Institution: University of Westminster		
Unit of Assessment: 13 Architecture, Built Environment and Planning		
Title of case study: Sustainable Freight Transport and Logistics		
Period when the underpinning research was undertaken: 2016 – 2019		
Details of staff conducting the underpinning research from the submitting unit:		
Name(s):	**Role(s) (e.g. job title):**	**Period(s) employed by submitting HEI:**
Maja Piecyk	Reader in Logistics	Jan 2016 - present;
Allan Woodburn	Principal Lecturer	2004 - present;
Julian Allen	Senior Research Fellow	1992 - present;
Jacques Leonardi	Senior Research Fellow	2007 - present;
Marzena Piotrowska	Research Fellow	2006 - present
Period when the claimed impact occurred: Aug 2013 – Dec 2020		
Is this case study continued from a case study submitted in 2014? ~~Y~~/N		

1. Summary of the impact (indicative maximum 100 words)

The University of Westminster Freight and Logistics Group's research into freight transport has included two key areas of innovation: the pioneering of a portering strategy aimed at achieving operational efficiency and sustainability improvements in the area of last-mile urban freight, and strategies to facilitate carbon reduction and the maintenance of existing infrastructure within the broader context of national and international freight transport. This research, along with direct engagement with stakeholders, has led to a number of impacts:

- aiding UK government compliance with climate change targets through changes in freight transport, via engagement with both the Committee on Climate Change and the National Infrastructure Commission;
- informing the Mayor of London's Freight and Servicing Action Plan, via a practical demonstration of the innovative portering strategy, which has also been adopted by commercial organisations and the City of London Corporation in order to enhance the sustainability of urban freight operations;
- providing best practice guidance to 59 governments on maintenance of their road assets, via the International Transport Forum.

2. Underpinning research (indicative maximum 500 words)

Last-mile urban freight in the era of ecommerce

Acknowledging that kerbside idling in parcel delivery contributes to the polluting of urban environments, and that such pollution will only increase in correspondence with the popularity of ecommerce (online shopping and related home delivery services), Piecyk, Allen, and Piotrowska have researched and developed methods for reducing vehicle activity within this context.

As part of the EPSRC-funded project Freight Traffic Control 2050 (FTC2050), which is aimed at transforming the energy demands of last-mile urban freight through collaborative logistics (partnerships with carriers such as TNT, Gnewt Cargo, DX, and Hermes), Piecyk, Allen, and Piotrowska have been able to empirically analyse carrier operational datasets and trial innovative methods of achieving operational efficiency and sustainability improvements in urban areas.

The researchers focussed on how carriers operate once at their location. Identifying the reliance of walking for carriers, whose vans are parked at the kerbside for on average 60% of the total vehicle round time, the researchers trialled a "portering" strategy in which fewer vehicles would instead drop off a number of porters (delivery persons) into an area to deliver packages by foot to various addresses, only returning to the vehicle for departure. Results showed potential savings of 86% in driving distance on some rounds and 69% in time [1].

Strengthening this portering strategy, the researchers developed a two-level parcel distribution model that combines walking and driving for a single driver. Taking decisions on parking locations into consideration, the model was intended to minimise the total travelling time involved in parcel delivery by scheduling a vehicle's routing and the driver's walking sequence. When applied to a case study of an actual vehicle round from a parcel carrier operating in London, savings of over 20% in the total operation time were returned over the current situation where 144 parcels were being delivered to 57 delivery locations [2].

National and international freight transport carbon emissions and infrastructure use

Reducing carbon emissions in the freight transport sector has proved more difficult to achieve than in many other industries due to available technologies, existing commercial circumstances, and infrastructure provision. The Freight and Logistics Group's research has provided approaches to the quantification and apportionment of energy consumption and carbon emissions across supply chains. As freight transport comprises multiple types of operations with very different characteristics (e.g. parcel deliveries, multi-drop deliveries and collections, long-haul movements of bulk materials, etc.), Piecyk and colleagues proposed an innovative approach to multi-dimensional benchmarking of the energy intensity of companies in the sector [3]. It has thereby helped to identify which activities to target for carbon reduction and the necessary actions to be taken by the various supply chain partners.

From an infrastructure perspective, the research has identified ways in which logistics operations can be modified and reorganised to reduce road wear and tear and has also examined how the location and function of logistics depots and warehouses can help facilitate less carbon intensive operations. For example, the analysis has shown that choosing the optimum transport mode for each freight flow could result in cost savings of nearly 23%, 58% reduction in road kilometres, and 46% lower CO_2 emissions. These savings can be even higher if the depot location is optimised [4].

3. References to the research (indicative maximum of six references)

[1] **Allen, J.,** Bektas, T., Cherrett, T., Bates, O., Friday, A., McLeod, F., **Piecyk, M., Piotrowska, M.** and Wise, S. (2018) 'The scope for pavement porters: addressing the challenges of last-mile parcel delivery in London', *Transportation Research Record: Journal of the Transportation Research Board*, Vol. 2672(9), pp. 184-193.

[2] Nguyen, T.B.T., Bektas, T., Cherrett, T., McLeod, F., **Allen, J.,** Bates, O., **Piotrowska, M., Piecyk, M.,** Friday, A. and Wise, S. (2019), 'Optimising Parcel Deliveries in London Using Dual-Mode Routing', *Journal of the Operational Research Society*. Vol. 70, Iss. 6

[3] Holden, R., Greening, P. and **Piecyk, M.I**. (2016) 'Towards a Common Measure of GHG-related Logistics Activity Using Data Envelopment Analysis', *Transportation Research Part A: Policy and Practice*, Vol.91, pp.105-119.

[4] Palmer, A., Mortimer, P., Greening, P., **Piecyk, M.** and Dadhich, P. (2018), 'A cost and CO_2 comparison of using trains and higher capacity trucks when UK FMCG companies collaborate', *Transportation Research Part D: Transport and Environment*, Vol.58, pp. 94-107.

Funded Research Projects (selected)

- EPSRC: *Centre for Sustainable Road Freight*, 2018-2023 (Piecyk P-I) EP/R035148/1 £672,887; and 2012-2018 (Piecyk C-I) EP/K00915X/1 £38,114.
- EPSRC: *Freight Traffic Control 2050*, 2016-2019 (Piecyk C-I) EP/N02222X/1 £243,639
- Transport for London: *Portering Delivery Trial,* Freight Consolidation Demonstration Programme, 2018 (Allen C-I, £50k to Gnewt)
- European Commission: *CityLab* 2015-2018 (Piecyk C-I from 04/16) 635898 €248,290; *SMARTFUSION* 2012-2015 (Allen C-I) 285195 €180,060

4. Details of the impact (indicative maximum 750 words)

Guidance to the UK Government on Freight Transport Carbon Efficiencies

The Freight and Logistics Group have informed the recommendations on freight given to government by both the Committee on Climate Change, which audits government compliance with climate change goals, and the National Infrastructure Commission, which the government appealed to for advice on how to ensure their compliance. Given the relationship between these organisations, the Westminster researchers have thus had the impact of **aiding UK government compliance with climate change targets through advice on changes in freight transport policy**.

The Committee on Climate Change (the CCC) is an independent statutory body that has been appointed by the UK government to audit its compliance with climate change policies. Piecyk contributed to the Committee's plan on carbon budgets, originally published in 2015, and has since continued to contribute to its work as part of Westminster's Freight and Logistics Group. The CCC has participated in workshops held as part of the Logistics Group's Freight Traffic Control 2050

(FTC) and Centre for Sustainable Road Freight (SRF) projects and has subsequently used research findings from these projects in the CCC's progress report to the UK parliament.

For instance, in a "technical annex" that provides a "detailed assessment of [the] drivers of van demand" summarised in Chapter 5 of the CCC's *Reducing UK Emissions: 2018 Progress Report to Parliament* [a-i, p.155], there is both a formal acknowledgment of Piecyk's contribution to this report and explicit references to the FTC research of Piecyk and Allen, which "found significant reductions in driving distances could be made through measures" including "better clustering and routing of 'last mile' deliveries" [a-ii, p.1 & 14]. Given that these progress reports by the CCC "draw together the work of the previous 12 months, assemble the latest evidence, refine our methodology, and produce our best assessment of the recent past and prospects for the future" [a-i, p.5], the Logistics Group have significantly contributed to **enhancing the climate change strategies proposed by this statutory body**.

In the Department for Business, Energy and Industrial Strategy (BEIS) response to the CCC report it is stated that: "To get a better sense of the scale of the opportunity**,** the Government has asked the National Infrastructure Commission to examine the future of freight out to 2050, to set out how the UK can deliver efficient and productive freight, while reducing its impact in terms of carbon emissions and congestion" [a-iii, p.48]. In this connection, it is notable that the researchers have directly **informed the knowledge base of the National Infrastructure Commission (NIC), from which the UK government has sought expert advice to aid in acting upon these CCC freight recommendations**.

The Logistics Group's meetings with NIC across 2018 and 2019, as well as their published research, was used to inform its understanding of the importance of freight transport in general and urban freight transport in particular. For instance, the Logistics Group's advice on developing a holistic logistics policy across "regulatory bodies, modes and geographies" in order to maximise efficiency is highlighted in a pull quote, and "human portering" is cited as an approach that will have an "impac[t] on the freight industry, infrastructure, and society" in the NIC's interim report on its Freight Study (Dec 2018) [b-i, p.19].

Piecyk and Allen are also cited several times in NIC's final Freight Study report, *Better Delivery: The Challenge for Freight* (April 2019), where their research insights **informed NIC's "Recommendation 4: government should produce new planning practice guidance" to "better support these [policymaking] authorities in planning for efficient freight networks to service homes and businesses as part of their plan making processes**" [b-ii, p.55]. The NIC further specify that the guidance "should give further detail on appropriate considerations when planning for freight, such as the need to […] support the clustering of related activities within a supply chain, minimising the distance that goods must be moved and maximising the potential for efficient operations" [b-ii, p.55]. Several citations to the Logistic Group's research are provided in support of this recommendation. These include reference to their identification of freight vehicles as a key polluter within the context of urban distribution, "where levels of CO_2 per tonne moved are highest" despite only constituting "around six per cent of total freight kilometres in 2016" [b-ii, p.19]; a 2005 report by Allen and Woodburn on the benefits of "different organisations bringing their freight into a single centre for consolidation by a single supplier who will then deliver the goods to the customer, creating fewer and fuller vehicles for the final part of the journey" [b-ii, p.48]; and reference to the FTC2050 portering project report [b-iii] when highlighting portering as one "of the most effective and promising solutions for an optimised last mile" [b-ii, p.49].

In the HM Treasury's *National Infrastructure Strategy* of Nov 2020 it was noted that: "The government has announced that it will provide a full response to the NIC's *Better Delivery: The Challenge for Freight* report through the publication of a comprehensive cross-modal freight strategy in 2021" [b-iv, p.42].

Adoption of Portering by Local Government and Industry

As part of their research [1], the Freight and Logistics Group partnered with Gnewt by Menzies Distribution (GMD) to trial their pedestrian porterage system within a Transport for London (TfL) scheme. **An independent evaluation report of this project confirms the benefits of this portering system**, stating that it "led to a significant reduction in kerbside parking time (up to 65%) and driving time (up to 71%), demonstrating that positive transport impacts can be achieved without the challenges of setting up a new physical consolidation centre" [c-i, p.58]. The report also rated the Westminster collaboration with GMD as *5A* (*5* = highest impact/change, *A* = most

robust evidence) in the areas of: Environmental Impact, Traffic/Congestion Impact, Ability to Roll Out, and Cost of Wider Roll Out [c-i, p.62-3]. The report recommends that the portering system "should be pursued and promoted on the basis of [its] potential to roll out as well as [its] providing positive transport impacts" such as "c.30% reduction in vehicles miles" [c-i, p.63].

Following this demonstration project, and the researchers' oral and written contributions to the consultation exercises undertaken for the Mayor's Transport Strategy and the new London Plan [c-ii], this **portering strategy was included in the Mayor of London's *Freight and Servicing Action Plan*** (2019) [c-iii]. This *Action Plan* describes the findings of the researchers' 2018 study [1] and highlights portering as one of the "good examples [of strategies] that minimise the impact of freight and servicing activity", and whose "positive impact" needs to be "scale[d] up […] across the city, and specifically in central London, to achieve our Mayor's Transport Strategy aim of reducing goods vehicles entering in the morning peak", and the broader aims of reducing carbon emissions and improving air quality [c-iii, p.97-98].

In the press release for the plan, TfL specify the tangible ways in which this scaling up will occur "to support sustainable last mile deliveries in neighbourhoods across the capital", including "work[ing] with businesses to encourage them to offer 'green' delivery slots, which enable shoppers to choose a delivery window when drivers are already in their area" [c-iv]. One such collaborative project between TfL and business, announced in Feb 2019, was **Ford Motor Company's collaboration with GMD to "trial [a] new digital parcel courier service** designed to help reduce congestion and offer faster deliveries" to shoppers [d-i]. Citing their FTC2050 portering project report [b-iii, d-i], this trial is the adoption of Piecyk, Allen, and Piotrowska's portering strategy, in which GMD took part [c-i, p.67], as interfaced with "Ford's cloud-based, multimodal routing and logistics software Mode:Link" [d-ii]. Though the results of the trial are commercially confidential, GMD confirm benefits in the **reduction of delivery time and workload**: "Although you've got more people delivering, they are doing fewer hours so you may have two or three people doing two or three hours every morning rather than having one person doing eight or nine hours" [d-ii]. The trialling of this service won Ford and GMB the "Last Mile Innovator Award" from the TRANStech Awards 2019 [d-iii].

Ford has since extended their Last Mile Delivery [LMD] programme, which demonstrates the continued implementation and development of the Freight and Logistics Group's portering strategy. The lead designer of Ford's LMD app has cited the following achievements in 2020: "50,000+ deliveries completed through the app. Scaled the amount of deliveries per day by 5X. Increased deliveries per hour by 160%. Evolved the product to profitability. Offset 10+ tonnes of CO_2 emissions" [d-iv]. Ford has further confirmed the success of a pilot scheme with Hermes undertaken in December 2020: "Working through the Christmas peak, the pilot service met unprecedented demand for home deliveries. Operating alongside a team of eight pedestrian couriers and located across three postcode areas, two Ford Transit vans delivered the same number of parcels as six vans making conventional doorstep deliveries – and did so more quickly" [d-v].

Ford's involvement in the initial portering trial has also fed into the trialling of such a scheme by the City of London Corporation, strengthening the latter's policy position on this matter as informed by the Freight and Logistics Group. The researchers, as part of the FTC2050 project group, **informed the City of London Corporation's aims to enhance the sustainability of freight operations in the Square Mile**, while maintaining the efficiency and commercial viability of these vital economic activities, through their detailed written contributions – which communicated their research and findings on last-mile – to consultations for the following three key documents that subsequently incorporated the portering strategy [e-i].

The City's *Freight and Servicing Supplementary Planning Document* (Feb 2018) states the key aim of "reduc[ing] the numbers of deliveries and servicing trips required to the premises" and advises operators in the sector that a "system of 'micro-consolidation' within the City which enables the use of last mile deliveries by foot, cycle or zero emission van could be considered" within their Delivery and Servicing Plans [e-ii, p.16]. The City's *Transport Strategy* (May 2019) more strongly states (as the researchers recommended in their submissions) that "[l]ogistics hubs within the City will enable deliveries to be made by cargo cycles and pedestrian porters" and that such "last mile logistic hubs" would be set-up in "underutilised City Corporation assets by 2022. A further three hubs will be delivered by 2025" [e-iii, p.81-82]. And the City's draft Local Plan – now titled *City Plan 2036* (May 2020) – states that "freight consolidation and promoting deliveries by foot or

bicycle for shorter distances" is part of its "Strategic Policy [on] Vehicular Transport and Servicing" [e-iv, p. 115].

As the City's Planning and Transportation Committee reported in Dec 2019, **the City of London's adoption and implementation of the portering strategy is gathering momentum in practical terms** as: "we are working with academia and groups such as Ford Smart Mobility on trialling innovative pedestrian porter freight delivery solutions for the Square Mile as well as smart kerbside management systems" [e-v, p.2]. Given the City of London's stated, and demonstrable, commitment to the portering strategy pioneered by the Logistics Group, the confirmed benefits described above will have an **ongoing impact on this key area of London – its financial centre – which aims to meet WHO (World Health Organisation) NO_2 air quality guidelines** in 90% of the Square Mile by 2025 [e-vi].

Best Practice Guidance to Members of the International Transport Forum

The International Transport Forum (ITF) is an intergovernmental organisation with 62 member countries (as of Nov 2020) and is the only global body that covers all transport modes. As stated in its mandate: "In its think tank role, ITF focuses on identifying key policy issues and provides recommendations underpinned by economic research, statistics collection and policy analysis" [f-i, p.6].

In this connection, the Freight and Logistics Group were involved in producing a key document for governmental guidance: *Policies to Extend the Life of Road Assets* (2018) [f-ii]. This research report "targets those involved in developing policies and making decisions concerning road infrastructure assets, truck regulation and compliance, truck traffic management and freight planning", and was co-edited by Piecyk [f-ii, p.14]. It also featured chapters written by Piecyk, Allen, and Woodburn, who drew on their research into operational improvements for road freight transport and modal shift to rail and water in order **to "provide policy options that can help to mitigate the deterioration of road infrastructure assets that is caused by trucks**" [e-ii, p.14]. This is a significant issue since, while freight transport represents a minority share of the demand for road transport, "the trucks that serve this demand cause a disproportionately high share of road asset deterioration" [f-ii, p.15].

This guidance document was "unanimously approved with only words of praise" by 59 different ministries of transports [f-iii], its total membership at the time, at "a historic joint session of ITF's Transport Management Board (TMB), Transport Research Committee (TRC) and Corporate Partnership Board (CPB) […] held in Seoul, Korea, on 7 November 2018" [f-iv]. Approval of the guidance document is significant as it reflects accepted best practice – these Member Countries of the ITF are expected to comply with the guidance. The delegates at the meeting notably expressed how previous "work in this area has benefitted their policy developments and deepened understanding for their countries", indicating that this report will have **ongoing impacts on these governments' management of road assets through the adoption of this approved guidance** [f-iv].

5. Sources to corroborate the impact (indicative maximum of 10 references)

[a] (i) CCC (2018) *Reducing UK Emissions: 2018 Progress Report to Parliament* (ii) CCC (2018) "Chapter 5 Annex: Growth in Van Demand" (iii) BEIS (2018) *Delivering Clean Growth: Progress Against Meeting Our Carbon Budgets – The Government Response to the CCC*

[b] (i) NIC (2018) *Future of Freight: Interim Report* (ii) NIC (2019) *Better Delivery: Final Report* (iii) FTC2050 (2018) *Report on the Portering Trial: TfL Consolidation Demonstrator project* (iv) HM Treasury (2020) *National Infrastructure Strategy*

[c] (i) Steer Evaluation of Demonstrator Projects (Oct 2019) (ii) UoW submissions 1,2,3 (iii) Mayor of London (Mar 2019) *Freight and Servicing Action Plan* (iv) TfL (2019) press release

[d] (i) Ford Media Centre (Feb 2019) "Ford's new take…" (ii) Fleet News (Sept 2019) "Gnewt, the electric-only pioneer, is pushing the boundaries" (iii) TransTech Award (Nov 2019) (iv) Ford Last Mile Delivery project overview [link] (v) Ford Press Release 2021 [link]

[e] (i) 3 Written FTC2050 Submissions (ii) City of London ["City" herein] (2018) *Freight and Servicing SPD* (iii) City (2019) *Transport Strategy* (iv) City (2020) *City Plan 2036* draft (v) City (2019) Freight programme update (vi) City (2019) "90% of Square Mile to meet WHO…"

[f] (i) ITF (2014) renewed mandate (ii) ITF (2018) *Policies to Extend the Life of Road Assets* (iii) ITF members approval confirmation (iv) ITF (2018) "ITF combines forces at Seoul meeting"