. This can be the vehicle for transporting perceptions of the sector, its role within society and the contributions it can make to a healthier, prosperous global city region.
2. **Freight Data:** To develop a catalogue of key datasets and a robust evidence base on which to base the foundations of a strategy that can withstand the test of time. This should foster data sharing and knowledge exchange on freight travel patterns, needs and opportunities allowing for the identification of opportunities for sustainable freight distribution.
3. **Key Infrastructure:** To develop a picture of freight gateways, transport facilities and vital physical and virtual networks to support the movement of goods. This includes assessing current provision and outlining potential infrastructure with decarbonisation, resilience and predictability at its core.
4. **Technology & Decarbonisation:** To develop an understanding of emerging trends with freight and logistics and future innovations to deliver a roadmap towards zero emissions for the Greater Dublin area. This includes drawing on traditional and innovative solutions that could be adopted through the freight industry.
5. **Operational & Planning Considerations:** To develop and recognise the role of industry and local/public institutions in supporting an 'optimised' environment for freight movements. This covers the role of urban planning and decision making, alongside increased training and educational opportunities for the safe, reliable and efficient movement of goods.

## MULTI CRITERIA ASSESSMENT FRAMEWORK

A Multi Criteria Assessment Framework (MCAF) has been developed to aid the process of filtering and selecting an appropriate and relevant range of practices and measures for consideration in a Sustainable Freight Distribution Strategy. This has been designed as a 'live' tool whereby a plethora of practices are scored using a traffic light system to evaluate the impact they would have on meeting a set of high-level freight objectives. A relevancy rating has also been applied in an attempt to contextualise the practice and its future deliverability in the GDA with commentary also being provided to aid decision making.

This tool, which will be expanded and adapted throughout the course of the project, will be applied to a range of practices identified under the following work packages:

- Key Infrastructure
- Technology & Decarbonisation
- Operational & Planning Considerations (split between industry & public authorities)

Multi Criteria Assessment Framework (MCAF)						
This matrix has been designed to collate together key technology types and measures that have the potential to be deployed in the context of the Greater Dublin Area (GDA). This is with a view to undertaking an assessment of their applicability and filtering out the best fit types for the development of individual dashboards.						
KEY		Maximum	Medium			
Impact on Freight Objectives		Economy	Environment	Society	Rating	Local Relevancy
Industry Considerations	Description					Comments
Tyre Management Programmes	A robust tyre management system is crucial for any professional vehicle and fleet operator especially as it can have implications on vehicle maintenance, with tyres usually accounting for around 20% of the total costs. Sound tyre management considers the safety, compliance as well as cost implications with tyres also contributing towards 20% of CO2 emitted, and fuel used, by a van or lorry. Unlike traditional restaurants, dark kitchens have no staff or seating area for serving customers. Instead they simply contain a professional kitchen that only produces food for delivery. As such, they can be set up relatively quickly with low overheads and needn't be located in areas attractive to customers, often instead opting for attention in light industrial units. They can also be located in less expensive real estate and/or closer to target demographics to keep delivery costs low.					Can be amalgamated into a Driver training programme. Useful for SMEs and larger fleet operators across GDA.
	Dark Kitchens/ Distribution Centres					Still untested at scale and loss of a priority measure relative to other trip generation activity. Can bring benefits to using underutilised warehouses where identified.
EcoStars Fleet Recognition Scheme						Accreditation schemes are quicker to implement and can dovetail industry body efforts. To include within 'Accreditation (Recognition) Scheme'
Fleet Operator Recognition Scheme (FORS)						To include within 'Accreditation/Recognition Scheme' targeted for SMEs and large fleet operators.
Quiet Deliveries						Key best practice for reducing negative externalities in big cities. Re-timing is a key consideration within Dublin City Centre.
Vehicle Fleet Sharing						Technology has been developed in limited cases in Ireland. Limited to existing fleet sharing for peer to peer.
Greener Fleet Policy						Larger fleet operators are key targets for policy (as well as public institutions). Each of the four local authorities as well as major fleet operators, such as hauliers (Daggle) and mainly reserved LGV fleets such as DPD.
Synchronizability						Logistics and practicalities across national/international supply chains are complex and need to be industry led.
Living Packets						Limited demand for international freight movements are bulky goods. Limited reference to passenger carrying capacity (but future option for smaller parts).

Figure 3 A screenshot of the MCAF for the range of practices across the work packages/themes (Author, 2021)

## DASHBOARDS

Concise dashboards have been created for measures under each work package that have been sifted through the MCAF to help provide a more detailed picture of its potential role, benefits and relevancy to the GDA; whilst referencing use cases and best practice examples of where it has been deployed successfully. The dashboards are a key precursor for collating together key information to take towards next steps where additional details, such as cost estimates and soft industry market testing would be recommended at the strategy phase. At this stage, the dashboards are more descriptive than providing a reference to key performance indicators.

The type of measures and practices alluded to in both the MCAF and expressed through dashboards are designed to be freight specific and complementary to wider travel, transport and land use planning objectives and recommendations. There is an appreciation that the safe, efficient and sustainable movement of goods is inextricably related to the performance and development of other transport networks, such as public transport and active travel. In some cases, the same practices and measures can fulfil a broader remit and objectives.

TELEMATICS		Mode Relevance	All freight modes	Freight Sector	Road (Haulage/Courier)	4 Rs	Re-route, Re-time	Technical Maturity	Mature technical operation	Commercial Maturity:	Mature commercial operation
Definition: [Trajectory]	Fleet management tools can provide real-time visibility into fleet operations while increasing driver satisfaction and decreasing fuel usage through predictive analytics and accurate reporting. It also helps fleet managers ensure that their operations are adhering to the complex regulations governing the industry. Fleet management can also improve operational efficiency by assigning and dispatching routes to drivers in real-time to ensure accurate pickups, deliveries and returns. Solutions include hazard alert services, delivery tracking, and dynamic routing							Category	Data and Connectivity		
	Best Practice							Geographical Applicability:			
Use Cases											
Major Market Failures	GeoTab Gnewt [London, UK]	has the UK's largest fully electric commercial vehicle fleet. Delivering zero-emission final mile logistics for retailers and third-party logistics companies, Gnewt's fleet of double payload modified vans has transformed green deliveries in London – growing from just a handful of vans into the UK's largest all-electric fleet. Gnewt needed to optimise its operations in order to compete with ICE delivery companies which were often cheaper. To add to this, there are charging limitations with only a finite amount of power coming into its charging depot. Only 35 vehicles a day could be fully charged at first. To combat these constraints, drive greater scalability, and provide a platform for future innovation, Gnewt needed a telematics solution that could transform how it views and models its fleet's charging operations – one that could directly feed in vital intelligence on vehicle state of charge									
	OptimoRoute [Software]	OptimoRoute enables users to optimise for the best routes & schedules while respecting all order and task criteria: priority, time windows, day of week, date range, reverse logistics orders, variable job durations vehicle matching (e.g. loading ramp/refrigeration). List minute orders can be integrated into route plans and automatically recalculated to reflect manual changes. It also integrates with delivery systems to provide proof of delivery, capturing digital signatures and sending messages to customers informing them when the driver is scheduled to arrive.									
	E-cargo bikes Zedify [UK, Nationwide]	Zedify built their own robust, efficient technology platform that addresses the specific demands of providing predominantly cargo bike based city logistics. Routes are optimised daily meaning deliveries are made as quickly and efficiently as possible. Barcode scanning enables consistency with other systems in the supply chain. Digital proof of delivery capture provides end-to-end tracking and client login means deliveries can be booked and tracked and reports accessed directly.									
	General	Route planning and optimisation is currently executed in isolation by individual fleet operators. There is a risk that if multiple fleet operators optimise their routing strategies in response to the same stimuli (e.g. diverting freight traffic onto a lower capacity road to avoid congestion), this could create new problems elsewhere. To counter this, more data sharing between major hauliers should be encouraged. Simulations have shown that if we were all willing to take a wider variety of coordinated routes that may not be optimised on an individual level, it would yield an overall reduction in congestion.									
Opportunities	Vehicle emissions savings due to route optimisation, reducing the amount of idling mileage and empty running. Better co-ordination of assets resulting in reduced waiting times and delivery windows										
Barriers	No co-ordination between operators, only done in isolation										
Local Relevancy	Larger fleet operators can again pave the way for the uptake in telematics and in cab technologies as they are more likely to have access to capital for upgrades and associated driver training requirements. The use and application of telematics can be a short-term win for helping the road sector, particularly HGVs, decarbonise in the event of a slower transition to alternative fuels. Congestion on the network and routing concerns in and around Dublin, as well as a lack of network resilience provided by on ground infrastructure, makes telematics investment a cost effective way to improve driver efficiency (and save costs), improve road safety and reduce the externalities from road freight movements (all led by industry).										
Impact on Freight Objectives											
Economy				Environment				Society			
Freight efficiency			Max	Air quality			Max	Safety			Min
Improved journey times, optimised use of fleets, delay mitigation and improved supply chain connectivity to save time and costs				Reduce the impact of the sector through air quality improvements and a reduction in other forms of pollution and intrusive activities				Improve the safety of the sector to reduce the number of accidents involving goods vehicles			
Industry contribution			Min	Greenhouse gas emissions			Max	Community disturbance			Max
Improved jobs and opportunities to address skills shortages, support for inward investment, land availability, infrastructure provision				Reduction in greenhouse gas emissions from the sector to achieve net-zero by 2050				Reduce the impact of freight on communities, noise levels, air quality and informal overnight lorry parking			
Connectivity			Med	Urban realm			Med	Placemaking			Max
Improved connectivity seamless intermodal activity to support local, national and international freight movements across the area				Minimising the intrusive impact of freight transport on visual amenity and local, protected settings				Better integrate freight into land use planning, development, construction and servicing plans, better freight data			

Figure 4 An example dashboard for Telematics which outlines use cases, benefits and local relevancy (Author, 2021)

## GREATER DUBLIN AREA: FREIGHT SNAPSHOT

### INTRODUCTION

Freight plays a pivotal role in the GDA economy and many businesses and industries based and serving the sub region depend on the expeditious movement of goods. The assessment of freight in Ireland, like many places, is heavily orientated towards road transport which constitutes the vast proportion of movements (and issues) across the GDA. The city of Dublin and the area bounded by the M50 also tends to receive the vast majority of attention as this is where the most substantial movements of freight intersect and where issues around safety, sustainability and efficiency are more likely questioned.

### ROAD FREIGHT

The freight context for the GDA is heavily defined by its larger freight trip generators; its ports, namely Dublin Port, and airport connection, which are of national significance to economic prosperity. These are part of the European TEN-T Core Network and heavily dependent on efficient access, mainly by the national motorway network, particularly the M50 orbital road, M1 and Dublin Port Tunnel, opened in 2006, for the movement of goods of high economic value. The M50, managed by Transport Infrastructure Ireland (TII), carries both local freight (approximately 40% of all HGV traffic (hauliers and freight forwarders) with a 25km catchment) circulating the City of Dublin concurrently with inter regional trips moving between key gateways and the rest of Ireland.

The M50 serves a number of premium logistics spots that have developed over recent years alongside linking into the N7 corridor, and estates such as Greenogue Business Park, providing access between Dublin and Cork and becoming home to a number of reputable logistics firms. A number of sites have been zoned for industrial and logistics use outside the M50 boundary which has inevitably drawn interest from companies wishing to benefit from the proximity of a major urban centre and international gateways.

As in many urban areas and capital cities across the world, the movement of goods vehicles within an urban setting, namely the City of Dublin, by road, has implications on air quality, placemaking and road safety. Urban logistics is therefore a key consideration. Proposals to increase pedestrianised space and remove parking in the centre of Dublin (around College Green/Dame Street, Parnell and Capel Streets and adjacent roads), inevitably raises questions about servicing and delivering to businesses and residents within the immediacy. The same 'think freight' approach is equally as important against a backdrop of developments, housing and employment land, across the city and wider GDA.

A HGV Management Strategy was introduced across Dublin City Centre concurrently with the opening of the Dublin Port Tunnel in with the introduction of a permit scheme being developed in 2019 to further restrict (and charge) 5+ vehicle axle movements, the most prominent vehicle type using the port, inside operational hours (07:00-19:00). Since its introduction, HGV movements within the cordon have decreased by 91%, although total emissions, in part to the need to re-route trips, increased across the Dublin region. Live discussions are ongoing to expand the cordon and incorporate other commercial vehicles across a broader coverage whilst there are known issues with enforcing the policy which needs to be addressed.

### RAIL FREIGHT

Rail freight has significant involvement in few markets namely traditional bulk traffics to/from private sidings on single customer trainloads, mineral services (daily from Tara Mines to Dublin Port) and container traffic serving the port (recently suspended due to customs and spatial pressures on site). The role of heavy rail and freight shipments by train is likely to increase in the future with capacity having expanded after recent signalling upgrades to the DART/Commuter rail network across the GDA and proposals for enhancing rail integration and services between Belfast and Dublin. Irish Rail is also pursuing new rail freight business opportunities including the drinks, healthcare, building materials, biomass, waste and dairy industries; with more businesses seeking to develop for environmentally efficient means of managing their respective supply chains.

Rail is also high on the Governments programme for continued investment in inter-urban and intercity networks to boost future freight carrying capacity. The introduction of longer freight trains in 2016 also boosts the sectors competitiveness versus road transportation for carrying bulk goods. The principle of rail freight aligns closely with the National Ports Policy, Dublin Port Master Plan and the emerging Department of the Environment National Low Carbon Roadmap, to increase its freight share across the GDA. Despite the challenges, the rail spur that serves Dublin Port, opened in 2011, offers huge potential for the movement of containers and bulk solids with increases in market demand potentially leading to freight volumes exceeding 130,000 TEUs (containers).

### SEA/WATER FREIGHT

Sea Ports play a vital role in the transfer of goods internationally and are key gateways where the transshipment of goods take place. Dublin Port, managed by the Dublin Port Company (DPC), is responsible for over 50% of overall tonnage through Irish Ports (CSO); with the UK being the biggest market for goods. It provides Ro-Ro and Lo-Lo services; with the former being most prominent with volumes expected to rise from 0.7 units in 2010 to 2.2m units by 2040. On this basis a new Ro-Ro terminal is being constructed. The Dublin Masterplan 2040 seeks to identify how the port can handle 77million gross tonnes by end of the masterplan period whilst also seeking to reintegrate with the city of Dublin. In contrast, Wicklow Port, to the east of Wicklow Town, is a Port of Regional Significance with a small percentage of overall tonnage in comparison. Dun Laoghaire Port, to the south of Dublin (city), has ceased operations in recent years.

The interconnections between the national primary road network and the commercial port network will continue to be of primary importance, especially for Dublin Port; with over three quarters of goods arriving from outside the M50 area and 21% originating within the city region catchment (Regional Freight Study, NTA 2011). Dublin Port benefits from its direct connection to the national motorway network through the Dublin Port Tunnel; with an average of 6,260 (or 86%) HGVs transporting port related consignments daily. Around 30% of all traffic moving through Dublin Port tunnel on a daily basis are HGVs on average (2018); hinting at the critical role the link plays in the national and local economy.

The Dublin Port Masterplan 2040 and Transport Strategy for the Greater Dublin Area 2016- 2035 sets out objectives to improve the integration of the port with the bay and city area and expand access southbound into Poolbeg Peninsula via a Southern Port Access Route by 2030 to unlock future capacity. This is the preferred option as opposed to the development of a completely new dock site further field. Despite the potential, there is limited coastal shipping activity between Dublin Port and other burgeoning ports at Belfast, Rosslare and Cork beyond the GDA.

## AIR FREIGHT

Air freight has increasingly come to the fore during the pandemic with the interconnectedness of supply chains being a crucial component of the national and local economy. Dublin Airport, the only commercial (and public access) airport within the GDA is only served by road. Air cargo is generally used to move mission critical, high value / time sensitive goods and packages with night flights being particularly important to the freight industry and local economy prosperity; allowing businesses to send a range of time critical consignments and loads; ranging from pharmaceutical products and manufacturing components to legal documents and consumer goods over night for arrival next day.

In total, 38% of all air freight associated with Dublin is flown at night, with the sector generally supporting 330 jobs and contributing €27 million annually to Dublins GDP and representing 90% of Irelands air cargo movements. Air cargo has also grown substantially in recent years; from 114,000 tonnes in 2013 to 145,000 tonnes in 2018 (Irish Freight Transport Association, 2021) and is viewed as a key component of the economic recovery from the pandemic. Night deliveries are crucial for supporting highly sensitive, Just in Time (JIT) supply chains and the rise in time sensitive B2C shipping and is likely to be a trend that continues growing in the near future.

Efficient road transport around the airport and serving Dublin is key for last mile deliveries by express freight services operated by major industry partners namely DHL, FedEx, TNT and UPS to meet growing customer expectations. As night deliveries operate outside of peak periods, consignments delivered by road avoid congestion and enable greater speed, efficiency and reliability of processing; all of which are key to the service being delivered.

## SNAPSHOT OF ISSUES & OPPORTUNITIES

The issues and challenges facing the freight sector are typically associated with the dependency of road freight transport as the primary means of transporting goods across and through the GDA fuelled by upgrades to access arrangements around major trip generators and the growth in logistics, distribution and warehousing facilities around the primary road network. This is coupled with alternative transport networks being underutilised due to capacity constraints, a lack of market demand or awareness of the potential for unlocking new opportunities.

A robust strategy relies on accurate and extensive datasets. As in many cases, the datasets available within the public domain are collected by public authorities and tend to focus on the performance of the transport networks rather than painting an accurate picture of how the freight industry operates to support future investment planning and forecasting. This is perhaps unsurprisingly as data sharing potentially exposes the competitive advantages developed over time by fleet

operators; although accreditation and recognition schemes are emerging as a valuable means in which to exchange data for boosting an operators profile, and market access, across the industry. This will be a key priority for public authorities to try and leverage with industry.

## ROAD FREIGHT

There are significant capacity constraints on the M50, the major regional and inter urban distribution road for freight traffic upon which major trip attractors, namely Dublin Port and clusters of business parks and industrial estates around its periphery, that have come to rely on for the distribution of goods. It has been widely acknowledged that traffic congestion severely hampers freight efficiency with typical weekday flows being unstable at sections to the west and south west of the city. The decision taken not to expand road capacity any further (after investment pre 2016) places emphasis on travel demand management techniques to boost network resilience and reduce car dependency.

The resilience of the road network is key, including arterial roads radiating across the GDA; both within the M50 boundary to address localised traffic delays, and where the hinterland intersects with the metropolitan area. Whilst the M7 enhancement project and Osberstown Interchange have improved national road accessibility to strategic employment locations (along this alignment) capacity constraints in housing and infrastructure must be addressed to ensure the regions continued competitiveness as a national economic driver.

Whilst there is a single point tolling system in place along a section of the M50, between Junction 6-7, plans to expand provision along its course (at each access point/junction) have taken place over a number of years with the aim of reducing congestion along its course. Variable speed limits have been muted as another option being pursued to improve traffic flow, reduce accidents and boost network resilience; alongside the provision of interconnected public transport interchanges. Opportunities for freight consolidation (a form of interchange facility) should be explored as part of these proposals or considered separately for reducing traffic circulation.

Road freight mixes with general traffic and at least half of the annual housing requirements, 25,000 outlined in the National Planning Framework for Ireland, will be across the GDA; adding additional vehicles on the network. All new residential and commercial property will have a delivery and waste requirement and will put further pressure on road capacity. Employment growth and commercial developments situated along other radial routes present a major threat to the efficient movement of goods in the medium to long term without any intervention and management of vehicle movements.

In an urban context, there are challenges with enforcing existing restrictions on HGV movements between the City of Dublin and accessing Dublin Port from the south; in spite of a HGV Management Strategy being in place. This compromises road safety through traffic mixing whilst access routes, via the East Link Bridge and Sandymount Strand, are urban in character with limited capacity. The same applies to accessing Drogheda Port, a port of regional significance which requires consignments to pass through residential areas where the externalities generated include visual intrusion and worsening air quality.

The dependence on road transport and the proportion of private vehicle use generates high levels of Nitrogen Dioxide across certain parts of the GDA, namely within Dublin City Centre, the entrance

to the Port Tunnel and along the M50 motorway. This is particularly problematic where locations are used by pedestrians or abut residential neighbourhoods and must seek to be addressed by switching towards cleaner fuel technologies, switching the way we travel and ultimately reducing trip demand. Increased congestion around these areas also exacerbates air quality problems.

There are also notable areas, namely St Johns Road West in Dublin, where EU annual average legal limit values for particulate matter (PM2.5) have been exceeded; triggering a legal requirement for an air quality action plan. PM2.5 is particularly harmful to human respiratory systems and is associated with tyre wear and tear as well as vehicle braking which are more prevalent in congested urban centres and from larger freight vehicles.

## RAIL-WATER/SEA FREIGHT

Despite rising interest in modal shift from road to rail for moving bulky goods and containers through Dublin Port, site storage capacity is constrained; partly as a consequence of additional customs and border inspection activities (and pre pandemic and forecast growth). Consolidation of existing areas for handling anticipated levels of bulk solid trade and Roll On-Roll Off (Ro-Ro) freight is the biggest challenge to be addressed in the recent Dublin Port Masterplan 2040. Smaller ports at Wicklow and Drogheda do not have a direct rail connection and rely purely on road-based access and goods handling.

For hauliers and freight forwarders, strict reception windows are enforced at Dublin Port with limited provision and timetabling to help coordinate arrivals and departures. The issue of access has been exacerbated by the UK leaving the European Union with there being a limited supply of lorry parking available to cater for HGV traffic during customs procedures; leading to delays and congestion on the immediate road network. The range of customs formalities and regulatory requirements is having significant impacts on the haulage sector and the Ro-Ro traffic through Irish Ports.

## RAIL

There are limited railhead facilities across the GDA generally, with the exception of Dublin Port and a number of private sidings, equipped to undertake cargo handling to upscale the movement of freight by rail and to shift regional based freight movements from the road network. Renowned differences in loading gauge and rail gauge clearances also limits rail cargo to Load On Load Off (Lo-Lo) freight consignments across Ireland more broadly. However, there is scope to explore future links between key processing and extraction sites around the periphery of the M50 and radial rail routes and the option of re-moding freight from road to rail; providing the infrastructure can be supplied.

However, a major upgrade of the city centre railway signalling system, completed in 2020, allows a significant increase in the number of trains that can operate in the city central area, including a 50% increase in the number of trains able to cross the Loop Line Bridge over the Liffey. This offers potential to both expand designated freight train services (providing demand is sought) but also exploring opportunities for utilising services for the movement of goods around the city region. As it stands and before the expansion of the DART network, limited rail electrification has taken place

across the GDA to reduce the sectors reliance on diesel traction (and the emissions this generates relative to electric traction).

## INLAND WATER WAYS (IWW)

The potential for waterbourne freight using Inland Water Ways (IWW) has not been explored in any depth as part of a package of options to aid with transporting goods across the city region. The GDA is blessed with the River Liffey and the Grand Canal amongst other watercourses that offer direct, radial access from across the GDA into sensitive, dense parts of Dublin and the scope for wider integration into strategic road, rail and sea/port transport networks. IWW are particularly suited to slower moving, bulky freight consignments and may be apt at transporting materials from processing/extraction sites from across the GDA into Dublin City Centre and Dublin Port.

## AIR FREIGHT

The planning conditions stipulated for the proposed North Runway wouldn't permit night time deliveries of air cargo and enable the competitive advantage offered through next day deliveries by third party logistics providers. This is despite the significant economic benefits that such services provide to boosting local prosperity and the trigger it may have on further clustering of logistics activity around Dublin airport and its surroundings.

## STAKEHOLDER ENGAGEMENT

### INTRODUCTION

Gaining insights into the local freight context will be essential for developing a robust and resilience strategy to guide the efficient, safe and sustainable movement of goods across the GDA in the future. Early identification and engagement with a broad range of organisations operating across the freight and logistics sector as well as key institutions that have a freight requirement, will be essential to highlighting some of the issues, challenges and opportunities associated with the movement of goods throughout a supply chain.

The stakeholders involve a range of key entities from the government departments, public sector bodies, transport operators, trade chambers and associations, Not-for-profit and Non-Governmental organisations, industrial groups and associations, Road safety groups, vehicle manufacturers along with Original Equipment Manufacturers (OEMs). It also involves legal and social groups that represent interests of the workforce employed in this sector.

Airport Operator	Industrial Estate
Airports	Regional Transport Authorities
Business (Trip Generator)	Logistics (3PL) Operators
Business (Fleet Operator)	Port Operators
Business Groups	Port Transport Authority
Business Associations	Energy Providers
Business Park	Transport/Urban Thinktanks
Constituent/Local Authority	Future Fuel Technologies
Road Safety Group	Public-Private Partnership
Environmental Group	Rail Group
Rail Freight Operator	Rail Operator
National Government	Road Haulier
Not-for-Profit Organisation	Inland Waterway Operators
Inland Waterway Authority	Sub-National Transport Body
Shipping Operators/Agents	Trade association

Table 1 List of different stakeholders with a freight requirement and interest (Author, 2021)

Early indications from the collated stakeholder data shows a large share of the businesses (trip generator) due to their prevalent role and nature of operations. These businesses have the ability to generate large amounts of freight traffic and influence other segments. The second largest share is of shipping operators/agents followed by Logistics (3PL) operators. In addition, a number of waste management and construction companies have been included within the stakeholder data, owing to their substantial involvement in freight movements on the network. Given the importance of sustainability to the freight network in the coming decade, energy providers, grid operators and transport/ urban thinktanks were also noted to be key stakeholders. The full list of stakeholders is noted in a separate appendix.

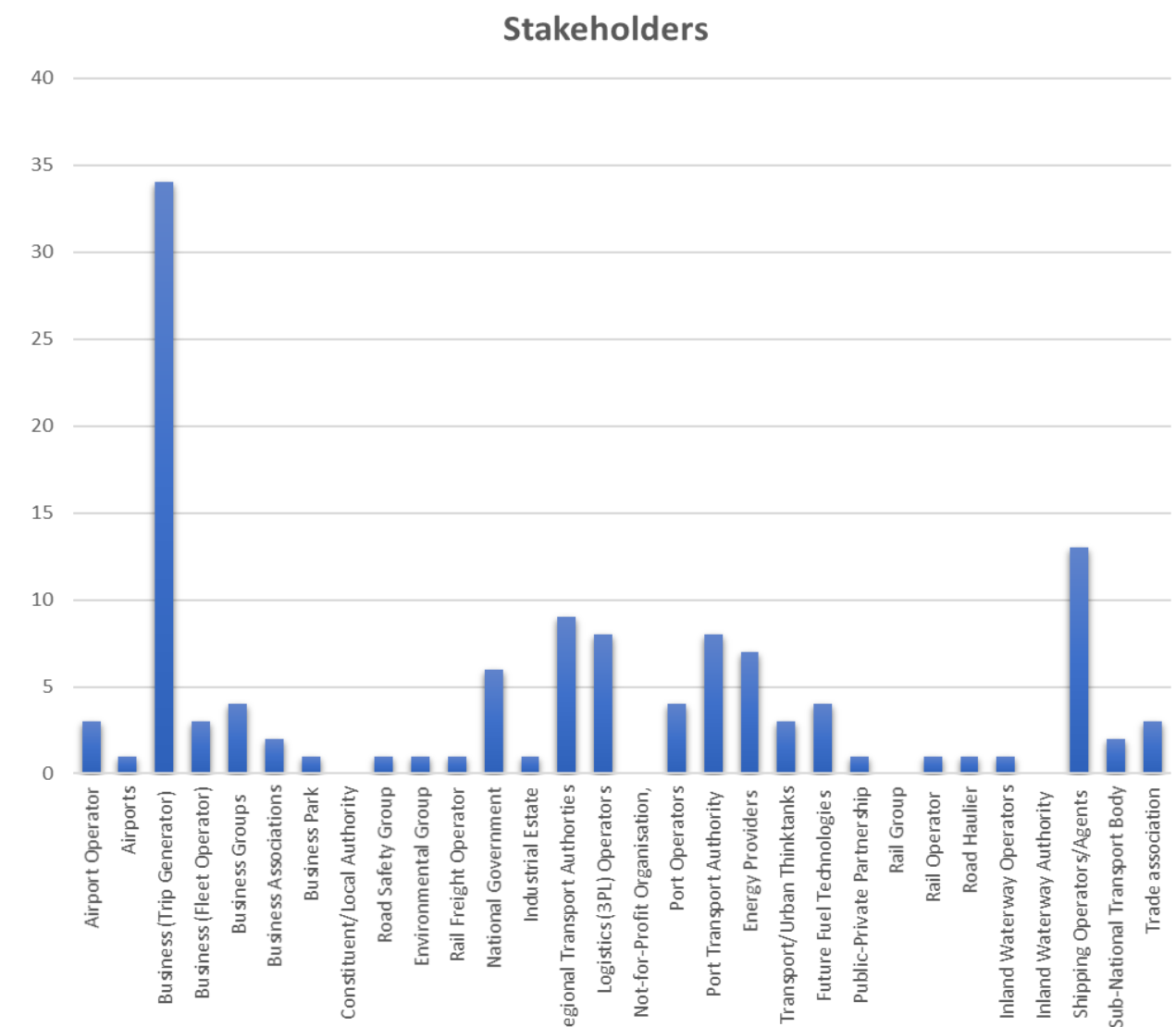


Table 2 Spread of stakeholders collated (Author, 2021)

## PLATFORMS FOR ENGAGEMENT

There are several effective platforms for capturing data insights and feedback from organisations and businesses to feed into the process of developing a strategy. There is significant value and buy in that can be generated by reaching out to local institutions and encouraging participation in the formation of a strategy; especially as the movement of goods has a direct impact on people's everyday life. On this basis, engagement shouldn't be exclusively targeted at the freight industry.

Two suggested platforms for gathering views and insights are:

- Freight Forum
- Steering Group

There is a complementary relationship between both platforms with members of FLGSG also attending **FLGFF** meetings to both convey key messages and listen to personal accounts. The FLGSG will also be accountable for feeding into the wider governance structure for the strategy as indicated by NTA. Terms of Reference (TOR) have been developed in each case (separate appendices), which may liable to change, to help establish the following:

- Purpose of the Forum/Group
- Objectives of the Forum/Group
- Meeting Programme
- Ways of Working
- Indicative Group Chair

A key early task to discuss at the inception meeting of the FLGFF and FLGSG will be to sense check any proposed freight objectives to ensure that they hold weight and relevance. A SWOC (Strength, Weaknesses, Opportunities, Challenges) analysis could also be completed in break out groups as a starter exercise to help set the tone for future meetings.

### FREIGHT, LOGISTICS AND GATEWAYS FREIGHT FORUM (FLGFF)

A Freight, Logistics and Gateways Freight Forum (FLGFF) will provide a key platform for bringing together a range of industry representatives, local authorities and interest groups to share data, collate local intelligence and express personal experiences with goods handling to assist with shaping and contributing towards the narrative of a strategy during, and potentially beyond, the development period. This is a broad group of members working across different sectors and of varying sizes who welcome the opportunity to contribute thoughts, ideas and feedback but are less inclined to take on responsibility and thought/technical leadership to directly mould the strategy.

### A FREIGHT, LOGISTICS AND GATEWAYS STEERING GROUP (FLGSG)

A Freight, Logistics and Gateways Steering Group (FLGSG) compromises of a more select group of individuals and organisations who will provide greater thought and technical leadership during and beyond the development of the strategy. Members will be able to offer technical, operational, local and strategic insight to key themes, helping to elicit key issues and challenges face by the

sector and, most importantly, help drive greater awareness of the strategy, developing outputs of benefit and raising the profile and role of freight as a key component of the traffic mix across Greater Dublin. Members will take on greater responsibility for harvesting data and information to feed into the development of the strategy whilst meeting periodically throughout its duration.

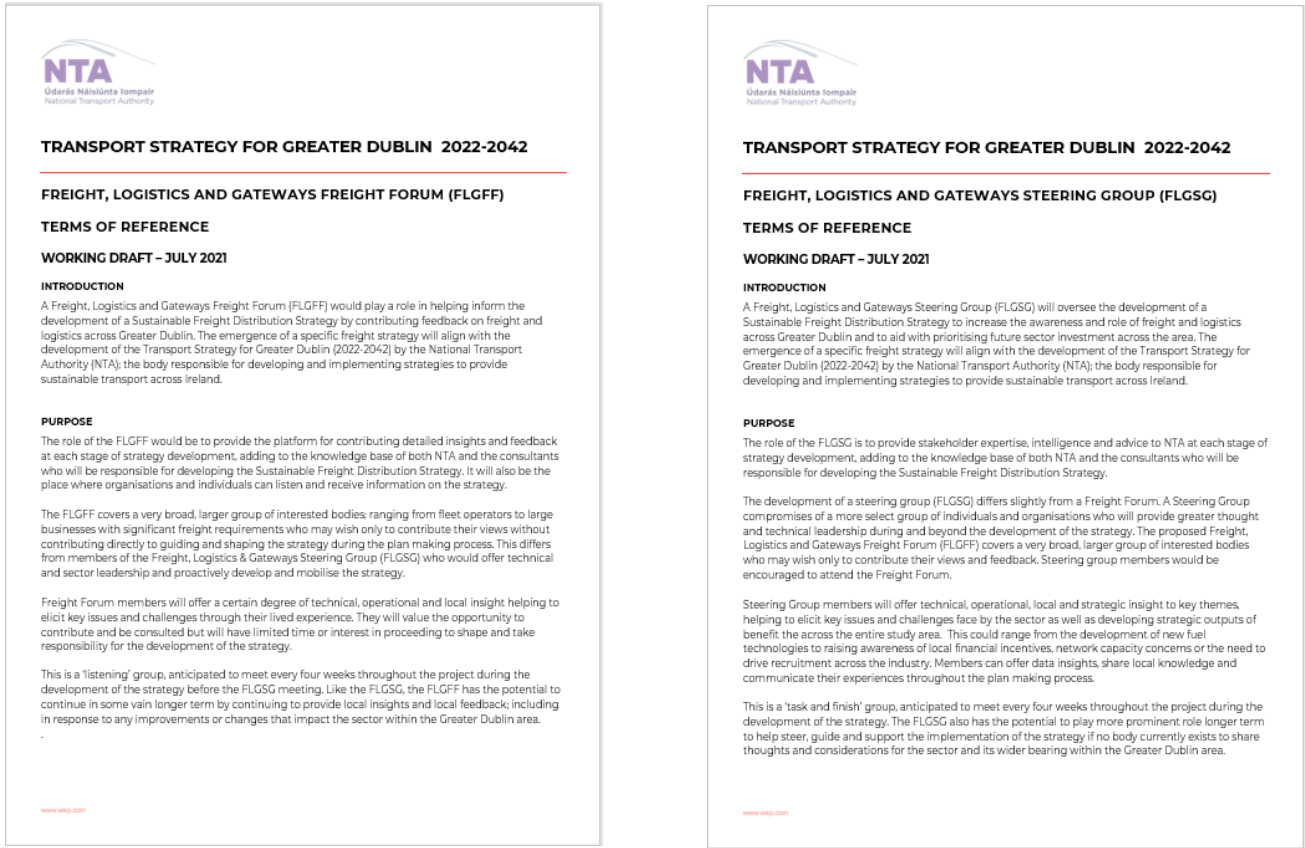


Figure 5 Terms of Reference Forms for a Freight Forum and a Steering Group (Author, 2021)

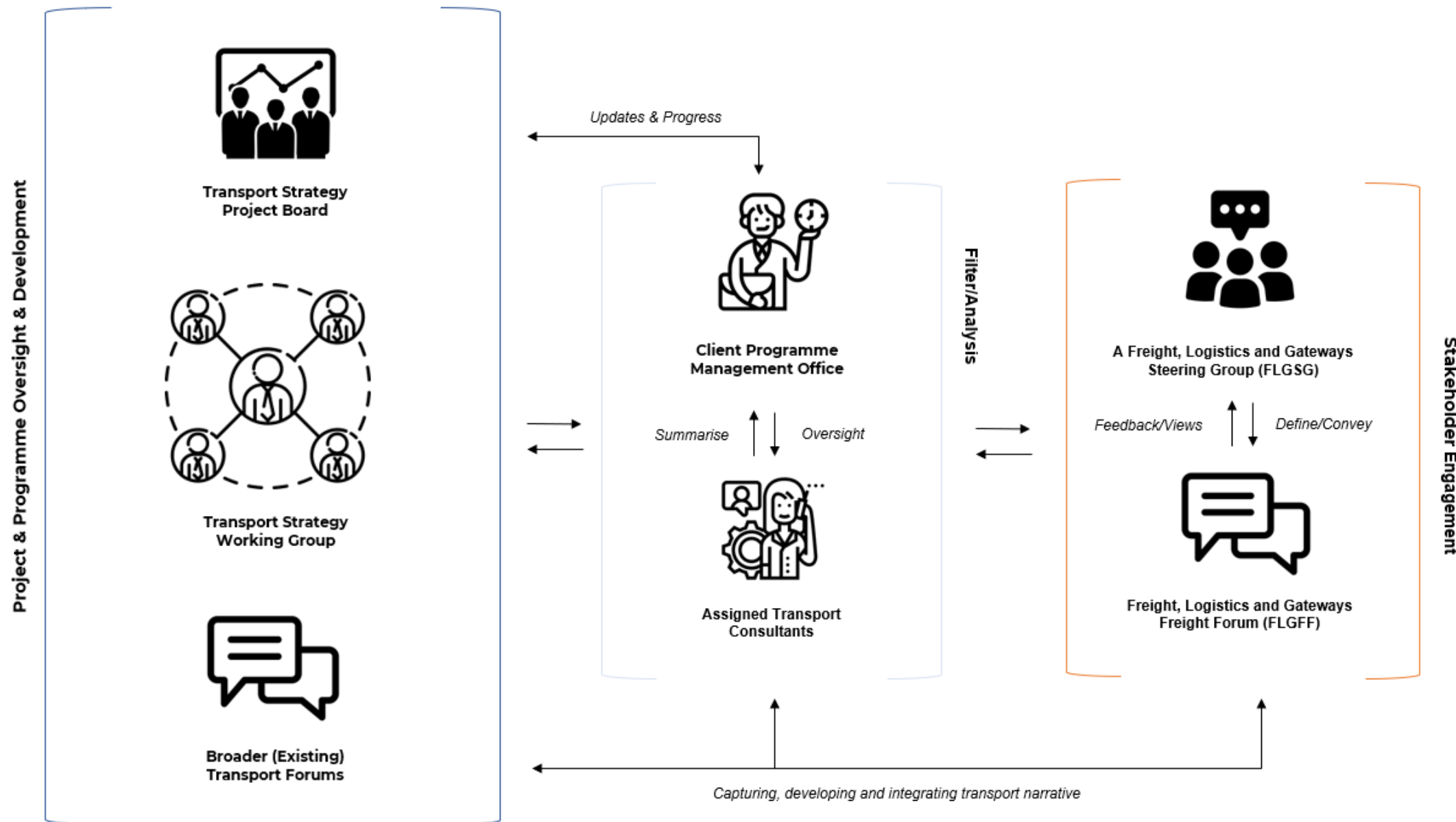


Figure 6 Indicative relationship between the FLGFF and FLGSG with the wider transport strategy development teams

## NEXT STEPS

This section has defined the importance of stakeholder engagement, highlighted the key stakeholders across the GDA and underlined the role of a Freight Forum and Steering Group to helping guide the development of a Sustainable Freight Distribution Strategy. The next steps will require planning the comprehensive engagement with identified stakeholders to sense check issues and challenges and to scope the availability of data to inform more detailed objectives and the strategy narrative.

## FREIGHT DATA

### INTRODUCTION

Collating together data and information on freight transport is key to appreciating the role and significance of the sector to supporting society and the economy. This ranges from the flow and volume of goods movements, the type of vehicles used to carry consignments and the origins and destinations of products along a supply chain. A picture needs to be developed that captures the networks and gateways used to move freight, where handling and transshipments take place and ultimately the impact that all this activity has on wellbeing and prosperity across the GDA.

Freight data is key. Future interventions to support the efficient, safe and sustainable movement of goods must be backed up by a robust evidence base to secure future investment and resource. A critical step towards this point is the need to source and catalogue data and information available within the public domain or provided through industry contacts so this can be assessed at a high level to determine the quality of local insight and determine any 'knowledge gaps'.

The assessment of freight data does not have to be confined to freight transport; land use and transport planning documents and industry leaders may hold visions on what towns and cities will aim to look like in the future and how this will have a direct impact on delivery and collections, waste management practices and the demand for travel. Qualitative as well as quantitative data is equally as important for setting the scene and future gazing across all modes of freight transport.

### DATA CATALOGUE

High-quality data is absolutely critical to any work aimed at improving understanding of the freight transport sector and its performance, including its ability to meet the growing sustainability obligations. There is a wide range of data available from different sources in the GDA region and across the country.

The Central Statistics Office (CSO) has the main responsibility on collecting and publishing key transport sector statistics, and especially for the freight sector but other public entities such as Department of Transport (DoT), Irish Rail, Environmental Protection Agency (EPA), Sustainable Energy Authority of Ireland (SEAI), Road Safety Authority (RSA), Transport Infrastructure Ireland (TII) and National Transport Authority (NTA) also collect and publish datasets, usually under Government's Open Data initiative. Some private sector entities such as TomTom, that provide navigation and operational support to road freight fleets also collect vital data on Heavy Goods Vehicle (HGV) movements and patterns. The complete data catalogue is presented in a separate appendix.

### GAP ANALYSIS

#### PAST STUDIES AND REPORTS

Some recent and past studies present an excellent opportunity to understand the state of affair on freight in Ireland, and more specifically in the GDA region. Few important ones among many are

'Five Cities Demand Management Study', 'Regional Spatial & Economic Strategy for Eastern & Midland Region', 'Freight Transport Report for the Island of Ireland', Dublin Transportation Office Regional Freight Study, Ten-year Strategy for the Haulage Sector, Greening Transport; Final Report no. 338, and Rail Freight and the Western Region. These studies have consolidated a strong background information that will be helpful in establishing the framework for sustainable freight transport.

### ROAD

CSO undertakes Road Freight Transport Survey (RFTS) every quarter and most recent has been published for quarter-4 2020. These statistics provide vital information on the following:

Road freight activity	Road freight tonnage
Quantity of goods	Road freight activity by business owner
Commodity group	Main type of work
Domestic transport activity classified by region of origin	Road freight activity by country of origin

TII and NTA also collect regular data on HGV movements at key locations on national primary roads and across GDA. These traffic counts provide excellent insight into the scale and volume of freight movements to and from the key locations along with health check of traffic operations leading to identification of congestion pinch points. RSA on the other hand, publishes road collision data, covering major accidents (Fatal and Serious) to minor road collisions all across the country. This data is available from 2005 to 2016 (2017 data awaited) and Figure 7 provides a snapshot of key accident-prone areas and black spots. These are presented in snapshots of the system.

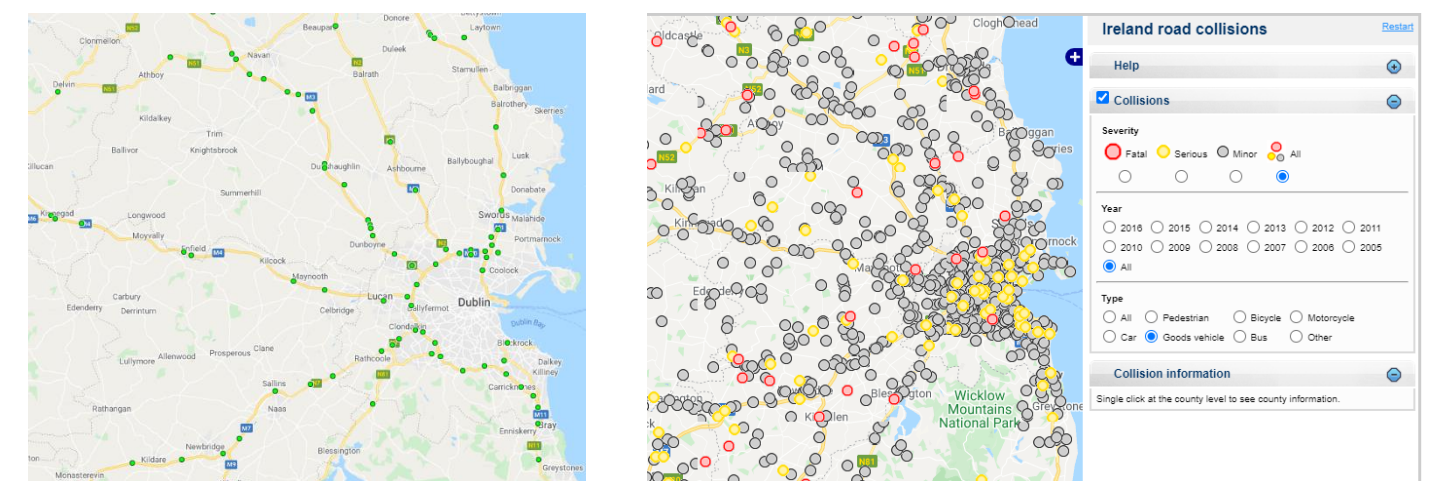


Figure 7 TII Traffic Monitoring Units (TMUs) (Left) and Goods Vehicle Road Collisions in GDA from 2005 to 2016 (NTA, 2021, RSA 2021)

## SEAPORTS

CSO collects and publishes Statistics of Port Traffic with latest being published for quarter-4 2020. The survey provides data on the scale and development of the carriage of goods and passengers by sea. The principle variables are Type of cargo, Direction, Port of loading/unloading, Gross weight of goods in tonnes, Number of passengers, Nationality of registration of the vessel, Number of vessels by type and size, Deadweight of vessels, Gross tonnage of vessels. It covers following main headline statistics for all ports in Ireland:

Tonnage of goods handled by main Irish ports	Number of arrivals and gross tonnage of vessels
Tonnage of goods handled classified by category of traffic	Details of roll-on/roll-off traffic handled by port
Details of lift-on/lift-off traffic handled by port	Total tonnage of goods handled classified by port and region of trade

Dublin port accounted for almost two thirds (63.9%) of all vessel arrivals in Irish ports and over half (52.7%) of the total tonnage of goods handled in Q4 2020. Figure 8 below shows the overall growth at Dublin Port between 2007 – 2018.

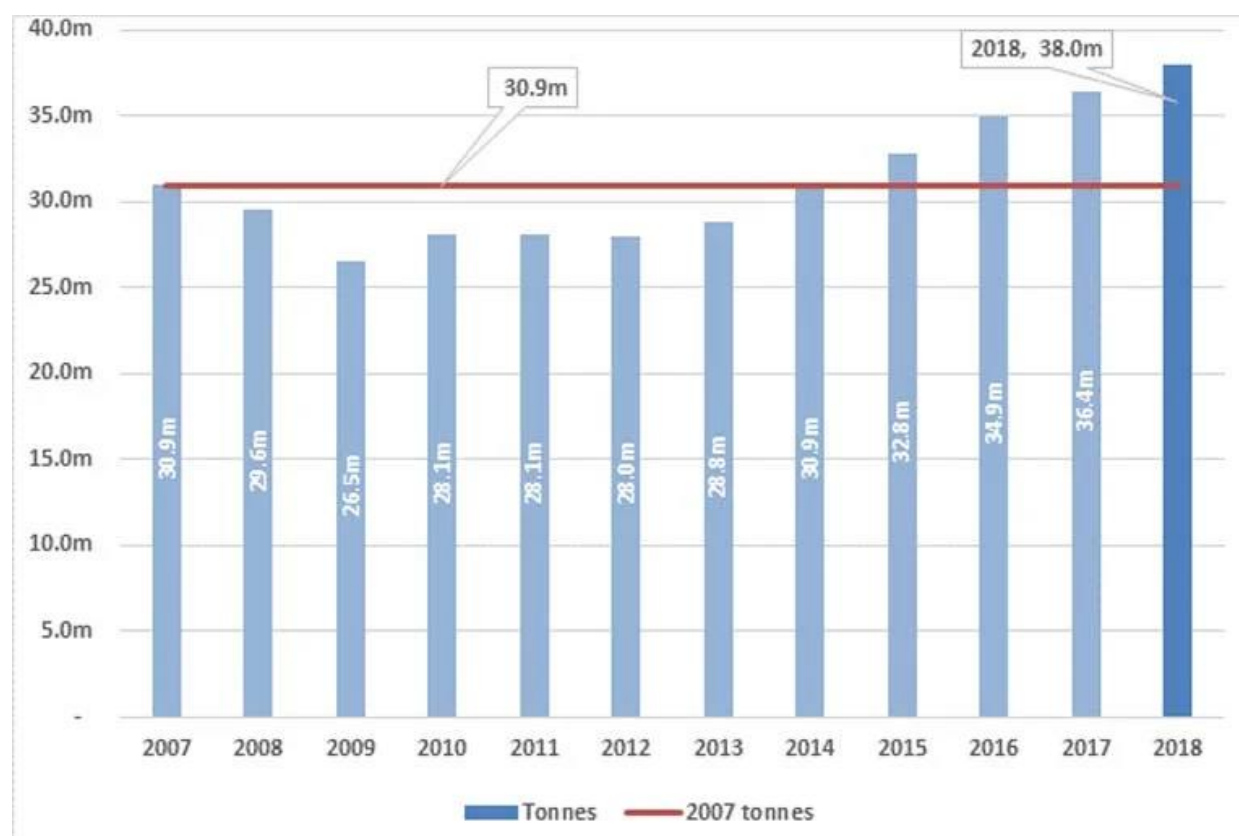


Figure 8 Overall growth at Dublin Port between 2007-2018 (CSO, 2021)

CSO's Aviation statistics have very recently been published for the quarter-1 2021. It provides information on the number of passengers and freight handled by the five main airports, Cork, Dublin, Kerry, Knock and Shannon. The principle variables are Airport origin and destination, number of passengers, air freight, flight types: arrival and departure, scheduled and non-scheduled, passenger and freight. It covers following main headline statistics for all ports in Ireland:

Number of passengers handled by main Irish airports	Passenger numbers classified by arrivals and departures handled by main airports
Air freight classified by national and international traffic handled by main airports	Air freight classified by arrivals and departures handled by main airports

Dublin Airport has seen a drastic reduction in passenger and freight activity in quarter-1 2021 due to Covid-19 travel restrictions but still commands a significant share. Dublin Airport handled 34,334 tonnes of air freight and accounted for 89.53% of all freight handled.

Airports	2013	2014	2015	2016	2017	2018
Dublin	113.5 (89%)	127.4 (92%)	137.3 (92%)	134.2 (91%)	144.9 (88%)	143.7 (91%)
Shannon	13.9	10.9	12.2	12.6	19	13.6

Figure 9 International Freight handled by Key Airports in Ireland (Thousand Tonnes, percentage share) (CSO, 2021)

The Freight Transport Association Ireland (FTAI) recently released the final report on 'The Economic Impact of Cargo Night Flying at Dublin Airport' on March 2020 and provides vital cargo handling facts and figures along with insights into the significance of night cargo flights.

## RAILWAY

CSO's Rail Statistics have been published up to 2018 with a purpose to collect and publish quarterly and annual data on goods and passenger transport by rail. Data is also collected on rail accidents and railway operators. The principle variable are Tonnes of freight carried, tonne-km, train-km, number of passengers carried, passenger-km, train movements, number of accidents, number of persons killed, number of persons seriously injured.

Iarnród Éireann Freight is a separate division of Irish Rail and provide rail freight services for the Bulk Freight, Intermodal and Freight Forwarding markets. Rail transport offers key advantages such as moving full trainloads of ISO tanks, containers or bulk freight such mineral ores or timber products over long distances.

## GAP ANALYSIS

On the basis of completing a thorough assessment of available datasets across the freight and logistics sector (see separate appendix for complete Data Catalogue), there are a number of gaps in the quality and quantity of datasets that have been identified. These are as follows.

### ROAD

- Data on Van (Light Goods Vehicles (LGVs)) freight data given significant increase in its share;
- Data on Foreign HGVs whether as cabotage or cross trade with focus on parameters such as the length of stay, commodities transported, nationality of vehicles and drivers, degree of planned and unplanned activities and amount of cabotage taken;
- Data on fuel consumption and emissions in relation to freight movements;
- Data on main times of day for travelling for peak activity identification; and
- Data on switching of modes (e.g. ship to road).

### SEAPORTS

- Data on Pure Car Carriers (PCCs) or Pure Car/Truck Carriers (PCTCs);
- Data on hybrid RoRo variations such as ConRo (container and RoRo), LMSR ([Large, Medium-Speed Roll-on/Roll-off](#)), RoLo (roll-on/lift-off), RoPax (roll-on/roll-off passenger);
- Data on fuel consumption and emissions in relation to freight movements
- Data on the contents of Ro/Ro and Lo/Lo containers; and
- Data on Real origin and destination of the cargo.

### AVIATION

- Data on Mail as proportion of Air freight; and
- Data on fuel consumption and emissions in relation to freight movements.

### RAILWAYS

- CSO Rail Statistics after 2018; and
- Data on fuel consumption and emissions in relation to freight movements.

## RECOMMENDATIONS

It is strongly recommended that regular data collection regime is established by undertaking following important surveys. This will help to develop a more comprehensive and robust evidence base for informing future decision making providing sufficient resource can be committed to undertaking this periodically. It is also recommended that a platform is created to bring private and

public sector together on data sharing and distribution. A deeper engagement with the rail and aviation industry will help consolidate all important data on their operations.

Loading-Unloading surveys	Commodity Flow survey
Shippers Survey	Infrastructure Survey
HGV Roadside interviews	Vehicle Trip Diary Survey
Establishment surveys	Parking Surveys
Service Provider Survey	Driver surveys
Axle Load survey	Freight Operator Surveys
Vehicle observations surveys	Mail-out/ Mail-back surveys
Videography and GPS surveys	Telephone surveys

Table 3 Recommended datasets required (Author, 2021)

## NEXT STEPS

Whilst the quality and quantity of freight data available for analysis is often limited, there is a substantial cross section of local plans, policies and industry insights already available that can be analysed and assessed throughout the development of the framework.

The data catalogue will be constantly updated to reflect the scale and breadth of the data that is available from different sources over the course of this framework development. A further contact will be made with the public and private sector alike, to grasp the full picture and establish the complexities involved in procuring all important datasets.

## KEY INFRASTRUCTURE

### INTRODUCTION

Infrastructure, the tangible provision providing the means to transport freight by road, rail, air or sea or to allow communication and energy supplies to reach across the GDA, is the essential ingredient in a modern day, functioning society. This is the network of provision, extending to warehousing, distribution centres and gateway facilities that enable consignments to pass through the supply chain. Infrastructure also extends to the availability of welfare provisions for drivers, the type and location of parking areas and the quality of the urban realm to ensure the safety and wellbeing of residents, businesses and industry operatives.

Dublin is a global city importing and exporting goods through a dense network of infrastructure that must support the movement and transfer of goods in an increasingly safe, sustainable and efficient manner to ensure it remains competitive on the world stage. Growth in freight traffic can have detrimental repercussion on air quality, congestion and road safety with infrastructure playing a major role in mitigating the associated risks to the industry and on effected communities.

Intermodal investment can also help stimulate mode shift away from road-based freight movements, the dominant means by which goods are transported, towards other road, rail and sea-based alternatives for at least part of a journey. This will be dictated by market demand. Highlighting missing gaps in the networks or opportunities to unlock freight capacity should form part of developing the future strategy.

### OVERVIEW OF INFRASTRUCTURE

The following paragraphs present an overview of the existing network infrastructure in the GDA for road, rail, sea and air. Commentary is also provided regarding warehousing, distribution, gateway and driver welfare infrastructure within the GDA. While every effort has been made to capture detailed data for this sprint stage, the information provided does not form an exhaustive list. As this framework develops, with input from stakeholders, the infrastructure details will be refined to ensure all relevant infrastructure is captured. This section of the report provides a snapshot visual of infrastructure provision across the GDA with full copies available in a separate appendix.

#### ROAD

The strategic primary road network in the GDA, for the most part, provides motorway standard infrastructure, linking all four counties with each other (and beyond) via the M50 orbital route. The various motorway routes from the north (e.g., M1, M2, M3), west (e.g., M4, M7) and south (e.g., M9, M11) converge at the M50 outside Dublin. In addition, two of the main freight generators in the GDA, Dublin Airport (via the M1) and Dublin Port (via the M50/ Port Tunnel), are directly accessed from the strategic motorway network. Figure 4 presents a snapshot of the primary road network and illustrates the location of online motorway service areas which include dedicated lorry parking facilities at Lusk (M1), Enfield (M4) and Kilcullen (M9). Figure x also presents a diagrammatic overview of the various motorways connection to the M50.

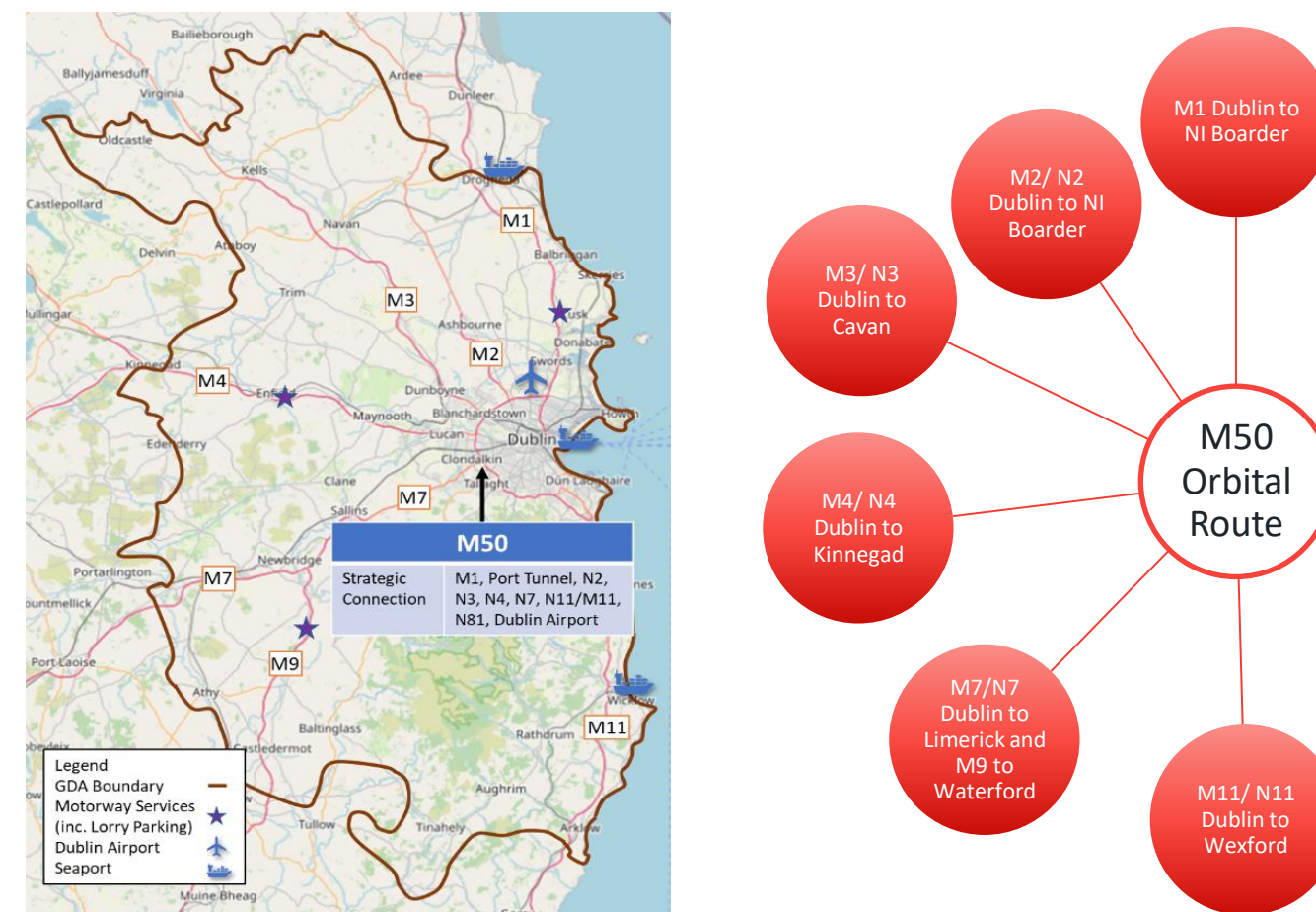


Figure 10 Map of the Primary Road Network across the GDA and interconnectivity (Author, 2021)

As previously noted, the M50 is a vital infrastructure asset for freight traffic in the GDA (and nationally) and the continued management of its capacity is inherently linked to the wider routes which feed it. At this sprint stage, initial consideration was also given to provision infrastructure (e.g., distribution, fulfilment centres, alternative fuel service sites, etc.) within the GDA.

In addition, to the strategic primary road network are numerous national secondary roads, regional roads and lower order local roads which feed into the primary network. These non-primary roads carry less traffic volume and are of a lower standard in comparison to the primary network, however, form an important function as the 'first/ last mile' connection for most freight generators.

#### RAIL

The rail network in the GDA is oriented towards serving Dublin and overwhelming provides for passenger services with some freight services. Nevertheless, as noted previously, there is opportunity for additional freight services on the rail network. There are two main terminal stations in Dublin, Heuston Station which serves rail lines to the west and southwest and Connolly Station which serves rail lines to the north, northwest and south. The Phoenix Park tunnel provides a rail

connection between the north/south mainline and the western mainline and was upgraded in 2016 to improve its capacity.

The Dublin to Belfast mainline has double track infrastructure along its length. A section of the mainline is electrified between Dublin and Malahide (for DART services). The branch line serving Dublin Port and the North Wall Freight Depot connects with the Dublin to Belfast mainline to the north of Connolly Station. In addition, there is a branch line off the mainline at Drogheda which serves Tara Mines outside Navan. The Tara Mines branch line is single track and only used for daily freight services. To the south of Connolly Station, the mainline links Dublin with Wexford and Rosslare Europort. This southern mainline is double track infrastructure as far as Bray (and electrified as far as Greystones), where it switches to single track for the rest of the route.

To the west of Dublin, the mainline from Heuston Station has multiple tracks as far as Hazelhatch which then reduces to a double track layout. This route continues to the southwest coast and west coast (as single track). A single-track line branches off the mainline to serve Waterford to the south. The route infrastructure can accommodate standard High Cube containers and supports daily intermodal services between Ballina and Dublin Port (\*as of June 2021, currently suspended) and Belview Port, Waterford. Figure 6 presents a snapshot of the rail network and track infrastructure along with an extract highlighting the Tara Mines branch line (Figure 5).



Figure 11 Tara Mines to Drogheda Branch Line (Author, 2021)

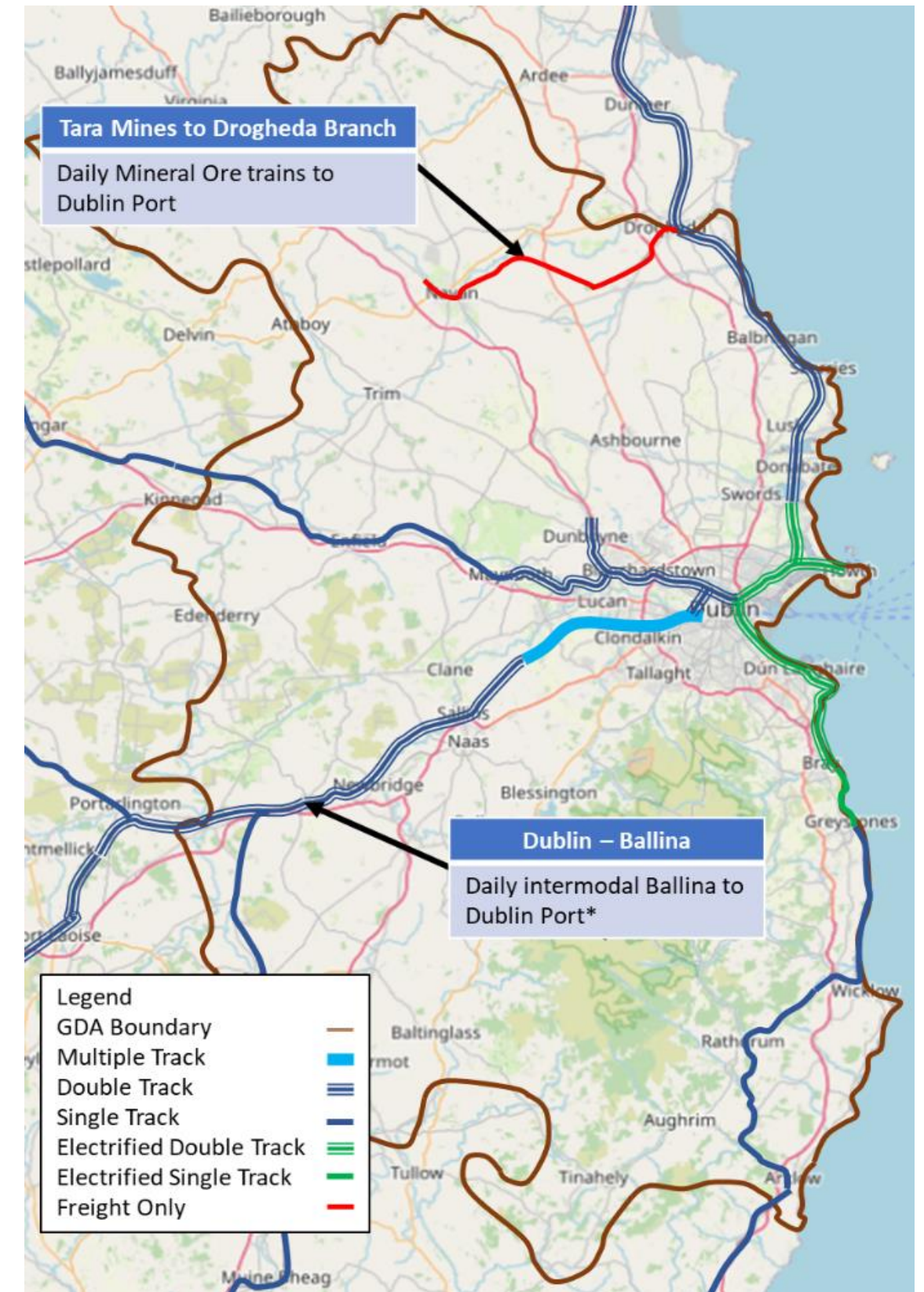


Figure 12 Map illustrating the extent of the rail network across the GDA (Author, 2021)

## SEAPORTS

Dublin Port, located to the east of the City, is the principal sea port for the GDA and indeed Ireland. Dublin Port is one of the main gateways for fright into/ from the GDA. In addition, Drogheda and Wicklow ports also handle some freight. Drogheda port provides Lo-Lo and bulk solid type freight with sailings to Irish (Belfast, Cork) and European (Rotterdam, Oslo) ports. Wicklow Port, operated by Conway Port company, provides bulk cargo, project cargo and warehousing services. The location of the three seaports and a summary of services are illustrated on mapping contained in appendix x.

Dublin Port covers circa 260 ha. of land and has facilities on both sides of the River Liffey. The port can be directly accessed by the primary road network (M50/ Port Tunnel). Rail infrastructure provides a direct connection to the northern port areas and includes a number of active and inactive railheads. Irish Rail’s North Wall Freight Depot, adjacent to the port, provides further rail infrastructure and storage areas for rail freight traffic. The port area also provides driver rest facilities and some public lorry parking. Figure 6 presents an overview of the port, its available facilities and strategic transport connections.

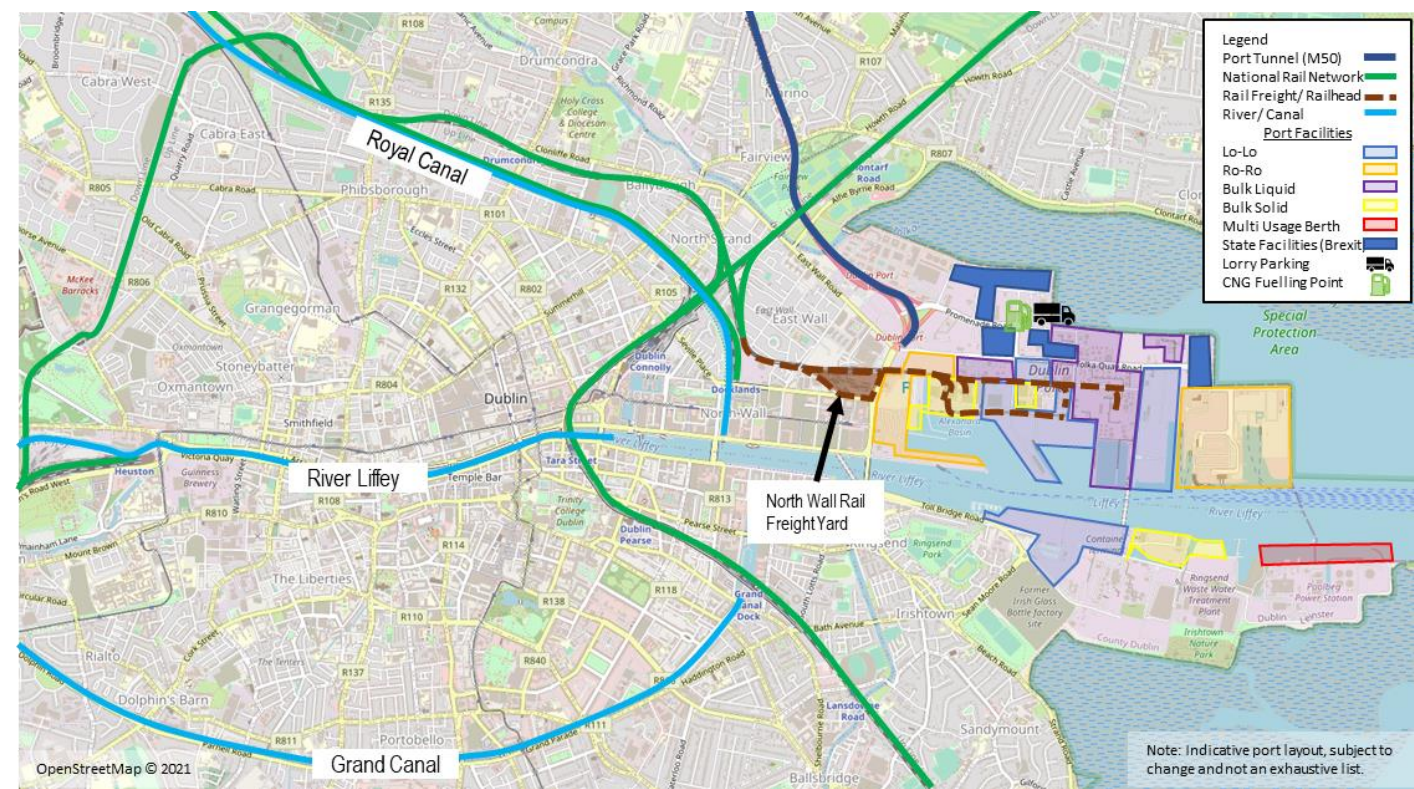


Figure 13 The scale and breadth of facilities and services available at Dublin Port (Author, 2021)

As indicated in Figure 7, Dublin Port handles the following five main freight types, Lo-Lo, Ro-Ro, bulk liquid, bulk solid and break bulk and other goods. To handle the various freight types, the port has an extensive range of handling and storage infrastructure (e.g., warehousing, tanks, holding areas, etc.). In terms of shipping routes, the port is linked to the UK, Europe and other non-European ports. For instance, up to 20 daily sailings, mainly for Ro-Ro type freight, operate between Dublin Port and UK ports (Holyhead, Liverpool, Heysham). Sailings to European port locations

include Cherbourg (Ro-Ro), Rotterdam (Lo-Lo), Bilbao (Lo-Lo) and Antwerp (Lo-Lo) and range for daily to 1 sailing per week

## AIR

Dublin Airport, located to the north of the City, is the principal airport for the GDA and indeed Ireland. Dublin Airport is the main gateway for air freight into/ from the GDA. Other airports within the GDA include Weston airport and Baldonnell Aerodrome, both to the west of the city. Weston Airport provides commercial passenger services for private and chartered flights and is accessed from the M4. Baldonnell Aerodrome is a military airport and is accessed from the N7. Figure 8 presents a snapshot of the three airports and provides a summary of services. Figure 9 also presents a diagrammatic overview of the various air freight routes operating from Dublin Airport.

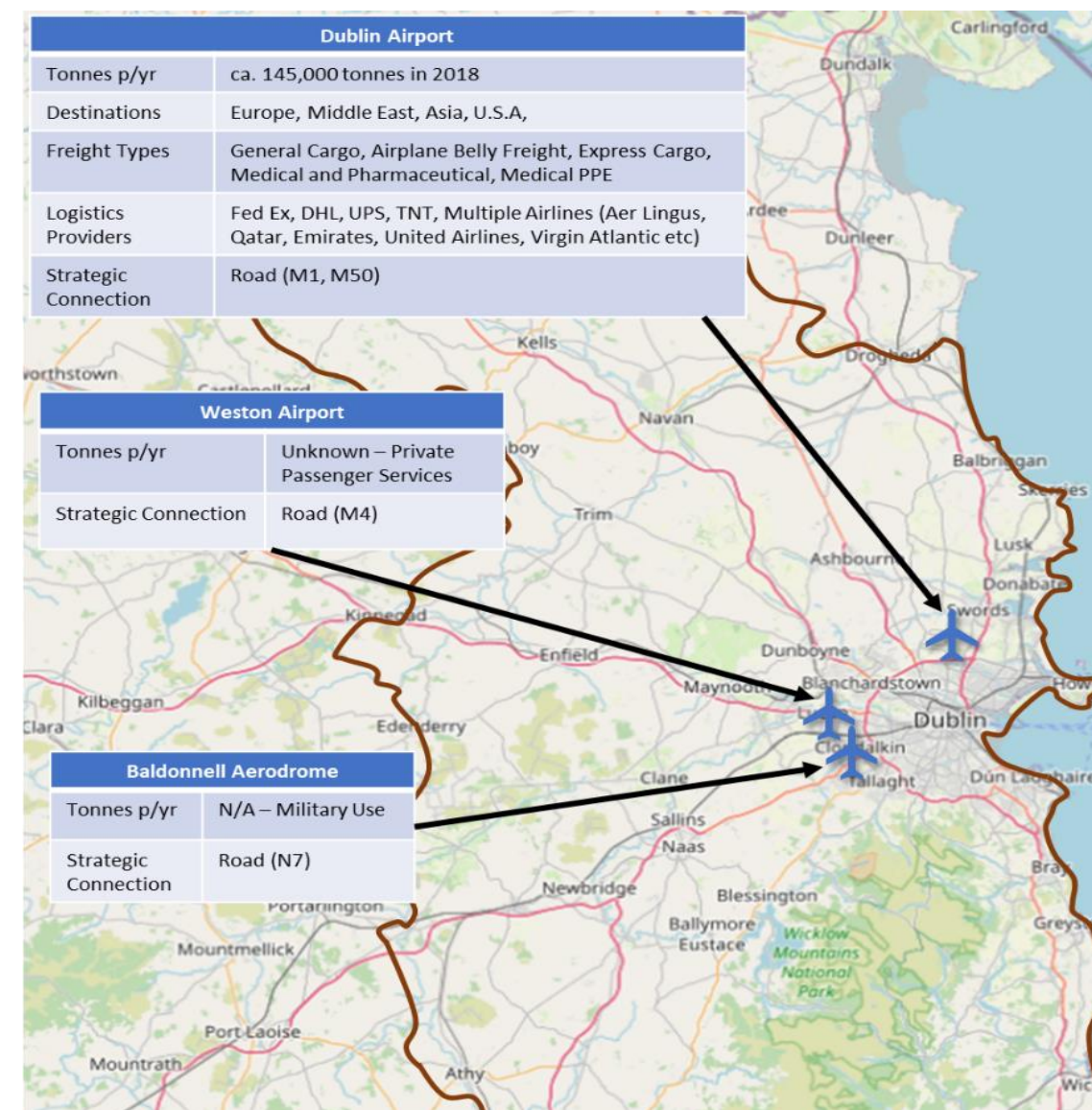


Figure 14 Location and profiling of airports across the GDA (Author, 2021)

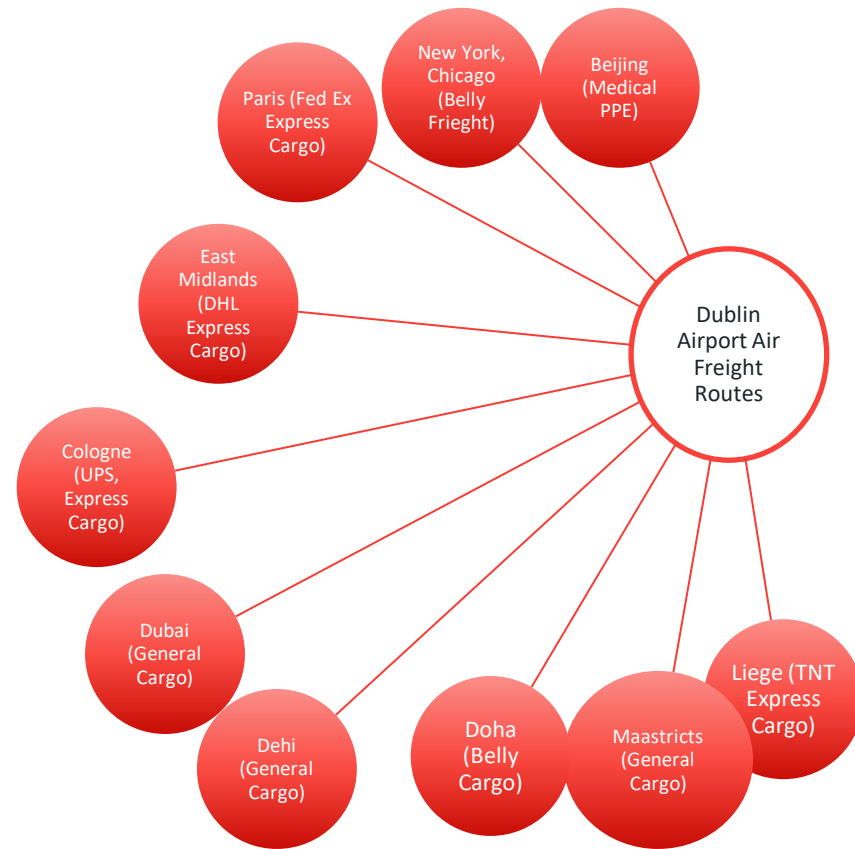


Figure 15 Freight routes to and from Dublin Airport (Author, 2021)

As indicated in Figure 8, Dublin Airport is located to the north of the city and accessed from the primary road network via the M1. The airport has one main runway and is expected to begin operating a newly built second main runway in 2021. The airport provides passenger and freight services and handled circa 145,000 tonnes of air freight in 2018.

Dublin airport has a number of air freight routes carrying varying freight types operated by both dedicated air freight carriers (e.g., DHL, Fed Ex, UPS, TNT) and as part of scheduled passenger services (e.g., Air Lingus, Emirates, Air France, etc.). Destinations served include airports in Europe, the Middle East, Asia and the U.S.A, as indicated in figure x. To the southeast of the airport complex, dedicated air freight handling infrastructure and facilities with direct access to the apron areas are provided. Aviation fuel storage facilities are also provided in this area, with aviation fuel transported by road from Dublin Port via the M1/ Port Tunnel. A large number of distribution/ logistics facilities (provision infrastructure) are located in proximity to Dublin airport.

## INDICATIVE PRIORITY MEASURES

A shortlist of priority measures (separate appendix) has been developed on the basis on collating together and mapping infrastructure across the GDA and assessing potential gaps in provision to further develop a safe, sustainable and efficient freight system. These have been highlighted amongst a longer list of measures that brought together best practice and emerging trends alongside measures alluded to in key policy documents and publications. Every measure was

subsequently scored against the three freight objectives with commentary being provided on its relevancy to the local context.

The full list of measures and the priority schemes will be reviewed and assessed against using a more detailed MCAF in a post sprint stage with only a brief description of the priority measures being provided below (see appendix for more detailed rationale and scoring).

## PRIORITY MEASURES

### Alternative Fuel/Energy Infrastructure:

**Electric Vehicle Charging Infrastructure:** Expanding the energy network infrastructure to cater for increases in electric vehicle fleet growth. This coincides with the transition away from conventional fuels and combustion engines with a focus on delivering quick and rapid fuel points along the strategic road network that will reduce range anxiety and boost confidence in the uptake on alternative fuels (and LGVs). This infrastructure is key and a practical solution for decarbonising LGV fleets in the short term to reduce GHG emissions.

**Hydrogen Hub:** A hydrogen hub brings together several users to share a hydrogen refueling facility. A large user base creates regular demand for hydrogen and the financial benefits extend to the purchase of vehicles and investment in the hydrogen refueling station. Producing higher volumes of hydrogen helps to reduce the fuel cost per mile so that it is comparable with diesel. Hydrogen hubs are particularly suitable for larger vehicles, including HGVs and the process is fast and familiar for easy adoption. Development along key primary route network and at major trip generators, namely Dublin Port (and Airport) would be recommended.

**Compressed Natural Gas (CNG) Network:** Alternative fuel source for use in HGVs and buses. Provides a cleaner and affordable fuel choice compared to traditional petrol and diesel. Requires new infrastructure to supply fueling stations and building of fueling stations themselves. May require some updating of vehicle fleet(s). Gas Networks Ireland is beginning to build out a CNG fueling network across the Island including within the GDA. There is one operational public fueling station at Dublin Port with a further 7 planned within the GDA. Gas Networks Ireland has expansion plans to increase network infrastructure and coverage.

**Sustainable/Renewable Energy Network:** Infrastructure investment in renewable and sustainable energy networks is required to meet with growing pressures on freight fleet operators and local governments to meet carbon zero targets and demand for non-petrol-based vehicles. This includes the use of solar panels on warehousing, hydroelectricity using local watercourses or tidal power, wind power from turbines and biomass plants transferring energy from waste produce. Limited knowledge of capacity but a key network for powering the shift towards alternative fuels.

### HGV & Road Freight Transport Provision

**Remote Lorry Parking (& Driver Facilities):** Secure, convenient and high-quality parking for lorries, HGVs and coaches just off the strategic road network equipped with accommodation, washrooms and refreshment facilities to support driver welfare. High level of surveillance and cleanliness with flexible tariff arrangements for short and long stays. Fuel bunkers and infrastructure can support high volume stays; with the aim of reducing vehicles parked within industrial estates and laybys with limited facilities. There are only three designated areas across the whole of the GDA and

investment would be focused along the primary road network (namely M50) and gateway locations (such as Dublin Port).

**HGV Priority Network:** Using available road capacity by allocating rights of way to restricted lanes to trucks or other categories of vehicles. Lane usage can be allocated to different users according to time windows: it can be shared by all users at specific time periods or assigned only to certain users all day to avoid a situation of conflict with other urban activities, for which HGV involve a visual intrusion, noise pollution and high occupancy levels on the roads and the rest of the urban space. This would be primarily targeted along the primary road network and could coincide with bus lane priority with timings for application.

### Consolidation/Transshipment Infrastructure

**Bulk Freight Railhead:** Explore opportunities to develop new or disused railhead at source of bulk material extraction/ processing. In the past, the rail network was utilised to carry a range of bulk construction material reducing the number of HGV movements, but new investment would require investment in track infrastructure, rolling stock, specialist loading/unloading equipment. Site assessments would also be necessary to attain best fit option with access to the primary road network and other transport networks (i.e. watercourses) being key to supporting inter modality. Collecting and collating additional rail freight data will be invaluable in this respect.

**Dublin Port Rail Access:** Expanding or integrating new or upgraded railheads into port facilities to increase the carrying capacity of single trains and to support more efficient marshalling of goods internally within the port confinements. This includes signal and track upgrades with upgrades also allowing for heavier trains to directly serve the port facility; with the aim of modal shift taking place from road to rail. This is driven by forecast growth but dependent on changes to gauge clearances. Rail access to smaller ports at Drogheda and Wicklow is not being considered at this time.

**(Shared Access) Consolidation Centres:** Consolidation can be defined as the process of combining goods shipments, often by road, into fewer deliveries to reduce the numbers of freight vehicles entering and urban area and to maximise carrying capacity. A Consolidation Centre is the facility, situated near the urban area that serves as a warehousing and inventory management location where goods are handled. The scale, type and means of access varies significantly depending on context and demand. A shared access model, with more inclusive access to haulers and businesses, can complement industry led examples (by larger third-party logistics operators) on the periphery of the M50 or within a more urban setting along radial routes (primary route network).

**Parcel Locker Network:** Parcel lockers, or hubs, are becoming commonplace across shopping centres and transport interchanges to allow seamless delivery of goods to a branded consolidation points in partnership with Train Operating Companies (TOCs). This allows customers to collect on route and reduces freight miles travelling door to door. Office employees can also have personal goods delivered to transport interchanges as to reduce vehicle movements in city centres and staff dependency to manage collections. Particularly relevant in the context of rail and tram network expansions across the GDA.

**Inland Waterway Mini Ports:** The infrastructure and goods handling areas/equipment required riverside to support the transshipment of goods between road and Inland Water Ways (IWW) to aid the movement of waterbourne freight movements (as a new offer). IWW, namely the Grand Canal

and the River Liffey, can serve as an alternative route for slow, nonperishable goods (and bulky loads) and construction traffic; with the primary aim of removing HGVs from the road network. Mini Ports at strategic stations can also offer a societal benefit if the halts service more courier-based requests (parcels) and waterbourne transport includes a passenger offer. These can be mobile and able to be relocated accordingly, especially linked to serve construction sites.

### Demand Management (Physical) Provision

**Intelligent Transport Systems (ITS):** Variable Message Signs (VMS) are digital road signs used to inform car drivers about specific temporary events and real-time traffic conditions. The signs are often linked to a manned control centre via a local network or a radio link. The aim of using VMS is to provide drivers with mandatory and/or advisory information at the roadside and can be used for many different purposes with the potential benefits of reducing car drivers' stress, travel time and increasing traffic safety. An Enhanced Motorway Operation Service (Emos) is being considered that will see VMS on 98 gantries over large parts of the M50 to satisfy this requirement.

## NEXT STEPS

There are many options to explore when assessing the type of freight-based interventions that could be deployed across the GDA; each with their own benefits and advantages. Investment in key infrastructure is expensive and time consuming so extra due diligence is needed when filtering the most relevant, deliverable options applicable across the GDA. Whilst the use of a Multi Criteria Assessment Framework (MCAF) helps to assess the value of different measures outlined in this section and their relevance to the GDA context, each measure will need to be referenced against Key Performance Indicators (KPIs) to further determine their value. Lastly, more specific recommendations can be made to locations where the priority measures could be deployed with further research and investigation.

## TECHNOLOGY & DECARBONISATION

### INTRODUCTION

Freight transport is undergoing a transition. The surge in e-commerce coupled with increasing demand for warehousing, driven by next day delivery and rising consumer expectations, is having a profound impact on urban logistics and supply chain management. The spotlight placed on minimising greenhouse gas emissions, improving air quality and placemaking are subsequently ushering in changes to how and when goods are delivered.

This is part of a broader shift towards a zero-carbon delivery with the development of technology platforms also helping to optimise loading capacities, aid routing behaviour and reduce fuel consumption to save time and costs. Pressure is being applied to nudge the freight industry towards decarbonising with technology helping to support the transition. Attitudes are also changing; there is a recognition across all quarters of society, including the freight sector, that everybody has a role to play in tackling the climate emergency and acting responsibility to move towards carbon neutrality.

### CURRENT TRENDS & SCENARIOS

Any transport strategy should seek to be visionary in its outlook based on current and emerging trends taking place across the world. The framework for shaping sustainable urban freight distribution must build in flexibility to cater for the rise of different technologies that aim to improve the sustainability, safety and efficiency of the sector, across all modes and their component parts, such as warehousing and goods handling equipment, in a supply chain. The following trends (Figure 10) are taking place across the world and bear relevance to shaping the discourse and strategy around decarbonising the freight sector and the use of technology across the GDA.

The Regional Spatial & Economic Strategy (RSES) recognises the challenge posed for transitioning towards a low carbon society but advocates the deployment of alternative fuel infrastructure, compact development patterns, high quality communication networks and smart city programmes to reduce emissions by 40% to 2030.

There must be a package of options and levers available to both industry and public authorities respectively to aid the transition towards decarbonising the freight sector that pivot around the application of various technologies that support re-timing, re-routing and reducing freight trips alongside a more comprehensive shift in goods moved by alternative vehicles. Whilst road freight will continue to make up the vast majority of freight trips and freight volumes, there is an expanded role for rail, IWW and last mile logistics by bike (in particular) across the GDA.

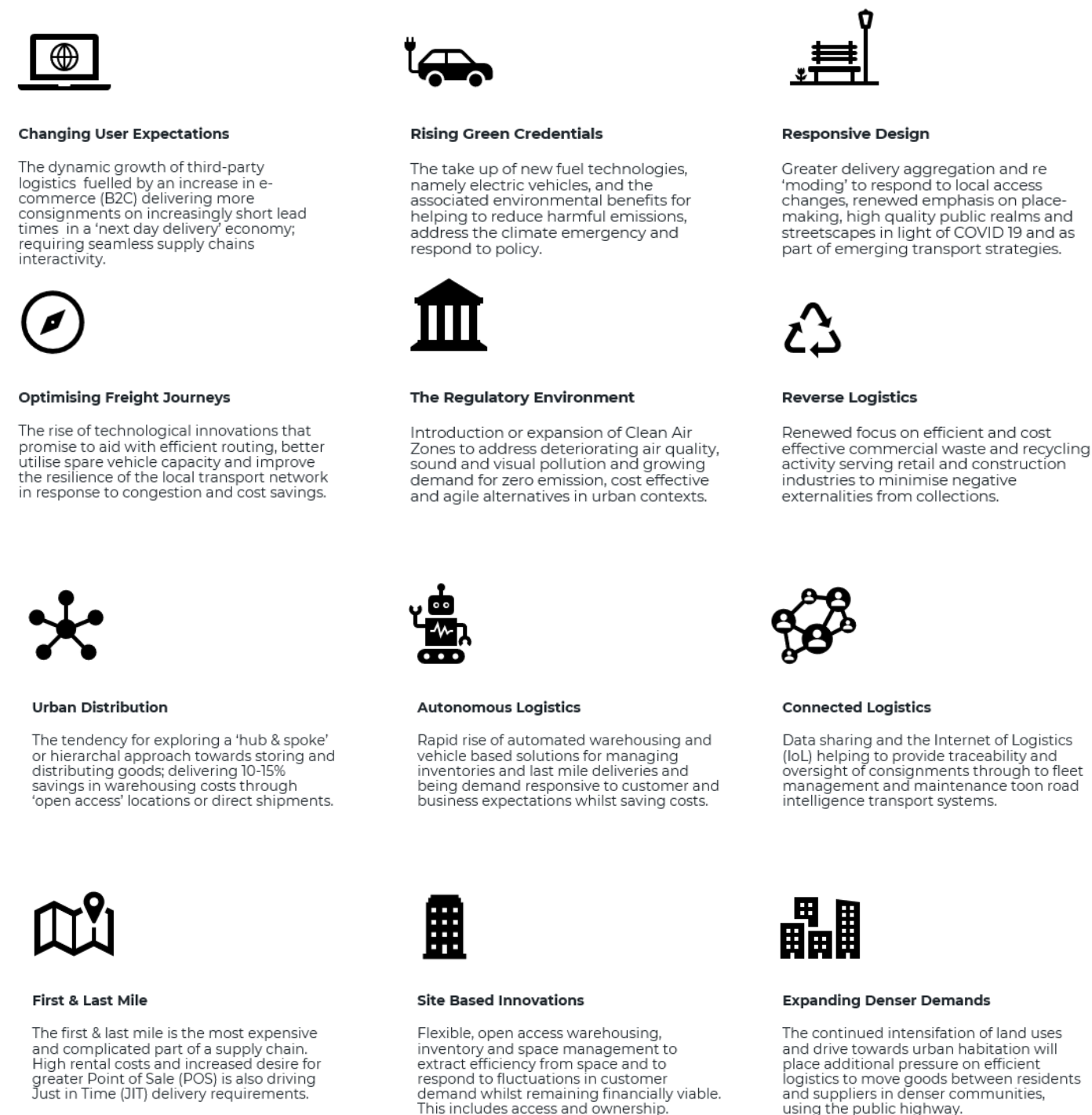


Figure 16 Current & Emerging Trends in Freight & Logistics

## TYPES OF TECHNOLOGY & DECARBONISATION

There are many existing and emerging technologies and processes that can allow organisations and industries across the GDA to optimise their freight operations, reduce the externalities from their activities on local communities and transition towards using cleaner, greener means of moving goods. The applicability of technology measures in the context of the GDA needs to be assessed against the feedback provided through previous stages of developing the strategy but can broadly sit under five themes. Reference is made to the relevant practices/measures with detailed dashboards, featuring use cases, noted in the appendix.

### CLEANER TRANSPORT

- Alternative Fuels
- Alternative Fuel Infrastructure
- Cargo Handling Equipment

Transport is becoming cleaner as a transition takes place from combustion engines to electrified vehicle powertrains, covering battery electric and hydrogen fuel cell across all modes of transport. This is a burgeoning growth area likely to be accelerated by changes in government policy, including future bans on petrol and diesel engines and future incentivisation. Decarbonisation and improved air quality are central to the Transport Strategy for the GDA whilst there are some interventions that specifically address these issues, the broader strategy focuses on tackling climate change and improving the quality of the air breathed by its citizens.

Decarbonisation is taking place at varying rates across the freight industry; contrasting the availability of capital investment, incentives and availability of new technologies that support Light Goods Vehicles (LGVs) undertaking short, local trips, with the requirements of Heavy Goods Vehicles (HGVs) on strategic journeys that demand greater capacity requirements.. However, decarbonising the road haulage industry is proving challenging, despite the strong collaboration between industry and government stakeholders with almost all HGVs in Ireland being diesel fuelled (Ten Years Strategy for Haulage Sector, 2021).

There is a number of support mechanism in place including maintaining a low excise rate for natural gas and biogas for a period of eight years to facilitate the uptake of CNG and natural gas technologies and the acceleration of indigenous renewable biogas production; and an accelerated capital allowance scheme for gas-propelled vehicles and related equipment.

Grants of €5,000 are available for new Battery Electric Vehicles (BEVs) or PHEV (Plug In Hybrid Electric Vehicles) purchased and registered in Ireland whilst these vehicles also qualify for Vehicle Road Tax relief of up to €5,000 for a BEV and €2,500 for a PHEV respectively. However, the vehicle threshold (below €50,000) will only appeal to LGVs across the freight sector.

However, to put this in context, 45% of HGVs are also 10 years or older which presents itself as both an opportunity and a challenge to transition to cleaner transport or risk 'locking in' diesel fleets for the foreseeable future. The transition may also be difficult, without financial incentive for smaller, licenced fleet operators (with less than five HGVs) who constitute the vast majority of national

hauliers. This is despite the European Commission Sustainable and Smart Mobility Strategy adopted in December 2020 which refers to 'Greening Freight Transport' and utilising digital technologies to reduce emissions by 50% by 2050.

Cleaner Transport relates both the network infrastructure to support alternative fuel technologies and the actual availability of vehicles that run on the fuel provided. Cleaner Transport also relates heavily to off road infrastructure that forms part of the supply chain, , alongside future intermodal facilities serving national and international freight movements. In this respect, cleaner transport practices/measures are viewed from the perspective of reducing Green House Gas (GHG) emissions and conventional petrol and diesel engines and opting for alternative vehicle fuels and associated infrastructure.

The Road Haulage Sector in Ireland notes the strong correlation between freight emissions and economic activity. There is a risk that newer and more efficient vehicles may be offset by increased freight activity, particularly around burgeoning logistics clusters. Without significant policy action, the emissions trajectory could increase substantially.

Currently there is limited capacity for alternative fuels serving both means of road freight across the GDA, particularly HGVs operating inter regional trips using the primary road network.. Larger fleet operators, and notably couriers/3PLs affiliated with Dublins Inland Port and Air Cargo Services (UPS, DHL) would be primed for the transition of LGVs to cleaner vehicles. This is also dependent on an extensive charging network being developed (ESB ecars are the main provider across Ireland). The use of alternative fuels, mainly electric, could also drive plant equipment and facilities supporting the transshipment of goods around Dublin Port.

### NEW MODES

- E Cargo Bikes
- Waterbourne Transport
- Freight on Public Transport

Technology is bringing forward new ways in which goods can be transported. New modes of freight transport powered by alternative fuel technologies and programmed to make pre planned data driven decisions can reduce freight miles, optimise trips and reduce the impact of movements on air quality. New modes can range from the conventional, such as e-bikes, to the more innovative and newer concepts for meeting a freight requirement, such as drones. Partnerships will be necessary to supports trials and research in some cases and will support adoption to market and viability across a range of different use cases. Inherent to this approach towards decarbonisation is modal shift; the transition away from conventional road freight transport, the primary means by which consignments are moved across the GDA and Dublin.

The continued growth of LGVs and B2C freight activity presents an equal challenge to the use of road space and network capacity; which has been driven by the rise in e-commerce and accelerated amidst the response to the pandemic and the future of more flexible, hybrid working arrangements. Exploration into re-moding trips seeks to address environmental concerns such as air and visual pollution whilst adopting zero carbon means of transport to deliver goods over the

first & last mile to navigate congestion and areas restricted to other users. On this basis, proposals to restrict inner city access into Dublin City Centre (Dublin City Centre Transport Study), may help foster a re-moding of last mile logistics.

However, the movement of heavier, bulkier goods, typically undertaken by HGVs is a key consideration; with opportunities to utilise alternative transport networks, namely local watercourses such as the Grand Canal and the city regions rail network, to move non-perishable, non-time sensitive goods, such as construction materials over short distances within an urban setting to new developments in the docklands and quays. The selection of new modes presented all require either some form of consolidation and intermodal interface between road freight or a substantial efficiency savings within the supply chain to save time and costs.

In total, 126 million vehicle-kilometres of freight movements move within Dublin alone; outstripping any other movements across Ireland ([2018](#)); with scope to shift shorter trips to other modes. Dublin also has the largest concentration of hauliers with registered licences 574 (2018); a similar number that was recorded five years previously. Relative to the rest of Ireland, almost a quarter (22%) of all road freight transport is destined for the capital.

There is scope to explore the role of other transport networks at the interface with the primary road network (M50 and radial M roads) to reduce freight miles and HGV traffic volumes during peak periods (recorded as between 11:00-13:00). The expansion of DART and MetroLink networks. services and stations across the city region could also be exploited to this effect; primarily through a network of unmanned, micro consolidation (locker) points

## DATA & CONNECTIVITY

- Portside Booking System
- Telematics
- Dynamic Kerbside Management

Data and digital connectivity are becoming essential and commonplace for enabling freight transport to access to optimise journeys, enabling responsiveness and facilitating more seamless connections between modes of transport, places and people. Data sharing across industries, sectors and organisations will help to plan, monitor and adjust freight deliveries across a supply chain in real-time whilst the role of data will play an increasingly important role in more heavily congested parts of urban areas to maximise the use of space.

The ease of access to trip generators across the GDA, namely Dublin Port and Dublin Airport and current challenges faced to managing and optimising trips, by road, is crucial; with technology being able to proactively regulate and manage vehicle volumes at select times to minimise backlogs. Challenges around loading and unloading are ever prominent across local service centres, and the city centre; a situation that could be resolved through the digitisation of space to aid re-timing and re-routing of deliveries.

Telematics, otherwise referred to as fleet management systems, are in cab technologies designed to aid with more efficient, safe and sustainable driving behaviours; with responsibility on operators to develop best practice as a cost saving mechanism and to fulfil their environmental and social

obligations. Larger fleet operators, with greater capital spend and more advanced fleets, would be best placed to take up this technology (alongside driver training).

Dynamic Kerbside Management has been previously trialled in Dublin and brings benefits to utilising inner-city space more efficiently. The use of data is particularly relevant to dictating port access with strict reception windows currently not being managed to allow forward planning. Equally the need for road network resilience is being driven though infrastructure-based use of Intelligence Transport Systems (ITS) in its various guises, which can be complemented by in can telematics designed to support trip optimisation.

The ongoing development of Dublin Inland Port, adjacent to Dublin Airport, includes providing a container terminal check in area whereby hauliers can be called forward in a controlled manner to reduce backlogs around the sea port entrances (via Dublin Port Tunnel). Dublin Port Company (DPC) are exploring opportunities for testing smart mobility and technology in the context of Dublin City Councils Smart Dublin Initiative.

## AUTOMATION

- Autonomous Vehicles
- Platooning

The pinnacle of technology use, especially in tackling the endemic challenge of driver shortages and reducing mundane tasks, is through automation of vehicle fleets. These are several trials and revolutionary approaches being fostered globally to explore and test the relevance of this field and measures that can be deployed within the public domain in the short term. This is an area that is likely to evolve with the potential applicability to different parts of the supply chain process beyond vehicle fleets, including storage, warehousing and inventory management (at port side for example and other intermodal facilities developed in the future).

Automation is closely aligned with emissions reduction and is a burgeoning theme running throughout each freight sector that is likely to revolutionise the industry. According to the Cities Demand Management Study (2021), HGV platooning could reduce CO2 emissions from between 1 to 8% for the lead vehicle and between 7 and 16% with the benefits being relevant for inter urban trips. Automation in an urban context could entail the use of small unmanned vehicles undertaking smaller consignments, normally undertaken by an LGV over the 'first & last mile' in sensitive urban contexts.

Alongside issues of driver shortages, automation over longer distances presents an opportunity to maximise driver 'road time' whilst automation can help overcome issues associated with warehousing and inventory management that can be subject to human error or be relatively time-consuming practices. There is small scale evidence of the latter taking place across distribution sites in peri urban locations around the M50 but generally the role of automated vehicles and platooning has been limited to date in large part due to the costs and concerns around safety and legal responsibilities.

Much of the technology behind automation is still in its infancy. The rise in autonomous vehicles would help address driver shortages observed across Ireland for long distance haulage and freight forwarding, whilst platooning would be relevant in the context of completing inter urban journeys using the primary road network across the GDA.

A study has been commissioned into the application of autonomous vehicles on Irish Roads to examine technologies, policies and governance with particular reference to the applicability to inter urban road freight movements.

## AGGREGATION

- Load Sharing

The means by which to group otherwise individual consignments, brokered by a single technology platform or facilitated through the collaboration of multiple organisations, into an optimised, dynamic delivery programme. This can simultaneously reduce freight miles by reducing travel demand and seeks to maximise vehicle payload. Technology can facilitate aggregation with the aim of removing vehicle traffic and stimulating mode shift if dynamic routing reduces journey distances.

Emerging technology can help with reducing freight miles, empty running and sub optimal carrying capacity of freight carriers; with a view to maximising vehicle utilisation and payloads (the revenue generated from a delivery). This is highly relevant and realistic for traffic mitigation; on the premise that data is shared transparently between a web of suppliers, couriers and customers; especially in the context of the GDA and the scale of local, national and international supply chain movements.

Enhanced aggregation should help stabilise the growth in road freight transport (LGVs) across the primary road network and within urban centres using software platforms that are readily available within the public domain. Some caution must be exerted as to the popularity and take up of load sharing because of the low rates charged for services and concerns by industry to share information on vehicle fleets, goods carried and fleet utilisation.

## NEXT STEPS

This section has sought to raise awareness of emerging technologies and how they can be effective in tackling the issues and challenges faced by the freight sector across the GDA. The practices identified are 'future ready'; applicable in a post-pandemic life and relevant for developing a sustainable transport network which meets climate change requirements.

## OPERATIONAL & PLANNING CONSIDERATIONS

### INTRODUCTION

The responsibility for sustainable urban freight distribution and meeting wider transport objectives to unlock economic development, protect the environment and support society, must be shared between public authorities and industry. The appropriate conditions for creating a safe, sustainable and efficient freight movements and supply chain activity to meet these objectives will need to be fostered over time. Public authorities and industry must also be responsive to changing circumstances and trends such as the way people shop or work going forward but are equally responsible for dictating the future discourse that shapes freight activity.

Generally, the role and significance of freight must also be appreciated whilst greater integration is required between transport and land use development planning to envelop a 'think freight' approach throughout decision making processes and formal mechanisms. This lack of awareness and knowledge of freight can have consequences on urban design, development masterplans and strategic growth. This section seeks to distinguish between the role and influence of the freight industry (industry considerations) and public authorities (planning considerations) and the role they play together for creating an optimal freight environment. Reference is made to the relevant practices/measures with detailed dashboards, featuring use cases, noted in the appendix.

### PARTNERSHIPS

- Waste Management Partnership

Public authorities play the leading role in shaping transport and land use policy and securing funding for delivering public goods. Local authorities across the GDA alongside the NTA, will ultimately be shaping the freight environment throughout the course of day to day based on decision making across a range of transport, land use, environmental and development planning subject areas. There is a critical role to play for public authorities on numerous fronts to create optimal conditions for the freight sector to thrive and support the economic, environmental and social wellbeing of the GDA. This should ideally coincide with greater industry collaboration to develop synergies and shared visions for the role of freight in the future.

The freight industry, composing of suppliers, couriers, hauliers, shippers and businesses partaking in a supply chain, alongside trade bodies, will play a key role in lifting industry standards. Industry increasingly recognises the role it plays in meeting environmental obligations and addressing concerns around road safety. The freight sector generally has developed a poor reputation with HGV driver shortages (most notably) being symptomatic of a wider challenge of recruiting and retaining staff across the industry.

Partnerships can also be key to supporting economic activity and coordinating a response across multiple stakeholders; such as responding to the impact on deliveries and collections from pedestrianisation proposals. Chamber of Commerce and Business Improvement Districts, for example, can be useful platforms for organising around a theme or agenda, which may have a freight and logistics angle.

### FREIGHT DATA

Data harvesting is increasingly key for developing a robust evidence base for informing decision making by both businesses and public authorities. However, obtaining and collecting freight specific data, ranging from vehicle movements to road and vehicle utilisation, is a notorious challenge faced by the freight sector historically and impacts on the relevancy of future investment priorities and fleet management respectively. This was acknowledged in a previous Regional Freight Study commissioned by NTA.

The emergence of the sharing economy and initiatives such as the FreightShare Lab (a collaboration of industry bodies with close links to public authorities) and Data Hubs by Subnational Transport Bodies (STBs) in England, are trailblazing approaches to collating and collecting data sources for informing policy approaches and investment priorities across the industry.

A similar imitative in the context of the GDA could help bring together disparate industry data to capture the true freight picture and mark a milestone in the link between public authorities and industry. This exists to a limited extent as Dublin City Council already manages the system that captures and stores permit data (HGV permits issued) as part of the HGV Management Strategy (although challenges with enforcement)

There is limited statistics available on what amount and type of freight comes in and out of Ireland by air, including via Dublin Airport. Better statistics on air freight would be useful to assess whether other policy considerations related to air freight should be further explored. The same applies to rail freight on the network and the characteristics of services and infrastructure provision which impacts on the ability to make informed decisions.

### REGULATIONS

- Emission Zones
- HGV Management/Routing
- Quiet Deliveries

Public authorities are increasingly introducing measures to minimise the impact of freight (and vehicle) movements in sensitive areas and the impact the sector has on air quality and the urban realm. Barriers imposed through traffic management or regulation orders, loading restrictions and zoning principles shape the freight operational environment. This can bring about the benefit of nudging fleet operators and freight sector businesses to transition towards greener vehicle fleets, in response to charging zones being introduced for higher emitting vehicles, alongside re-timing deliveries outside of peak hours to minimise interaction with vulnerable road users.

Since 2007, Dublin City Council have operated an HGV Management Strategy which bans 5+ axle vehicles during the hours of 07.00-19.00, seven days a week from a designated cordon area around the city. This is with the aim of reducing through traffic and incentivising the use of Dublin Port Tunnel and reducing conflict between vulnerable road users and the servicing requirements of businesses. However, enforcing this legislation and testing compliance has been challenging. Permits can be sourced to enter the restricted area along designated roads for delivering or collection materials from registered addresses /construction site (Load/Unload Permit), or where vehicle loads exceed 2.6 metres in length (Transit Permit).

Enforcement of the HGV management scheme has been a challenge; one that other local authorities have also experienced. Extending the cordon or adding additional vehicle specific restrictions may be premature without developing a more coherent package of freight related measures alongside enhanced enforcement measures, such as ANPR technology (similar to that used to enforce the M50 Barrier free tolling) that could feature as part of developing a Clean Air Zone (CAZ). A CAZ offers the potential to stimulate mode shift and reduce all vehicle trips on the local network to free up capacity. There is also limited data available within the public domain to assess the nature of HGV trips passing through the city centre.

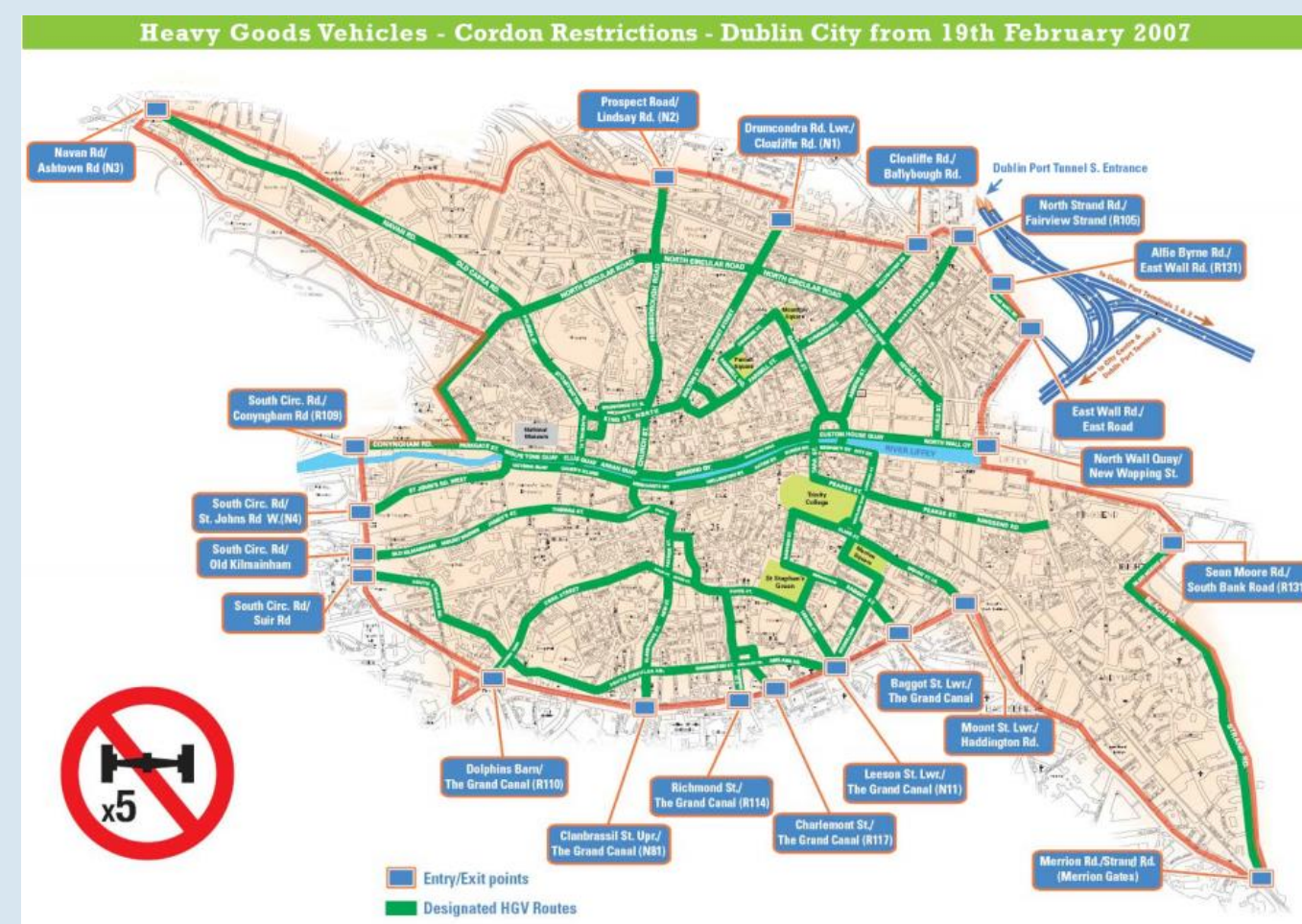


Figure 17 Cordon Restrictions as part of the HGV Management Strategy for the GDA (NTA, 2021)

Caution must be taken to the disproportionate impacts of regulations on different parts of the freight sector across the GDA and their ability to respond (quickly) to changing conditions. For example, lorry parking bans may be symptomatic over a lack of available parking and absence of real data demonstrating the gulf between demand and supply available locally which must be factored into the discourse by those involved in the making decisions internally. The harmonisation and legibility of regulations is also key; this can lead to issues with enforcement and overall effectiveness whilst infrastructure costs, administrative and maintenance costs must be evaluated.

## Travel Demand Management

Within the GDA, tolling is applied at various points on the motorway network and is generally connected to schemes which were funded through Public Private Partnerships (PPPs). Dublin Port Tunnel uses tolling as a means to protect road space for HGVs. Advancements in tolling may include further demand management measures such as the NRA's proposal to implement multi-point tolling on the M50 during peak periods to manage traffic levels on the route. A reduced tolling incentive regime was also rolled out in 2020 for alternatively fuelled HGVs to support re-modelling whilst tolling systems can be configured to incentive the use of less polluting vehicles.

Variable Messaging Signs (VMS) are currently located on various sections of the road network in the GDA and provide for the communication of real time journey information to help re-route journeys or prioritise the movement of certain road users at different times of the day. This could be tailored to support the expeditious movement of freight, through the use of priority lanes, or to aid with re-routing car traffic to Park & Ride facilities to reduce traffic volumes as a whole. Incident Detection Systems (IDS) are also another means to aid network resilience and influence travel behaviour to minimise the impact on journey times and reliability.

## PLANNING CONDITIONS

- Delivery & Servicing Plans
- Construction Logistics Plans
- Building Code Regulations

A prime opportunity to counteract the combined challenges of a growing urban population, rapid development growth and increased freight trips across GDA, is to embed a 'think freight' approach into the planning process and the conditions requested by developers to secure permission. Land zoned for housing, industrial development and employment/commercial uses will all have a freight requirement and generate freight movements; contributing and potentially exacerbating concerns around congestion, local access, pollution and road safety.

On this basis, there is an opportunity to embed freight best practice principles into the process of securing permission and ensuring new developments and urban regeneration mitigate the externalities from freight movements; during both the construction (build) phase and for day to day operations covering waste management, deliveries and servicing activity. This will require providing sufficient materials and guidance to developers and initially upskilling department staff on the value, requirements and application of conditions. This should align with a commitment in local policy discourse with consideration also given to enforcing conditions and monitoring compliance.

Good site management practices, traffic and construction management plans and consultation with the competent and statutory authorities prior to any port related developments have been outlined to be kept to a minimum over a short timescale. This approach to mitigation, combined with monitoring of these activities, should be upheld across all larger sites; with Dublin Port having taken a particularly proactive approach to development plans for their sites.

## PLANNING POLICY

The NTA will be chiefly responsible alongside the four local planning authorities for influencing the allocation of land uses (zones) and supporting future growth of the freight and logistics sector across the GDA. Policy integration must take place across different areas beyond transport to ensure holistic approaches are being adopted to prevent freight and logistics being a siloed. This is whilst ensuring consistent with the spatial planning policies and objectives set out in the Regional Spatial and Economic Strategy (RSES) adopted by the Eastern and Midland Regional Assembly in January 2020 and the National Planning Framework (NPF) 2018-2027.

The NPF aims to address unsustainable travel patterns and the implications that this could have on exacerbating congestion by promoting developments that reduce trip demand, distances and support the uptake on sustainable travel through the co-ordinated delivery of infrastructure and services in tandem. This can be extremely complex and involve multiple agencies. Encouraging policymakers and stakeholders to view developments through a 'freight lens' will be a first step toward embedding in good practice principles.

Freight efficiency, particularly intermodal movements of transport, rely on the seamless transition between different stages and stakeholders of the supply chain and the ease of access between and through local, national and international gateways. This can manifest in different ways and can be shaped by public authorities by means of:

### Economic Agglomeration

The term to describe the clustering of businesses activity to support economies of scale, productivity efficiencies and cost reduction. The zoning principles deployed across the GDA are evident; ranging from Dublin Port and Dublin Airport Logistics Park (Inland Port) through to the hive of industry hugging the M50 south west of the city of Dublin. These locations, often in peri-urban settings, ultimately come to depend on high quality access by road but have limited rail capacity (with the exception of the Dublin Port).

Future agglomeration will depend on policy and investment commitments, including mode shift and multimodalism, to unlock industry growth. This is hinted at in the optimum growth scenarios for the regional economic strategy (RSES); to promote smart specialisation and cluster policies based on identified strengths and competitive advantages. However, planning for key processing facilities is equally as pertinent in the current climate as the transport network; with a growing lack of affordable, accessible warehousing facilities available or visible to meet the demand of space (led by e-commerce).

The burgeoning freight and logistics sector is an emerging economic driver driven by both the proximity of strategic road and rail networks and clustering of suppliers, wholesales and third party logistics providers, offering competitive advantages through supply chain efficiencies. Alongside high-profile companies such as Amazon who had established distribution hubs pre pandemic amidst the boost in e-commerce, other third-party logistics companies, namely UPS, who recently acquired Irish Nightline Logistics Group, an Irish parcel delivery company, are also establishing residency. This presents a fantastic opportunity to work with industry to address some of the challenges faced from the rise in e-commerce.

The recent emergence of an Inland Port by Dublin Port Authority (DPA) adjacent to Dublin Airport signifies the future significance of the sector and its role in supporting local employment and economic prosperity. Continued investment in major infrastructural investment (such as Dublin Port Tunnel and radial road network around Dublin) continues to attract shippers and hauliers and will inevitably lead to future demand for warehousing capacity and associated land uses.

Dublin Port Company (DPC) is developing Dublin Inland Port; a 44-hectare estate located 14km from Dublin Port which will comprise of empty storage depots, haulier facilities and warehousing facilities earmarked for existing operators in Dublin Port who will be reallocated from Dublin Port to Dublin Inland Port as DPC implements the Franchise Policy. This will help support the operational requirements of the container terminals at the port but more importantly help to manage traffic flows through to Dublin Port by road from a designated check in area. The Inland Port is explicitly zoned to include the activities envisaged by DPC including road transport depots and transport logistics facilities to expand the roles contribution towards the local economy.

### Land Uses

Land use policy advocating higher development densities within the confinements of Dublin City and suburbs, will simultaneously boost the financial viability of public transport whilst improvements to the active travel network have been well underway across Dublin for many years to boost cycling and walking and reduce car dependency (Healthy Placemaking). Population density across the GDA rose 13.5% between 2000-2016 hinting at the increased intensification of land and the additional demand generated for freight to help move goods.

The competing use of space and the ramifications on freight, notably waste management and local delivery access need to be considered in this equation. The dockland in particular and more specifically the intensification of development around the Quays are prime targets for embedding in best practice principles to offset the impact of construction and future delivery traffic within the immediacy.

In another context, the M50 in particular, has acted as magnets for large-scale, vehicle centric employment developments such as office parks, business parks and industrial estates, including the intensification of employment at Sandymount / Leopardstown, Park West, City West, Grange Castle, Greenogue and between the M2 and N3 at Ballycoolin / Damastown to north of Blanchardstown. This has and will continue creating additional pressure on the road network.

## Infrastructure Schemes

Infrastructure schemes, which are often integrated into land use planning decisions, are the most substantial category of measures and are usually implemented by public authorities. Due to the high cost of planning, implementing, and maintaining transport infrastructure in urban areas and their perception as being for the “public good”, they are often the only actors willing and able to fund their implementation. Public Private Partnerships (PPPs) have emerged over recent decades as another financing model to invest in substantial improvements to road, rail, sea and air networks whereby the initial capital and risk is absolved by public authorities to leverage private sector investment in the operational and longer term viability of initiatives that are associated with delivering a public good.

This would include developing a network of strategic rail-based park and ride facilities at appropriate points, as indicated in local policy narrative, where rail services intersect with the national road network, adjacent to, or outside of, the M50. Such schemes can incorporate a freight component, particularly in this context where there are opportunities to support micro consolidation (parcel locker provision) and parcels by public transport to dovetail service upgrades to DART and Metrolink.

## CONSOLIDATION

- Urban Consolidation

Consolidation, the means of grouping consignments in fewer vehicles based out of ‘remote’ or ‘last mile’ hubs are increasingly popular as a mechanism to reduce freight externalities in an urban setting but requires proactively identifying and developing appropriate sites with industry partners to bring this to fruition. In the context of the GDA, remote consolidation; hosting suppliers, couriers and other distribution activities, can benefit from the orbital nature of the M50 and radial road, rail and inland waterway connections to move goods within the city region, providing complementary policies in place to upgrade transport network infrastructure.

There is a prime opportunity for the new NTA Park & Ride Design Office to factor in micro consolidation into the various Park & Ride projects through their design and planning stages, covering both manned and unmanned (parcel locker) facilities for the storage and movement of goods (namely parcels). Park & Ride sites are proposed in Project Oreland 2040: National development Plan 2018-2027 and sites must look to incorporate provision for loading/unloading and any good handling/storage equipment to aid with the transshipment of goods.

Previous industry experience of consolidation points towards the challenges of a state led scheme comparatively to facilities that are accepted and embedded within business supply chains (the users). The growth in third party logistics companies establishing bases around the GDA provides an opportunity to work with industry partners on initiatives that can re-mode and reduce trips into the City of Dublin and through other towns across the GDA.

There is evidence of this type of initiative being explored; a ‘Last Mile Delivery Challenge’ was launched in late 2018 with six organisations, which was co-funded by Enterprise Ireland and Dublin City Council, in partnership with Belfast City Council, as part of the Small Business Innovation Research Programme. The feedback from trials revealed the need to upgrade parking legislation to reflect technological advancements alongside the need for detailed stakeholder engagement and buy-in from local businesses.

In theory, consolidation can help meet some of the policy interventions highlighted within the existing Transport Strategy for the GDA (2016-2035), with a focus on targeting deliveries in urban centres and introducing low impact, zero carbon delivery schemes combining the use of storage locations with last mile deliveries by bike, e-vehicles and other ‘new modes’ of transport depending on the consignments being moved.

## PROCUREMENT

- Sustainable Procurement
- Greener Fleets

Anchor institutions, large public and private sector organisations with deep roots within the GDA and notably sway over local decision making, also have substantial budgets and spending power to procure goods and services. Alongside obvious examples, such as each of the four local authorities, businesses such as Guinness, can arrange procurement contracts and terms to develop sustainable and local supply chains. This can help to reduce travel demand and freight miles with smaller organisations based within the GDA being able to compete on smaller contracts delivering goods over a shorter distance or in clean vehicles. This itself supports the local freight and logistics sector and local prosperity whilst minimising the impact of supply chain activities.

Whilst decarbonisation within the private sector is likely to be driven by cost efficiencies and a strong commitment to Corporate Social Responsibility (CSR) policies, public authorities can start to set future trends and are increasingly faced with legislative obligations to adapt procurement practices and policies to reflect this change.

The EU Clean Vehicles Directive could be a gamechanger to accelerating uptake of greener fleets across public sector bodies. This directive will be transposed into Irish law and will oblige public sector bodies to meet minimum targets for the share of low-emission and zero-emission vehicles in public procurement from August 2021. Furthermore, the Sustainable Energy Authority of Ireland (SEAI) mandates for enhanced energy efficiency and GHG emissions reduction for public authorities equivalent to 50% and 30% respectively by 2030.

ISO accreditation (ISO50001) is an internally recognised standard and practical means by which to improve energy use (and transport related activities, fleet operations/grey fleets) which is viewed as best practice for public authorities to uphold. Only 30 organisations across Ireland have been accredited so there is scope for future uptake.

## INDUSTRY OPERATIONS

- Shared Assets
- Driver Training
- Accreditation & Recognition Scheme

First and foremost, businesses working within the freight sector are seeking to improve their operational performance to save time and reduce their overheads whilst seeking to enter new markets and build their reputations. Freight transport is always seeking to optimise journeys with hauliers, couriers and shippers naturally consolidating loads to reduce trips and maximise payloads. The rise of sharing platforms to broker spare vehicle capacity or share fleet and warehousing resources are growing whilst options to re-mode away from road freight, the dominant mode of freight transport, to rail or inland waterways, are proving more attractive against a backdrop of changes to local access changes and regulations.

There is growing demand by manufacturers and retailers that freight transport, distribution and logistics providers move goods with a low CO2 footprint and start to invest in environmentally friendly technologies and practices to both reduce their impact on society. This transition is also necessary to remain competitive and for longer term financial sustainability. Businesses seeking to access warehousing space or managing a facility can also benefit from new trends towards sharing assets as a low cost means to enter burgeoning new markets.

The Irish Road Haulage industry recognises the challenge posed to individual operators to transition towards cleaner modes of transport and the role of fuel, fleet and journey efficiencies to reduce emissions in the short to medium term. The Low Emission Vehicle Taskforce, a cross section of key industry and academic stakeholders, have helped support the transition towards alternative fuels through incentive programmes but limited focus has been applied to a wider package of measures to maximise the use of assets and support better fleet management.

Whilst individual operators, notably larger companies with larger fleets (and vehicles) have likely explored eco driving techniques or upgraded to in cab telematics systems, additional promotion and targeted marketing campaigns, as well as incentives, would likely be required to nudge smaller companies towards greater uptake in schemes that could benefit their operational efficiencies.

## NEXT STEPS

This section has sought to shine a light on the role and importance of public authorities in shaping the freight environment across the GDA and how the freight industry can respond to changing economic, environmental and social conditions. The practices highlighted must be further reviewed as part of the strategy development but are well placed to support freight related objectives and wider demands of society.

## SUMMARY & POST SPRINT

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### SUMMARY

This sprint report attempts to set the tone for the development of a Sustainable Urban Freight Distribution Framework and future strategy across the GDA and has sought to develop key overarching opportunities across all five identified work packages to support the expeditious, safe and sustainable movement of goods. A future strategy must look towards developing a future ready approach towards freight transport founded on local context and an evidence base as well as a vision of what the sector should and could look like to meet economic, environmental and social objectives.

This sprint report will be complemented by a more robust and thorough development of a framework that can help guide a future strategy and will include building on the tools developed during this stage of the project. There are many opportunities that public authorities and the freight industry can explore providing that 'think freight' approach is adopted within the broader narrative about transport and land use planning across the GDA. The following steps post sprint will seek to entail:

1. Stakeholder Engagement (and development of Key Performance Indicators)
2. Redefining and readjusting freight objectives
3. Development of a more detailed MCAF, including Key Performance Indicators
4. Applying the SOSTAC & PESTLE frameworks to aid with strategy development








The development of a freight forum and steering group will be a key component of bringing together a framework that speaks for the industry and can guide future interventions and investments. Engagement with stakeholders will provide valuable insights into major issues and barriers and allow for sense checking assumptions within the public domain. This process will subsequently feed into redefining freight objectives and the development of the MCAF tool with the final aim of creating a clear and concise framework for a final strategy.


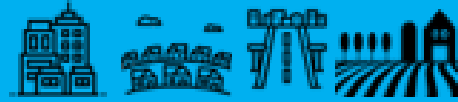
A key requirement progressing through the post sprint steps, pending feedback to this sprint report, will be to finalise the priority list of recommended measures and practices across the three themes so that these can be taken forward for future development into detailed toolkits that outline:




- Implementation Steps
- Resource Options
- Delivery Timescales



# Appendix

## DASHBOARDS



ALTERNATIVE VEHICLE FUELS		Mode Relevance	  	Freight Sector	Road (Haulage/Courier)	4 Rs	Re-mode	Technical Maturity	Initial real-world operation	Commercial Maturity:	Operating commercially
<b>Definition:</b> [Trajectory]	The use of alternative fuels and drivetrains to traditional diesel and petrol internal combustion engines is helping to reduce vehicle emissions. A range of alternatives are in development including battery electric vehicles (BEVs) and Hydrogen vehicles, as well as biofuels and Compressed Natural Gas (CNG). Alternative fuels are essential in the decarbonisation of freight transport and in reducing the public health impact of harmful exhaust emissions. However, for alternative fuels to become mainstream, there is a significant infrastructure needed to enable seamless commercial operation.							Category		Cleaner Transport	
								Geographical Applicability:		   	
Best Practice		Use Cases									
	Tesla <b>Tesla Semi</b> [Battery electric truck]	The Tesla Semi is an all-electric battery-powered Class 8 semi-truck in development by Tesla, Inc. Two concept vehicles were unveiled in November 2017, and production in 2021 is planned. ... Tesla CEO Elon Musk said that the Semi would come standard with Tesla Autopilot that allows semi-autonomous driving on highways. Electric energy costs are half those of diesel. With fewer systems to maintain, the Tesla Semi provides \$200,000+ in fuel savings and a two-year payback period. The long range version can cover 500 miles on a single charge when fully laden.									
	Nikola <b>Nikola Two</b> [Fuel cell electric vehicle]	Hydrogen-powered vehicles use fuel cells to convert Hydrogen and Oxygen into electricity and water. The electricity drives electric motors to propel the vehicle. The major benefit of Hydrogen over electrification is its flexibility. A Hydrogen truck can be refuelled in approximately the same time as a diesel truck and the operating range and operating patterns are similar meaning that Hydrogen-powered trucks could fit into the existing logistics system without too much change. However, Hydrogen is much more energy intensive than electricity and consequently is inherently more expensive for the economy, the environment and probably for the vehicle operator.									
	Scania <b>Bioethanol trucks</b> [Biofuel vehicle]	Biogas is the most commercially viable way to reduce CO2 emissions for transport. It provides cleaner, greener and quieter operation with significantly lower costs than those associated with hybrid, electric or hydrogen options. It's a completely natural, sustainable and renewable fuel source, and it's available now. Biogas is produced by the natural breakdown of food and sewage waste. It uses a process called anaerobic digestion to split waste material into gas (biofuel) and solids (bio fertilizer).									
	Waitrose <b>CNG HGVs</b>	Waitrose is expected to order 40-60 new Bio-CNG trucks every year until the HGV fleet is 100% Bio-CNG by 2027/28. Operating dedicated gas trucks has transitioned from being a trial, to being 'business as usual', with positives on carbon reduction, driver acceptance and cost. Waitrose have saved up to 40% on their fuel bill by making the switch to Bio-CNG with new stations being developed. The fuel is 100% renewable whilst the transition across has also had positive repercussions on noise pollution from running HGV fleets.									
Opportunities	Pairing with renewable energy generation to create net zero carbon logistics, creating refuelling/recharging hubs around sites such as ports and warehousing sites which generate a lot of HGV trips										
Barriers	Conversion of fleets currently limited by production capacity for BEVs and H2, Infrastructure not yet there for heavy duty use cases, BEVs may not fit into existing service patterns										
Local Relevancy	HGV & LGV traffic is unlikely to subside because of the dependency on road freight for accessing major trip attractors across the GDA. Larger third-party logistics companies stationed around the M50 and burgeoning industrial/logistics parks with large LGV fleets should be the trailblazers for EV technology. The shift towards hydrogen and CNG should also be led by larger fleet operators, especially those carrying regional consignments along the primary route network; providing infrastructure can be located at strategic locations (Dublin Inland Port, N7/M7). Forecast rise in RO-RO services at Dublin Port, for example, will likely increase flows of HGVs so failure to support the transition may exacerbate local air pollution.										
Impact on Freight Objectives											
Economy			Environment				Society				
Freight efficiency		Med	Air quality		Max	Safety		Min			
Improved journey times, optimised use of fleets, delay mitigation and improved supply chain connectivity to save time and costs			Reduce the impact of the sector through air quality improvements and a reduction in other forms of pollution and intrusive activities			Improve the safety of the sector to reduce the number of accidents involving goods vehicles (particularly linked to vulnerable users)					
Industry contribution		Med	Greenhouse gas emissions		Max	Community disturbance		Med			
Improved jobs and opportunities to address skills shortages, support for inward investment, land availability, infrastructure provision			Reduction in greenhouse gas emissions from the sector to achieve net-zero by 2050			Reduce the impact of freight on communities, noise levels, air quality and informal overnight lorry parking					
Connectivity		Min	Urban realm		Med	Placemaking		Min			
Improved connectivity seamless intermodal activity to support local, national and international freight movements across the area			Minimising the intrusive impact of freight transport on visual amenity and local, protected settings			Better integrate freight into land use planning, development, construction and servicing plans, better freight data					



CHARGING/FUEL INFRASTRUCTURE		Mode Relevance		Freight Sector	All sectors	4Rs	Re-mode	Technical Maturity	Initial real-world operation	Commercial Maturity:	Operating commercially
Definition: [Trajectory]	Charging or fuel infrastructure is a core component of a healthy transport ecosystem and requires adequate planning and dedicated facilities and energy/utility networks connected into a distribution grid. Electric Vehicle charging networks have grown substantially in recent years through public and private investment to serve the road freight sector alongside an emergence of hydrogen stations serving HGVs; the latter of which is growing in popularity. Compressed Natural Gas (CNG) is increasingly viewed as the short-term option to help decarbonise the freight sector quickly and efficiently with a network required to support uptake.							Category	Cleaner Transport		
								Geographical Applicability:			
Best Practice	Use Cases										
	EV Charging Network <b>Wien Energie</b> [Vienna]	Roll out of public EV charging network in the capital over three years with over 1,000 stations now developed and used over 320,000 times since installation began in 2017. This is part of their mission2030 to be carbon neutral within the decade. Additional 'demand orientated' stations are also being installed whilst the 'basic network' covering mainly fast chargers, will be complemented by additional rapid chargers across the city to support the shift towards electric vehicles and tie in with wider micromobility schemes									
	Hydrogen Fuelling Station, <b>BOC</b> [Aberdeen]	Aberdeen City Council install a tailored, hydrogen refuelling station at the Kittybrewster bus depot which has been upgraded periodically to cater for a greater range of vehicles, including vans & HGVs. The site has the capacity to produce 360kg of hydrogen daily; enough for the current fleet of 10 x 42-seat buses to travel up to 350km each day. Over a four-year period, a small fleet of 10 buses (or equivalent sized vehicles) saved over 1,000 tonnes of carbon dioxide compared to running the latest Euro 6 diesel engines, helping to improve air quality in the city.									
	Electric Highway <b>Ecotricity</b> [UK]	Ecotricity, in partnership with Nissan, has installed strategically placed electric vehicle rapid-charging infrastructure at over half the UK's motorway service stations to help address "range anxiety", one of the barriers to electric vehicle adoption. This involved working with various service station providers to fuel vehicles in quick time; all powered through renewable energy sources to power longer distances journeys.									
	CNG Network <b>Foresight Group</b> [UK]	CNG Fuels opened its fifth refuelling station near Birmingham last week, and the funding will see it develop at least 14 further public access stations on major routes over the next two years, quadrupling the company's capacity and enabling it to refuel 8,000 vehicles a day. The fuel is 35%-40% cheaper than diesel and cuts vehicle greenhouse gas emissions by up to 85%. CNG Fuels has secured a pipeline of development sites on major trucking routes to serve fleet operators throughout Great Britain. Stations due to open next year include major trucking hotspots such as Eurocentral, near Glasgow, Milton Keynes, Avonmouth and Wakefield.									
Opportunities	The key ingredient for a quick transition towards a zero-carbon future with additional charge points facilitating the expansion of additional vehicle sales and volumes.										
Barriers	Investment and support from national government towards decarbonising transport and providing the road freight sector with the time and incentive to make the transition.										
Local Relevancy	Highly relevant in Ireland with progress already underway to establish a network by Gas Works Ireland. One is currently present within Dublin Port and 7 are planned across the GDA with additional fuelling stations being sight at major trip attractors and servicing larger fleet operators travelling along radial route along the primary route network outside of (and on) the M50. Low processing, transportation and electricity costs make it a low-cost, clean solution which can be scaled up quickly to aid the freight sector to transition towards zero carbon quickly.										
Impact on Freight Objectives											
Economy			Environment				Society				
Freight efficiency		Max	Air quality		Max	Safety		Improve the safety of the sector to reduce the number of accidents involving goods vehicles (particularly linked to vulnerable users)			Min
Improved journey times, optimised use of fleets, delay mitigation and improved supply chain connectivity to save time and costs			Reduce the impact of the sector through air quality improvements and a reduction in other forms of pollution and intrusive activities								
Industry contribution		Med	Greenhouse gas emissions		Max	Community disturbance		Reduce the impact of freight on communities, noise levels, air quality and informal overnight lorry parking			Min
Improved jobs and opportunities to address skills shortages, support for inward investment, land availability, infrastructure provision			Reduction in greenhouse gas emissions from the sector to achieve net-zero by 2050								
Connectivity		Med	Urban realm		Med	Placemaking		Better integrate freight into land use planning, development, construction and servicing plans, better freight data			Max
Improved connectivity seamless intermodal activity to support local, national and international freight movements across the area			Minimising the intrusive impact of freight transport on visual amenity and local, protected settings								

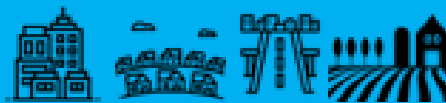
CARGO HANDLING EQUIPMENT		Mode Relevance	 	Freight Sector	Rail, Sea (Ports/IWW)	4Rs	Re-duce, Re-mode	Technical Maturity	Technical operation	Commercial Maturity:	New commercial operation
Definition: [Trajectory]	Cargo Handling Equipment is the provision of off-road, self-propelled vehicle or equipment used in the context of an intermodal rail yard or port/dock facility to lift or move container, bulk, or liquid cargo carried by ship, train, or another vehicle. Cargo handling equipment is still largely diesel-based and involves a lot of CO2 emissions with equipment, including reach stackers and empty container handlers – contributing almost a quarter of the total emissions attributed to a site. Handling goods can also be noisy and contribute towards sound pollution which can have a disproportionate impact on local neighbourhoods.							Category		Cleaner Transport	
								Geographical Applicability:			
Best Practice		Use Cases									
	Electric Top Handlers <b>Everport Terminal</b> [Los Angeles]	As part of the Everport Advanced Cargo Handling Demonstration Project, the world's first zero-emission battery-electric top handlers will be tested at a California container terminal as part of a port's drive for clean cargo-handling operations. The battery-electric top handlers, which are off-road vehicles with an overhead boom for loading containers, run on a one-megawatt battery designed to operate for up to 18 hours between charges. Each top handler has a data logger for tracking hours of operation, charging frequency, energy usage and other performance indicators. The port aims to advance commercially feasible solutions to meet its goal of transitioning all cargo-handling equipment to zero emissions by 2030.									
	Hydrogen Container Yard Crane, <b>KICT</b> [Japan]	A new near zero-emission (NZE) rubber-tired gantry (RTG) container yard crane is being piloted at the MOL-operated Kobe International Container Terminal (KICT). The model seeks to improves fuel consumption by 20-30% and reduces emissions of CO2 and other harmful substances in diesel exhaust in comparison with conventional fuels. The introduction of the NZE RTG matches the concept of Carbon Neutral Port (CNP), which is an initiative of Japan's Ministry of Land, Infrastructure, Transport and Tourism aimed at achieving decarbonization in ports and harbours									
	Renewable Diesel Fuel <b>Fenix Marine Services</b> [Los Angeles]	The Fenix Marine Services, a container terminal at the Port of Los Angeles that handles 2m containers a year, has transitioned its entire fleet of more than 300 pieces of container-handling equipment, as well as some support vehicles, from fossil-based diesel fuel to renewable diesel fuel, a blend made 80% of recycled organic oils and animal fats, and 20% of biomass. Fenix has been able to immediately and significantly reduce its harmful emissions while also minimizing its costs and the time required for such a transformation. The change does not require any modifications to the equipment and can simply replace conventional fuels. This is taking place alongside a trial of five hydrogen-fuelled heavy-duty trucks, two battery-electric yard tractors, and two battery-electric forklifts through the Shore 2 Shore project.									
Opportunities		New equipment is being trialled globally and introduced as a key way for ports and rail yards to reduce emissions, with wider benefits to society from lower noise pollution.									
Barriers		Making the transition towards electric or hydrogen fuelled handling equipment will require investment in fuelling infrastructure on site. This will take time.									
Local Relevancy		Dublin Port is exploring automated and electrically powered cargo handling equipment as part of its 2040 masterplan are using a combination of primary and secondary handling equipment to ensure the quick turnaround of ships and better use of the space available within the Port. Space is a key constraint, but future investment could look to upgrade equipment to reduce emissions. Future investment in railheads and IWW infrastructure (mini ports) could look to go green with these likely to require <u>less</u> substantial mechanisms and capital costs for investment.									
Impact on Freight Objectives											
Economy				Environment				Society			
Freight efficiency Improved journey times, optimised use of fleets, delay mitigation and improved supply chain connectivity to save time and costs			Max	Air quality Reduce the impact of the sector through air quality improvements and a reduction in other forms of pollution and intrusive activities			Max	Safety Improve the safety of the sector to reduce the number of accidents involving goods vehicles			Min
Industry contribution Improved jobs and opportunities to address skills shortages, support for inward investment, land availability, infrastructure provision			Min	Greenhouse gas emissions Reduction in greenhouse gas emissions from the sector to achieve net-zero by 2050			Max	Community disturbance Reduce the impact of freight on communities, noise levels, air quality and informal overnight lorry parking			Max
Connectivity Improved connectivity seamless intermodal activity to support local, national and international freight movements across the area			Max	Urban realm Minimising the intrusive impact of freight transport on visual amenity and local, protected settings			Min	Placemaking Better integrate freight into land use planning, development, construction and servicing plans, better freight data			Min




E-CARGO BIKES		Mode Relevance			Freight Sector	Last Mile Logistics	4Rs	Re-mode	Technical Maturity	Initial real-world operation	Commercial Maturity:	Operating commercially
Definition: [Trajectory]	Electric cargo bikes are a highly versatile form of first and last mile freight transportation that can replace deliveries in urban areas traditionally made by light goods vehicles (LGVs), whilst using a fraction of the roadspace. Being electrically assisted, they enable the rider to efficiently transport cargo with zero emissions at street level, with some variants able to carry loads of 250kgs+. Additionally, where infrastructure allows, they can use the cycling network to efficiently move around a city and their smaller size allows them to be parked more conveniently near to their destination and to have access to pedestrianised areas.								Category		New Modes	
									Geographical Applicability:			
Best Practice		Use Cases										
	Outspoken Cycles <b>Zedify</b> [UK]	Zedify use a fleet of zero emission cargo bicycles and tricycles, supplemented by electric vans, that operate out of small urban logistics hubs to fulfil deliveries and collections in urban areas. At the hubs, items are sorted into local, digitally-tracked delivery rounds and sent to their final addresses by specially adapted cargo bikes carrying up to 250kg – or electric vans for longer distances, if needed. Clients include online retailers, logistics carriers, as well as local businesses for ‘across town’ same day deliveries. They currently operate in 9 UK cities, including Cambridge, London, Edinburgh, Glasgow and most recently in Bristol										
	DHL <b>City Hub</b> [Utrecht, Netherlands]	DHL Express is piloting a new City Hub concept that will enable increased use of cargo bicycles for inner-city deliveries. The City Hub is a customised trailer which can carry up to four containers for the DHL Cubicycle, a customised cargo bicycle which can carry a container with a load of up to 125 kg (one cubic meter in volume). A DHL van delivers the trailer into the city centre, where the containers can be quickly loaded on to two Cubicycles for last-mile inner-city delivery. It can then be reloaded for outbound shipments. DHL Express has already replaced up to 60% of inner-city vehicle routes in some European countries with cargo bicycles and they plan to roll out the approach more widely over the next 3-5 years.										
	Hereford Pedicabs <b>Pedicargo</b> [Hereford]	Hereford PediCargo collect business waste for recycling on a weekly or ad hoc basis. They use cargo trikes and deployable trailer bins to gather the city’s paper, cardboard and plastic and then shred, compact and send it for recycling. The service is then invoiced at the end of the month to collect cash from the clients. Having diversified from a pedicab service after identifying a lack of trade waste recycling facilities in Hereford, they now provide an easy way to recycle waste, much of which would ordinarily go to landfill despite 80% of the waste being recyclable. Having rapidly grown, they now operate a fleet of e-cargo bikes and prevent over 10,000kg of recyclable waste from going to landfill every week.										
Major Market Failures		General Challenges	Previous work has identified that e-cargo bike operators face a number of challenges which affect their ability to compete with traditional van traffic. Firstly, in logistics, e-cargo bike operators are subject to strong downward price pressures and the margins in logistics are quite slim, making expedient or risky investments very difficult. Furthermore, as a relatively new mode, there is a limited market for e-cargo bikes and many models haven’t gone through the same rigorous testing processes as ordinary bikes. This leads to issues with reliability and increases costs, especially given that some larger models can cost in excess of £10,000. Whilst e-cargo bikes are highly versatile, clearly much larger modes are out of scope. This can result in partners needing to manage two separate operators, which often proves too costly or time-consuming.									
Opportunities		Links to micro-consolidation centres and mobility hubs, logistics centred development										
Barriers		Limited to a small geography, cannot carry some larger loads, not suited to all locations, dependent to a degree on urban form										
Local Relevancy		Dublin has over 200km of cycle network and although there are issues with its attractiveness and coherence (to be addressed through planned investment), it offers the opportunity to support the safe and efficient movement of goods by bike. E cargo bikes are likely to have a competitive advantage over other vehicles especially where measures are introduced to limit and restrict vehicle access (pedestrianisation, timed closures or a CAZ) whilst there are plentiful opportunities for established couriers and third part logistics providers to remode from new and potential consolidation points within the cordon area defined by the current HGV Management Strategy. E cargo bikes can form part of a more intermodal freight system within an urban setting; delivering over the last mile and supporting reverse logistics whilst they can have relevance in smaller towns across the GDA through ‘only mile’ schemes.										
Impact on Freight Objectives												
Economy				Environment				Society				
Freight efficiency			Max	Air quality			Max	Safety			Max	
Improved journey times, optimised use of fleets, delay mitigation and improved supply chain connectivity to save time and costs				Reduce the impact of the sector through air quality improvements and a reduction in other forms of pollution and intrusive activities				Improve the safety of the sector to reduce the number of accidents involving goods vehicles				
Industry contribution				Greenhouse gas emissions				Community disturbance				
Improved jobs and opportunities to address skills shortages, support for inward investment, land availability, infrastructure provision			Max	Reduction in greenhouse gas emissions from the sector to achieve net-zero by 2050			Max	Reduce the impact of freight on communities, noise levels, air quality and informal overnight lorry parking			Max	
Connectivity			Max	Urban realm			Max	Placemaking			Max	
Improved connectivity seamless intermodal activity to support local, national and international freight movements across the area				Minimising the intrusive impact of freight transport on visual amenity and local, protected settings				Better integrate freight into land use planning, development, construction and servicing plans, better freight data				



WATERBOURNE FREIGHT		Modes Relevance	 	Freight Sector	Haulage	4Rs	Re-mode	Technical Maturity	Technical operation	Commercial Maturity:	Commercial Operation
Definition: [Trajectory]	A city's waterways are often an underutilised asset and yet, whilst the roads are increasingly congested, the rivers and canals experience very little traffic and run right through the heart of many of our towns and cities. There is an opportunity to connect transport networks and watersides for goods transshipment without needing to interface with road traffic. Equally, waterbourne freight can be used for accessing hard to reach areas inaccessible for other vehicles and can be used as compounds for construction activity taking place canalside or adjacent to river courses. Waterbourne freight is apt at carrying non-time dependent, non-perishable bulky goods (such as aggregate materials) or abnormal loads with affiliated infrastructure required for goods handling and storage.							Category	New Modes		
								Geographical Applicability:			
Best Practice	Use Cases										
	River Barges Vert chez Vous [Paris]	An intermodal example of using low emission vehicles, combining barges and e-tricycles to deliver 2,500 packages each day. The ship doubles up as floating 'mobile' warehouse that cruises on the river Seine, with 5 pre-set stops per day with seamless transition and handling of goods between modes. Each trike has a 2m cargo hold, while the barge holds 120m, so a total of 60 full bike loads can be delivered each day. Space constraints put additional value on a moving warehouse as more stops can be made per day.									
	Green Highway Ship Canal [Manchester]	The Port of Liverpool and the Manchester Ship Canal are jointly owned and managed by Peel Ports and now handle more than 40 million tonnes of cargo and 15,000 ship movements. A canal barge service linking Liverpool and Manchester serves as a 'green highway' and provides an alternative to the congested motorway network in the North West; with each journey equating to a saving of 180kgs of CO2 emissions, with the potential to save an additional 2,000 tonnes of CO2 per annum. Until recently the service carried only containers, but the carriage of a giant chemical tank to a facility at Runcorn saw the start of non-containerised traffic									
	Aggregate Shipments Hanson, Grand Canal [London]	The shipment of 450,000 tonnes of aggregate started in 2003 as part of a new initiative to move sand and gravel by water and avoid using congested local roads (with width restrictions also in place) from the gravel pit to a canalside concrete making plant owned by Hanson, the international construction materials group at Stockley Park, West London. Up to 60,000 tonnes was move by four crafts annually over a distance of 5 miles: with sometimes two journeys a day. This culminated into taking off 6,000 lorry movements off the network each year.									
Major Market Failures	New Lock System Albert Canal [Belgium]	The Albert canal, located in the eastern part of Flanders and used as a vital connection between industrial zones around Liege with the harbour of Antwerp, recently invested in new lock systems and developed a dependency on the Meuse Basin to receive water for the sluice gates. As a consequence of climate change, it is projected that there will be extensions to the discharge time for water to feed through the sluices to feed into the canal system to support navigation of ships along its course.									
Opportunities	Increasingly popular as a cost-effective means for transporting bulkier goods and removing HGV traffic from sensitive and hard to reach urban areas. Can integrate with other land uses and transport networks.										
Barriers	Does require handling and canal/riverside infrastructure (mini ports) and enhanced integration with portside facilities (if required). River and canals must be navigable and future proofed for long term use										
Local Relevancy	The GDA has a number of navigable watercourses that are underutilised for freight transport; despite them being originally built to serve this purpose. Whilst there is currently a lack of integration and dedicated provision to support waterbourne freight and transshipment/goods handling between modes, the Grand Canal and the River Liffey are radial in nature; connecting the hinterlands of the GDA to the core of Dublin. Waterbourne freight could refer to carrying aggregate and construction materials (bulky loads) with higher capacity loads, at a slow pace that avoids congestion and reduces HGV volumes between compounds on the edge of the GDA/Dublin, through to smaller consignments of parcels and more time critical deliveries using passenger services and last mile deliveries by e-cargo bike. Waterbourne freight has huge scope to reduce HGV movements destined for the city centre and potential to connect into port infrastructure for delivery of consignments within the M50 boundary.										
Impact on Freight Objectives											
Economy			Environment				Society				
Freight efficiency Improved journey times, optimised use of fleets, delay mitigation and improved supply chain connectivity to save time and costs		Max	Air quality Reduce the impact of the sector through air quality improvements and a reduction in other forms of pollution and intrusive activities			Max	Safety Improve the safety of the sector to reduce the number of accidents involving goods vehicles			Max	
Industry contribution Improved jobs and opportunities to address skills shortages, support for inward investment, land availability, infrastructure provision		Med	Greenhouse gas emissions Reduction in greenhouse gas emissions from the sector to achieve net-zero by 2050			Med	Community disturbance Reduce the impact of freight on communities, noise levels, air quality and informal overnight lorry parking			Med	
Connectivity Improved connectivity seamless intermodal activity to support local, national and international freight movements across the area		Max	Urban realm Minimising the intrusive impact of freight transport on visual amenity and local, protected settings			Max	Placemaking Better integrate freight into land use planning, development, construction and servicing plans, better freight data			Min	



FREIGHT ON PUBLIC TRANSPORT		Modes Relevance		Freight Sector	Haulage/ Courier	4Rs	Re-mode, Re-time, Re-duce	Technical Maturity	Technical operation	Commercial Maturity:	Commercial Operation
Definition: [Trajectory]	Train stations act as major transport interchanges and offer unparalleled direct access to city centres and low journey times compared to travel by road. This is a benefit to logistics as it is to passengers and could allow e cargo bikes to collect parcels offloaded from trains for onward delivery. Similarly, buses are running below capacity and supplementing the movement of people with freight would add another much-needed revenue stream and it would in turn improve the experience for passengers. The routing algorithms that underpin DDRT could factor in both people and freight to create the most efficient routes that do not compromise on customer experience or journey times.							Category	New Modes		
								Geographical Applicability:			
Best Practice	Use Cases										
	GB Railfreight <b>Freight rail</b> [UK]	UK rail freight operator GB Railfreight has taken a leaf out of the air cargo industry playbook and converted a commuter train to carry express freight to London. The company completed a trial shipment of NHS supplies on a passenger train on the West Midlands to London route in 2020, and said that with minor interior modifications, it could be loaded in both dedicated freight terminals or platform-side in any town or city that has a station and appropriate road access. The train was loaded with cages that can each carry 200kg of packages and parcels. The test was to ensure that the cages could be loaded/unloaded from the trains existing door arrangement, with minimal modifications, and to see how many of the parcel cages could be conveyed within each vehicle with seating removed or a modified seating arrangement."									
	HobbyDB <b>PostBus</b> [Switzerland]	PostBus Switzerland is a subsidiary company of the Swiss Post, which provides regional and rural bus services throughout Switzerland, and also in France and Liechtenstein. Whilst post and passengers are mostly separate in Switzerland, the PostBus still exists to connect to post offices in peripheral regions. The federal law and the Swiss Constitution stipulate that every village with a population greater than 40 is entitled to regular bus services. The frequency of these services is in direct proportion to the population density, however, for the most remote communities, combining postal and passenger movements makes commercial sense.									
	Greyhound <b>Greyhound Freight</b> [Australia]	Using the Greyhound Coach network, and available space on coaches, the Greyhound Freight division delivers over 220,000 freight items each year from major capital cities and country towns to the most remote places in Australia. Greyhound Freight offers competitive rates, and as parcels travel on regular scheduled services, and there is no need to wait for a full freight load to depart. As soon as freight has been received in their depot, it departs on the next available coach service.									
Major Market Failures	Royal Mail <b>Postbus</b> [UK, Historic]	Royal Mail postbuses used to be a common sight in some rural areas across the United Kingdom, most notably across the Yorkshire Dales and South West Scotland, but as the needs of passengers and freight diverged, so did the respective services. The postbus was originally created to replace rapidly declining local bus and rail services across remote locations where they sometimes served as the only form of public transportation, running once or twice a day. Even as recently as 2006 there were more than 200 services running.									
Opportunities	Creating consolidation hubs at rail stations to create a modal interchange for goods for onward delivery by last mile modes										
Barriers	Regulatory barriers to moving freight alongside passengers, security concerns										
Local Relevancy	This is an area that has not yet been explored to any extent across the GDA but would align with the expansion of transport networks and service provision (e.g. Dart, Laus Line etc.). Emerging from the pandemic, many operators will be exploring new revenue streams to complement a core, but reduced commuter and leisure offer. The density of rail and tram connections and improvements to bus provision and priority along arterial routes radiating from Dublin is particularly conducive to shipping goods efficiently; with first & last mile logistics in place to transfer goods (parcels) between origins and destinations. This would supplement the scaling up of e cargo bike whilst freight on public transport would apply to reaching out into rural hinterlands; saving suppliers of goods and <u>third-party</u> logistics suppliers significant costs from consolidating/dovetailing pre-existing vehicle services										
Impact on Freight Objectives											
Economy			Environment				Society				
<b>Freight efficiency</b> Improved journey times, optimised use of fleets, delay mitigation and improved supply chain connectivity to save time and costs		Max	<b>Air quality</b> Reduce the impact of the sector through air quality improvements and a reduction in other forms of pollution and intrusive activities		Max	<b>Safety</b> Improve the safety of the sector to reduce the number of accidents involving goods vehicles		Min			
<b>Industry contribution</b> Improved jobs and opportunities to address skills shortages, support for inward investment, land availability, infrastructure provision		Med	<b>Greenhouse gas emissions</b> Reduction in greenhouse gas emissions from the sector to achieve net-zero by 2050		Med	<b>Community disturbance</b> Reduce the impact of freight on communities, noise levels, air quality and informal overnight lorry parking		Min			
<b>Connectivity</b> Improved connectivity seamless intermodal activity to support local, national and international freight movements across the area		Max	<b>Urban realm</b> Minimising the intrusive impact of freight transport on visual amenity and local, protected settings		Med	<b>Placemaking</b> Better integrate freight into land use planning, development, construction and servicing plans, better freight data		Min			








PORT SIDE BOOKING SYSTEM		Mode Relevance		Freight Sector	Container Haulage (Freight Forwarding)	4 Rs	Re-time	Technical Maturity	Mature technical operation	Commercial Maturity:	Mature commercial operation
Definition: [Trajectory]	Bottlenecks, producing truck congestion inside and outside the terminal, can lead to serious local environmental problems such as noise and harmful emissions, but also to major inefficiencies in various operations. The main cause of truck congestion is the fluctuating arrival pattern of trucks. This results in a situation where demand significantly exceeds supply or vice versa. Truck appointment systems (TAS) allow ports to reduce peaks in truck arrivals. Thereby, the operation costs for terminals and the waiting times for trucking companies are reduced							Category		Data and Connectivity	
								Geographical Applicability:			
Best Practice		Use Cases									
	1-Stop Vehicle Booking System (VBS) [Australasia / SE Asia]	VBS was developed to drive efficiencies by addressing the common issues shared by port communities around the world – the lack of transparent information flow, under-utilisation of equipment and inefficient practices. VBS allows terminal operators to match terminal resources with landside demand. Terminals can configure timeslots, work-day calendars and business rules, and create and maintain customer details. For example, when the quayside is busy, landside resources can be adjusted to support best use of equipment. Equally, when quayside activity is lower, landside operations can be ramped up to support clearing for the next vessel arrival.									
	Terminal Appointment Booking System [Manila, Philippines]	Manila's two main terminals have launched a vehicle booking system that is expected to improve container flows into and out of the port as the Philippines' peak shipping season approaches. The Terminal Appointment Booking System, or TABS, was a response to the truck ban and road policies that were introduced by the local government in 2014 to combat the traffic congestion in Manila but only served to bring the port to a complete standstill with vessel delays often measured in weeks. TABS will also allow the terminals to better manage their port capacity and ensure the resources are in place to handle more predictable volumes and scheduling.									
	DP World QLess [Antwerp, Germany]	Between 1,400 to 2,400 trucks funnel through the Antwerp Gateway Terminal each day which creates large lines of idling vehicles waiting to drop off or retrieve cargo. As soon as the vehicle booking system for terminal capacity management was implemented, the port experienced massive improvements: Firstly, all truck lines have been eliminated. As a result, exchange areas are always now reachable because there are not hundreds of trucks blocking common areas. Additionally, traffic jams leading in and out of the port have been eradicated. Truck drivers now avoid wasting hours a day waiting in line which, within the first year of the new queuing system, is expected to result in eliminating at least 730,000 kilograms of CO2.									
Major Market Failures	Hutchison Port of Felixstowe [UK]	The UK's largest container port, Port of Felixstowe, is making some significant changes to its troubled vehicle booking system (VBS) following criticism from the British International Freight Association to try to prevent container collection slots for box hauliers and freight forwarders being wasted. The failure of the system has come about as a result of a poorly migration to the new systems and a spike in demand for the movement of containers. A statement from BIFA read "BIFA members have suffered from two years of poor service from the port, and we feel that there is a need for independent intervention by government to address the many issues faced by the port's users."									
Opportunities	Integration with real-time fleet management systems to enable flexible scheduling dependent on slot availability to reduce waiting time. Active routing of drayage trucks through the port based on internal traffic.										
Barriers	Most actors of the port community are small-sized, and struggle to fund the investment for developing or modifying their systems for connecting to the booking system										
Local Relevancy	The management of vehicle access to Dublin Port (the focus area for this measure) complements the development of Dublin Inland Port and the recognition that Dublin Port Tunnel carries a substantial volume of freight traffic now with future forecasting likely to put huge constraints on capacity. A booking system that enables hauliers and freight forwarders to better plan journeys and provides Dublin Port Company (DPC) to better utilise and manage limited on-site space, will help bring benefits to journey times, reduce backlogs and improve the overall transshipment experience between road and sea. A booking system, featuring clear guidance on customs procedures and live traffic information, could be equally applicable for other sea ports (Drogheda and Wicklow).										
Impact on Freight Objectives											
Economy			Environment				Society				
Freight efficiency Improved journey times, optimised use of fleets, delay mitigation and improved supply chain connectivity to save time and costs		Max	Air quality Reduce the impact of the sector through air quality improvements and a reduction in other forms of pollution and intrusive activities		Med	Safety Improve the safety of the sector to reduce the number of accidents involving goods vehicles		Min			
Industry contribution Improved jobs and opportunities to address skills shortages, support for inward investment, land availability, infrastructure provision		Min	Greenhouse gas emissions Reduction in greenhouse gas emissions from the sector to achieve net-zero by 2050		Med	Community disturbance Reduce the impact of freight on communities, noise levels, air quality and informal overnight lorry parking		Min			
Connectivity Improved connectivity seamless intermodal activity to support local, national and international freight movements across the area		Max	Urban realm Minimising the intrusive impact of freight transport on visual amenity and local, protected settings		Med	Placemaking Better integrate freight into land use planning, development, construction and servicing plans, better freight data		Min			


TELEMATICS		Mode Relevance	All freight modes	Freight Sector	Road (Haulage/Courier)	4 Rs	Re-route, Re-time	Technical Maturity	Mature technical operation	Commercial Maturity:	Mature commercial operation
Definition: [Trajectory]	Fleet management tools can provide real-time visibility into fleet operations while increasing driver satisfaction and decreasing fuel usage through predictive analytics and accurate reporting. It also helps fleet managers ensure that their operations are adhering to the complex regulations governing the industry. Fleet management can also improve operational efficiency by assigning and dispatching routes to drivers in real-time to ensure accurate pickups, deliveries and returns. Solutions include hazard alert services, delivery tracking, and dynamic routing							Category		Data and Connectivity	
								Geographical Applicability:			
Best Practice	Use Cases										
	GeoTab Gnewt [London, UK]	has the UK's largest fully electric commercial vehicle fleet. Delivering zero-emission final mile logistics for retailers and third-party logistics companies, Gnewt's fleet of double payload modified vans has transformed green deliveries in London – growing from just a handful of vans into the UK's largest all-electric fleet. Gnewt needed to optimise its operations in order to compete with ICE delivery companies which were often cheaper. To add to this, there are charging limitations with only a finite amount of power coming into its charging depot. Only 35 vehicles a day could be fully charged at first. To combat these constraints, drive greater scalability, and provide a platform for future innovation, Gnewt needed a telematics solution that could transform how it views and models its fleet's charging operations – one that could directly feed in vital intelligence on vehicle state of charge									
	OptimoRoute [Software]	OptimoRoute enables users to optimise for the best routes & schedules while respecting all order and task criteria: priority, time windows, day of week, date range, reverse logistics orders, variable job durations vehicle matching (e.g. loading ramp/refrigeration). List minute orders can be integrated into route plans and automatically recalculated to reflect manual changes. It also integrates with delivery systems to provide proof of delivery, capturing digital signatures and sending messages to customers informing them when the driver is scheduled to arrive.									
	E-cargo bikes Zedify [UK, Nationwide]	Zedify built their own robust, efficient technology platform that addresses the specific demands of providing predominantly cargo bike based city logistics. Routes are optimised daily meaning deliveries are made as quickly and efficiently as possible. Barcode scanning enables consistency with other systems in the supply chain. Digital proof of delivery capture provides end-to-end tracking and client login means deliveries can be booked and tracked and reports accessed directly.									
Major Market Failures	General	Route planning and optimisation is currently executed in isolation by individual fleet operators. There is a risk that if multiple fleet operators optimise their routing strategies in response to the same stimuli (e.g. diverting freight traffic onto a lower capacity road to avoid congestion), this could create new problems elsewhere. To counter this, more data sharing between major hauliers should be encouraged. Simulations have shown that if we were all willing to take a wider variety of coordinated routes that may not be optimised on an individual level, it would yield an overall reduction in congestion.									
Opportunities	Vehicle emissions savings due to route optimisation, reducing the amount of stem mileage and empty running. Better co-ordination of assets resulting in reduced waiting times and delivery windows										
Barriers	No co-ordination between operators, only done in isolation										
Local Relevancy	Larger fleet operators can again pave the way for the uptake in telematics and in cab technologies as they are more likely to have access to capital for upgrades and associated driver training requirements. The use and application of telematics can be a short-term win for helping the road sector, particularly HGVs, decarbonise in the event of a slower transition to alternative fuels. Congestion on the network and routing concerns in and around Dublin, as well as a lack of network resilience provided by on ground infrastructure, makes telematics investment a cost effective way to improve driver efficiency (and save costs), improve road safety and reduce the externalities from road freight movements (all led by industry).										
Impact on Freight Objectives											
Economy				Environment				Society			
Freight efficiency		Max	Air quality		Max	Safety		Min			
Improved journey times, optimised use of fleets, delay mitigation and improved supply chain connectivity to save time and costs			Reduce the impact of the sector through air quality improvements and a reduction in other forms of pollution and intrusive activities			Improve the safety of the sector to reduce the number of accidents involving goods vehicles					
Industry contribution		Min	Greenhouse gas emissions		Max	Community disturbance		Max			
Improved jobs and opportunities to address skills shortages, support for inward investment, land availability, infrastructure provision			Reduction in greenhouse gas emissions from the sector to achieve net-zero by 2050			Reduce the impact of freight on communities, noise levels, air quality and informal overnight lorry parking					
Connectivity		Med	Urban realm		Med	Placemaking		Max			
Improved connectivity seamless intermodal activity to support local, national and international freight movements across the area			Minimising the intrusive impact of freight transport on visual amenity and local, protected settings			Better integrate freight into land use planning, development, construction and servicing plans, better freight data					

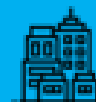
DYNAMIC KERBSIDE MANAGEMENT		Mode Relevance	 	Freight Sector	Last Mile Logistics & B2B Couriers	4Rs	Re-time, Re-route	Technical Maturity	Piloting	Commercial Maturity:	Not operating commercially
Definition: [Trend]	Dynamic kerbspace management allows spaces to be booked through a connected digital system. This enables the creation of virtual loading bays and for the use of kerbspace to be changed throughout the day to better suit local demand. It also enables dynamic pricing structures to manage demand for parking across urban areas and to ensure that the roadside is clear ahead of essential works or events.							Category	Data and Connectivity		
								Geographical Applicability:			
Best Practice	Use Cases										
	Grid Smarter Cities Kerb [Dublin, Westminster]	Grid Smarter Cities have been working with Dublin City Council to better understand and analyse potential use-cases for Kerb, their Intelligent Kerbside Management solution in the city centre—with the ambition to dynamically manage the kerbside with the use of Virtual Loading Bays (VLBs). Kerb is an app that gives commercial vehicles the ability to book a Virtual Loading Bay (VLB) on previously restricted kerb space in the city or to extend loading periods in time restricted locations. This added flexibility helps to ensure that more deliveries are made during in the least disruptive places and periods.									
	Ford GoPark [London, Islington]	GoPark has been developed in collaboration with city and local government partners to manage their kerbspace more effectively. Previous and current work includes digitally mapping city on-street parking, a parking guidance app for drivers, and using live vehicle data to identify empty parking spaces nearby. the app (still in beta testing) distils all of Islington's convoluted parking rules down to three pieces of information: Can you park here? If so, for how long? And how much will it cost?									
	Arup FlexKerbs [Simulation]	To understand if, and to what extent, FlexKerbs could support CAV deployment while maintaining streets' active and placemaking functions, this project simulated FlexKerb functionality on Cheapside—the historic high street in the City of London. An illustrative 24-hour schedule was devised of FlexKerb space allocation, informed by demand data but driven by local policy, which was then tested using microsimulation modelling. This assessment demonstrated that FlexKerbs would serve as a highly effective tool for improving both the operational efficiency and the public realm of a CAV-enabled street especially.									
Major Market Failures		[Currently in piloting and proof of concept stage]									
Opportunities	Better management of kerb space, dynamic uses throughout the day to enable space to be used more efficiently, fewer PCN issues to operators, enables other uses such as 'play streets' or 'school streets' during the day. Also offer more clarity to operators and consumers to have the certainty that loading bays will be available and that space can be used as needed, potentially closer to the destination. Targeting PCN hotspots.										
Barriers	Digitisation of kerbside could be costly, enforcement for non-digital users without using physical measures, possible policy and TRO implications. Needs to involve lots of silo organisations, shifted revenue streams										
Local Relevancy	Dublin already has experience of deploying kerbside management practices so could look to reflect on the feedback from trials to scale up its application to dovetail proposed changes to streets within the city centre (through pedestrianisation). There is an opportunity to take a proactive approach towards developments across the Quays and Docklands to introduce smart systems as l way to mitigate the impact of future delivery movements on the local environment and ultimately the final design of new sites (i.e. not building plentiful delivery and servicing spaces but making best use of selected areas). A single platform that can be rolled out to local service centres and smaller urban centres across the GDA would be recommended whilst trials in Dublin City Centre covering smart first and last mile deliveries also noted the need to upgrade parking legislation so to support the uptake of new technologies.										
Impact on Freight Objectives											
Economy			Environment				Society				
Freight efficiency Improved journey times, optimised use of fleets, delay mitigation and improved supply chain connectivity to save time and costs		Max	Air quality Reduce the impact of the sector through air quality improvements and a reduction in other forms of pollution and intrusive activities			Min	Safety Improve the safety of the sector to reduce the number of accidents involving goods vehicles			Med	
Industry contribution Improved jobs and opportunities to address skills shortages, support for inward investment, land availability, infrastructure provision		Med	Greenhouse gas emissions Reduction in greenhouse gas emissions from the sector to achieve net-zero by 2050			Min	Community disturbance Reduce the impact of freight on communities, noise levels, air quality and informal overnight lorry parking			Max	
Connectivity Improved connectivity seamless intermodal activity to support local, national and international freight movements across the area		Max	Urban realm Minimising the intrusive impact of freight transport on visual amenity and local, protected settings			Max	Placemaking Better integrate freight into land use planning, development, construction and servicing plans, better freight data			Max	


AUTONOMOUS VEHICLES		Mode Relevance		Freight Sector	Haulage & Cordoned Sites	4Rs	Re-mode	Technical Maturity	Piloting	Commercial Maturity:	Commercial testing / piloting
Definition: [Trend]	Much of the cost of delivery is the costs of drivers' salaries, and often deliveries are slowed due to mandatory rest periods whilst driving. Furthermore, 95% of accidents are attributed to human error, so with increasing automation it is hoped that road safety will improve for all users. CAVs are considered by many to be key to the future of parcel delivery, due in part to the cost savings that can be achieved by removing the need to pay a driver's salary. There are many pilots underway to test different sizes and types of CAVs which vary from small units that travel to residential areas for last mile delivery, to long distance applications using platoons of HGVs on trunk roads.							Category	Automation		
								Geographical Applicability:			
Best Practice	Use Cases										
	ARRIVAL ROBOPILOT [Bristol, UK]	In the ROBOPILOT project, a small all-electric van will be fully automated for local deliveries and tested safely in the north Bristol Innovation Corridor. Also involving work on safety and security (including cyber security), the objective is to deliver parcels on a fully autonomous 10-mile journey in all kinds of weather, and on various types of roads. The project seeks to understand what real-world use cases could adopt highly automated commercial vehicles, helping to overcome existing problems, issues or challenges in the transport system.									
	Nuro Nuro R2 [USA]	Nuro have designed a vehicle specifically to move goods between and among businesses, neighbourhoods, and homes. The fully autonomous vehicle is unmanned and about half the width of a passenger car. It's built with ultra-light materials and designed for neighbourhoods. These combined design elements will make it one of the safest vehicles on the road. Furthermore, this vehicle is the first company to receive a driverless exemption from the federal government in the USA.									
	Oxbotica CargoPod [Greenwich UK]	The trial service is part of the GATEway (Greenwich Automated Transport Environment) program and will operate in the Woolwich area of Greenwich. Once customers place an order at Ocado, the CargoPod collects it and sets out on a number of set routes around the neighbourhood. Each order has its own GPS coordinates, and once the van has reached its programmed destination, customers can collect their order from one of the eight compartments. The van can hold up to 128kg (282 pounds) of groceries at a time.									
Major Market Failures	Uber [USA]	Uber decided in 2020 to sell off its driverless car division to technology start-up Aurora. The move came as part of a drive to push for profitability. The company has maintained a 26% stake in the self-driving subsidiary and continues to maintain an interest, but the programme hit seer setbacks when one of Uber's driverless vehicles hit a woman in Tempe, Arizona in 2018. Although a supervisory driver should have been attentive to intervene, the supervisor was watching a streaming service at the time of the incident.									
Opportunities	Big savings on the cost of delivery thanks to the removal of a human driver, Vehicle could operate continuously without the need for driver breaks. Likely safety benefits due to automated systems not getting tired or distracted etc. Autonomy also allows vehicle platooning to reduce fuel costs.										
Barriers	Trialling is possible as long as the vehicle adheres to the 1988 Road Traffic Act – still requires human oversight. New regulations allow 'hands off, eyes on up to 60kmph, perhaps enabling urban applications but this is not full self-driving and still requires a human in the loop.										
Local Relevancy	Although autonomous vehicles have not be trailed commercially within the GDA, there is potential scope to explore its use for selected scenarios; namely operating a small vehicle within a portside environment for movements of goods and equipment within a cordoned environment. However, the best-case example would seek to use radial road infrastructure and the prominence of longer distance inter regional trip generation as the test bed for autonomous vehicles between the GDA and other parts of Ireland (for example Cork to Dublin along the N7/M7). Autonomous vehicles can help make up for the shortfall in haulage drivers, particularly for longer distance driving.										
Impact on Freight Objectives											
Economy			Environment				Society				
Freight efficiency		Max	Air quality		Med	Safety		Max			
Improved journey times, optimised use of fleets, delay mitigation and improved supply chain connectivity to save time and costs			Reduce the impact of the sector through air quality improvements and a reduction in other forms of pollution and intrusive activities			Improve the safety of the sector to reduce the number of accidents involving goods vehicles					
Industry contribution		Max	Greenhouse gas emissions		Med	Community disturbance		Min			
Improved jobs and opportunities to address skills shortages, support for inward investment, land availability, infrastructure provision			Reduction in greenhouse gas emissions from the sector to achieve net-zero by 2050			Reduce the impact of freight on communities, noise levels, air quality and informal overnight lorry parking					
Connectivity		Med	Urban realm		Max	Placemaking		Min			
Improved connectivity seamless intermodal activity to support local, national and international freight movements across the area			Minimising the intrusive impact of freight transport on visual amenity and local, protected settings			Better integrate freight into land use planning, development, construction and servicing plans, better freight data					


PLATOONING		Mode Relevance:			Freight Sector	Haulage	4Rs	Re-mode	Technical Maturity	Piloting	Commercial Maturity:	Commercial testing / piloting
Definition: [Trend]	In truck platooning highly advanced V2V and sensor technology will allow two or more wirelessly connected trucks to drive at a short distance apart. Using the driving information from the first truck in the platoon, the following vehicles can automatically accelerate, brake and steer. While platooning, when the lead vehicle brakes, the following vehicles automatically brake with no noticeable reaction time significantly increasing road safety. This enables the gap between truck combinations to be reduced as much as possible, which due to slipstreaming can save 10% in fuel and an equivalent reduction in CO2 emissions.								Category		Automation	
									Geographical Applicability:			
Best Practice	Use Cases											
	TRL DAF Vehicle Platooning [UK]	TRL successfully delivered a feasibility study for a UK road trial of autonomous platooning heavy vehicles. Their report predicts significant and practical benefits to road safety, capacity, congestion, CO2 efficiency and fuel economy and defines the aspects that require further information. Their independent assessment provided the Department of Transport with a clear picture of how an autonomous platooning trial could operate for heavy vehicles, along with producing a number of technology roadmaps.										
	TNO ENSEMBLE [Europe]	The ENSEMBLE Project aimed to demonstrate technical trials of platooning technology including ensuring interoperability between different manufacturers, safety and designed-in failsafes that manage the interactions between vehicles in the platoon and other road users. Practical tests on closed testing grounds and in real life serve to an experience of 'learning by doing', to assess the impact on traffic and infrastructure and to promote multi-brand platooning. Furthermore, the project will design an interface to cloud-based services so that the platooning concept can be seamlessly integrated into the logistic value chain.										
	Pelaton PlatoonPro [California, USA]	The Peloton System has proven savings of more than 7% when platooning using industry standard tests: 4.5% for the lead truck, and 10% for the following truck. Platooning only occurs when it's safe, where it's safe, and how it's safe. Peloton's cloud-based Network Operations Cloud (NOC) approves each platoon. It adjusts platooning parameters to be safe for conditions. Each driver is empowered with over-the-horizon alerts at all times. The NOC maximizes platooning opportunities by notifying drivers of potential pairings based on their location and anticipated route. The NOC can find platooning partners for drivers on route or platooning can be planned ahead of time.										
Major Market Failures	Mercedes-Benz	Mercedes-Benz Trucks has concluded that there is no business case for truck platooning, saying that the technology failed to deliver appreciable fuel savings in its on-the-road tests. Although the manufacturer will remain committed to ongoing platooning projects with partners, such as Ensemble in Europe, it now plans to refocus its resources on developing autonomous, self-driving technologies in its trucks.										
Opportunities	Ties in with increasing levels of vehicle automation and is particularly suited to inter regional and national movements of freight along key corridors											
Barriers	Congestion and relatively frequent motorway junctions in the UK may be a barrier to implementation. Regulatory barriers - need to understand the liabilities of the lead and following vehicles when platooning. Successful application would require a critical mass of platoon-capable vehicles on the SRN to provide the opportunities to link with other vehicles.											
Local Relevancy	Highly relevant for interregional trips radiating from the GDA to major conurbations across the rest of the Island or Ireland and may be well suited to complement proposals to improve strategic corridors (i.e. Belfast to Dublin (MI). Platooning, as with automation more generally, can help overcome some of the challenges of recruiting and retaining HGV drivers in Ireland whilst the opportunity for a driver to rest mid route can also offset the demand for a quick investment in lorry parks. Platooning would also dovetail any plans for a priority freight network and the use of its (VMS). As a sector, platooning could aid hauliers with saving costs from enhanced fuel efficiency. There may even be scope for operators to share responsibility and to develop platoons.											
Impact on Freight Objectives												
Economy				Environment				Society				
Freight efficiency Improved journey times, optimised use of fleets, delay mitigation and improved supply chain connectivity to save time and costs		Max	Air quality Reduce the impact of the sector through air quality improvements and a reduction in other forms of pollution and intrusive activities		Max	Safety Improve the safety of the sector to reduce the number of accidents involving goods vehicles		Min				
Industry contribution Improved jobs and opportunities to address skills shortages, support for inward investment, land availability, infrastructure provision		Med	Greenhouse gas emissions Reduction in greenhouse gas emissions from the sector to achieve net-zero by 2050		Max	Community disturbance Reduce the impact of freight on communities, noise levels, air quality and informal overnight lorry parking		Min				
Connectivity Improved connectivity seamless intermodal activity to support local, national and international freight movements across the area		Med	Urban realm Minimising the intrusive impact of freight transport on visual amenity and local, protected settings		Min	Placemaking Better integrate freight into land use planning, development, construction and servicing plans, better freight data		Min				


LOAD SHARING		Mode Relevance	  	Freight Sector	Haulage & Freight Forwarding	4Rs	Re-duce	Technical Maturity	Mature Technical Operation	Commercial Maturity:	Operating Commercially
<b>Definition:</b> [Trajectory]		Load sharing connects parcels to journeys by making use of available space in existing journeys to deliver parcels which otherwise would have been shipped through traditional more expensive means. Load sharing means that businesses can move freight sooner, rather than having to wait until they have accumulated enough product to fill an entire deck. Very often, there is always someone nearby about to undertake a journey, who is prepared to take a parcel to its destination by incorporating a parcel delivery in their routine or occasional trip.						Category		Aggregation	
								Geographical Applicability:		   	
Best Practice		Use Cases									
		Innovate UK <b>FreightShareLab</b> [UK]	FreightShareLab is aiming to reduce empty running and improve partly loaded vehicle percentages. They are developing an open data software platform to coordinate the sharing of assets. In a similar way to what it appears Clear Chain, discussed above, is looking to achieve, they aim that the software will act as a strategic planning tool, integrating job and vehicle data from shippers, fleets and carriers								
		Penske Logistics <b>Clear Chain</b> [USA]	In the United States, Penske Logistics have developed software called Clear Chain that aims to match up empty-running trucks with jobs they could undertake. Real-time visibility of trucks, driver hours and work allow backhaul loading opportunities to constantly be updated and matches to be facilitated when appropriate. Finding the right backhaul opportunity requires intense coordination, because the timing must match at every step of the delivery process. Carriers need to find backhauls that fit within their schedule and also products that work within their trailers.								
		<b>LoadShare</b> [UK]	LoadShare is a unique service connecting parcels to journeys or people to deliveries. If you have a parcel to deliver there is always someone, about to undertake a journey, who is prepared to take that parcel to its destination by incorporating your parcel delivery in their routine or occasional trip. Likewise, if you have a journey to undertake, there is always a parcel close to your route that, for some small deviations of journey, you can take with on route and supplement your journey costs.								
Major Market Failures		<b>Road Tech</b> [UK]	Road Tech is a market leader for providing IT services for the haulage and logistics sectors in the UK. The company trialled a marketplace hub for matching requirements for haulage work with spare capacity with the Road Haulage Association for several years. In the end they concluded it did not work as what was always left were either jobs that no one wanted or ones that were priced at too low a rate. It was also argued that many activities in logistics actually rely on a relationship of trust between the logistics provider and their customer and often include a certain degree of uniqueness so that a commoditised sharing notion, although on the surface an attractive option, in reality is difficult to actually achieve								
Opportunities		Making use of spare capacity on other modes such as rail, bus, DDRT or car.									
Barriers		Most effective in geographies where transport is over longer distances than is common in the UK. Also concerns by operators around data sharing and the value for money for taking up shipment opportunities									
Local Relevancy		This is a mechanism/platform that can be quickly and easily mobilised across the GDA and relies more on the awareness and promotion by industry and public authorities to scale up interest. Empty running is a particular issue within both an urban context (LGVs) and for hauliers having unloaded at ports across the GDA. Load sharing does offer SMEs working within the GDA on tighter margins and less established/regulated customer bases to develop additional workstreams; an approach that could be pursued with the support of trade/industry bodies.									
Impact on Freight Objectives											
Economy			Environment				Society				
<b>Freight efficiency</b> Improved journey times, optimised use of fleets, delay mitigation and improved supply chain connectivity to save time and costs		Max	<b>Air quality</b> Reduce the impact of the sector through air quality improvements and a reduction in other forms of pollution and intrusive activities			Max	<b>Safety</b> Improve the safety of the sector to reduce the number of accidents involving goods vehicles			Min	
<b>Industry contribution</b> Improved jobs and opportunities to address skills shortages, support for inward investment, land availability, infrastructure provision		Min	<b>Greenhouse gas emissions</b> Reduction in greenhouse gas emissions from the sector to achieve net-zero by 2050			Max	<b>Community disturbance</b> Reduce the impact of freight on communities, noise levels, air quality and informal overnight lorry parking			Min	
<b>Connectivity</b> Improved connectivity seamless intermodal activity to support local, national and international freight movements across the area		Med	<b>Urban realm</b> Minimising the intrusive impact of freight transport on visual amenity and local, protected settings			Min	<b>Placemaking</b> Better integrate freight into land use planning, development, construction and servicing plans, better freight data			Min	


WASTE MANAGEMENT PARTNERSHIP		Investment Needed	LOW	Sector	Waste Management	Actors	Public/Private	Risk Level	Low	4Rs	Re-duce
Definition: [Trajectory]	Business Improvement Districts, Chamber of Commerce and other business led groups developing a contract framework with a waste management provider on behalf of levy payers or members to offer a reliable, efficient service that would increase recycling, reduce costs and reduce vehicle movement around the city centre to ease congestion and improve air quality. The basic premise is to consolidate waste collections into fewer vehicles and seek to informally regulate the industry.							Category	Eco Logistics		
								Geographical Applicability:			
Best Practice	Use Cases										
	Suez & Bath BID Trade Waste Partnership [Bath]	The Bath BID has been working in partnership with SUEZ (formerly SITA) for the past seven years to provide a streamlined and excellent citywide trade waste and recycling service for the BID area. The purpose of streamlining the city's trade waste collection and recycling service is to reduce congestion and city pollution by reducing the number of waste collection operators in the city each day and improve the appearance of the public realm in our World Heritage Site. Rates are 25% less for levy payers, with on site support from Suez to foster better recycling practices and reduce the weight of commercial waste. Companies save over 20% on costs of collections and Suez optimises vehicle loads during collections.									
	Bristol Waste & Broadmead BID Zero Emission Collections	Broadmead BID's partnership with Bristol Waste enables all levy-payers to take advantage of discounted, and very competitive, prices. Bristol Waste is proud not to be just a waste collection company, but also a part of the Bristol community, bringing together businesses across Bristol by reducing and re-using waste. There is plenty of B2B movement too as Bristol Waste would like to encourage businesses to recycle crisp packets to reduce general waste stream, with packets a being donated to Bristol Zoo Gardens, who send them to Walkers, who then sends back a small rebate (circular economy)									
	Better Bankside BID Subsidised Recycling Service	All Better Bankside businesses are eligible to sign up for subsidised recycling service with Paper Round offering an allocation of sacks (and 15% discount on food waste sacks) and a subsidised range of other collection requirements (dry recycling). Paper Round will work with the business to arrange collections times and dates that work for the business. They can also come into the business and carry out a waste audit to identify areas were recycling rates can be improved and additional savings made and work with other partners to collect and recycle more unusual consignments									
Opportunities	Fostering better recycling activity and reducing business overheads through behaviour change techniques. Reduces HGV movements and allows for routing optimisation to save provider costs/secure demand										
Barriers	Challenge of operating within an unregulated market where other commercial providers are still present. Needs buy in at volume to work effectively.										
Local Relevancy	An opportunity for Dublin Town, a consortium of businesses and local stakeholders to proactively coordinate future waste management activity to reduce businesses overheads, minimise vehicle trips (and shadowing) and support alternative modes for transport for the collection and serving of properties within Dublin City Centre. This could act as a pilot proof of concept to roll out to other service centres and urban areas. This initiative would help bring together a focus on wider recycling and environmentally friendly practices and catalyse a discussion on the role and impact of deliveries (B2C), the scope for reverse logistics (C2B) and options that businesses could pursue for moving goods and items between levy payers/members (Peer 2 Peer)										
Impact on Freight Objectives											
Economy			Environment				Society				
Freight efficiency Improved journey times, optimised use of fleets, delay mitigation and improved supply chain connectivity to save time and costs		Max	Air quality Reduce the impact of the sector through air quality improvements and a reduction in other forms of pollution and intrusive activities		Med	Safety Improve the safety of the sector to reduce the number of accidents involving goods vehicles		Med			
Industry contribution Improved jobs and opportunities to address skills shortages, support for inward investment, land availability, infrastructure provision		Max	Greenhouse gas emissions Reduction in greenhouse gas emissions from the sector to achieve net-zero by 2050		Med	Community disturbance Reduce the impact of freight on communities, noise levels, air quality and informal overnight lorry parking		Max			
Connectivity Improved connectivity seamless intermodal activity to support local, national and international freight movements across the area		Min	Urban realm Minimising the intrusive impact of freight transport on visual amenity and local, protected settings		Max	Placemaking Better integrate freight into land use planning, development, construction and servicing plans, better freight data		Max			


EMISSION ZONES		Investment Needed	Medium	Sector	Road Transport	Actors	Public	Risk Level	High	4Rs	Re-mode, Re-duce, Re-mode
Definition: [Trend]	A Clean Air Zone is an area where targeted action is taken to improve air quality, in particular by discouraging the most polluting vehicles from entering the zone. No vehicle is banned in the zone, but those which do not have clean enough engines will have to pay a daily charge if they travel within the area. There are different types of emission zones of measures to offset the impact of vehicle traffic on air quality that can be implemented by local authorities (often under the jurisdiction of national government departments).							Category		Regulatory	
								Geographical Applicability:			
Best Practice	Use Cases										
	Ultra-Low Emission Zone (ULEZ) London	The Ultra-Low Emission Zone (ULEZ) operates 24 hours a day, 7 days a week, every day of the year (except Christmas Day). It covered the same area as the Congestion Charge zone until 25 October 2021 when it expands to cover a broader area. Despite recent improvements in air quality, toxic air pollution in remains the biggest environmental risk to the health of all Londoners and reducing the amount of pollution from traffic remains one of the best ways of improving air quality. The vehicle standards for entering these CAZs will be Euro VI for diesel and Euro IV for petrol, any non-compliant vehicles will be charged upon entry to the zone, but not banned									
	Air Quality Speed Limit Trials UK	Trialling 60mph speed limits on short sections of the Strategic Road Network where action needs to be taken to reduce emissions and improve air quality. This is a trail but should result in a reduction in NO <sub>2</sub> when traffic speed is reduced from 70 to 60mph at six locations. The locations (noted above) were identified as locations where NO <sub>2</sub> levels exceed the legal limit annual mean limit level of 40 µg/m <sup>3</sup> .									
	Green Travel Districts Birmingham	Pre-requisite to the Clean Air Zone, The Green Travel Districts sought to focus investment on public transport, walking and cycling to try to encourage people to use cars less, with the city's road infrastructure stretched. The vision is for districts with less congestion, less pollution and fewer accidents to contribute towards Birmingham's carbon and air quality targets. GTDs build on the experiences of Birmingham's Smarter Choices programme by integrating travel awareness on a local level within a wider policy and infrastructure framework and where there were higher concentrations of commercial activity.									
Opportunities	The core objectives of reducing air pollution through regulation and legislation to reduce the number of high emitting vehicles on urban roads and nudge changes in freight practices										
Barriers	Needs government and political backing. Will be less effective if undertaken voluntarily or if the approach does not suggest charging models are applied. Will have disproportionate impact on HGVs										
Local Relevancy	One of the main causes that Dublin would see contributing to its overall pollution levels would be fumes and emissions coming from vehicles, with large amounts of personal automobiles such as cars and motorbikes inhabiting the roads, causing the levels of PM2.5 and other pollutants to skyrocket during certain periods of the day, particularly during rush hour or in any area that sees a high volume of traffic. There is also the issue of HGVs giving off their own pollutants, with many of them running on diesel which can release further pollutants related to the combustion of fossil fuels. An emission zone, targeted at reducing GHG emissions and nudging behaviour change through re-modelling and reducing journeys through the city centre, could complement or replace the HGV cordon; with the opportunity to deploy greater enforcement measures (through ANPR technology) to manage access accordingly.										
Impact on Freight Objectives											
Economy			Environment				Society				
Freight efficiency Improved journey times, optimised use of fleets, delay mitigation and improved supply chain connectivity to save time and costs		Med	Air quality Reduce the impact of the sector through air quality improvements and a reduction in other forms of pollution and intrusive activities		Max	Safety Improve the safety of the sector to reduce the number of accidents involving goods vehicles		Med			
Industry contribution Improved jobs and opportunities to address skills shortages, support for inward investment, land availability, infrastructure provision		Med	Greenhouse gas emissions Reduction in greenhouse gas emissions from the sector to achieve net-zero by 2050		Max	Community disturbance Reduce the impact of freight on communities, noise levels, air quality and informal overnight lorry parking		Max			
Connectivity Improved connectivity seamless intermodal activity to support local, national and international freight movements across the area		Med	Urban realm Minimising the intrusive impact of freight transport on visual amenity and local, protected settings		Min	Placemaking Better integrate freight into land use planning, development, construction and servicing plans, better freight data		Max			


HGV Management /Routing		Investment Needed	Low	Sector	Road (Haulage & Freight Forwarding)	Actors	Public	Risk Level	Medium	4Rs	Re-route, Re-time
Definition: [Trend]	Working with partners to reduce HGV movements on inappropriate routes by working with departments, businesses and fleet operators (drivers included) when travelling through, to and from, and within the GDA. There are notorious challenges with enforcing certain restrictions and raising visibility of them in, around and between key trip generators to minimise externalities, particularly air pollution and road safety issues in urban areas. Dublin has had a HGV Management Strategy in place since 2007 with a cordon being employed across the city centre to limit access for HGVs within the time window through the application of a permit scheme.							Category	Regulatory		
								Geographical Applicability:			
Best Practice	Use Cases										
	Truck Route System Vancouver	Vancouver implemented a truck route system which sought to sift the movement of truck with 3 or more axles and a gross vehicle weight greater than 4.5 tonne along designated routes, which skirted the city centre and passed key trip generators. These were operation on a 24-hour basis with vehicles only able to deviate to make local deliveries. In the city centre, no vehicle with a length greater than 15.25m was permitted between 7am and 6pm, seven days a week with deliveries arriving outside of peaks or in alternative vehicles.									
	Lorry Maps (& Signage) Worcestershire	Lorry Route Map was developed to mitigate the impact of road freight movements that outlined advisory routes for HGVs, identify barriers to lorry movements and highlight suitable facilities for lorry drivers. Major trip attractors, peak time congestion, inclines, width and heigh restrictions, laybys etc were also incorporated to aid with routing behaviour. 8 sites were also developed on the strategic road network where signage was deployed to assist with the distribution of information whilst HGV directional signage was also installed.									
	Freight Gateway Oxford County Council [UK]	The Gateway system is a computerised system, which enables Local Authorities to disseminate their freight strategies including freight restrictions into a national mapping portal. The significant advantage of using the Gateway system is dynamic routing function which can be updated to reflect planned incidents on the highway network such as road closures or temporary highway restrictions. To further support this system a driver app is being developed which aims to rival the driver's use of satellite navigation system whist the system also ties into a 'Lorry Watch' portal and the councils VMS system,									
	Lorry Route (& Watch) Pro Mapping	A software platform that can aid both public authorities, drivers and fleet managers with HGV routing and to digitise a range of restrictions, regulations and road information to support navigation and compliance respectively. The software also enables residents and communities to contribute information and violations into the system that are then uploaded to the public authorities for enforcing retrospectively.									
Opportunities	Offers an opportunity to collate data (software options) whilst improving legibility of access restrictions and suitable routing options. Popular initiative that can be supported by industry.										
Barriers	Enforcement will remain an issue until powers to ensure and legislate the use of ANPR technology can subsequently be used to issue Penalty Charge Notices for noncompliance of restrictions										
Local; Relevancy	Highly relevant to the GDA and the City of Dublin with a longstanding HGV Management Strategy already in place since 2007. Live discussions taking place about extending the cordon and restricting access to a greater number of vehicles (four axles as well as five axles) need to account for the current challenges around enforcement and visibility of the restrictions on road and in pre-planning. Further research is required to assess whether abuse of the system is due to a deliberate lack of compliance or poor wayfinding and signage; the latter potentially being addressed through digitising information and feeding area restrictions and routing requirements into sat-nav software systems.										
Impact on Freight Objectives											
Economy			Environment				Society				
Freight efficiency Improved journey times, optimised use of fleets, delay mitigation and improved supply chain connectivity to save time and costs		Max	Air quality Reduce the impact of the sector through air quality improvements and a reduction in other forms of pollution and intrusive activities		Max	Safety Improve the safety of the sector to reduce the number of accidents involving goods vehicles		Max			
Industry contribution Improved jobs and opportunities to address skills shortages, support for inward investment, land availability, infrastructure provision		Min	Greenhouse gas emissions Reduction in greenhouse gas emissions from the sector to achieve net-zero by 2050		Max	Community disturbance Reduce the impact of freight on communities, noise levels, air quality and informal overnight lorry parking		Max			
Connectivity Improved connectivity seamless intermodal activity to support local, national and international freight movements across the area		Max	Urban realm Minimising the intrusive impact of freight transport on visual amenity and local, protected settings		Max	Placemaking Better integrate freight into land use planning, development, construction and servicing plans, better freight data		Max			


QUIET DELIVERIES		Investment Needed	Low	Freight Sector	Road Freight	Actors	Public Sector, Businesses, Industry Bodies	Risk Level	Low	4Rs	Re-time, Re-route
Definition: [Trend]	Re-timing deliveries allow goods to be delivered to businesses outside normal hours, using techniques to minimise noise and disturbance and the externalities generated from freight movements. The aim of shifting deliveries to other times is to improve delivery schedules and reduce congestion and the impact of carbon emissions in peak hours (within or outside the shoulders of the day). There can be many techniques involved to reduce visual and noise intrusion; ranging from the type of vehicle used to the equipment sourced to move goods over the last 250m for minimising community disturbance.							Category		Eco Logistics	
								Geographical Applicability:			
Best Practice	Use Cases										
	Silent Night time Deliveries <b>CIVITAS</b> [Barcelona]	The development of night deliveries was made in collaboration with two supermarket operators, Mercadona and Condis. In Valencia Street. The operator Mercadona demonstrated that night-time deliveries could be made using adapted trucks and quiet unloading methods. The pilot (which was subsequently rolled out across the rest of the city) demonstrated benefits in terms of reduced delivery times and lower transport operating costs whilst greater efficiency was achieved by replacing seven daytime deliveries with two deliveries by larger, quieter vehicles outside peak hours.									
	Retiming Deliveries Consortium <b>Transport for London</b>	The consortium was established on the back of the 2012 Olympic Games and in collaboration with the Freight Transport Association, Road Haulage Association, Noise Abatement Society, major national retailers and several local authorities, to advocate, promote and educate business and government around the benefits of retiming within London. The Co-op was one of the organisations who engaged with the consortium to help re-time deliveries across 100 of their London based stores. A subsequent guide of Quiet Deliveries was also produced for the capital to aid with re-timing deliveries based on industry best practice.									
	Project ZEUS <b>European Institute of Innovation and Technology</b>	The ZEUS project aims to show that urban goods can be delivered in off-peak hours in a quiet, efficient, and environmentally friendly way. Using off-peak hours of 7pm-7am means delivery trucks will not contribute to rush hour and traffic jams. To keep these late-night deliveries quiet the project is looking at quiet transport trailers, low-noise pallet trucks, and covered loading docks at the stores. Colruyt Group is using their stores in city centres as real test sites and hoping that the ZEUS project not only helps their own delivery system but can be used as a blueprint for cities across Europe.									
Opportunities	Reduces the externalities from delivery and collection activities on local communities whilst recognising the need for freight movements to take place and optimised for the industry to support society										
Barriers	The application may vary depending on the organisation and influence over supply chain decisions (especially if vehicles are trip chaining between multiple sites during a day)										
Local Relevancy	As with many urban areas and city centres/service centres, a key aim is to encourage deliveries serving Dublin City Centre and using the primary route network to re-time outside of peak periods (which will vary from place to place). Traffic mixing between freight and other forms of road transport, creates congestion and concentrates air pollution; with quiet deliveries aiming to identify and recalibrate freight activity outside of busy windows to minimise delay (and ultimately supply chain efficiency). Large supermarket chains and wholesalers, both with larger fulfilment centres in peri urban locations, should be the target audience for re-timing and even re-routing deliveries to improve journey times. Quiet deliveries can be factored into DSP and CLP guidance too for minimising noise pollution during different times of the day.										
Impact on Freight Objectives											
Economy			Environment				Society				
Freight efficiency Improved journey times, optimised use of fleets, delay mitigation and improved supply chain connectivity to save time and costs		Max	Air quality Reduce the impact of the sector through air quality improvements and a reduction in other forms of pollution and intrusive activities		Max	Safety Improve the safety of the sector to reduce the number of accidents involving goods vehicles		Max			
Industry contribution Improved jobs and opportunities to address skills shortages, support for inward investment, land availability, infrastructure provision		Min	Greenhouse gas emissions Reduction in greenhouse gas emissions from the sector to achieve net-zero by 2050		Med	Community disturbance Reduce the impact of freight on communities, noise levels, air quality and informal overnight lorry parking		Max			
Connectivity Improved connectivity seamless intermodal activity to support local, national and international freight movements across the area		Min	Urban realm Minimising the intrusive impact of freight transport on visual amenity and local, protected settings		Max	Placemaking Better integrate freight into land use planning, development, construction and servicing plans, better freight data		Max			



DELIVERY & SERVICING PLANS		Investment Needed	Low	Sector	Planning Policy	Actors	Public	Risk Level	Low	4Rs	Re-duce, Re-mode, Re-route
Definition: [Trend]	A Delivery and Servicing Plan (DSP) sets out how building occupiers will enable safe, clean and efficient deliveries to their site. These are typically a planning condition that is discharged on the basis that organisations and developers are making attempts to reduce the externalities from delivery and collection activity across a site. DSPs can apply to existing sites where there may also be opportunities to save costs, make efficient use of space and contribute towards CSR.							Category		Land Use Planning	
								Geographical Applicability:			
Best Practice	Use Cases										
	Delivery & Service Plans Guidance Transport for London	Transport for London (TfL) have developed a detailed set of DSP guidance from to help showcase and illustrate the stages that local authorities and developers (omnrganisations) go through to ensure freight movements are considered at the forefront of developing new residential or commercial dwellings; with the aims of ultimately discharging a planning condition for a site. The guidance is designed to support the planning process and mitigate the externalities from freight movements on new and existing communities.									
	Pathfinder Towns Trailblazer Project UK Towns	The TRAILBLAZER project (Transport and Innovation Logistics by Local Authorities with a Zest for Efficiency and Realisation) has achieved a reduction in energy used in urban freight transport through public sector policy interventions across Europe by showcasing good practices and promoting DSPs. The key objectives of the project was to implement the actions container in the DSPs produced by PATHFINDER cities/towns (Liverpool, Sutton, Croydon and Lambeth); evidence reduced energy use as a result of DSPs; transfer knowledge to less experienced organisations and promote best practice in freight energy efficiency amongst local and regional authorities and the private sector in Europe..									
	Delivery & Servicing Plan Toolkit Birmingham City Council	Birmingham City Council created a toolkit to support the development and implementation of Delivery and Servicing Plans (DSPs) by businesses and organisations operating in Birmingham to support the roll out of Green Travel Districts (GTD) and business engagement across service centres located on arterial routes through the city. This was based on a desire to encourage behaviour change through an assessment of delivery and servicing activities as part of a one to one survey, interviews and observational analysis of sites.									
Opportunities	Embedding best practice into key decision-making processes and supporting integrated land use and transport planning. Mitigates externalities from developments and optimises freight journeys										
Barriers	Needs to be properly enforced and monitored to assess compliance. A 'stick' needs to be applied to have an impact such as the need for a plan to be developed to discharge a planning condition										
Local Relevancy	A missing component of assessing and setting planning conditions for new development sites that can be factored into the process for the four local authorities. The development of a clear toolkit for developers would be highly valuable and ensure consistency in the development of plans that can be requested at pre-application phase for sites of a particular size or with notable frequent requirements. A toolkit should also have equal applicability to pre-existing developments so that it can be used to target freight generators and rolled out across service centres where delivery and servicing issues are prevalent and need addressing to reduce congestion, improve air quality and improve business/supply chain efficiency. This would be applicable along the R network in places such as Rathmines, Portobello and The Liberties.										
Impact on Freight Objectives											
Economy			Environment				Society				
Freight efficiency Improved journey times, optimised use of fleets, delay mitigation and improved supply chain connectivity to save time and costs		Max	Air quality Reduce the impact of the sector through air quality improvements and a reduction in other forms of pollution and intrusive activities		Max	Safety Improve the safety of the sector to reduce the number of accidents involving goods vehicles		Max			
Industry contribution Improved jobs and opportunities to address skills shortages, support for inward investment, land availability, infrastructure provision		Max	Greenhouse gas emissions Reduction in greenhouse gas emissions from the sector to achieve net-zero by 2050		Max	Community disturbance Reduce the impact of freight on communities, noise levels, air quality and informal overnight lorry parking		Max			
Connectivity Improved connectivity seamless intermodal activity to support local, national and international freight movements across the area		Med	Urban realm Minimising the intrusive impact of freight transport on visual amenity and local, protected settings		Max	Placemaking Better integrate freight into land use planning, development, construction and servicing plans, better freight data		Max			

CONSTRUCTION LOGISTICS PLANS		Investment Needed	Low	Sector	Planning Policy	Actors	Public	Risk Level	Low	4Rs	Re-duce, Re-route, Re-time
Definition: [Trend]	A CLP provides the framework for understanding and managing construction vehicle activity into and out of a proposed development. They are developed early in the planning process and focus specifically on construction supply chains and how to reduce impact on the road network. The construction supply chain covers all movements of goods, waste and servicing activity to and from site. The plans are developed by developers, but the guidance is produced by local authorities and enforced by them internally. There are outline and detailed CLPs with affiliated non-compulsory codes of practice, namely the Considerate Constructor Scheme, also worth consideration down the supply chain							Category		Land Use Planning	
								Geographical Applicability:			
Best Practice	Use Cases										
	H2020 Programme for SUCCESS CIVITAS EU	The European Sustainable Urban Consolidation Centres for construction (SUCCESS) project aimed to improve the efficiency and reduce negative impacts of the construction supply chain by exploring and testing reliable and innovative solutions. Different solutions were tested in four pilot sites in the partner countries, Valencia, Paris, Verona and Luxembourg City which including using guidance material and tools to assess data and use appropriate solutions (e.g. e-collaboration tools, GIS) to reduce cost and transit time of construction materials, the number of journeys and/or the number of kilometres per vehicle (GHG emissions) and improve the reliability and the flexibility regarding delivery of supplies to construction sites.									
	Construction & Logistics Plans (CLP) Transport for London	Transport for London alongside CLOCS have produced a best practice guidance document for developers and local authorities to help mitigate the externalities from developments. This guidance document assists those looking to write either an effective outline CLP or a detailed CLP as well as explaining in further detail the difference between the two. Templates and tools have also been designed that can be completed by developers to save time and costs with developing the plans and helping to steer the content required.									
	Construction Logistics Plan Framework Croydon Council	Fostering a collaborative model between the council, contractor and supply chain in order to maximise efficiencies and provide greater project certainty. The implementation of a macro level 'Framework CLP' considers collectively the construction activity taking place across Croydon Town Centre to generate more substantial benefits than could be achieved by considering individual sites in isolation. This would make it easier to integrate logistics processes across development sites; for example, among others, removing direct conflicts between deliveries to neighbouring sites and allowing consolidation of deliveries leading to a reduction in the number of deliveries.									
Opportunities	Embedding best practice into key decision-making processes and mitigating externalities from new developments. Supply chain efficiencies and collaboration save time and reduce costs.										
Barriers	Needs to be properly enforced and monitored to ensure developer and supply chain compliance. Success is built on sound cooperation between different stakeholders to be meaningful.										
Local Relevancy	Similarly, to DSPs, CLPs are a missing component of the local development planning architecture to help mitigate the externalities from construction activity. Each local palling authority should seek to embed the requirement for a CLP into the conditions set for planning permission. These can be outline or full CLPs with clear guidance/toolkit being developed to complement the roll out of the condition. CLPs are relevant in all contexts; whether it is a new site within a burgeoning logistics site which will inevitably look towards using the M50 for access, to city centre locations which are spatially constrained and where HGV access should be limited to improve (the perception of) road safety.										
Impact on Freight Objectives											
Economy			Environment				Society				
Freight efficiency		Max	Air quality		Max	Safety		Max			
Improved journey times, optimised use of fleets, delay mitigation and improved supply chain connectivity to save time and costs			Reduce the impact of the sector through air quality improvements and a reduction in other forms of pollution and intrusive activities			Improve the safety of the sector to reduce the number of accidents involving goods vehicles					
Industry contribution		Max	Greenhouse gas emissions		Max	Community disturbance		Max			
Improved jobs and opportunities to address skills shortages, support for inward investment, land availability, infrastructure provision			Reduction in greenhouse gas emissions from the sector to achieve net-zero by 2050			Reduce the impact of freight on communities, noise levels, air quality and informal overnight lorry parking					
Connectivity		Med	Urban realm		Max	Placemaking		Max			
Improved connectivity seamless intermodal activity to support local, national and international freight movements across the area			Minimising the intrusive impact of freight transport on visual amenity and local, protected settings			Better integrate freight into land use planning, development, construction and servicing plans, better freight data					


BUILDING CODE REGULATIONS		Investment Needed	LOW	Sector	Planning Policy	Actors	Public	Risk Level	Low	4Rs	Re-route, Re-duce
Definition: [Trend]	This measure involves the use of building code regulations to ensure that new business premises provide adequate space for goods handling and storage. By ensuring that they have suitable off-street delivery areas or storage zones, the number of on-street loading/unloading activities causing congestion and obstruction due to the high number of delivery trucks and the related heavy burden on public streets can be reduced. Markets, bars, and restaurants are the most relevant targets for this measure as they generate very frequent deliveries							Category		Land Use Planning	
								Geographical Applicability:			
Best Practice	Use Cases										
	Servicing Adaptations <b>Mercat de la Concepció</b> [Barcelona]	The remodelling of the Mercat de la Concepció in 1998 was the start of the initiative to provide off-street cargo handling space in public markets regulations to build off-street delivery areas or storage areas within newly built business establishments and stores, with the objective of reducing the number of on-street operations. The ordinance states that all new buildings of at least 400 m2 have to arrange at least one delivery zone within their premises. New bars and restaurants have to build a storage area with a minimum size of 5 m2 or <u>5% of</u> their total floor area.									
	BREEM Certification <b>BREEM</b>	BREEAM is an assessment undertaken by independent licensed assessors using scientifically based sustainability metrics and indices which cover a range of environmental issues. Its categories evaluate energy and water use, health and wellbeing, pollution, transport, materials, waste, ecology and management processes. This means BREEAM rated developments are more sustainable environments that enhance the well-being of the people who live and work in them, help protect natural resources and make for more attractive property investments									
	Locking Dock Safely <b>Logistics UK</b>	Shopping centres and large stores in central business districts have limited space and often have insufficient or out-dated loading docks. Logistics UK have developed a guide for delivering safe, efficient, and sustainable logistics. Loading docks present a number of significant risks that require careful management. Differing specifications for docks and vehicles, visiting drivers, and the lack of direct communication between drivers and warehouse staff all contribute to potential problems.									
Opportunities	To reduce enforcement requirements, road user conflict and congestion alongside user safety during delivery, collection and servicing activity; Would set best practice.										
Barriers	Would require cross department collaboration within local authorities to deliver working with developers. Sites may also be physically constrained or need retrofitting and unable to accommodate servicing yards.										
Local Relevancy	This scheme would start the process of normalising freight considerations into the design and planning process of new developments; especially given the forecast growth in mixed use developments across the GDA and particularly the intensification of housing and commercial activity across Dublin. There is limited consistency in the application of building codes to this effect so embedding best practice principles or a sense check tool into the process can help to raise standards.										
Impact on Freight Objectives											
Economy				Environment				Society			
Freight efficiency Improved journey times, optimised use of fleets, delay mitigation and improved supply chain connectivity to save time and costs			Med	Air quality Reduce the impact of the sector through air quality improvements and a reduction in other forms of pollution and intrusive activities			Min	Safety Improve the safety of the sector to reduce the number of accidents involving goods vehicles			Max
Industry contribution Improved jobs and opportunities to address skills shortages, support for inward investment, land availability, infrastructure provision			Min	Greenhouse gas emissions Reduction in greenhouse gas emissions from the sector to achieve net-zero by 2050			Min	Community disturbance Reduce the impact of freight on communities, noise levels, air quality and informal overnight lorry parking			Max
Connectivity Improved connectivity seamless intermodal activity to support local, national and international freight movements across the area			Min	Urban realm Minimising the intrusive impact of freight transport on visual amenity and local, protected settings			Max	Placemaking Better integrate freight into land use planning, development, construction and servicing plans, better freight data			Max


URBAN CONSOLIDATION		Mode Relevance		All	Freight Sector	Last Mile Logistics	4Rs	Re-mode, Re-route	Technical Maturity	Initial real-world operation	Commercial Maturity:	Commercial Launch
Definition: [Trajectory]	Freight consolidation exploits the economies of aggregation by combining multiple shipments destined for a geographic region into a single load where upon arrival, the shipment is broken into smaller consignments for onward delivery across the locality. Consolidation can happen at all scales, manifesting differently at various points in the logistical chain. Remote consolidation, as implied, takes place on the periphery of an urban area usually aggregating deliveries in larger warehousing units; with LGVs delivering consignments across a broad area. Micro consolidation is associated with zero carbon delivery over the last mile and is more interwoven within a city centre context.								Category		Consolidation	
									Geographical Applicability:			
Best Practice		Use Cases										
	Zedify Zero emission hub [Bristol]	Zedify received a £100,000 grant to set up a zero emission delivery hub in Bristol to enable their fleet of electric cargo bikes to make sustainable last mile deliveries across the city centre. It is hoped that within 10 years, 95% of deliveries can be made by electric vehicles. The zero-emission hub is located on the edge of Bristol where it interceptions deliveries bound for the city centre. Here, freight is processed and then remoded on to electric cargo bike, or other sustainable last mile mode of delivery, to make the part of its journey to the recipient of the delivery. This mode prevents vans an HGVs from having to access the congested centre of Bristol, and therefore creates savings in CO2 emissions and improves air quality in the locality. Zedify Bristol's new depot is part of a national urban network, with nine other microconsolidation hubs across the country.										
	Travelwest Bristol Bath Freight Consolidation Centre	Bristol Freight Consolidation Centre was initially set up as a pilot scheme in 2004 with European funding to help alleviate issues associated with freight in Broadmead, Bristol. At its peak, a 70% to 80% reduction in the number of onward trips was seen by the freight consolidation scheme subsidised by Bristol City Council to serve the central area between 2004 and 2018. This meant that for every 10 vehicles that made a delivery to the consolidation centre, just 2 or 3 onward journeys to the central area were made. The return trip provided the opportunity to return packaging materials for recycling. This has only recently become commercially viable; with management now shifted to DHL to operate and run										
	CoMoUK Mobility Hubs Guidance	'Local Mobility Hubs' will provide an array of mobility, commercial and community services to a surrounding area and will allow people to lead low-car lifestyles by co-locating the movement of people with the services that they might commonly need on their daily journeys. One such service that could be provided is a micro-consolidation hub where freight can arrive for distribution across a local area. Furthermore, the coincidence of the movement of goods and people also offer an opportunity for travellers to access 'click-and-collect' services and make use of parcel lockers.										
Major Market Failures	Elcidis UCC Urban consolidation Centre [La Rochelle]	La Rochelle Urban Community has been implementing a last mile urban freight delivery service using electric vans and trucks for more than 15 years, based on receiving conventional heavy goods vehicles (HGVs) and transferring goods to electric vehicles to make the last mile delivery. The assessment on the freight movements captured by the Elcidis UCC revealed that the service is not fully delivering the expected environmental and financial gains (capturing 100 freight movements per day out of 670 (15%) in the city centre generated by freight carriers - or 4% of 2,288 movements per day overall). As such, the business model is proving to be unprofitable, and unsustainable. Reasons for failure included: Location – not being located on strategic routes in La Rochelle, Regulatory framework - does not incentivise the use of the UCC, or indeed electric vehicles. Complementary functions - No additional services beyond the distribution of goods are offered (e.g. recycling processing facility for reverse flows)										
Opportunities	Links with mobility hubs and transport interchanges for interface with space capacity on public transport, consolidation as a means of re-moding for the last mile of delivery											
Barriers	Extra cost incurred as a result of additional handling of goods whilst any approach should look to be industry led and embedded to ensure synergies with business supply chains											
Local Relevancy	The GDAs urban grain and transport networks are particularly conducive to consolidation. The canal and river network, radial and orbital road network as well as defined urban centres, allow for consolidation at key intermodal interchange points in both remote and hyper urban locations. This could include the M50, where fulfilment and distribution centres are already established by industry leaders, as well within the vicinity of the cordon applied for managing HGV traffic in Dublin City Centre. Ideally the rings of consolidation would also be linked. A number of pilot initiatives, involving six established third partly logistics providers, were trailed in 2018 within Dublin City Centre which offered a valuable insight to test proof of concept. Business engagement and buy in were crucial to this particular workstream.											
Impact on Freight Objectives												
Economy				Environment				Society				
Freight efficiency		Max	Air quality		Med	Safety		Med				
Improved journey times, optimised use of fleets, delay mitigation and improved supply chain connectivity to save time and costs			Reduce the impact of the sector through air quality improvements and a reduction in other forms of pollution and intrusive activities			Improve the safety of the sector to reduce the number of accidents involving goods vehicles						
Industry contribution		Max	Greenhouse gas emissions		Med	Community disturbance		Max				
Improved jobs and opportunities to address skills shortages, support for inward investment, land availability, infrastructure provision			Reduction in greenhouse gas emissions from the sector to achieve net-zero by 2050			Reduce the impact of freight on communities, noise levels, air quality and informal overnight lorry parking						
Connectivity		Max	Urban realm		Max	Placemaking		Max				
Improved connectivity seamless intermodal activity to support local, national and international freight movements across the area			Minimising the intrusive impact of freight transport on visual amenity and local, protected settings			Better integrate freight into land use planning, development, construction and servicing plans, better freight data						

SUSTAINABLE PROCUREMENT		Investment Needed	LOW	Sector	Procurement	Actors	Public/Private	Risk Level	Low	4Rs	Re-mode, Re-duce
Definition: [Trend]	Starting with in house policy changes for procuring goods and services to ensure these are 'green' and can reduce freight miles; with conditions applied to contract terms and conditions for sustainable delivery and opportunities for re-moding. Changes to procurement can leverage a wider benefit pool, including supporting SMEs, conditioning living wages and ultimately helping to improve the social, environmental and economic outlook of the town and wider region. Joint procurement should also be explored between public institutions for essential non-perishable goods.							Category		Demand Management	
								Geographical Applicability:			
Best Practice		Use Cases									
	Preston Model Community Wealth Building [Preston, Lancashire]	The "Preston Model" is a term applied to how the council, its anchor institutions and other partners are implementing the principles of Community Wealth Building within Preston and the wider Lancashire area. The city council is committed to implementing this approach and, as the "place leader" for the city is promoting the concept to other anchor institutions in and around Preston and to the private sector. Community wealth building offers an opportunity for local people to take back control, to ensure that the benefits of local growth are invested in their local areas, are used to support investment in productive economic activities and that people and their local institutions can work together on an agenda of shared benefit.									
	Joint Procurement Ryedale, Selby and Scarborough Councils [North Yorkshire]	Joint procurement means combining the procurement actions of two or more contracting authorities. The key defining characteristic is that there should be only one tender published on behalf of all participating authorities with aggregation taking place in the supply chain during delivery. The Councils of Ryedale, Selby and Scarborough jointly spend £53 million every year on the supplies, services and works needed to deliver services to public of all areas. How well these goods are procured to those requirements has a critical impact on performance and ability to provide value for money									
	Sustainable Procurement Framework Clean Cargo UK	In order to reduce their transport-related impacts and achieve global climate objectives, member companies of the Clean Cargo Working Group have co-developed a framework that will enable companies to effectively benchmark themselves against their peers and to evaluate their progress in supplier management, within the context of sustainability practices in logistics. Shippers advance their supplier management programs by identifying key activities and best practices that they can implement to improve their own sustainability performance and foster sustainability improvements among their suppliers.									
Opportunities		Reducing freight miles and maximising vehicle payloads by securing constant demand. Opportunities to re-mode freight vehicles by sourcing locally and embedding this in contractual agreements									
Barriers		Potential to conflict with competition authority is seen to favour local companies; but can be avoided by breaking up large contract orders into smaller requests under a procurement threshold.									
Local Relevancy		A key discussion that could be facilitated between anchor instructions across the GDA, starting first with the four local authorities to look at benchmarking procurement practice, exploring shared procurement opportunities and collating together local spend and contract conditions to understand the extent to which procurement is sustainable and reducing freight trips/miles/demand. This discussion can expand to larger private sector companies such as Accenture and Johnsons Controls etc to assess the impact that freight requirements have on supporting the local economy and also the ramifications have on transport efficiency, safety and sustainability.									
Impact on Freight Objectives											
Economy				Environment				Society			
Freight efficiency Improved journey times, optimised use of fleets, delay mitigation and improved supply chain connectivity to save time and costs			Max	Air quality Reduce the impact of the sector through air quality improvements and a reduction in other forms of pollution and intrusive activities			Max	Safety Improve the safety of the sector to reduce the number of accidents involving goods vehicles			Min
Industry contribution Improved jobs and opportunities to address skills shortages, support for inward investment, land availability, infrastructure provision			Max	Greenhouse gas emissions Reduction in greenhouse gas emissions from the sector to achieve net-zero by 2050			Max	Community disturbance Reduce the impact of freight on communities, noise levels, air quality and informal overnight lorry parking			Min
Connectivity Improved connectivity seamless intermodal activity to support local, national and international freight movements across the area			Med	Urban realm Minimising the intrusive impact of freight transport on visual amenity and local, protected settings			Min	Placemaking Better integrate freight into land use planning, development, construction and servicing plans, better freight data			Min

GREENER FLEETS		Investment Needed	Low-High	Freight Sector	Road Freight	Actors	Businesses, Industry Bodies, Public Sector	Risk Level	Medium	Scheme Maturity:	Deployed
Definition: [Trend]	Undertaking periodic vehicle fleet review and maintain a clean fleet with corporate procurement policy being developed to continue with improving fleet efficiency. Led by industry and public institutions to help catalyse shift towards cleaner vehicles and earmarking upgrades for complementary charging infrastructure in future investment priorities and strategies respectively. Industry is increasingly exploring a shift in fleet management practices and vehicle procurement to keep up with the shift towards a zero-carbon future.							Category		Procurement	
								Geographical Applicability:			
Best Practice		Use Cases									
	Cleaner Fleet Policy <b>Derby City Council</b> [UK]	An attempt by a local authority to replace their fleet of 48 vehicles (cars & LGVs) with electric battery alternatives, which will remove 98 tonnes of CO2 tailpipe emissions from the air each year. The policy introduces a 'Low Emission Hierarchy of Vehicle Procurement'; providing the flexibility to take advantage of future shifts in the operational, financial and environmental changes across low emission vehicle technologies. The intention is to lead the way locally as a major employer and key anchor institution to encourage others across the private sector to adopt the same practices to meet the aims of local and national policy and address the climate emergency.									
	Green Fleet Review <b>Commercial Group</b> [UK]	Commercial Group, the UK's largest independent office services company, transformed their delivery scheduling after committing to a 'greening' of their vehicle fleets and managed to reduce fleet carbon emissions by 50 per cent during 2007. This was partly attributed to a commitment to a company wide carbon emissions reduction after an extensive review of its fleet vehicles with almost 90 per cent of the organisation's CO2 emissions came from its owned fleet vehicles. A 300,000-mile replacement policy was also introduced across the LGV fleet alongside a commitment to upgrading vehicles to a more fuel efficient, compliant Euro 6 engines.									
	EV Fleet Transition <b>Lime</b> [US]	Lime have pledged to transition its entire fleets to electric by 2030. This is well over 100,000 owned and leased trucks, vans and vehicles used for moving around scooters and associated equipment as part of its commitment to the Climate Group V100. It is working with Ceres to advocate policies internally that will support the transition. Lime are the first micromobility provider engaged in the programme and view its fleet transition in the context of improving infrastructure capacity and delivering its local fleet management strategy. It initial started its fleet transition in 2018 by neutralized all emissions associated with their fleet of operations vehicles with verified carbon offset projects.									
Opportunities		Opportunity for organisations to fulfil their CSRs and respond to the need to transition from diesel and petrol vehicles (linked to national policy) towards electric and alternative fuels on a comprehensive scale.									
Barriers		May appeal to larger organisations with significant fleet management responsibilities but more difficult for SMEs to achieve, especially sole traders.									
Local Relevancy		Hugely significant in the context of local authorities across Ireland; with less than 2 per cent of local authority vehicles being electric or hybrid and no common policy being in place to green vehicle fleets. However, with a larger proportion of the GDA covering urban areas, the public sector should look to lead by example; starting first with LGVs and then exploring the development of hydrogen or CNG powered fleet policies depending on a parallel policy being put in place for alternative fuel infrastructure. Dublin City Council, as the biggest public authority within the GDA, should seek to take the lead and work with NTA  develop a coherent approach towards fuel infrastructure and green fleet policies.									
Impact on Freight Objectives											
Economy			Environment				Society				
Freight efficiency Improved journey times, optimised use of fleets, delay mitigation and improved supply chain connectivity to save time and costs		Max	Air quality Reduce the impact of the sector through air quality improvements and a reduction in other forms of pollution and intrusive activities		Max	Safety Improve the safety of the sector to reduce the number of accidents involving goods vehicles		Min			
Industry contribution Improved jobs and opportunities to address skills shortages, support for inward investment, land availability, infrastructure provision		Med	Greenhouse gas emissions Reduction in greenhouse gas emissions from the sector to achieve net-zero by 2050		Max	Community disturbance Reduce the impact of freight on communities, noise levels, air quality and informal overnight lorry parking		Min			
Connectivity Improved connectivity seamless intermodal activity to support local, national and international freight movements across the area		Min	Urban realm Minimising the intrusive impact of freight transport on visual amenity and local, protected settings		Min	Placemaking Better integrate freight into land use planning, development, construction and servicing plans, better freight data		Min			

SHARED ASSETS		Investment Needed	Low	Freight Sector	Road, Rail, Air, Sea	Actors	Businesses, Industry Bodies, Public Sector	Risk Level	High	Scheme Maturity:	Deployed
Definition: [Trend]	Larger companies working together or a host of smaller organisations seeking to achieve online delivery logistics synergies in an industry led approach to cost savings and efficiencies. Can work to support economies of scale or provide low cost access into consolidation/fulfilment to mitigate investment risk in a facility and to share the running of the site and many aspects of the delivery operations. Affordable warehousing space is becoming a premium due to the rise in e-commerce and the costs and availability of land in strategic locations so more flexible or shared options are becoming more attractive.							Category		Groupage	
								Geographical Applicability:			
Best Practice		Use Cases									
	Shared Fulfilment <b>Ocado &amp; Morrisons</b> [South East London]	Ocado entered into an agreement to supply Morrisons' online grocery delivery service and provided space Shared Fulfilment Centres (SFC) alongside access to Morrisons with the software necessary to fulfil online orders from its stores with the aim of offering online services in areas not currently serviced by a customer fulfilment centre. Morrisons has also recently agreed terms with Amazon based on a similar offer to expand area coverage – including last mile deliveries. The approach is viewed as low risk and a capital light wholesale supply arrangement.									
	Flexible Warehouse <b>Peel Ports</b> [Liverpool]	The availability of decentralised, strategic network of warehouses located closer to the market available for sharing (one-to-one and multi-customer space sharing). A multi-user facility provides flexibility in space allocation with rental space covering pallets or other standardised module designs. The digital sharing platform allows utilisation of the vacant warehousing space where mixing diverse sectors with different seasonality peaks supports flexibility. Peel Ports home to the £400m Liverpool2 terminal is an example of a new container shipping with advanced facilities, port-side storage and the flexibility to meet the demands of each and every customer, through flexible warehousing solutions.									
	Multi User Warehouse <b>Imperial Logistics</b> [Germany]	Opened in 2020 with easy access to Germany's A1 and A2 autobahns and proximity to courier and express companies with adjacent land available for potential future expansion. The multi user warehouse operates a pay-as-you-use billing model, reducing user costs and assisting budgeting and cash flow and is closely aligned to manufacturing operations within the wider industrial zone (Imperial is handling inventory control for outbound lines, as well as providing frequent trailer shuttles to and from manufacturing sites). The lean management methodology also drives efficiencies whilst the company is able to pass on savings through consolidated purchasing of packaging materials.									
Opportunities		Maximising the use of surplus warehousing capacity and optimising use of new facilities at strategic locations for freight movements to improve site, travel and cost efficiencies									
Barriers		High capital cost to invest or retrofit a facility (who pays). As a burgeoning concept, there may be a demand by companies to see supply chain transparency. Land also has to be available in key locations									
Local Relevancy		This practice looks towards building a future ready freight sector which acknowledges both the rising demand and pressure on warehousing space that will come to fruition across the GDA and the opportunity that shared assets bring for allowing smaller organisations to enter the market to further boost the role of freight and logistics as a key economic driver for the city region. There are a number of examples of shared fulfilment centres associated with wholesale storage and distribution (banded around the M50) with scope longer term to explore shared assets at a local scale within a city centre and service centre environment (where currently none exist). The latter would be complemented by zero carbon last mile logistics.									
Impact on Freight Objectives											
Economy			Environment				Society				
Freight efficiency		Max	Air quality		Med	Safety		Min			
Improved journey times, optimised use of fleets, delay mitigation and improved supply chain connectivity to save time and costs			Reduce the impact of the sector through air quality improvements and a reduction in other forms of pollution and intrusive activities			Improve the safety of the sector to reduce the number of accidents involving goods vehicles					
Industry contribution			Greenhouse gas emissions			Community disturbance					
Improved jobs and opportunities to address skills shortages, support for inward investment, land availability, infrastructure provision		Max	Reduction in greenhouse gas emissions from the sector to achieve net-zero by 2050		Med	Reduce the impact of freight on communities, noise levels, air quality and informal overnight lorry parking		Min			
Connectivity		Max	Urban realm		Min	Placemaking		Min			
Improved connectivity seamless intermodal activity to support local, national and international freight movements across the area			Minimising the intrusive impact of freight transport on visual amenity and local, protected settings			Better integrate freight into land use planning, development, construction and servicing plans, better freight data					

DRIVER TRAINING		Investment Needed	Low-Med	Freight Sector	Road Freight	Actors	Businesses, Industry Bodies	Risk Level	Low	4Rs	Re-duce
Definition: [Trend]	The provision of training and development opportunities will provide a cost-effective way of getting the best out of individuals. A training programme would be aimed at drivers of HGVs and vans and is designed to improve overall fuel consumption, whilst assisting fleet managers with improving vehicle utilisation, accident rates, vehicle downtime and maintenance costs. Often this can involve extensive research into the technical and behavioural aspects of driving and undertaking a fleet review.							Category		Raising Best Practice	
								Geographical Applicability:			
Best Practice		Use Cases									
	Driver Training <b>Carlsberg</b> [UK]	Carlsberg UK runs a fleet of 296 vehicles, covering over 8.5 million miles every year and delivering to around 13,000 accounts every week. They wished to reduce the fuel cost and emissions generated by their vehicles, all of which are 7.5 tonnes or above, mostly 26 tonne rigid trucks. On this basis, emphasis was place on driver engagement and empowerment with the use of telematics (monitors drivers' performance on a daily basis and gives live updates via a web portal) helping to provide feedback on driving efficiency alongside providing training (courses), debriefs and introducing incentives. Since 2011, Carlsberg have saved 502,549 litres of fuel, £568,687 and 1,346 tonnes of CO2 and has reduced their drivers insurance premiums.									
	Young Driver Academy <b>British Gas</b> [UK]	Launched in 2014 to reduce collision rates, improve fuel use and lower fleet maintenance costs; with 45% of the company's young drivers (under 25s) involved in a collision. The academy was created to also improve the reputation and image of the company as well as meeting its CSR objectives. The academy is mandatory for 12 months under an apprenticeship produced by Fleetmaster and is ran in a structured manner covering 9 units, including eco-driving training which is subsidised through the Energy Saving Trust. Overall, the academy has helped see a 14% reduction in fuel consumption/wear and tear, a 30% reduction in collision rates (despite fleet growth) and positive feedback from engaged drivers on the course.									
	Advanced Driver Training <b>Drive DeVilbiss</b> [UK]	The organisation experienced rapid expansion and formed a 'Green Team' to assess environmental performance; identifying advanced driving training as key part of employee inductions alongside a handbook to develop a sustainable driving culture and technology to monitor data/feedback. Overall, fleet speeding offences reduced by over 15,000 in 2014 alone whilst the average distance, percentage speeding and vehicle idling times dramatically fell by 44% in the same year. Fuel use also declined year on year from 3,960 litres per vehicle in 2012 to 3,145 litres per vehicle on average in 2015 through EcoDriving and enhance fleet maintenance alone.									
Opportunities		Considerable cost saving benefits to businesses within road freight alongside better driver recruitment and retention levels. A strong case for schemes to tie in to meeting businesses CSRs.									
Barriers		Can often be associated with larger fleet operators and organisations who have significant budgets- in contrast to smaller operators who may also lack the time to invest in training and fleet reviews									
Local Relevancy		With such as large proportion of the overall haulier industry dominated by smaller fleet operators with limited capital to invest in new technologies and alternative fuels,, driver training can provide a valuable means to save costs associated with fuel consumption and vehicle maintenance through a structured training programme. Like with many accreditation and recognition schemes, boosting uptake and promoting the virtues of the scheme (potentially supplemented by financial incentives) could mark a realistic step in the roadmap towards decarbonising the road freight sector. Whilst a local scheme covering the GDA would be advantageous, a national programme may be necessitated because of the <u>cross-boundary</u> movements of operators and their respective bases across Ireland.									
Impact on Freight Objectives											
Economy			Environment				Society				
Freight efficiency		Max	Air quality		Max	Safety		Max	Max		
Improved journey times, optimised use of fleets, delay mitigation and improved supply chain connectivity to save time and costs			Reduce the impact of the sector through air quality improvements and a reduction in other forms of pollution and intrusive activities			Improve the safety of the sector to reduce the number of accidents involving goods vehicles					
Industry contribution		Max	Greenhouse gas emissions		Max	Community disturbance		Max	Max		
Improved jobs and opportunities to address skills shortages, support for inward investment, land availability, infrastructure provision			Reduction in greenhouse gas emissions from the sector to achieve net-zero by 2050			Reduce the impact of freight on communities, noise levels, air quality and informal overnight lorry parking					
Connectivity		Min	Urban realm		Max	Placemaking		Min	Min		
Improved connectivity seamless intermodal activity to support local, national and international freight movements across the area			Minimising the intrusive impact of freight transport on visual amenity and local, protected settings			Better integrate freight into land use planning, development, construction and servicing plans, better freight data					

ACCREDITATION AND RECOGNITION SCHEMES		Investment Needed	Low	Freight Sector	All Road Freight	Actors	Industry Bodies, Public Sector, Businesses	Risk Level	Low	4Rs	Re-mode, Re-duce, Re-route, Re-time		
Definition: [Trend]	Many businesses are recognising the value of being an accredited or recognised member of an industry body and scheme to help boost their credentials amongst potential clients and supply chain partners. Whilst improving supply chain visibility, refining efficiency, and minimising cost are key operational drivers, fleet operators, suppliers and operators recognise the virtues of setting high environmental, safety and vehicle performance on financial sustainability. Equally local authorities and industry bodies are able to raise standards and help generate valuable datasets to inform future decision making.							Category		Raising Best Practice			
								Geographical Applicability:					
Best Practice	Use Cases												
	Fleet Operator Recognition Scheme <b>FORS</b>	The Fleet Operator Recognition Scheme (FORS) is a voluntary accreditation scheme for fleet operators which aims to raise the level of quality within fleet operations, and to demonstrate which operators are achieving exemplary levels of best practice in safety, efficiency, and environmental protection. FORS helps reduce work related road risk (WRRR) and demonstrates to a commitment to exceeding the industry standard. Already well stablished across Ireland with accreditation delivered through C Track (Inseego) but promotion is key. There are three levels of accreditation that can be attained for hauliers, suppliers and carriers of goods.											
	EcoStars Fleet Recognition Scheme <b>ECOSTARS</b>	EcoStars has been adopted around many UK and European cities with several membership options available to new organisations, businesses and local authorities. The aim of the scheme is to help fleet operators improve efficiency, reduce fuel consumption & emissions and make cost savings. This type of scheme seeks to both accredit /recognise the impetus taken by industry to improve safety, environmental standards and provide further, practical assistance to members. Implementing the key measures recommended by ECO Stars, a typical commercial vehicle operator could expect to reduce fuel consumption at least 5% in the first year or up to £2,450 per vehicle in fuel costs. The scheme is managed by consultants, TTR.											
	Logistics Emissions Reduction Scheme <b>Logistics UK</b>	A voluntary industry initiative to record, report and reduce transport emissions to feed into a public database (open source) to help report the sector contribution towards national emission reduction targets. The scheme is accessible to a company with a minimum of one vehicle and is designed to raise standards across the industry and awareness of the challenges and opportunities faced to meet targets. Such a scheme helps build awareness and promotion of environmentally friendly practices across the industry; operators can demonstrate their green credentials which hold weight with buyers, government and industry bodies. The scheme is also pivotal for data collection and using this to inform future decision making.											
Opportunities	Can help raise industry standards to support businesses efficiency and meet wider social and environmental aims. The structure of accreditation & recognition schemes is already well established in some cases.												
Barriers	Extra energy will need to be expended to engage with smaller operators, who may be less inclined or able to raise standards due to financial and time constraints/commitments												
Local Relevancy	Freight standards and best practice can be scaled up with support from major trade bodies such as the Irish Road Haulage Association and the promotion and awareness of accreditation and recognition schemes aimed at both large and small fleet operators across haulage and freight forwarding sub sectors of road freight transport. The push towards the professionalisation of the sector will have positive impact on reducing the environmental (emissions through fuel efficiency) and social (road safety and accidents) impacts of the sector whilst bringing about positive benefits to individual organisations and businesses who can benefit from additional exposure to market, access to training and resources. The collection of data, in some schemes, will help contribute towards a better, more robust database for making informed freight decisions.												
Impact on Freight Objectives													
Economy			Environment					Society					
Freight efficiency Improved journey times, optimised use of fleets, delay mitigation and improved supply chain connectivity to save time and costs			Max	Air quality Reduce the impact of the sector through air quality improvements and a reduction in other forms of pollution and intrusive activities					Max	Safety Improve the safety of the sector to reduce the number of accidents involving goods vehicles			Max
Industry contribution Improved jobs and opportunities to address skills shortages, support for inward investment, land availability, infrastructure provision			Med	Greenhouse gas emissions Reduction in greenhouse gas emissions from the sector to achieve net-zero by 2050					Max	Community disturbance Reduce the impact of freight on communities, noise levels, air quality and informal overnight lorry parking			Max
Connectivity Improved connectivity seamless intermodal activity to support local, national and international freight movements across the area			Min	Urban realm Minimising the intrusive impact of freight transport on visual amenity and local, protected settings					Max	Placemaking Better integrate freight into land use planning, development, construction and servicing plans, better freight data			Min



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