Knight Frank

Future Gazing

The Future of Urban Logistics

FOREWORD

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The role of urban logistics has been brought to the forefront by the recent rapid growth of e-commerce as well as the evolving nature of consumer demand.

Distribution to businesses remains an important part of urban logistics, but the focus is shifting; from predominantly business to business fulfilment, towards more business to consumer fulfilment.

Operating in the urban environment comes with its challenges; rising populations and competing property uses are putting pressures on the supply of industrial land, and the proximity of residents can lead to conflict. But densely populated cities of affluent consumers offer huge opportunities.

Stiff competition amongst retailers and logistics service providers is driving a range of delivery options such as same-day or next-day delivery, and click & collect. A growing spectrum of delivery options brings new logistics challenges such as higher delivery frequencies, shorter turnaround times, fluctuating demand, changing delivery patterns, and uncertainties around the returns.

Fundamental changes to consumer habits are taking place and businesses need to consider changes to their operational models and their real estate footprints, particularly within urban areas. But consumer habits are not the only factor driving changes for operators. There are also important technological and sustainability considerations.

Consumers, retailers, and logistics carriers are increasingly looking at the environmental impact of their decisions. While shoppers want more goods, more quickly and more conveniently, they also want those goods produced and delivered more sustainably. Consumers are demanding higher standards of sustainability from retailers and in turn, retailers are looking at the delivery options they provide, and the sustainability credentials of the operators they partner with. Balancing financial, social, and environmental objectives, which are sometimes contradictory, remains critical for logistics service providers.

Councils and policymakers are also becoming increasingly concerned with the environmental and social impacts of urban logistics. This is challenging traditional distribution models and delivery methods. Clean air zones are encouraging greener transport choices, with more electric fleet vehicles as well as the adoption of alternative delivery methods such as cargo bikes. Councils are also promoting the use of consolidation centres, fundamentally changing how goods are delivered to city centre businesses.

Technological advances are offering solutions for urban logistics operators. Enabling them to improve how efficiently they manage their facilities, inventory, and operations. Improvements in automation technology are allowing equipment to be scaled down and applied in smaller facilities. High-tech solutions are also bringing about new ways to move goods around the city.

In this report, we explore these key themes of consumer demand, sustainability, and technology, and how they are influencing the urban logistics environment.

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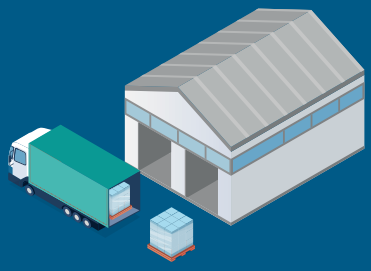
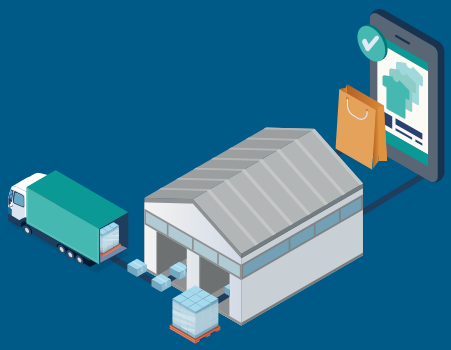
FROM TRADITIONAL DISTRIBUTION FORMATS TO NEW URBAN FULFILMENT MODELS

How are evolving operational models and new fulfilment formats transforming urban logistics?



Distribution Centre

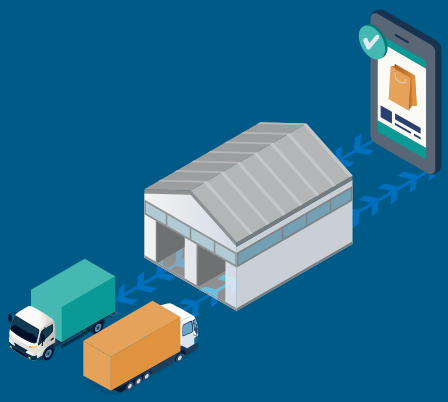
The traditional Distribution Centre model centres on a warehouse focused on consolidating goods from several suppliers, storing goods and dispatching them to a store network, with the operator using their own fleet for distribution. These are large facilities that may distribute to a national or regional network. National Distribution Centres (NDCs) are typically located in central-UK locations such as the Midlands. Goods are pallet racked with no need to access individual items for picking and packing, this model allows for excellent utilisation of space. The regular, scheduled nature of deliveries and locations allows for optimised delivery routes and configuration of space within the warehouse.



Customer Fulfilment Centre

A Customer Fulfilment Centre (CFC) picks and packs individual customer orders and can process high volumes of goods for both B2C and B2B customers. CFC's are typically operated by the third-party logistics provider that manages inventory and distribution. They will utilise parcel carrier networks for distribution. The growth in e-commerce has driven a need for more warehouse space dedicated to fulfilling B2C orders. Fulfilling e-commerce orders requires more warehouse space compared with traditional retail distribution.

Centralised Customer Fulfilment Centres allow for economies of scale, and this means that operators can invest heavily in optimising their facilities to suit their requirements in terms of building specification and large-scale automation systems. High volumes of stock and less efficient use of space (compared with traditional retail) means that these CFCs are located some distance away from higher cost urban centres. These facilities tend to be in a central UK position such as the Midlands Golden Triangle, or at a city gateway location, with good transport connections to maximise their reach. However, the need for access to parcel carrier networks and growing pressures for labour have pushed these facilities further north.



Reverse logistics and returns processing centres

Reverse logistics and returns processing centres involve the movement of goods backwards through the supply chain, from the customer to the retailer. Return rates for e-commerce are higher than in-store purchases. According to Invesp, at least 30% of all products ordered online are returned compared to 9% for in-store purchases. Customers expect free and simple returns processing and retailers need goods to be quickly processed and added back into stock inventory, and refunds issued. Customer returns are usually made using Post Office drop offs or by courier collection, but some retailers may facilitate in-store returns.

How businesses facilitate returns can vary, some are establishing separate warehouses to handle reverse logistics, and some may have a returns department within their CFC, though this is less common. Clipper Logistics have established a returns management function called Boomerang, their clients include ASOS and John Lewis. The service allows returns to be quickly processed through quality control and added back into stock so that they can be re-sold. These facilities are typically located outside urban areas and are configured to process multiple orders and to undertake refurbishments, recycling or disposal of stock.

URBAN LOGISTICS AND LAST-MILE FORMATS

The rise in e-commerce is encouraging new retail and logistics formats and this is driving new fulfilment models in urban areas.

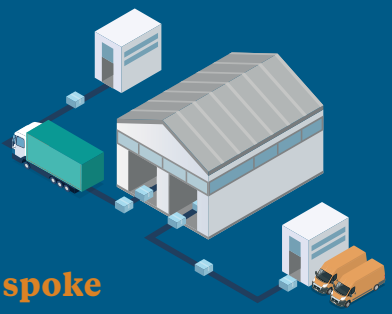
Mini and micro-fulfilment centres

While the giant CFC can allow for efficiencies of scale and high levels of automation, getting local is the key to faster delivery times. Rather than the more pervasive hub and spoke model, where orders are fulfilled in one (CFC) facility before being sent on to a delivery station, these new facilities perform both the fulfilment and the dispatch to customers, with delivery drivers collecting orders from the facility.

Both Amazon and Ocado utilise **mini-fulfilment centres**. At around 100,000 - 150,000 sq ft they are significantly smaller than the large, centralised CFCs. Ocado opened their first mini-CFC in Bristol earlier this year and plan to open a second in Bicester in 2022.

But the fulfilment centre ecosystem is growing and evolving. New hyper-local fulfilment models are emerging to meet customer demand for fast turnaround times. **Micro-fulfilment centres (MFCs)** are tiny urban warehouses utilising automated systems to fulfil customer orders quickly and efficiently. By reducing the size and catchment of fulfilment centres, these facilities can be located within densely populated urban areas offering delivery within an hour. By locating close to the customer, they can reduce the timeframe and delivery costs of last-mile delivery. A host of new, on-demand supermarkets have emerged over the past 18-months; such as Getir, Zapp, Weezy and Gorillas; offering grocery deliveries within 15-minutes.

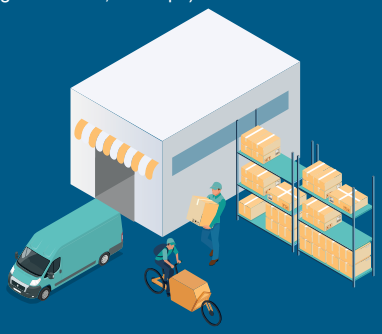
Some supermarkets are utilising their existing retail store network in urban areas and either converting existing space or extending their building footprint to accommodate micro-fulfilment centres at these locations. These small-footprint, low investment, highly automated systems, typically occupy 3,000-10,000 sq ft and can be built into the backroom or on the perimeter of existing stores. Converting or extending at their retail locations means that the transport logistics that stock and service their store network can be utilised to service these fulfilment centres with minimal cost implications.



Hub and spoke

Hub and spoke has become the main operating model for many logistics businesses. This relies upon a large, CFC which acts as the hub. Goods are then dispatched to spoke locations and onward for the last-mile customer delivery. The hub and spoke system means that the CFC can maintain centralised stock control and systematic, scheduled delivery dispatches to the spoke locations. These “spokes” are often cross-docked facilities; they have high volumes of throughput, with customer orders being brought in on HGV lorries from the CFC and moved onto smaller vans for customer delivery.

Online grocery store, Ocado relies on a hub and spoke distribution model for most of their order fulfilment. For servicing their London-based customers, orders will be fulfilled at their CFCs located in Erith or Hatfield before being transported to “spokes” located around the city, at Enfield, Ruislip, Park Royal, West Drayton, Wimbledon, Weybridge, Dagenham, and Waltham Forest. These spokes range between 30,000 and 85,000 sq ft (averaging around 50,000 sq ft).



Dark stores

Dark stores are laid out like a retail store but do not permit customers to enter. They perform the same function as micro-fulfilment centres, where goods are picked, packed, and delivered straight to customers. However, dark stores will rely on manual picking and packing of orders rather than the highly automated systems found in fulfilment centres.

Supermarkets began opening dark stores to assist with distribution in geographical areas where there was a high demand for online delivery. However, some have now moved away from this model. Retailers with dark stores usually operate fleets of light vans to deliver orders made online, particularly to inner urban areas, avoiding disruptions to offline in-store operations. Some dark store formats may permit customers to collect orders, but this is not typical.

During the Covid-19 pandemic, Sainsburys repurposed some of their unused central London convenience stores as dark stores. This was because of a sharp decline in footfall as office workers, who comprised their customer base, worked from home. Switching to a dark store format, allowed Sainsburys to flex-up their home delivery operations during the pandemic, without relying solely on in-store fulfilment that can negatively affect customers’ in-store shopping experience.

Consolidation centres

Consolidation centres allow deliveries from various suppliers to be consolidated into a single consignment before delivery to a store. The Crown Estate Regent Street Consolidation Centre is in Enfield and run by Clipper. More than 20 retailers use the facility to consolidate orders and minimise traffic movements, deliveries, and emissions within Central London. It has reduced vehicle movements in the West End by up to 85%.

Consolidation centres are not just used in retail distribution. Construction Consolidation Centres (CCCs) are used to reduce vehicle deliveries to construction sites. These have been used for major development projects such as Heathrow Terminal 5 and the London Olympics. The Olympics CCC was in Barking and run by DHL.

As pressure to reduce traffic movements within cities grows, there is increasing appetite for **micro-consolidation centres,** where deliveries destined for offices or shops in central locations are consolidated off-site and then taken onward into the city in a single delivery. An example is the Grosvenor Micro Consolidation centre, where goods destined for Grosvenor's head office at 70 Grosvenor Street are consolidated off-site at Bow in east London.

For retailers, click & collect can reduce the cost of last-mile delivery, particularly for those using their own store networks. There is also the benefit of bringing shoppers to the store and the additional in-store spend this can attract.

In-store fulfilment

Particularly in the case of grocery retail, in-store fulfilment is by far the most widely adopted approach. It does not require any significant capital outlay and by utilising existing retail space and logistics infrastructure, it can be quickly implemented.

There are drawbacks however; handpicking orders is costly and inefficient and if this service is offered free to customers, the margins for this type of fulfilment are typically negative. Inventory management is also more difficult when picking goods in store, the ability to control stock levels and product availability are impacted by in-store shopping. There is also a negative impact on in-store shoppers; product availability may be impacted, the store will require more frequent restocking, and there will be more staff and roll cages blocking the isles.

Click & collect

Although this is, more of a delivery model, rather than fulfilment model, it is worthy of note here. Retailers with a physical store network can utilise their existing scheduled store delivery infrastructure to facilitate the drop off and collection of online customer orders. Pure-play, online-only retailers, and retailers with a smaller store network are partnering with larger retailers to utilise their store network. For example, online fashion retailer ASOS offer a click & collect (as well as returns) through ASDA. Sportswear retailer Sweaty Betty offer click & collect through both their own store network as well as through Waitrose. Many retailers are also offering click & collect services, as well as returns, through their delivery partners; parcel delivery platforms, such as DPD, Hermes and Collect+.

How the orders are fulfilled, or picked and packed can differ, for grocery retailers, orders may have been manually picked in-store, or they may have been fulfilled using a large, centralised fulfilment centre, or perhaps an MFC either within, or adjacent to the store. Orders for pure-play e-commerce retailers will be processed at a fulfilment centre before being distributed to the network for click & collect. This may be done using a third-party parcel carrier, or centrally by the 3PL managing the logistics for the retailer.

For retailers, click & collect can reduce the cost of last-mile delivery, particularly for those using their own store networks. There is also the benefit of bringing shoppers to the store and the additional in-store spend this can attract.

OCCUPIER MARKET

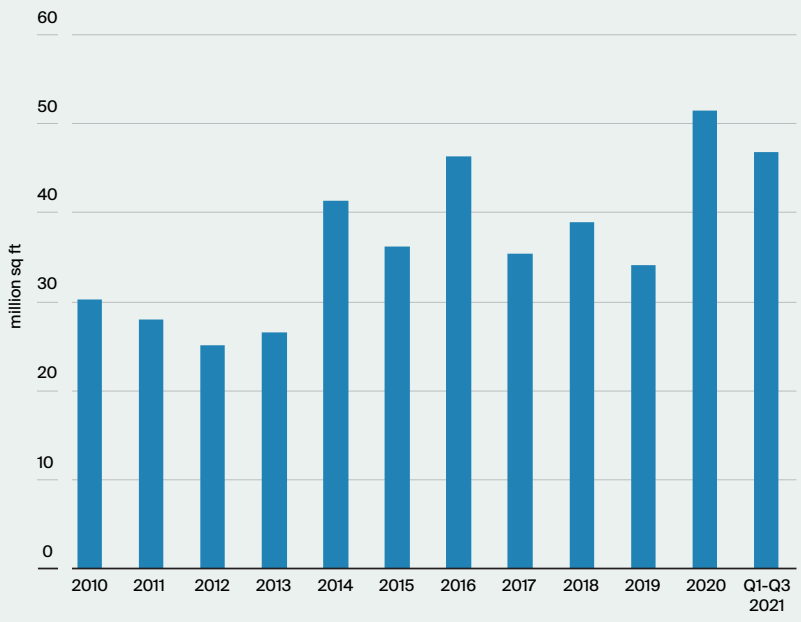
With consumers demanding ever-faster delivery times, and the high costs associated with the last-mile of the supply chain, retailers and logistics operators are pushing to improve their distribution models, reduce inefficiencies, and hold stock closer to consumers.

Rampant demand

The robust levels of growth in the e-commerce market have driven a surge in demand for urban logistic space.

A record 51.6 million sq ft of space was taken in 2020 (in units over 50,000 sq ft) and a further 46.9 million sq ft has been taken so far in 2021 (Q1-Q3), demonstrating the robust occupier market for UK logistics space. E-commerce has been a strong driver of tenant demand, with retailers and distribution firms accounting for 76% of take-up in the first half of 2021. However, the manufacturing sector has increased its share of take-up, accounting for 19% in the first half of this year.

Take up (units over 50,000 sq. ft.)

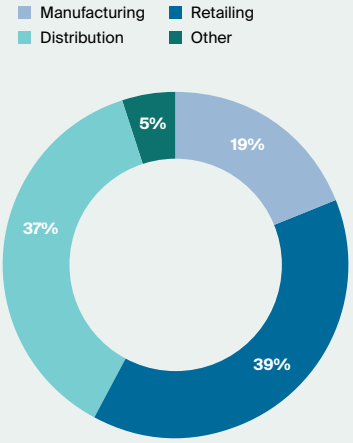


Source: Knight Frank Research *Preliminary Q3 2021 figure

Tenants in the urban logistics market are typically third-party logistics companies and UK businesses that deliver goods to businesses or to consumers and require last-mile or e-fulfilment services. The growth in the on-demand grocery delivery market has given rise to several new companies offering grocery home deliveries within a matter of minutes. Companies such as Weezy, Getir, Zapp, and Gorillas are increasingly taking space in urban centres across the UK. They operate from small dark stores or micro-fulfilment centres located very close to their customer base. Their rapid fulfilment operational model means they can not locate further away from their customers. The "race for space" in these location is driving up rents.

Across the UK, the vacancy rate for units under 100,000 sq ft and located in urban areas, is just 3.2% and is expected to fall further.

Take up by occupier type H1 2021 (units over 50,000 sq ft)



Source: Knight Frank Research

Manufacturing in UK cities

Manufacturing was once a prominent feature in UK cities. Across the UK's top 11 major cities, there were more than 1 million people employed in manufacturing in 1984. Over the following 35 years, the sector lost 697,000 jobs, equivalent to 68% of the workforce. By the end of 2019, there were just 335,000 employed in manufacturing across the top 11 cities. In percentage terms, Nottingham has seen the sharpest fall, with a loss of 77% of all manufacturing jobs over the past 35-years. Despite losing half of its manufacturing jobs, Cardiff fared better than the other top ten cities, followed by Leeds (-58%).

Not just last-mile

Demand for urban logistics space is not all to do with e-commerce (though it accounts for a significant proportion), it also reflects a need for supply chain resilience. While 'just-in-time' supply chains limit the need for storage and thus reduce the need for warehousing space, Covid-19 highlighted issues with this model as supply chains from Asia were shut off. As a result, we have seen a re-shoring or near-shoring of manufacturing operations, with operators moving facilities closer to the end consumer.

The Suez Canal incident in March and the more recent HGV driver shortages have further underscored the importance of supply chain resilience. Suppliers are looking to increase their stock holdings, and develop shorter, more dependable supply chains to ensure their operations can withstand any further shocks.

MANUFACTURING JOBS BY CITY (,000'S)

LOCATION	1984	2019	JOBS LOSS	% CHANGE
Liverpool	37.1	10.4	-26.7	-72%
Sheffield	63.4	23.4	-40.1	-63%
Leeds	68.6	28.9	-39.7	-58%
Nottingham	40.3	9.2	-31.1	-77%
Birmingham	153.8	41.4	-112.4	-73%
Inner London	125.5	50.6	-74.9	-60%
Outer London	293.5	93.3	-200.2	-68%
Bristol	31.9	10.9	-21.1	-66%
Cardiff and Vale of Glamorgan	26.7	13.3	-13.4	-50%
Edinburgh	29.9	8.0	-21.9	-73%
Glasgow	65.2	17.7	-47.5	-73%
Manchester	96.0	28.1	-68.0	-71%
TOTAL	**1031.9**	**335.0**	**-697.0**	**-77%**

Source: Knight Frank Research, ONS

Is there potential for reshoring manufacturing within urban areas?

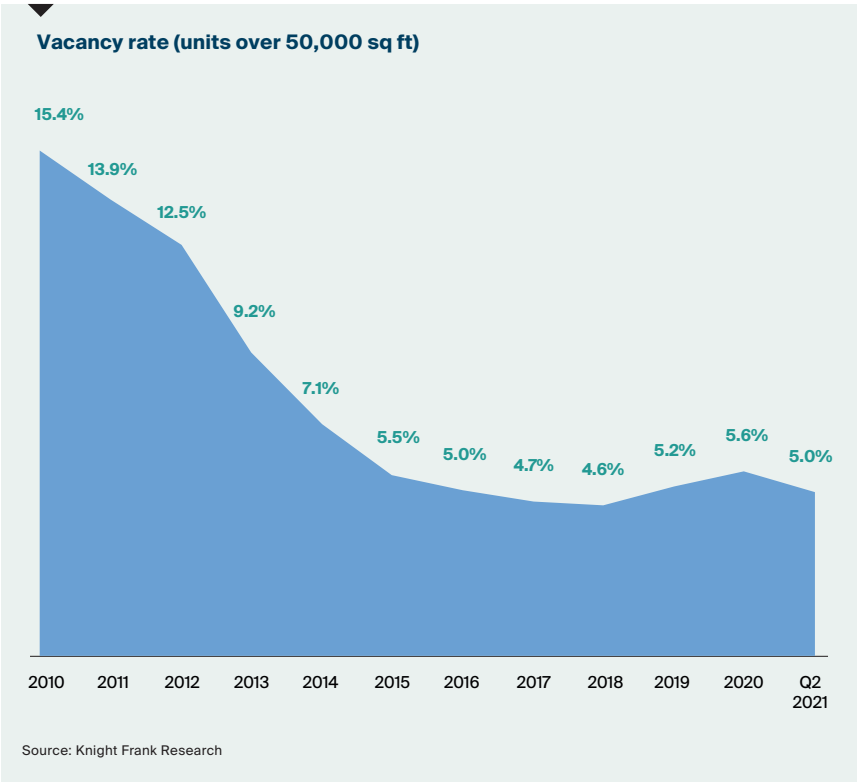
Bringing manufacturing back to the UK and into urban areas has the benefit of building resilience into supply chains but also enhances their sustainability credentials, and enables faster turnaround times for consumers. There is strong government support for retaining and bringing new manufacturing industries to UK cities. However, historically industrial land has been undervalued, and eroded, with other use classes given priority. This has meant a shrinking manufacturing base across UK cities. Employment in the manufacturing sector has fallen across all cities. However, some cities are nurturing growing advanced engineering and manufacturing centres.

UK cities once thrived as centres for manufacturing but many industrial activities were unsightly and polluting. Much of the UK's manufacturing base was moved outside of cities or sent overseas, to remove the negative impacts of heavy industry and take advantage of cheaper production to boost profit margins. Although production was offshored, the design base was typically retained in UK cities. Now, new technologies are changing that, reuniting the design and production functions. New technologies offer cleaner, flexible, scalable solutions and many of the drivers that led to offshoring are no longer applicable.

Advanced Engineering has announced its ranking of the UK's top high-value manufacturing hotspots, with Sheffield securing the top spot, followed by Bristol, Milton Keynes, Cambridge, Nottingham, and London.

Advances in technologies such as 3D printing and additive manufacturing are changing the ways that we make goods, and bringing manufacturers closer to their customers. These technologies allow for efficient small-scale production, meaning designers can develop and create prototypes extremely quickly and replacement parts can be easily printed and dispatched to consumers. Advanced Engineering has announced its ranking of the UK's top high-value manufacturing hotspots, with Sheffield securing the top spot, followed by Bristol, Milton Keynes, Cambridge, Nottingham, and London.

The new, post-Brexit, UK-EU trade deal means that traded goods must meet requirements on "rules of origin" in order to benefit from duty and quota free trade. These regulations are set to tighten over the next few years. UK manufacturers will also have to reduce their dependence on components manufactured outside of the region and may need to reshore or nearshore some of their supply chains.



Creative Industries

There has been a rise in alternative uses for urban logistics space, which is adding to demand. For example, film studios have been acquiring space recently. Netflix, Pinewood Studios, Warner Brothers, and Garden Studios have taken space in London over the past couple of years. There has been a key focus on London as a centre for creative industries, the city has a great pull for creative talent and the agglomeration effect and brought about thriving creative clusters in the city. Other creative clusters are developing in Bristol, Leeds, Cardiff and other UK cities. The media sector has been a growing source of demand in Cardiff, with Great Point Media and Urban Myths Filming both taking space recently.

Limited supply

Demand for urban logistics units is driving down vacancy rates in urban areas. Across the UK, the vacancy rate for units under 100,000 sq ft and located in urban areas, is just 3.2% and is expected to fall further. In Greater London, the vacancy rate (units under 100,000 sq ft) is just 3.1%, in Bristol it stands at just 1.5% and in Edinburgh, Birmingham, and Manchester, vacancy rates are less than 1%. This compares with a vacancy rate of 5% across the UK, for all unit sizes over 50,000 sq ft.

Development opportunities are limited in urban areas and much of the existing space is in older units. There is a desire to intensify industrial land or combine it with other uses. The new London Plan (2021) acknowledges the rising demands on industrial land, in part due to the growth in e-commerce, and the role it will play in the coming years. Research from the Greater London Authority (GLA) has stated that there will be a positive net demand for industrial land in the coming years. As a result, the amount of Strategic Industrial Land (SIL) to be released before 2041 has been limited to 233 hectares.

In London, the east London boroughs of Newham and Tower Hamlets, along with south London boroughs of Merton and Southwark top the list, all of which are expected to record more than 7% rental growth this year.

The lack of space and development opportunities is driving robust rental growth for industrial assets across urban areas. With particularly strong growth being recorded in markets in London and the South East region.

Across the UK, Sheffield has the highest rental growth forecast for 2021, with annual growth of 7.8%. In London, the east London boroughs of Newham and Tower Hamlets, along with south London boroughs of Merton and Southwark top the list, all of which are expected to record more than 7% rental growth this year. Outside of London, markets in the Eastern region feature highly in the top ten for rental growth. Many of these markets are within close proximity to London. Manchester, the UK's second most populous city (after London) also features in the list of top markets for rental growth.

7.8%

Across the UK, Sheffield has the highest rental growth forecast for 2021.

Highest rental growth forecast (2021) by market - London

1	Newham	7.5%
2	Tower Hamlets	7.1%
3	Merton	7.1%
4	Southwark	7.1%
5	Redbridge	6.9%
6	Havering	6.6%
7	Croydon	6.4%
8	Enfield	6.4%
9	Brent	5.8%
10	Waltham Forest	5.8%

Source: RealFor

Highest rental growth forecast (2021) by market – Outside of London

1	Sheffield	7.8%
2	St. Albans	7.2%
3	Basildon	7.1%
4	Colchester	7.1%
5	Manchester	6.9%
6	Harlow	6.8%
7	Hertsmere	6.6%
8	Peterborough	6.5%
9	Luton	6.4%
10	Ipswich	6.4%

Source: RealFor

INVESTMENT MARKET

The urban logistics market has attracted strong investor interest, particularly over the past 18-months. The Covid-19 pandemic has accelerated the structural shifts in the retail market, and the growth of e-commerce, driving investors to increase capital allocations to the sector.

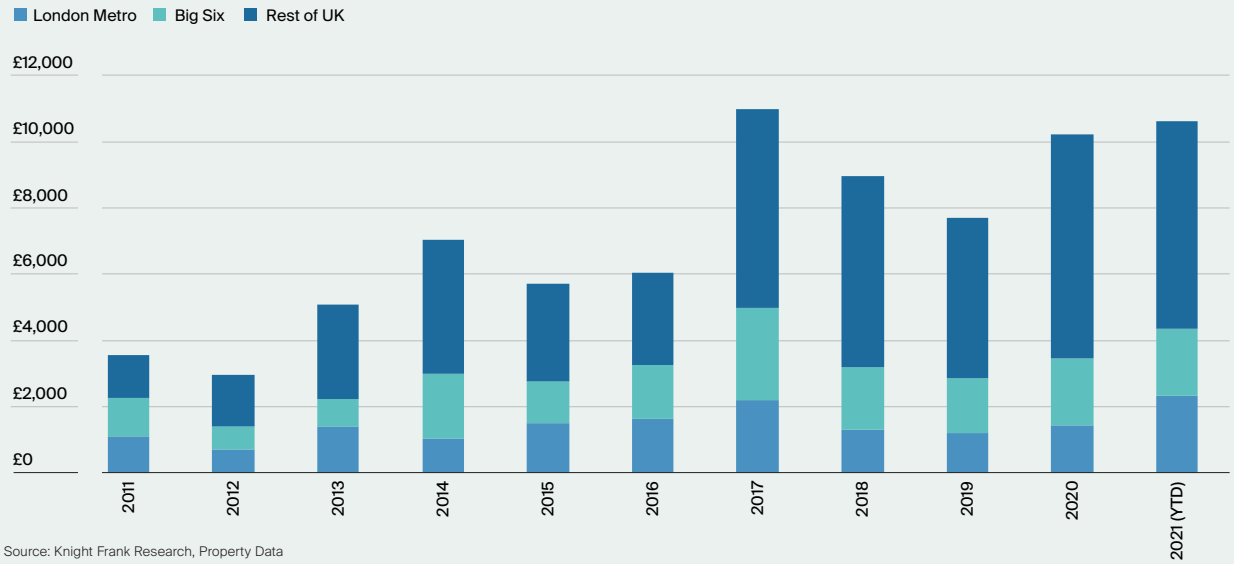
With consumers demanding ever-faster delivery times, and the high costs associated with servicing the last-mile, retailers and logistics operators are pushing to improve their distribution models, reduce inefficiencies, and hold stock closer to consumers. This strong occupier demand to hold stock within urban areas is supporting investor sentiment.

Investment into the industrial and logistics sector has already topped the full-year total for 2020, with £10.6 billion invested, and the fourth quarter still to come, investment is expected to reach record levels. 41% of the total transacted in 2021 was for assets located in the London metro area and the big six UK cities (Birmingham, Manchester, Bristol, Leeds, Glasgow, and Edinburgh). Investment into industrial and logistics assets located within the London metro region has totalled £2.3 billion so far this year, up 63% on the total for 2020.

Many institutional investors were already looking to tilt their portfolios towards the logistics sector and the Covid-19 pandemic has led them to intensify their push. Allocations to the UK industrial and logistics sector have increased from

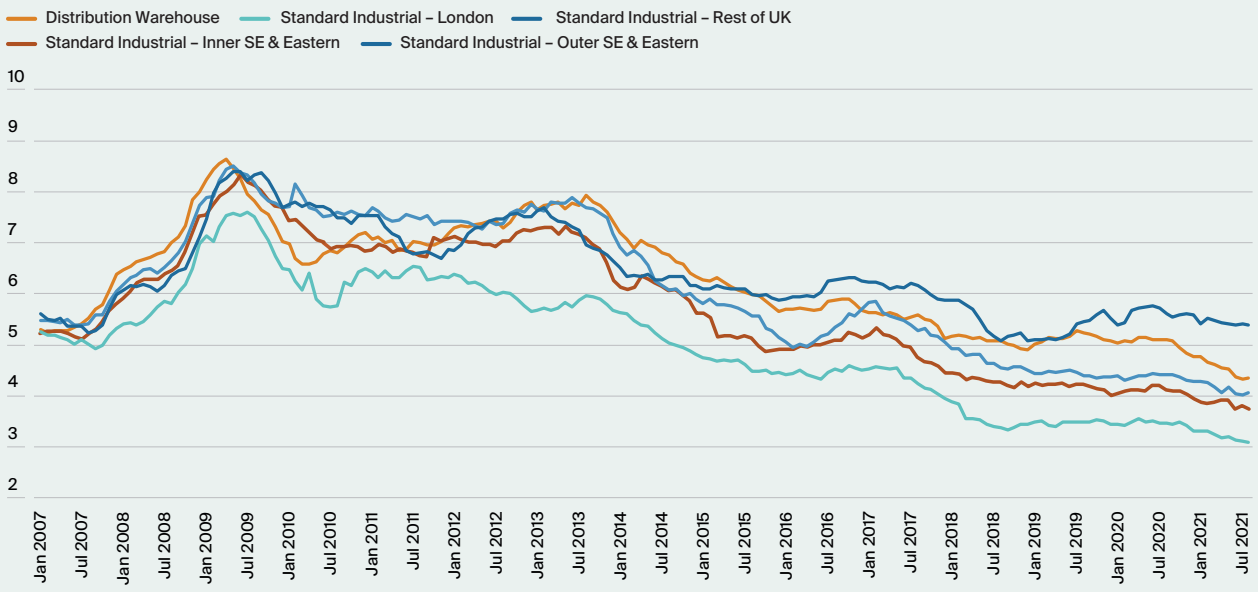
Allocations to industrial and logistics assets located in London and the South East have almost doubled over the past five years.

Industrial and logistics investment by market (£millions)



Source: Knight Frank Research, Property Data

Net initial yield (%)



Source: MSCI, Knight Frank Research

21.0% five years ago, to 36.4% in Q2 2021, according to the MSCI/AREF All Balanced Fund Index. Allocations to industrial and logistics assets located in London and the South East have almost doubled over the past five years, from 12.5%, to 23.8% of the All balanced property fund index.

British Land recently announced a new investment strategy to target urban logistics opportunities. It has just agreed to pay £87 million for a warehouse near London and is also developing land into urban logistics space. Canadian investment firm BMO bought three regional UK logistics assets after selling a Royal Mail distribution centre in Bristol. BMO said it is diversifying out of larger, older distribution centres into modern facilities in areas of strong demand. InfraRed Capital Partners' dedicated Urban Logistics Income Fund continues to both invest and rotate its portfolio, having traded several assets over the past year.

Industrial developers and operators are now competing with residential developers for land.

Those already invested in the sector are looking to increase their exposure and new entrants are looking to enter the market and this is driving competition which is, in turn, fuelling pricing. Average net initial yields for standard industrial in London were recorded at 3.08% in August 2021, down 38 bps from 3.46% in August 2020 and a post-GFC high of 7.60%. Yields in the South East and Eastern region have also recorded significant compression over the past year, with Inner SE & Eastern down 37 bps on August last year. Over the same period, net initial yields for standard industrial across the rest of the UK recorded just 16 bps compression over the past year. However, the strongest yield compression was recorded for distribution warehouse assets, with net initial yields down 73 bps year-on-year.

Despite strong investor sentiment for urban logistics, obtaining exposure can be tricky. With good quality, existing assets in short supply, the only option for many investors is to look to drive value through development.

Strong growth in land values (and rents) have been recorded in urban areas, where competition for land is strongest and supply of industrial and logistics stock, most constrained. Over the past 20 years, large tracts of industrial land have been sacrificed to higher value use-classes such as residential. London lost around 100 ha of industrial land annually, compared to the target of just 37 ha per annum according to the now superseded London Plan (2016). This has led to limited stock available for occupiers and restricted opportunities for investors and developers.

However, given the growth in occupier demand, industrial developers and operators are now competing with residential developers for land. Amazon recently acquiring a site in Barnet with planning consent for a residential-led scheme. Examples of industrial land values starting to compete with residential values are not yet being seen outside of London, however, the rapid growth in online retailing has generated demand for urban and last-mile logistics throughout other UK cities and this is pushing up land values in these locations too.

Indirect investment is another method for investors seeking to gain exposure to the urban logistics sector. Urban Logistics REIT concentrates on the last-mile of the supply chain. Target assets have smaller lot sizes (typically under £10 million) and tend to be single-let assets under 200,000 sq ft. They are currently trading at a 17.6% premium over NAV (net asset value), 24th September 2021, with their latest fundraising oversubscribed.

Returns for the industrial and logistics sector have surpassed those across other real estate sectors, and logistics returns in urban areas have outperformed other locations. Total returns for UK industrial and logistics reached 9.7% in 2020 and are forecast to reach 18.5% in 2021 (Source: RealFor, Q2 2021 forecast), though it is likely these will be revised up based on Q3 performance. The highest returns for 2021 are forecast for Newham in East London. London Boroughs of Tower Hamlets, Waltham Forest, Southwark, Redbridge, Croydon, and Ealing are all forecast to record total returns over 20% this year. Outside of London, the markets of Leeds, Maidstone, Manchester, Newcastle, Amber Valley (East Midlands), and Durham are all forecast for returns of more than 20%.

Returns for the industrial and logistics sector have surpassed those across other real estate sectors, and logistics returns in urban areas have outperformed other locations.

CONSUMER HABITS

How much space is needed to service the last-mile and where is consumer demand greatest?

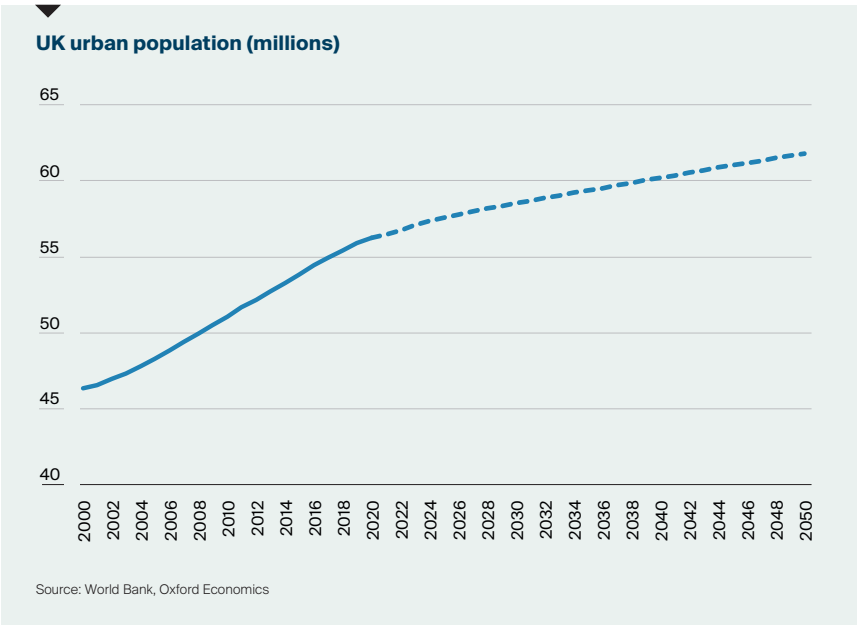
The UK's urban population has grown significantly over the past twenty years. Since the year 2000, the population of UK cities has risen by 10 million (Source: World Bank). Urban populations are forecast to continue growing. 56.3 million people or 83.9% of the UK population currently live in cities and Oxford Economics forecast to rise to 61.8 million, or 87.5% of the population by 2050. As urban populations grow, the need for logistics space in cities will rise.

HOW MUCH SPACE WILL WE NEED?

The amount of space required to service last-mile delivery for e-commerce is a function of both the consumer demand (or, online spend), as well as the distribution model (including the delivery speed and vehicle fleet). Different fleet vehicles may have a different range for deliveries and some distribution models will have a greater focus on urban logistics space compared with large, centralised distribution centres. Based on analysis of e-commerce operators (utilising a hub and spoke distribution format) we found that 23.5% of their warehouse space was located in "spoke" facilities, that are servicing the last-mile delivery. However, this could change through the adoption of more micro fulfilment centres or through greater adoption of in-store fulfilment, etc.

Our analysis last year found that, for each £billion of online retail sales, a total of 1.36 million sq ft of warehouse space is required. Therefore, based on a hub and spoke model and at current capacity utilisation rates, each £1 billion requires around 320,000 sq ft of *last-mile* logistics space (or space in "spoke" facilities).

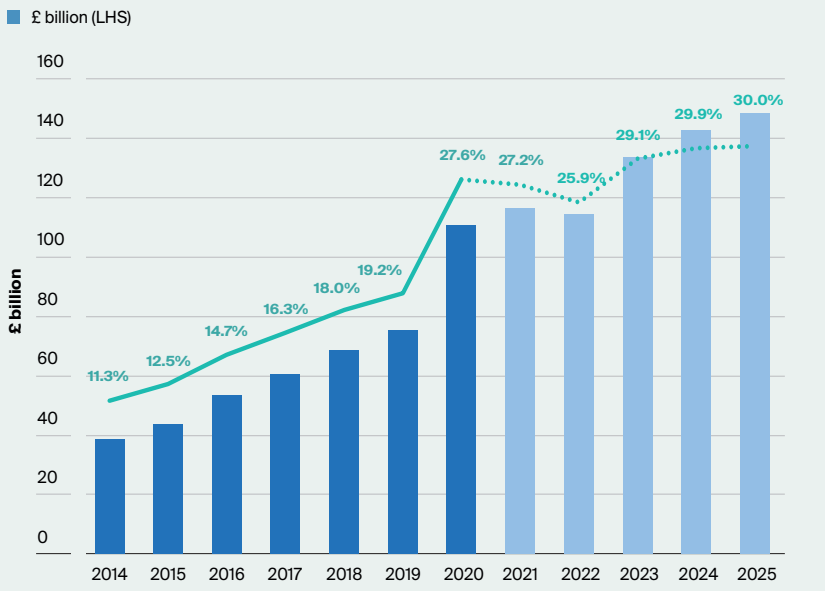
In 2020, e-commerce sales totalled £111 billion in the UK, and accounted for 27.6% of total retail sales, up from £75 billion (19.2% of retail sales) in 2019. An annual increase of £36 billion. This rapid growth in e-commerce and the above figures help to quantify the surge in demand for urban logistics space we have witnessed in 2020-2021. According to our analysis, the additional e-commerce sales in 2020, would have required an additional 11 million sq ft of last-mile logistics space, based on a hub and spoke model. It is



Source: World Bank, Oxford Economics

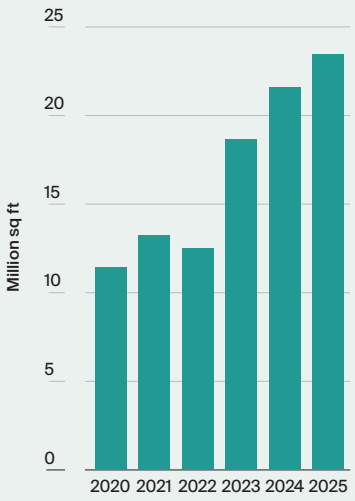
Based on analysis of e-commerce operators (utilising a hub and spoke distribution format) we found that 23.5% of total warehouse space was located in "spoke" facilities, that are servicing the last-mile delivery.

Online sales volume and % of total retail spend



Source: Knight Frank Research, ONS, Oxford Economics, Mintel

Projections for e-commerce driven demand for last-mile facilities
2020-2025 (cumulative)



Source: Knight Frank Research

important to note however, that much of this demand has, and will continue to be met through alternative fulfilment models, such as micro-fulfilment centres or in-store fulfilment. Vacancy rates in urban locations are at historic lows, and development remains highly constrained in these markets.

Online retail sales are forecast to rise over the next five years (2021 – 2025), to account for 30% of retail sales by 2025 (Source: Mintel). This will result in an additional £37 billion worth of online spend. Based on the above stated assumptions, we could see additional requirements for urban or last-mile fulfilment space totalling 12 million sq ft (2021-2025).

Populations in urban areas are growing, consumers are getting more demanding, fulfilment models are evolving, and how efficiently operators use space is improving. These factors could impact the amount of space required to service last-mile deliveries. The most difficult factors to account for are improvements in the use of space, and shifts in distribution models. These factors are mainly driven by the adoption of new and emerging technologies.

WHERE WILL WE NEED THIS ADDITIONAL LAST-MILE LOGISTICS SPACE? WHICH ARE THE MOST IN-DEMAND MARKETS?

To answer these questions, we have produced a model assessing the distribution of household online spend, across the UK. Combining data on income, retail spend, and demographic, profile to determine online retail spend.

Retailers and operators will seek facilities that can service these "hotspot" locations for online consumer demand.

WHAT FACTORS DETERMINE HOTSPOTS OF ONLINE SPEND?

Population density

Areas with high population density offer a clear opportunity, with more chimney pots within close proximity, delivery routes can be shorter, with more stops and lower costs per delivery compared with deliveries in more rural areas.

Online retail sales are forecast to rise over the next five years (2021 – 2025), to account for 30% of retail sales by 2025 (Source: Mintel). This will result in an additional £37 billion worth of online spend.

Most densely populated local authorities in London

LOCAL AUTHORITY	POPULATION DENSITY (PERSONS PER KM)
Tower Hamlets	16,237
Islington	16,164
Hackney	14,796
Kensington and Chelsea	13,011
Westminster	12,444
Camden	12,274
Lambeth	12,075
Hammersmith and Fulham	11,571
Southwark	10,994
Newham	9,809
Wandsworth	9,696
Haringey	8,955
Lewisham	8,738
Brent	7,669
Waltham Forest	7,102

Source: ONS

Most densely populated local authorities outside London

LOCAL AUTHORITY	POPULATION DENSITY (PERSONS PER KM)
Portsmouth	5,373
Southampton	5,050
Luton	4,955
Leicester	4,852
Manchester	4,766
Watford	4,599
Slough	4,531
Liverpool	4,447
Nottingham	4,439
Southend-on-Sea	4,360
Birmingham	4,261
Bristol, City of	4,213
Reading	4,045
Blackpool	3,984
Sandwell	3,819

Source: ONS

Across Greater London, there are 5,700 people per square kilometre but fewer than 50 people per square kilometre in the most rural local authorities of the UK. The most densely populated areas of London have more than 10,000 people per square kilometre.

Household income

UK cities tend to have higher average household disposable incomes. Across the UK, households have an average of £51,600 per annum, while in London, the average is £74,300 per annum. As well as London, Cambridge, Oxford, Brighton and Hove, Southampton, and Northampton all have average household incomes above the UK average. So it is clear to see the opportunity that household consumption in these areas offers for retailers, and the logistics operators that service deliveries to these areas.

The list of top 15 local authorities for average earnings is dominated by local authorities in Greater London, several local authorities from the South East and Eastern region also feature. Local authorities that have high commuter flows into London, such as Brentwood, Chiltern and Elmbridge also feature.

Average Earnings (resident-based) by Local Authority – top 15

LOCAL AUTHORITY	RANK 2020
Kensington and Chelsea	1
Richmond upon Thames	2
Westminster	3
Brentwood	4
Wandsworth	5
Chiltern	6
City of London	7
Hammersmith and Fulham	8
Elmbridge	9
Tower Hamlets	10
St Albans	11
Camden	12
Islington	13
South Bucks	14
Windsor and Maidenhead UA	15

Source: ONS

We could see additional requires for urban, or last-mile fulfilment space totalling 12 million sq ft (2021-2025).

Retail spend (propensity to consume)

The proportion of income a household spends on retail is largely determined by income level, but also the cost of living, and composition of the household. Households on a lower income spend a larger proportion of it.

In locations where living costs are higher, households will have less disposable income available for retail spend. In cities with lower living costs (relative to wages), the proportion of household income spent on retail will be higher.

The structure of the household also impacts spending patterns, for example, a household comprised of a single adult will typically have lower retail spend compared with a couple with the same household income.

Online penetration rate

Age profile and household composition play a significant role in determining the proportion of retail spend that takes place online. Younger demographic groups tend to have higher online shopping propensities compared with older shoppers. Urban areas typically have a younger demographic profile compared with more rural locations, and the lowest proportion of residents aged 70+. However, online penetration rates are growing rapidly amongst older shoppers. In the future, we expect age profiles to play less of a role in determining online spend.

Based on current shopping habits, population distribution, income levels, and demographics/household structure, we have determined hotspot locations for online retail spend, both within Greater London and the cities/areas outside of London.

SO, WHERE ARE THE HOTSPOTS FOR ONLINE RETAIL SPEND ACROSS THE UK?

The locations in the tables below have been identified as hotspots for e-commerce. These locations are based on online spend per sq km.

WHERE ARE THE BIGGEST SHORTFALLS IN TERMS OF STOCK?

The biggest shortfalls in terms of stock can be found in inner London boroughs. However, facilities servicing last-mile deliveries into these markets will often be located in neighbouring boroughs or less central locations. Westminster and Kensington, and Chelsea do not have sufficient stock to service demand, and rents in the locations would be prohibitively high for many operators.

Top 15 locations in London

RANK	LOCAL AUTHORITY
1	Kensington and Chelsea
2	Westminster
3	Islington
4	Tower Hamlets
5	Hammersmith and Fulham
6	Camden
7	Wandsworth
8	City of London
9	Lambeth
10	Hackney
11	Southwark
12	Haringey
13	Lewisham
14	Merton
15	Ealing

Source: Knight Frank Research

HOW ARE THINGS CHANGING? WHAT DOES THIS MEAN FOR URBAN LOGISTICS DEMAND AND FULFILMENT MODELS?

Though urban populations continue to grow in the UK, the rate of growth is slowing. The areas with the highest rates of population growth from mid-2019 to mid-2020 were predominantly areas of London such as the City of London (12.5%), Camden (3.5%), and Westminster (3.3%). The areas that saw the greatest decrease in population were Lambeth (-1.3%), West Suffolk (-1.0%), and Inverclyde (-1.0%).

However, in 2020, more people left London for elsewhere in the UK than moved in. In the year to mid-2020, internal migration flows (within the UK) show more people arrived than departed in the East and South East in comparison with previous years; driven by people moving out of London. As higher income commuters move from London to the surrounding areas, they are likely to drive up demand for last-mile logistics to service these locations.

As well as changing populations and migratory influences. The profile of online shoppers is broadening, as a wider demographic takes to online shopping, demographic profiles will play less of a role in determining online penetration rates.

Based on our models forecast growth in online retail spend, the locations where we expect to see the largest rise in online consumer demand over the next five years are the City of London, Elmbridge, Kensington and Chelsea, South Bucks, and Westminster.

This analysis aims to highlight areas of demand for last-mile fulfilment based only on consumer demand. Further analysis factoring in drive times to these populations, as well as current stock levels, development potential, and rental levels, could offer a fuller picture in terms of locations that could service this demand.

Top 15 locations outside of London

RANK	LOCAL AUTHORITY
1	Cambridge
2	Watford
3	Oxford
4	Brighton and Hove
5	Elmbridge
6	Reading
7	Epsom and Ewell
8	Bristol
9	Slough
10	Southend-on-Sea
11	City of Edinburgh
12	Portsmouth
13	Southampton
14	Glasgow City
15	Manchester

Source: Knight Frank Research

GREEN PROCUREMENT AND URBAN LOGISTICS

Brands and retailers are increasingly promoting and leveraging sustainability strategies to win customers and ensure brand loyalty. To pursue this strategy, they must consider the environmental and ethical impacts of all supply chain operations and as part of this, embrace green logistics operations.

Consumers and media are increasingly scrutinising retailers' environmental and sustainability credentials. The environmental, social and ethical impacts of the whole supply chain, from sourcing, manufacturing and processing through to delivery are all being examined. Retail brands that don't embrace sustainability as a key element in supply chain strategy, risk falling behind. 77% of FTSE 350 companies now provide detailed disclosures on environmental considerations such as climate change, though only 31% have environmental KPIs (Grant Thornton, Corporate Governance Review 2020).

While consumers want firms to improve their environmental performance, they also seek speed and convenience. Consumers are demanding more same-day and one-hour deliveries. On-demand, and one-package-per-stop deliveries have a much greater environmental footprint than scheduled deliveries, where capacity utilization rates and routes can be optimised. Retailers want to offer customers on-demand delivery options in order to be competitive, but these are typically not the most sustainable. Research from MIT found that fast shipping not only increases costs, it also increases total carbon emissions by up to 15%.

When it comes to order fulfilment and delivery, a conflict arises. Retailers want happy customers, and customers want environmentally-friendly retailers as well as convenient deliveries. But can they have both?

Most major retailers outsource their distribution, warehousing, and fulfilment to a third party logistics firm (3PL). Some retailers will choose to manage the warehousing and order fulfilment and use a delivery partner (or parcel carrier) to handle distribution. Traditionally, contract selection or performance evaluation for 3PL or delivery partners, have been driven by cost reduction and customer service levels, with little consideration given to sustainability and environmental performance measures.

15%

Research from MIT found that fast shipping not only increases costs, it also increases total carbon emissions by up to 15%.

Third-party logistics providers and delivery partners are key to helping companies reach their supply chain sustainability targets and in turn, green credentials are becoming an important tool for 3PLs in securing contracts with retailers.

In January 2021, Mars UK announced its partnership with DHL, which will see the construction of warehousing facilities, as well as the creation of sustainable logistics operations. The partnership is set to reduce Mars' outbound logistics carbon emissions in the UK by 7.7%. New purpose-built depots will be built at 'East Midlands Gateway' and 'London Thames Gateway'. They will be partially powered by solar and will feature automated pallet storage. The SEGRO East Midlands Gateway is served by its own rail freight interchange. The new logistics operation will remove a million miles a year from roads, while increasing warehousing capacity by over 50%.

It is not just the larger distribution firms and parcel carriers that are 'greening' operations and securing retailer contracts. New, sustainable delivery fleets are entering and expanding within the urban logistics arena in order to capture a share of the growing market for more sustainable delivery models, as retailers look to offer customers greener deliveries. Cheesemonger Paxton&Whitfield use delivery firm Ecofleet, providing a same day delivery service to London-based customers with deliveries dispatched from their shop and delivered via bicycle.

Urban delivery firm Zedify deliver on behalf of online retailers Freddies Flowers and Abel&Cole. Its growing network of 10 'hyperlocal' micro hubs in cities across the UK act as consolidation centres for small items coming into and out of the urban area. Zedify recently announced the opening of a new micro-consolidation hub in Finchley, as the company further expands its sustainable consolidation and delivery service in London. Non-alcoholic beer company Freestar, utilise Urb-it's Micro-fulfilment centre (MFC) service to hold stock closer to its local customer base and offer sustainable deliveries across London.

In Paris, Urb-it partner with Amazon Logistics, utilising Amazon's urban delivery hubs to provide a sustainable last-mile delivery service across the city. They also partner with Alibaba Group, providing last-mile deliveries in Paris. Urb-it now operate across several UK cities, offering ship-from-store, ship-from-warehouse and micro-fulfilment services. Working with carriers including DHL and Yodel to offer zero-emissions last-mile deliveries.

As retailers and consumers demand higher sustainability standards, behaving more sustainably is becoming critical for 3PLs and delivery partners' business models. Many 3PLs are working on initiatives such as achieving carbon neutrality, introducing more electric vehicles into their fleets and operating from BREEAM (Building Research Establishment Environmental Assessment Method) certified facilities. 3PLs are competing to enhance their environmental credentials in order to secure new retailer contracts, this is fuelling demand for greener, more sustainable logistics facilities in urban areas.

Much of the current focus is around sustainable transport management initiatives such as electric vehicles, improving fuel efficiency, vehicle scheduling and capacity utilisation. This is particularly critical for the last touch logistics in urban areas. These sustainability initiatives have implications for the building fit-out and amenities that occupiers require, such as EV charging and bicycle racks.

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The drive for more sustainable last-mile deliveries is also encouraging more click & collect facilities, either in-store or through collection lockers. Parcel delivery firm DPD are partnering with the Post Office in order to roll out a new click & collect service, which will result in a more sustainable delivery mode, with more parcels delivered to a single location. DPD conducted a review of last-mile delivery and the impact of click & collect on the environment and found greenhouse gases could be reduced an average of 63% in the last-mile delivery when using the DPD Pickup network.

Aside from the impacts of transportation and delivery methods, energy use within warehouses also has a significant environmental impact. Reducing operational costs, including energy bills, is a way for distribution firms and 3PLs to maintain competitiveness, particularly in the face of rising energy costs. Energy efficient floor designs, ventilation systems, renewable energy sources, photo-voltaic cells and LED lighting are all features that enable an occupier to reduce both their operational costs and carbon footprint.

CITY CENTRE EMISSIONS REGULATIONS

City centre emissions regulations and the impact on urban delivery models

For urban logistics operators, proximity to the consumer is key to reducing delivery times. Urban consumers want home deliveries on demand. Delivery methods are increasingly coming under the scrutiny of city planners, neighbours and customers. Locating within densely populated urban areas means that operators face more stringent regulations in terms of traffic movements, operating hours and vehicle emissions.

The UK government is pushing hard to achieve zero-emission status by 2030 and UK cities have set ambitious plans to decrease their carbon emissions over the next ten years. In city centre locations, vehicles are increasingly facing emissions charges, traffic congestion and parking restrictions. Several cities across the UK have introduced charges for vehicles that do not meet certain emissions criteria. The roll-out of these Ultra Low Emission Zones (ULEZs), Clean Air Zones (CAZs) and other pollution-reducing schemes in cities across the UK is accelerating. Urban logistics operators are therefore exploring cleaner, alternative methods of transportation such as Electric Vehicles and bicycle couriers.

Clean Air Zones

Clean Air Zones (CAZ's) are designated areas where vehicles are subject to certain emissions standards, the vehicles subject to these criteria varies according to the class of CAZ and minimum standards vary across vehicle types. There are four classes of CAZ (A-D), class D is the most wide-ranging. Depending on the class that is applied to the CAZ, certain vehicles will be restricted from driving in the zone. Restrictions are based on how much pollution is caused by certain vehicles (based on European emissions standards).

Larger vehicles like HGVs, coaches and buses that do not meet emissions requirements are charged around £100, although this varies between cities.

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Businesses with a client base located within the ULEZ must adapt their fleet and delivery networks to operate efficiently and competitively within this area. This will influence their location preferences, space requirements, fleet choices and thus the specification of facilities they require.

◆◆

London's expanding Ultra Low Emissions Zone

In 2019, London became the first city in the world to introduce an ultra-low emission zone, or ULEZ, designed to encourage people to drive less polluting cars or use other methods of transport in order to improve air quality.

When introduced, the ULEZ covered the same area as the London Congestion Charge zone. Reaching from Vauxhall bridge in the south west, up to Paddington in the north west, up to Angel in the north, Whitechapel in the east and Elephant and Castle in the south east.

From 25th October 2021, the ULEZ will be expanded to incorporate all areas between the north and south circular ring roads. An area 18 times larger than the original 2019 ULEZ. The 2021 ULEZ will have significant impacts on businesses, especially those that require larger vehicles. Whilst there is an abundance of ULEZ compliant alternatives for smaller vans and private vehicles, these alternatives become increasingly limited and expensive as vehicle size increases.

More logistics schemes are moving towards cleaner industrial use, distribution centres and warehousing facilities with electric vehicle options, and this trend is set to continue. However, there are questions over whether the new boundary will influence location decisions for some logistics operations. The requirement to

London's Expanding Ultra Low Emissions Zone

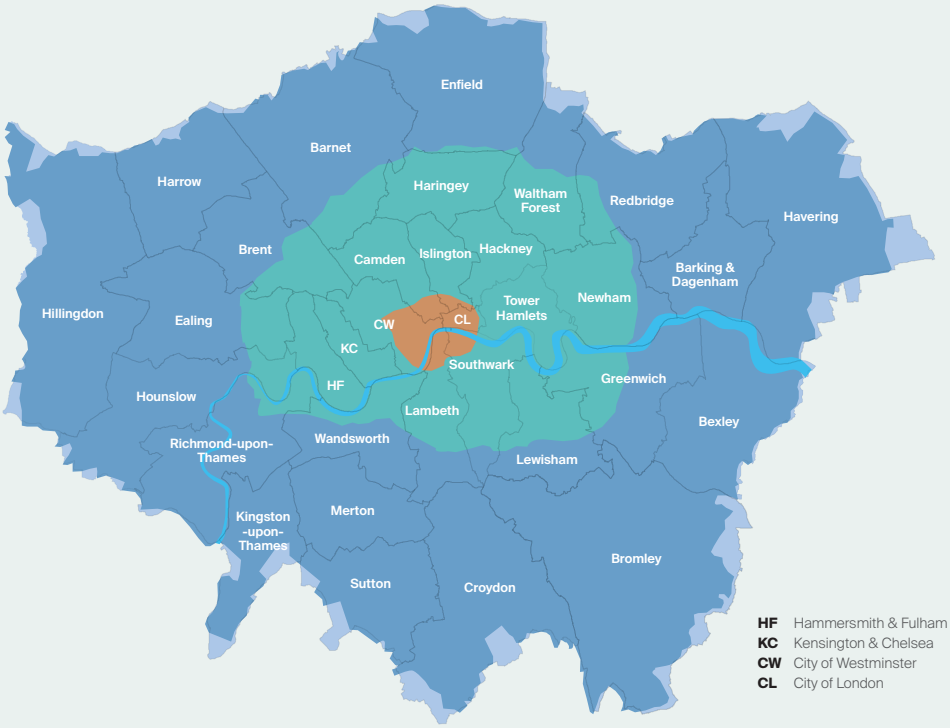
OPERATING 24/7

ULEZ central London from 8 April 2019
in the same area as the Congestion Charge

ULEZ extension to inner London from 25 October 2021
up to North and South Circular roads, including existing central London zone (all vehicles)

LEZ London-wide from 26 Oct 2020
(lorries and other vehicles over 3.5T)

Greater London Authority Boundary



Source: TfL

upgrade fleet vehicles or face paying the charge could mean some SMEs and heavy industry operations are no longer able to afford to operate within the ULEZ and may look to relocate outside of inner London. Businesses with a client base located within the ULEZ must adapt their fleet and delivery networks to operate efficiently and competitively within this area. This will influence their location preferences, space requirements, fleet choices and thus the specification of facilities they require.

Traffic congestion and the higher operating costs for older, large petrol or diesel vehicles, are driving a trend toward smaller, electric fleet vehicles. These vehicles often have a shorter range, meaning a smaller catchment area per facility. At the same time, urban consumers are demanding faster turnaround times and the ability to select delivery windows. Together, these factors are driving an impetus for operators to locate closer to consumers and adjust their operating networks – away from a few, largescale units to more numerous, smaller units.

Fleet changes have implications for vehicle route optimization and scheduling as well as the requirements for facilities in terms of yard configuration and amenities. Operators increasingly require cargo bike parking, EV charging facilities as well as staff facilities for couriers and this is changing their fit-out requirements.

New multi-modal delivery models are evolving as a response to road congestion and clean air initiatives. For example, DHL launched London's first riverboat parcel delivery service last year (2020), aiming to reduce road traffic, carbon output and improve air quality, while providing a reliable and efficient way of transporting deliveries across the capital. The shipments will be loaded from electric vehicles onto the riverboat at Wandsworth before travelling along the Thames into central London, docking at Bankside Pier for final mile delivery on DHL courier bicycles.

The need for more consolidation centres is rising, and with the expansion of the ULEZ, it seems likely that these will locate outside of the zone. A network of consolidation centres (and micro-consolidation centres) could also support SMEs currently located in within the ULEZ in helping them drive down emissions within the city and reduce costs associated with bringing goods into London.

A Construction Consolidation Centre for South London is one of the projects supported as part of the Mayor's Air Quality Fund, announced in 2019, to improve air quality in the capital. The Consolidation Centre initiative aims to consolidate construction deliveries across six south London boroughs and cut at least 150 construction vehicle movements per day. Aside from government-led projects, companies located within the ULEZ are likely to look to operate such centres in order to reduce the cost, traffic congestion and emissions associated with bringing multiple deliveries into London each day.

Elsewhere in the UK

Other cities are also introducing emissions regulations. However, some cities have delayed or cancelled their CAZs, with many citing the Covid-19 pandemic as part of the reason. Birmingham introduced a class D CAZ in June 2021 (originally planned for 2020).

Manchester plan to implement a class C CAZ in May 2022, which will include most local roads in Greater Manchester. While Bristol are to introduce a small CAZ D, covering the centre of Bristol, due to come into force in Summer 2022. Newcastle was originally set to launch a CAZ in January 2021, but the plan has been delayed and Sheffield's proposed class C CAZ has been delayed until at least 2022. Plans to introduce a class B CAZ in Leeds were scrapped in 2020. Cardiff have also decided not to introduce a CAZ and will instead roll out other measures to combat air pollution.

Emissions regulations and clean air zones provide financial incentive for urban logistics operators to reduce emissions. However, the push towards more sustainable transport methods is not being driven by these measures alone. Consumer choices are increasingly being made with sustainability in mind and this is adding to the incentive for operators to improve their environmental credentials and embrace greener delivery methods. Traffic congestion in city centres can also mean that bicycles, e-bikes or motorcycles are a faster delivery method (compared with delivery vans) and can thus offer a competitive advantage, as well as save fuel costs.

The introduction of clean air zones in urban areas may encourage the use of consolidation centres, with these centres located outside of the clean air zone or urban area, thus reducing traffic movements and heavy vehicles within central city areas. They may also encourage other modes of transport within urban areas and this may give rise to more multi-modal logistics, as we are seeing in London, with warehousing requirements arising around modal interchanges.

Fleet changes have implications for vehicle route optimization and scheduling as well as the requirements for facilities in terms of yard configuration and amenities. Operators increasingly require cargo bike parking, EV charging facilities as well as staff facilities for couriers and this is changing their fit-out requirements.

FROM SMART CITIES TO SMART WAREHOUSES

Logistics supply chains and operations are being transformed by a new influx of innovative tech solutions. The promise of operational efficiencies is encouraging operators to rethink current fulfilment models and adopt new data-based technologies and solutions. This evolution of tech is meaning changes to fulfilment methods and models within the warehouse, capital expenditure requirements to upgrade fleet vehicles and install automated solutions in warehouses and consequently, the delivery options offered to customers.

Changes in urban delivery systems will create new sources of competition as well as new opportunities for logistics operators. The supply chain will become more dynamic, with new smart city logistics concepts such as small urban warehouses and drones.

SMART CITIES

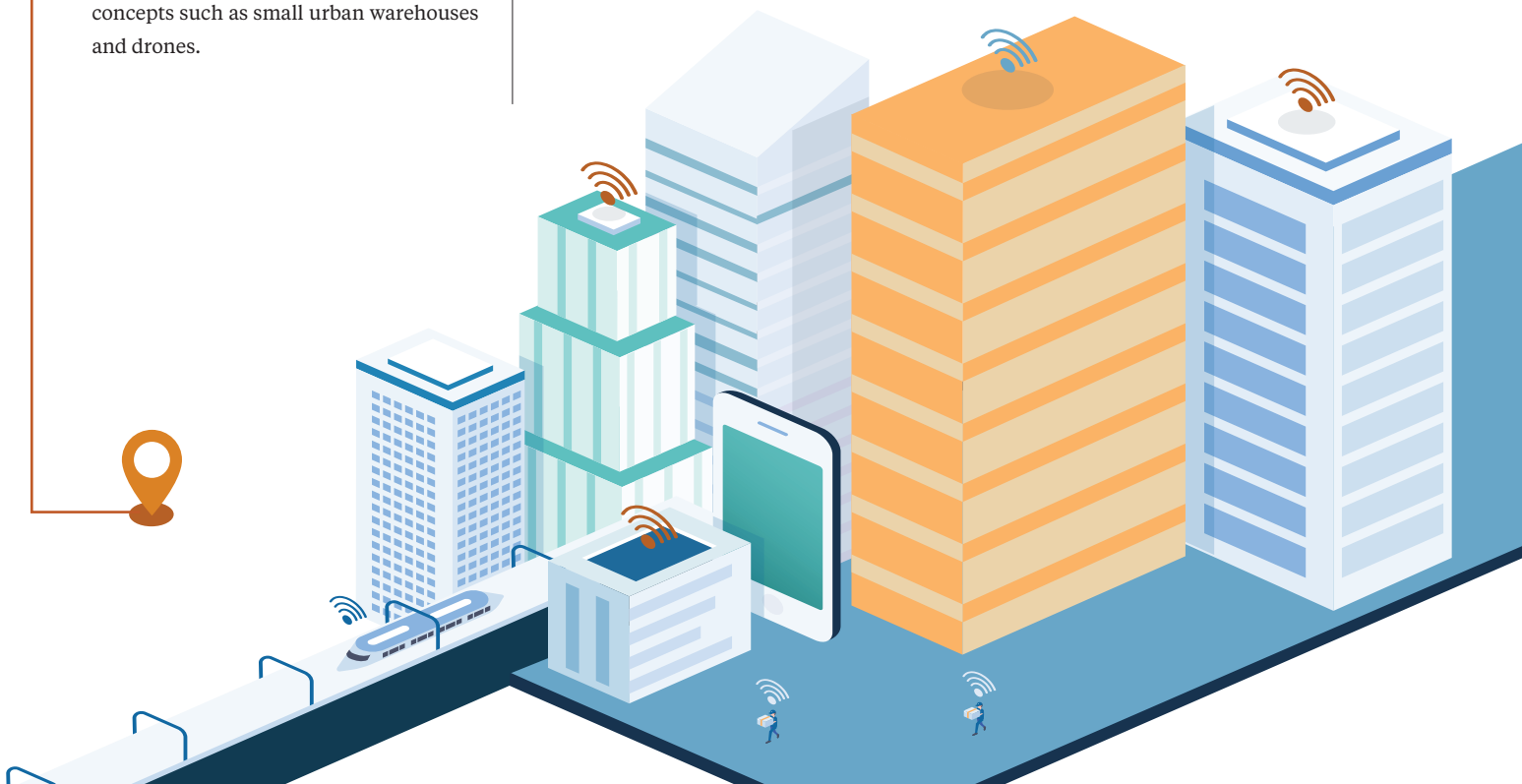
What is a smart city?

Cities are getting smarter through integrating new and evolving technologies. The improvement of digital platforms, implementation of wireless technology and use of big data analytics, has meant that data can be collected from transactions, devices, vehicles, distribution facilities, building envelopes and people, and subsequently analysed in real-time.

The European Commission defines a smart city as follows: A smart city is a place where traditional networks and services are made more efficient with the use of digital and telecommunication technologies for the benefit of its inhabitants and business. It means smarter urban transport networks and, more efficient ways to light and heat buildings.

What does this mean for urban logistics?

Logistics providers need to be prepared for drastic changes, especially in urban centres. Competition for land, traffic congestion and emissions are the drivers for changes to current distribution models, and innovative technologies are offering workable, cost-efficient solutions.



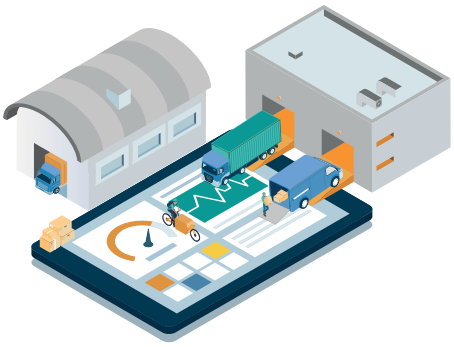
Technological innovation and digital capabilities are key to driving more sustainable and efficient urban logistics, both in terms of freight movements and warehousing operations; optimising delivery routes and transport modes as well as fulfilment and supply chain models.

The future of urban logistics will be dominated by connected, shared, autonomous, and electric solutions. These trends will be driven by emerging technologies such as IoT, Big Data, predictive analytics, cloud computing, crowdsourcing platforms and connected devices. As logistics operators embrace digital technologies, inventory management, distribution networks and supply chain optimisation will increasingly rely upon advanced analytics, automation, robotics, and AI.

Urban logistics operators can harness this data and technology to improve their operations. Technological innovation and digital capabilities are key to driving more sustainable and efficient urban logistics, both in terms of freight movements and warehousing operations; optimising delivery routes and transport modes as well as fulfilment and supply chain models. Technology is enabling dynamic route planning, consolidation of deliveries and better utilisation of both warehouse and fleet capacity.

Despite technological advances offering potential sustainability and efficiency gains, particularly where we are looking at shared intelligence or shared capacity and consolidation of deliveries across companies, issues arise with privacy and security with respect to gathering, storing, analysing, and sharing data. There are many technological ideas and concepts, with various schemes such as decentralized warehouses or aggregating goods flows being trialled, but they are not yet functioning at scale.

We have investigated how some of these new, emerging technologies and interconnected digital concepts are set to change the urban logistics landscape.



Integrated systems and capacity sharing

Applying the smart cities concept to urban logistics, means building an integrated digital ecosystem where all the players from small bicycle courier firms to major global parcel carriers are participating. The sharing of data via a central platform allows for capacity sharing (load pooling) and could enable efficiency gain.

Load pooling or capacity sharing requires an online system that matches vehicles with spare capacity and customers who require delivery space. At full potential, McKinsey believes load pooling in urban areas can reduce delivery costs by up to 25%.

Urban consolidation centres are a form of logistics pooling that will benefit from higher levels of data and software integration amongst users, from the optimisation of space usage to more efficient vehicle movement in and out of the facility.

Significant levels of cooperation amongst carriers across a city is not yet being seen and may be unrealistic. However, we are seeing a rising number of urban logistics partnerships. Typically, where larger global parcel carriers identify gaps in their network or offering and look to partner with a local delivery firm, or store network that can offer click & collect

Load pooling or capacity sharing requires an online system that matches vehicles with spare capacity and customers who require delivery space. At full potential, McKinsey believes load pooling in urban areas can reduce delivery costs by up to 25%.

facilities. These partnerships often rely upon some degree of data sharing and integration of systems.

The Post Office has opened its branch network to parcel carrier firm DPD. This is the first time it has allowed an external carrier access to its network. DPD will offer a click & collect service, available at around 250 Post Offices before being rolled out to around 1,500 branches and will integrate with existing PO systems (used for transactions, accounting, and stocktaking). The partnership will allow DPD to offer more delivery options at the point of purchase, while the customers the choice to pick a branch close to their home.

Delivery drones and autonomous delivery vehicles

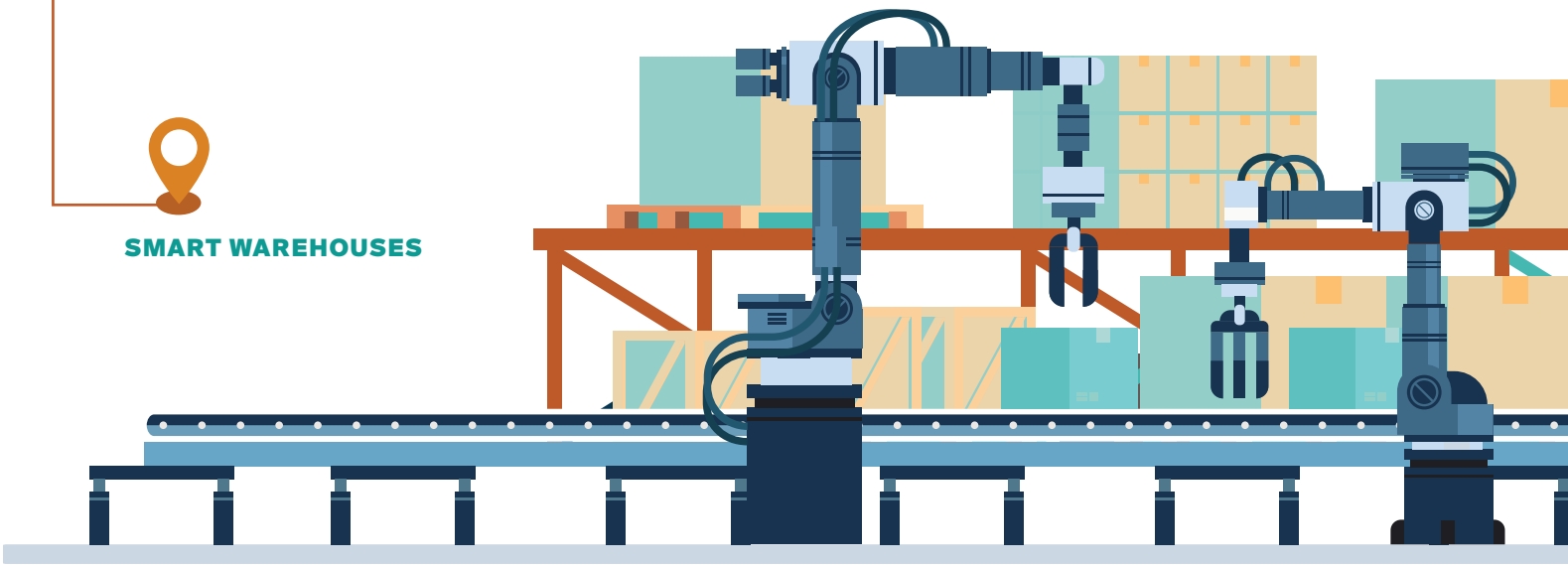
High levels of congestion in urban areas and potential security concerns mean that operating delivery drones within built up urban areas is not yet viable. Amazon recently cut back its Amazon Prime Air drone delivery business in the UK, which launched in 2016, signalling that the technology and regulatory environment may be some way off from enabling drone parcel deliveries.

However, aviation authorities in the US and in Japan have both recently relaxed rules regarding the use of drones within populated areas at night and the UK's CAA (Civil Aviation Authority) have authorised delivery drone trials (to test the safety of allowing drones to be flown beyond the pilot's line of sight). Could this be a step towards widespread adoption of delivery drones in urban areas?

Delivery companies like UPS and Amazon have been funding and exploring drone technology solutions for years, though the technology may be better suited to servicing remote locations rather than urban ones. In May, the Royal Mail trialled scheduled autonomous flights for one month between the Cornish mainland and the Isles of Scilly, with the use of a drone to deliver parcels to remote communities on the islands.

UK high street retailer, Wilko recently announced a £3 million investment in autonomous delivery vehicle company StreetDrone, to bring autonomous deliveries to the last-mile. The investment will allow StreetDrone to accelerate the development of its autonomous delivery vehicle operations. StreetDrone is aiming to deploy driverless delivery vehicles on the UK's roads by the end of 2023 and is working with UK-based vehicle safety agencies on defining industry standards.

SMART WAREHOUSES



A smart warehouse is enabled with several automated and interconnected technologies, making use of automated processes and technologies for improved productivity, efficiency, and accuracy. Smart warehouses may utilise a warehouse management system, automated picking equipment, automated guided vehicles (AGVs), automated inventory control platforms and implementation of the internet of things (IoT).

Automation and robotics are already in use in the logistics industry and rapid technological advancements and improving affordability are driving occupiers to adopt robotics solutions for more tasks and across more aspects of the supply chain. Automation has been an important enabler of improvements in scalability, agility, and visibility for logistics operations in urban areas.

Technological improvements are enabling the rise of small, highly automated fulfilment centres in urban areas. Low-cost, scalable automation solutions allow faster response times, quicker turnarounds, and by locating close to consumers, retailers can offer rapid delivery options. Micro-fulfilment technology is set to accelerate as it can be easily replicated and deployed across a network of locations.

The global warehouse automation market was valued at US$15 billion (around £11 billion) in 2019 and is expected to be worth US$30 billion (£22 billion) by 2026, at a CAGR of 14% (Source: LogisticsIQ).

Micro-fulfilment technology is set to accelerate as it can be easily replicated and deployed across a network of locations.

The growth in adoption is expected to be fastest in small warehouse facilities and amongst SMEs. At present, restricted budgets and floor space limit the ability of operators to fully automate operations. However, technological advancements and competition is driving down costs, thus improving the flexibility and modularity of automation solutions. This will enable operators of smaller facilities and SMEs to adopt automation solutions and services in greater number in the near future.

What is driving the need for smarter warehouses?

Shortage of space: Strong growth in e-commerce is driving demand for warehouse space. Knight Frank forecast that an additional 92 million sq ft of UK warehouse space would be required due to online sales (2020-2024). However, this forecast is based on current capacity utilisation rates, or how efficiently space is used, and this is not a constant. New technologies are enabling better use of space in warehouses. Supply of new space, particularly in urban areas is limited and therefore, getting the maximum use of the cubic area will be essential. Smarter inventory management and the use of automation and robotics could offer ways to improve capacity utilisation rates in warehouses.

Utilising existing retail footprint: Automation in small, urban warehouses known as micro-fulfilment centres (MFCs) is enabling retailers to expand their click & collect offering, utilising part of their existing retail footprint and supply chains, and converting or extending their stores to accommodate MFCs to cater for increased online orders.

Availability of labour: Automation can help unlock urban locations where limited and costly labour pools exist. Issues of labour cost and availability are generally more acute in urban areas. As the UK economy recovers and expands, urban locations are forecast to see the strongest growth in GDP and job creation. Over the next five years, employment in the UK is forecast to rise by 6.6%, while in London it

is forecast to grow by 8.6% (Source: Oxford Economics). Cities such as Manchester and Bristol are also forecast to see strong growth. Companies must look at ways to enhance their operational efficiencies through the adoption of mechanisation and automation and thus reduce their workforce requirements.

Building resilience: Covid-19 has heightened the interest of organisations in the use of automation technology, as a tool to improve operational resilience and the means to rapidly flex-up capacity in a cost-effective manner, while also reducing their reliance on human labour. Retailers are turning to automation to improve productivity and to smooth out peaks.

What are the typical components of a smart warehouse?

Warehouse Management Systems (WMS): A WMS solution gathers valuable, real-time data, helping operators manage warehousing processes, monitor efficiency levels, and detect deficiencies. Warehouse Management Systems can be used to plan order processing and calculate requirements in terms of labour, vehicles, and picking sequences. This will reduce the need for dock staging space, by having orders arrive at the shipping dock in trailer load sequence and enable faster more efficient throughput. It can also be used to assign tasks to staff members.

A WMS can utilise IoT (Internet of Things) technology to connect to a variety of communication technologies and automatic identification technologies such as sensors and RFID (Radio Frequency Identification) tags. Sensors can be utilised to help track goods at all stages throughout the supply-chain and to ensure correct storage conditions are used, both in the warehouse and inside trucks. Inventory data can be collected using RFID tags or sensors, stored on a cloud-based platform, then processed and analysed. IoT technology is also utilised by Amazon, DHL, and Alibaba to improve and streamline their inventory management.

Automated parcel handling equipment: Automated parcel sorters can significantly improve parcel processing times. Parcel carriers are facing increasing demand for parcel handling due to the rise in e-commerce and technological developments are enabling accurate checking of parcel dimensions and weight, automated label application and scanning for verification and routing. These systems will utilise conveyors along with IoT technology and may incorporate robotics.

Automated Guided Vehicles (AGVs) / Autonomous Mobile Robots (AMRs): AGVs may include automated forklift trucks for loading and unloading, robotic palletizing solutions, or the transportation of inventory. These vehicles typically follow magnetic strips, or a track laid in the warehouse. AMRs are mobile robots that create their own routes based on information from sensors such as cameras or lasers and will reroute when necessary to avoid obstacles on the warehouse floor, such as other AMRs. They offer flexibility, speed and performance allowing for efficient goods-to-person automation.

They can manoeuvre in small spaces enabling better use of space and operate in extreme temperatures that would be difficult for humans. They can increase safety, with IoT warehouse devices enabling operators to track and monitor the vehicles in real-time and use sensors to avoid collisions. Amazon employs over 100,000 robot workers in a smart warehouse using IoT.

Advances in ASRS systems are allowing them to be installed in micro-fulfilment centres and as the technology evolves, MFC operators will utilise higher levels of automation and thus reduce per-unit labour costs.

As last-mile formats become increasingly specialised, operators will seek facilities in which they can maximise their operational efficiencies.

Importantly, they offer scalability and modularity, which is critical for firms who may not be able to make the large-scale capital investment required for fully automated solutions. Firms can purchase one or two at a time and slowly increase the automation within their facilities.

Automated Storage and Retrieval Systems (ASRS): These are automated systems that can retrieve or store items in specific locations. The system relies upon predefined storage locations where machines can follow established routes to locate items. They are used to process large volumes of throughput when speed and accuracy are important. Ocado's "hive-grid-machine" is one such example, they may also operate as cranes, retrieving or storing goods vertically in high-bay facilities. Advances in ASRS systems are allowing them to be installed in micro-fulfilment centres and as the technology evolves, MFC operators will utilise higher levels of automation and thus reduce per-unit labour costs. As this technology further advances, it will prove critical in the growth of hyper-local distribution models.

What do these "smart" components mean for urban logistics facilities, building design and occupier requirements?

In urban areas, the scarcity of sites or developable land means that occupiers need to look to older buildings, that will typically not have the eaves height, or other optimal characteristics suited to last-mile fulfilment , or the potential to accommodate automation processes and technology. As last-mile formats become increasingly specialised, operators will seek facilities in which they can maximise their operational efficiencies. The risk of obsolescence for older buildings will increase, though strong land value growth and demand for logistics space is likely to support robust rental growth, in urban locations over the next five years.

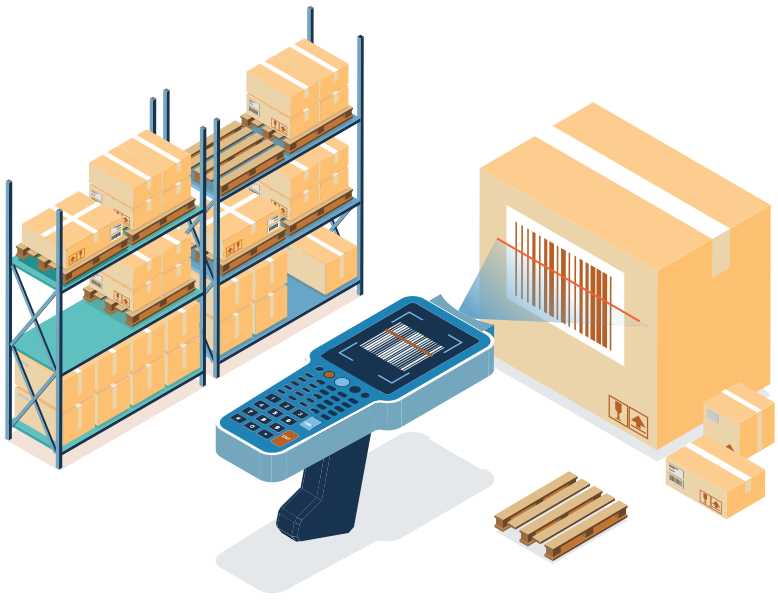
Power: Increasing automation and technology within a facility leads to greater power consumption. While automation can improve cost-efficiencies, energy efficiencies are also an important consideration. Securing sufficient electricity from the grid can be a challenge, particularly within urban areas, given the pressures on the local network from competing uses such as new residential developments.

Building height: As competition for land drives up pricing in urban areas, the use of vertical space will become more important. Advances in automation are enabling better use of vertical space. Urban logistics facilities tend to have a much lower eaves height compared with the big box market, but as cubic volume becomes increasingly important over floor area, there is likely to be a divergence in rental value growth (based on sq ft area). While forklifts are limited to a maximum operational height of 18 metres, automated systems can be embedded into mezzanines. This is driving increased demand for taller buildings.

There are often less restrictions on building height in urban centres (compared with suburban or rural areas), and this may propel the adoption and development of taller urban logistics facilities, particularly where falling automation costs mean better cost-efficiencies for operators.

Floor specification: As advances in technology and automation enable operators to make better use of vertical space, and mezzanine floors are installed, the floor loading requirements will increase. Heavy, large-scale automation equipment such as ASRSs will have major considerations for floor loading requirements. While the use of AMRs and AGVs will have implications for the floor finish and serviceability.

Design & build: Operators that utilise highly automated systems tend to opt for design and build solutions, or seek to modify and optimise an existing building or speculative build.



We like questions, if you've got one about our research, or would like some property advice, we would love to hear from you.

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