Sustainability intervention mechanisms for managing road freight transport externalities: A systematic literature review.

Supplementary Data

Appendix A1 – Compilation and details of reviewed papers

Appendix A2 – Database search extract and pre-analysis records (stage 1)

Appendix A1: Contexts, thematic categories and outcome overview of articles in the systematic review

No	Author	Year	Title	Journal	Methodology	Instrumentation	Theory	Context	Theme (Intervention Mechanism	Outcomes
1	Alises et al.,	2014	Road freight transport decoupling: A comparative analysis between the United Kingdom and Spain	Transport Policy	Quantitative	Decomposition analysis	Unstated	UK and Spain	Decoupling	Explores the stagnation of freight transport growth using decomposition analysis to identify and explain determining variables in the UK and Spain. Construction sector growth in Spain is found to be influencing slower decoupling rates compared to the UK, accounting for the higher road freight transport intensity measurements.
2	McKinnon, A. C.	2007	Decoupling of Road Freight Transport and Economic Growth Trends in the UK: An Exploratory Analysis	Transport Reviews	Qualitative	Explorative (decomposition) analysis	Unstated	UK	Decoupling	Paper reviews research on decoupling strategies and identifies decline in road share, offshoring, growth of service sector and decentralisation as drivers of decoupling within the UK. Advances the proposition that environmental gains from decoupling are modest at best, unless supported with other modal, policy and operational mechanisms.
3	Liimatainen and Pollanen	2013	The impact of sectoral economic development on the energy efficiency and CO2 emissions of road freight transport	Transport Policy	Quantitative	Quantitative Modelling	Unstated	Finland	Decoupling	Examines decreasing road freight transport in Finland. The study provides a 2016 forecast update for the Finnish road freight transport sector; highlighting an 8% increase on the previous forecast levels. Fuel consumption increases are cited as a factor influencing the emissions increase and evidence points to little or no decoupling taking place within the Finnish economy.
4	Button et al.,	2001	Intelligent transport systems in commercial fleet management: a study of short term economic benefits	Transportation Planning and Technology	Mixed	Case Studies/ Surveys	Unstated	USA	ICT (Information and Communications Technology)	ICT improves productivity of freight transport drivers and also reduces stress in despatchers due to improved efficiencies. Software use for congestion mitigation is still very limited and unhelpful.
5	Crainic et al.,	2009	Intelligent freight-transportation systems: Assessment and the contribution of operations research	Transportation Research Part C: Emerging Technologies	Qualitative	Conceptual Review	Unstated	Generic	ICT (Information and Communications Technology)	Paper focuses on and assesses the main technological issues affecting freight transport, emphasizing the role of operations-based DS software for improving freight ITS performance. The importance of DS software has both policy and industry implications for ITS uptake and performance
6	Davies et al.,	2007	Assessing the impact of ICT on UK general haulage companies	International Journal of Production Economics	Quantitative	Survey	Unstated	UK	ICT (Information and Communications Technology)	ICT is important and has a positive effect on haulage operations, enabling efficiencies, back-loading and planning. Size is instrumental to adoption with smaller firms missing out on benefits
7	Harris et al.,	2015	ICT in multimodal transport and technological trends: Unleashing potential for the future	International Journal of Production Economics	Qualitative	Conceptual Review	Unstated	EU	ICT (Information and Communications Technology)	Reviews 33 EU framework projects and links ICT trends to future outcomes. Paper identifies policy, user and technology barriers to ICT use for multimodal transport. Cloud computing, wireless technologies, social networking and interface technologies determined as crucial ICT modifiers for increased use in intermodal freight, helping to lower adoption barriers.

8	Marchet et al.,	2009	An exploratory study of ICT adoption in the Italian freight transportation industry	International Journal of Physical Distribution & Logistics Management	Qualitative	Case Studies	Unstated	Italy	ICT (Information and Communications Technology)	Only operational routines are ICT supported. Even lower adoption levels for innovative applications and integrating IT platforms. Affirms the influence of size on adoption tendencies amongst firm. Lack of awareness and fragmentation inhibits integration
9	Marchet et al.,	2012	Modelling the impacts of ICT adoption for inter-modal transportation	International Journal of Physical Distribution & Logistics Management	Mixed	Modelling/ Case Studies	Unstated	Italy	ICT (Information and Communications Technology)	ICT extends to gains across economic and environmental benefits for the adopting firms. ICT can improve all companies and help logistics and transport companies to improve their effectiveness and efficiencies. Important considerations extend to integration and terminal size for intermodal operations.
10	Sternberg et al.,	2014	The efficiency potential of ICT in haulier operations	Computers in Industry	Mixed	Case Studies	Unstated	Europe: Germany, Sweden, Switzerland	ICT (Information and Communications Technology)	IC benefits on individual transportation unit levels (drivers' working time) in terms of reduced work hours in the administration and waiting times associated with administration. Identifies driver's working time saving as credible ICT adoption propositions for managers to look to, in addition to fuel savings.
11	Walker and Manson	2014	Telematics, urban freight logistics and low carbon road networks	Journal of Transport Geography	Quantitative	Simulation	Unstated	UK	ICT (Information and Communications Technology)	Telematics does not always lead to more efficient urban logistics. Indeed, in many cases the same outcomes can be achieved with 0% telematics as it can with 100%. Policy enforcers have important roles to play and topography is important for the application of telematics to urban freight
12	Wang et al.,	2015	The use of ICT in road freight transport for CO2 reduction - An exploratory study of the UK's grocery retail industry	The International Journal of Logistics Management	Qualitative	Case Studies	Unstated	UK	ICT (Information and Communications Technology)	Study identifies positive correlations between ICT and CO2 emissions reduction. ICT contributes to improved energy efficiencies; better routing and scheduling at different levels. ICT also improves collaborative transport arrangements
13	Agbo, A., and Song, T.	2017	Sustainable freight transport optimisation through synchromodal networks	Cogent Engineering	Quantitative	Case Modelling	Unstated	Africa (Ghana)	Modality (Inter and Co-modality)	Synchromodality has a great potential of improving total transportation and service cost as well as, help in the reduction of road transport emissions and road congestions for great environmental benefits.
14	Arnold et al.,	2004	Modelling a rail/road intermodal transportation system	Transportation Research Part E: Logistics and Transportation Review	Quantitative	Modelling	Location theory	Europe: Iberian Peninsula	Modality (Inter and Co-modality)	International freight traffic is more cost sensitive to modal share variations than national traffic. Intermodal transport provides significant advantage over unimodal road, rail or water systems.
15	Banomyong and Beresford	2001	Multimodal transport: The case of Laotian garment exporters	International Journal of Physical Distribution & Logistics Management	Qualitative	Modelling	Unstated	Lao (South East Asia)	Modality (Inter and Co-modality)	Inter-modality offers competitive gains and increased awareness and accessibility to exporters may offer Laotian garment exporters.
16	Bontekoning and Priemus	2004	Breakthrough innovations in intermodal freight transport	Transportation Planning and Technology	Qualitative	Review	Unstated	EU/ Generic	Modality (Inter and Co-modality)	Technological and management breakthroughs are critical to intermodal freight transport. Although ICT is a viable breakthrough, uncertainties, risks and benefit perceptions limit ICT integration and

										intermodal freight growth. Advocates the simultaneous or early involvement of all stakeholders at the early stages of innovation to overcome these perceptive limitations.
17	Caris et al.,	2008	Planning Problems in Intermodal Freight Transport: Accomplishments and Prospects	Transportation Planning and Technology	Qualitative	Review	Unstated	Generic	Modality (Inter and Co-modality)	Reviews papers on inter-modality from a STO (Strategic, Tactical and Operational) framework. Terminal design and infrastructure configuration for network are the 2 most critical planning elements for intermodal operations
18	Kim, and Van Wee	2009	Assessment of CO2 emissions for truck-only and rail-based intermodal freight systems in Europe	Transportation Planning and Technology	Quantitative	Life Cycle Assessment Modelling	Unstated	Europe	Modality (Inter and Co-modality)	Fuel production in engines only account for between 10-12.5% of emission. Also, intermodal freight isn't always more sustainable than road freight and drayage distance affects inter-modality.
19	Li et al.,	2015	Intermodal freight transport planning – A receding horizon control approach	Transportation Research Part C: Emerging Technologies	Quantitative	Modelling/ Simulation	Systems and Control theory	Netherlands	Modality (Inter and Co-modality)	Dynamic models for addressing modality in freight transport have significant limitations. RIFC models help provide time, control and cost scenarios for accurately modelling intermodal transport
20	Macharis et al.,	2011	A decision support framework for intermodal transport policy	European Transport Research Review	Quantitative	Modelling	Unstated	Belgium	Modality (Inter and Co-modality)	Inter-modality as a cost, policy and efficiency construct. DSS are critical to optimising intermodal operations. Demonstrates the viability of DSS for intermodal freight transport efficiencies.
21	Nealer et al.,	2011	Modal freight transport required for production of US goods and services	Transportation Research Part E: Logistics and Transportation Review	Quantitative	Modelling	Unstated	USA	Modality (Inter and Co-modality)	International shipping is the dominant method of freight transport, followed by trucks and rail. Decomposition strategies that help to identify trucking emissions by sectors will afford better options for targeted implementation of modal changes.
22	Rich et al.,	2011	On structural inelasticity of modal substitution in freight transport	Journal of Transport Geography	Quantitative	Modelling	Aggregation	EU/ Scandinavia	Modality (Inter and Co-modality)	Strong inelasticity for modal shift from trucks in the freight market. The structural inelasticity is also strongly connected to the ''last-mile problem" of freight transport.
23	Ruiz-Garcia et al.,	2007	Review. Monitoring the intermodal, refrigerated transport of fruit using sensor networks	Spanish Journal of Agricultural Research	Qualitative	Conceptual Review	Unstated	Generic	Modality (Inter and Co-modality)	Efficiencies are critical to intermodal freight operations and the combination of available information technologies can provide useful efficiencies for food freight, reducing costs, improving integration and mobility
24	Wiegmans, B. W	2010	The Freight Transport Portfolio: A New Way to Analyse Intermodal Freight Transport as Compared to Single-Mode Road Transport	Transportation Journal	Quantitative	Modelling	Equity Portfolio Management	Europe	Modality (Inter and Co-modality)	Reliability of rail and inland waterways as alternatives to road is still very low and the development of policies that improve reliability and cost efficiencies is crucial to intermodal arrangements
25	Winebrake et al.,	2008	Assessing Energy, Environmental, and Economic Trade-offs in Intermodal Freight Transportation	Journal of the Air & Waste Management Association	Quantitative	Modelling/ Case Studies	Unstated	USA	Modality (Inter and Co-modality)	Trucking holds significant time advantage over other modes of freight transport. Routing also creates emission trade-offs between CO2 and PM10 emission.

26	Woxenius, J	2007	Generic Framework for Transport Network Designs: Applications and Treatment in Intermodal Freight Transport Literature	Transport Reviews	Qualitative	Review/ Conceptual	Unstated	EU/ Generic	Modality (Inter and Co-modality)	Intermodal studies are still fragmented across countries, references and even meanings attached to terminologies. Convergence is essential for progressive learning.
27	Aljohani, K and Thompson, R	2016	Impacts of logistics sprawl on the urban environment and logistics: taxonomy and review of literature	Journal of Transport Geography	Qualitative	Review	Unstated	Austrailia	Operations (Design and Process)	Address the problem of urban frieght and makes some interesting contributions in terms of the impact of suburban consolidation centres on travel for road freight vehicles (suggests a converse outcome) and greater environmental impact.
28	Allen et al.,	2012	Investigating relationships between road freight transport, facility location, logistics management and urban form	Journal of Transport Geography	Quantitative	Survey	Unstated	UK	Operations (Design and Process)	HGV freight loads in urban areas vary according to size of the urban areas. Geographical, spatial and land use factors have influences on freight activity in urban. Also urban land use patterns affect freight intensity, impacting the balance of trade.
29	Allen et al.,	2012	The Role of Urban Consolidation Centres in Sustainable Freight Transport	Transport Reviews	Qualitative	Reviews	Unstated	Generic	Operations (Design and Process)	Improving load factor of goods vehicles through UCCs can provide km savings, reducing GHG and air quality. Public funding is required to promote UCCs, however the UCCs can become self-sustaining.
30	Ando and Taniguchi	2006	Travel time reliability in vehicle routing and scheduling with time windows	Networks and Spatial Economics	Quantitative	Case Study/ Experiments	Unstated	Japan	Operations (Design and Process)	Vehicle routing and scheduling can yield favourable emissions savings. VRPTW-P model reduced negative emissions in terms of CO2, NOx and PM in addition to cost savings
31	Arvidsson, N Pazirandeh, A	2017	An ex ante evaluation of mobile depots in cities: A sustainability perspective	International Journal of Sustainable Transport	Mixed	Case Study	Unstated	Europe	Operations (Design and Process)	Addresses mobile depots in cities and advances a multimodal approach for standardized load units to make transloading easier.
32	Boysen, N., Briskorn, D., and Emde, S.	2018	Scheduling electric vehicles and locating charging stations on a path	Journal of Scheduling	Quantitative	Case modelling	Unstated	Europe (Germany)	Operations (Design and Process)	Investigate electric vehicle scheduling problem and provides an efficient heuristic solution procedure based on decomposition approach. Further addresses the charging station long-term decision problems. Study is within a restricted environment 9rail-rail shipment). Application to everyday urban road freight problems is unclear)
33	Crainic et al.,	2004	Advanced freight transportation systems for congested urban areas	Transportation Research Part C: Emerging Technologies	Quantitative	Case Study/ Experiments	Unstated	Italy	Operations (Design and Process)	Modelling problems and scenarios on improving urban freight efficiencies within urban spaces. Finding a compromise of views and methods is vital to planning for and controlling road freight without eliminating service. Integration a key success factor
34	Demir et al.,	2011	A comparative analysis of several vehicle emission models for road freight transportation	Transportation Research Part D: Transport and Environment	Quantitative	Simulation	Unstated	Generic	Operations (Design and Process)	Compares and models fuel consumption and GHG emissions. Fuel consumption varies with the size of vehicle, road gradient and speed of travel. Measurement models still vary.
35	Ehmke, et al.,	2016	Vehicle Routing to Minimize Time-Dependent Emissions in	European Journal of Operational	Quantitative	Modelling/ Experiment	Unstated	Germany	Operations (Design and	Paper focuses on the problem of minimizing CO2 emissions in the routing of vehicles in urban areas. Study adopts a methodology that

			Urban Areas	Research					Process)	identifies emissions minimizing path and shows savings in emissions are proportion ally larger than the associated increases in duration, indicating improved emissions are achievable at a low cost. Sizes of trucks are important in the addressing emissions reductions.
36	Fleischmann et al.,	2004	Dynamic Vehicle Routing Based on Online Traffic Information	Transportation Science	Quantitative	Modelling	Unstated	Germany	Operations (Design and Process)	Dynamic planning for routing and travel for freight, Flexible assignments yield better performance based on optimal AP solutions, accounting for time, empty loads and routing variations
37	Furst and Oberhofer	2012	Greening road freight transport: Evidence from an empirical project in Austria	Journal of Cleaner Production	Quantitative	Survey	Environmental Management / Theory of Planned Behaviour	Austria	Operations (Design and Process)	Company structure and inclination to implement environmental sustainability in road freight transport. Higher number of companies do not actively practice environmental management and size and environmental management have some relationship
38	Galos et al.,	2015	Reducing the energy consumption of heavy goods vehicles through the application of lightweight trailers: Fleet case studies	Transportation Research Part D: Transport and Environment	Qualitative	Modelling	Unstated	UK	Operations (Design and Process)	Single deck trailers have better mass energy performance compared to existing double deck fleets. Reducing the empty weight of HGV trailers used in mass-limited operations can impact energy consumption savings which will lead to a reduction in both operation costs and carbon footprint
39	Gilpin et al.,	2014	Biodiesel's and advanced exhaust after treatment's combined effect on global warming and air pollution in EU road-freight transport	Journal of Cleaner Production	Quantitative	Survey	Unstated	EU	Operations (Design and Process)	The independent implementation of RME biodiesel and advanced exhaust after treatment SCR and DPF in road-freight transport results in the reduction of their targeted emissions GWP100 and the life-cycle emissions of NOx, PM, CO, and NMHC, respectively. Perceived benefits associated with reduction may vary when measured independently.
40	Haughton, M. A.	2002	Route re-optimization's impact on delivery efficiency	Transportation Research Part E: Logistics and Transportation Review	Quantitative	Experiment/ Simulation	Probability	West Indies/ Generic	Operations (Design and Process)	Increased driver learning is critical to routing efficiencies, especially where disruptions are unpredictable. High staff retention helps to improve driver learning and invariably helps to improve routing optimisation
41	Lammgård and Andersson	2014	Environmental considerations and trade-offs in purchasing of transportation services	Research in Transportation Business and Management	Quantitative	Survey	*Process	Sweden	Operations (Design and Process)	Reliability, Quality and Price are at the apex of the decision making agenda for logistics managers in the selection of transport providers. Market coverage is equally important but environmental importance has little and unchanged significance over 9 years (2003-2012).
42	Li, et al.,	2015	Oil-saving pathways until 2030 for road freight transportation in China based on a cost-optimization model	Energy	Quantitative	Modelling	Unstated	China	Operations (Design and Process)	The cost-effective GHG emission reduction target of developing alternative fuels should be set below the turn point for road freight transport. diesel and gasoline will remain the dominant fuels over the planning horizon, because the deployment scale of biofuel and natural gas was constrained by resource supply and construction speed of filling station respectively

43	Liimatainen, et al.,	2014	Energy efficiency of road freight hauliers-A Nordic comparison	Energy Policy	Quantitative	Survey	Unstated	Europe (Nordic Region)	Operations (Design and Process)	Examined decarbonisation EEI practices of hauliers in 4 Nordic countries, replicating an earlier study in Finland. EEI reporting helps to improve environmental performance and the effect of EEI as a tool for comparison revealed very similar trends across all four counties.
44	Matthias Klumpp	2016	To Green or Not to Green: A political, economic and social analysis for the past failures of green logistics	Sustainability	Quantitative	Case Modelling	Jevon's Paradox	Europe (Germany)	Operations (Design and Process)	Analyses the reasons for the current failure of green logistics by drawing on political, economic and business as well as social motivations to highlight challenges with the greening of logistics. The share of greenhouse gas emissions by the transportation and logistics sector in Europe rose from 16.6% in 1990 to 24.3% in 2012. Jevons paradox to address the rebound effect of technology efficiencies in logistics. Technological efficiencies may be inadvertently advancing emissions and carbon energy demand. Median voter preferences and impact on policy. Taxation is presented as a viable tool for effecting consumption change.
45	McKinnon and Ge	2006	The potential for reducing the empty running by trucks; a retrospective analysis	International Journal of Physical Distribution & Logistics Management	Quantitative	Survey	Unstated	UK	Operations (Design and Process)	This analysis suggests that, across the 29 vehicle fleets sampled, there was very limited potential for reducing the distance that the trucks ran empty. It highlights the effects of operational constraints on back-loading, particularly, where the average length of haul is short, the scheduling is tight and a large proportion of freight requires refrigeration.
46	Midgley and Cebon	2015	Control of a hydraulic regenerative braking system for a heavy goods vehicle	Proceedings of the Institution of Mechanical Engineers, Part D: Journal of Automobile Engineering	Quantitative	Secondary Data	Unstated	UK	Operations (Design and Process)	Three global optimisation techniques for breaking systems in HGVs were investigated over four standard driving cycles. The greedy algorithm was identified as the only algorithm that can operate in real time, yielding an Elv decrease of 9–17%, depending on the driving cycle. Also highlights problems with accurate data for predictive controllers.
47	Midgley et al.,	2013	Modelling of hydraulic regenerative braking systems for heavy vehicles	Proceedings of the Institution of Mechanical Engineers, Part D: Journal of Automobile Engineering	Quantitative		Unstated	UK	Operations (Design and Process)	Examines breaking systems in HGVs, finding gain efficiencies from simulation, with corresponding fuel and energy savings. Gains on fuel consumption could be as high as 29.4%.
48	Moreno-Quintero et al.,	2013	Modelling planner-carrier interactions in road freight transport: Optimisation of road maintenance costs via overloading control	Transportation Research Part E: Logistics and Transportation Review	Quantitative	Modelling	Unstated	Mexico	Operations (Design and Process)	Extends methods for modelling multi-actor approaches in freight transport from a policy perspective. The bi-level approach allows for hierarchical designations within the model with significant outcomes for different actors, thereby enabling policy planners achieve better and more acceptable policies
49	Morrison et al.,	2013	Effects of longer heavy vehicles on traffic congestion	Proceedings of the Institution of Mechanical	Quantitative	Simulation	Unstated	UK	Operations (Design and	The study indicates that the introduction of LHVs to UK roads would have very little effect on motorway traffic congestion, with potential of very little decrease in congestion although LHVs would

				Engineers, Part C: Journal of Mechanical Engineering Science					Process)	significantly reduce energy consumption compared to HGVs
50	Newnam and Goode	2015	Do not blame the driver: A systems analysis of the causes of road freight crashes	Accident Analysis and Prevention	Qualitative	ACCIMAP	Systems theory	Australia	Operations (Design and Process)	Socio-technical perspective to road freight transport externalities. Administrative faults and management faults as key causes of HGV accidents.
51	Olsson and Woxenius	2014	Localisation of freight consolidation centres serving small road hauliers in a wider urban area: Barriers for more efficient freight deliveries in Gothenburg	Journal of Transport Geography	Quantitative	Case study/ Surveys	Unstated	Sweden	Operations (Design and Process)	Time is more important than cost in urban freight planning and clustering FCCs close to freight providers can improve efficiencies, helping to address congestion queries within urban centres. By clustering or consolidating around FCCs, shippers can also reduce vehicle kms and corresponding emissions.
52	Ozen and Tuydes-Yaman	2013	Evaluation of emission cost of inefficiency in road freight transportation in turkey	Energy Policy	Quantitative	Survey	Unstated	Turkey	Operations (Design and Process)	22.3% of empty running in 2009, accounting for over 42% of emissions. Emission reduction savings could be gained from policy initiatives that address empty running. Additional implementation of Euro IV standards could drive down GHG by up to 40% in some cases.
53	Palsson and Kovács,	2014	Reducing transport emissions: A reaction to stakeholder pressure or a strategy to increase competitive advantage	International Journal of Physical Distribution & Logistics Management	Quantitative	Survey	RBV/ Stakeholder	Sweden	Operations (Design and Process)	Greening freight transportation is both a response to external pressure and internal management strategy. Stakeholder pressure sets the minimal acceptance levels whilst RBV explains the competitive factors of sustainability
54	Pérez-Martínez, P. J.	2009	The vehicle approach for freight road transport energy and environmental analysis in Spain	European Transport Research Review	Quantitative	Surveys/ PRFSS	Unstated	Spain	Operations (Design and Process)	Paper reviews some key indicators of efficiency in road freight performance in Spain. Identifies a 0.2% increase in energy and environmental efficiencies using the PRFSS model to analyse data between 1997 and 2003. Also short and medium distances, 9–112 km, are critical as small increments within this distance range produce high increments on transport content and therefore high environmental impacts. It asserts that internalisation of external costs can lead to energy savings and CO2 reductions.
55	Rogerson, S	2017	Influence of freight transport purchasing processes on logistical variables related to CO2 emissions: A case study in Sweden	International Journal of Logistics Research and Applications	Qualitative	Case study	Unstated	Europe (Sweden)	Operations (Design and Process)	Paper examines how freight transport purchasing process influences logistics variables, adopting a purchasing model perspective. Highlights the import of contractual specification in the outsourcing of logistics by managers.
56	Rogerson, S., and Sallnas, U.	2016	Internal coordination to achieve high load factor	International Journal of Logistics Management	Qualitative	Case Study	Mintzberg's coordination mechanisms	Europe	Operations (Design and Process)	Paper examines load factor constraints exploring them from a shipper's coordination perspective. It clarifies the importance of internal coordination in order to achieve high load factor. Also provides a substantial list of activities that could be coordinated to

										realise the goal of high load factor.
57	Sanchez-Rodrigues, et al.,	2014	Developing “Extra Distance” as a measure for the evaluation of road freight transport performance	International Journal of Productivity and Performance Management	Qualitative	Case Studies (Workshops)	Unstated	UK/ South Africa	Operations (Design and Process)	The “Extra Distance” measure was applied to quantify the effects of disruptions that can occur in road freight transport networks with adverse effect on profit margins. Late notification of deliveries, size, loading schedules, congestion and road restrictions were highlighted as main sources of extra distance costs, Operations integration is identified as a viable means of reducing extra distance incidents, mitigating losses by 80% in one instance, with energy and emissions implications
58	Schiffer, M., and Walther, G	2017	The electric location routing problem with time windows and partial recharging	European Journal of Operational Research	Quantitative	Case Modelling	Unstated	Europe	Operations (Design and Process)	Employs a location routing approach to consider routing of electric vehicles and siting decisions for charging stations simultaneously in order to support strategic decisions of logistics fleet operators. Advances a more robust model for integrating siting and refuelling decisions in EV VRP optimisation
59	Soleimani et al.,	2018	Collection and distribution of retruned -remanufactured products in a vehicle routing problem with pickup and delivery considering sustainable and green criteria	Journal of Cleaner Production	Quantitative	Case study	Fuzzy	Europe	Operations (Design and Process)	Paper proposes a multi- objective non-linear programming model for the green vehicle routing problem (GVRP), including original and remanufactured products distribution (both delivery and pickup) of end of life (EOL) products. Results suggest improved performance under the model configurations and proposed solution approach with potential to reduce fuel, cost and pollution impacts
60	Sternberg et al.,	2013	Who controls the fleet? Initial insights into road freight transport planning and control from an industrial network perspective	International Journal of Logistics Research and Applications	Qualitative	Case Study	Network theory	Switzerland	Operations (Design and Process)	Discusses road haulage as a complex operation with implications for control and coordination. Integration of planning and control through ICT needs to overcome fragmented barriers within the industry.
61	Ubogu et al.,	2011	Port-hinterland trucking constraints in Nigeria	Journal of Transport Geography	Quantitative	Survey	Unstated	Nigeria	Operations (Design and Process)	Operational issues in the Nigeria context. Nuances of security, policy bottlenecks, infrastructure etc. as key limitations to sustainability within road freight operations
62	Velázquez-Martínez et al.,	2016	A new statistical method of assigning vehicles to delivery areas for CO_2 emissions reduction	Transportation Research Part D: Transport and Environment	Quantitative	Modelling/ Experiment	Unstated	Mexico	Operations (Design and Process)	Evaluates the effect of delivery conditions on freight vehicle performance. Empirical findings from Mexico suggest matching vehicle to environment topography can reduce emissions from delivery. Fleet design choices affect emissions savings from road freight transport.
63	Wang et al.,	2017	Internalisation of negative external cost of green logistics and incentive mechanism	Advances in Mechanical Engineering	Quantitative	Case Modelling	Unstated	China	Operations (Design and Process)	Highlights differences in externality costings for enterprise and government cases, suggesting parallels between government subsidies and greening of logistics by enterprises when certain conditions remain constant. It links externality changes to freight rates
64	Wang, et al.,	2014	Operational transportation planning of freight forwarding companies in horizontal	European Journal of Operational Research	Quantitative	Modelling	Unstated	Germany	Operations (Design and Process)	To improve operational efficiencies, forwarders have to reorganize their internal processes for better management of external relations to partners in both vertical and horizontal cooperation.

			coalitions							Systematic considerations that combine routing, computational simulation can help reduce cost of subcontracting by up to 10%.
65	Alho, and de Abreu e Silva	2014	Analysing the relation between land-use/urban freight operations and the need for dedicated infrastructure/enforcement - Application to the city of Lisbon	Research in Transportation Business and Management	Mixed	Modelling/ Case Studies	Unstated	Portugal	Other	Illegal parking by non-freight vehicles impacts road freight performance. Better planning and enforcement will improve congestion and aid efficiency in urban freight deliveries
66	Carballo-Penela et al.,	2012	From the motorways of the sea to the green corridors' carbon footprint: the case of a port in Spain	Journal of Environmental Planning and Management	Quantitative		Unstated	Spain	Other (Green Corridors)	Carbon strategies built around various stakeholders are vital to the success of green corridor initiatives. Indirect emissions have to be taken into account in emissions management.
67	Demir et al.,	2014	A review of recent research on green road freight transportation	European Journal of Operational Research	Qualitative	Review	Unstated	Generic	Other	Other factors besides routing and travel minimisation affect energy consumption in road freight. Speed, load weight and road gradient also determine consumption. Driver working hours may impact efficiencies and sustainability.
68	Figliozzi, M. A	2011	The impacts of congestion on time-definitive urban freight distribution networks CO2 emission levels: Results from a case study in Portland, Oregon	Transportation Research Part C: Emerging Technologies	Quantitative	Modelling/ Case Studies	Unstated	USA	Other	Uncongested travel reduces emissions, although the impact of congestion on freight vehicle emissions is difficult to forecast.
69	Islam et al.,	2013	Performance evaluation of an online benchmarking tool for European freight transport chains	Benchmarking: An International Journal	Mixed	Survey/ interview	Unstated	EU	Other	Cost is the most important indicator in evaluating freight transport performance. Use of information technology for planning and benchmarking still not prevalent in the road freight industry
70	Khorheh et al.,	2015	Socio-environmental performance of transport systems	Management of Environmental Quality: An International Journal	Quantitative	Survey	Unstated	Australia	Other	Logistics perceptions have gone beyond economic considerations. Political, soci0-ecnomic, infrastructure and technological solutions impact road freight transport but technology has the most significant impact on environmental and social performance
71	Kinnear et al.,	2015	Emissions Reporting in the Australian Road Freight Transport Sector: Is There a Better Method than the Default Option?	International Journal of Sustainable Transportation	Quantitative	Modelling/ Case Studies	Unstated	Australia	Other	Makes case for the migration from default reporting methodologies to NGERS reporting as a means of reducing emissions.
72	Lagorio, A., Pinto, R., and Golini, R.	2016	Research in urban logistics: a systematic review	International Journal of Physical Distribution & Logistics Management	Mixed	Citation network	Unstated	Europe (Italy)	Other (Review)	Fragmentations in the urban logistics literature and some directions on trends and future research directions

73	Marchet, Gino; Melacini, Marco; Sara, Perotti	2014	Environmental Sustainability in Logistics and freight transportation: A literature review and research agenda	Journal of Manufacturing Technology Management	Qualitative	Conceptual Review	Unstated	Generic	Other	Although researchers have started to examine the decision-making process involved in environmental sustainability adoption in recent years, many themes, such as sustainability evaluation and measurement, and the level of adoption of sustainability initiatives in the context of the third-party logistics (3PL) industry are under-represented in the literature. articles are either conceptual papers or empirical studies (i.e. mostly based on surveys or case studies), while simulation and analytical modelling have rarely been addressed.
74	Pan et al.,	2013	The reduction of greenhouse gas emissions from freight transport by pooling supply chains	International Journal of Production Economics	Quantitative	Modelling/ Case Studies	Unstated	France	Other	Joint road and rail transport is a significant way to reduce CO2 emissions, provided the electrically powered train generates low emissions in France. Alternatively, the study affirms that a single transport mode can yield similar emission reduction and cost savings through the consolidation of supply network
75	Pérez-Martínez and Vassallo-Magro	2013	Changes in the external costs of freight surface transport in Spain	Research in Transportation Economics	Quantitative	Modelling	Unstated	Spain	Other	Policy measures driving modality, vehicle load distribution and fuel efficiencies are helping to address external cost from road freight in Spain. Also highlights some difficulties with predictions from existing data structures.
76	Ballantyne et al.,	2013	A comparative study of urban freight transport planning: Addressing stakeholder needs	Journal of Transport Geography	Qualitative	Survey/ interview	Stakeholder Theory	Europe	Policy	Local council awareness of urban freight issues and the capacity to regulate urban freight as actors or just stakeholders.
77	Behrends, Sönke	2016	Burden or opportunity for modal shift? – Embracing the urban dimension of intermodal road-rail transport	Transport Policy	Qualitative	Review	Unstated	Europe	Policy	Examines the role of urban planning in the development of multimodal transport. Highlights some measures to improve IRRT synchronisation and reduce the environmental impact of urban freight. The results emphasise that growth of rail freight without negative consequences for the sustainability of urban areas can only be achieved by appropriate actions that demonstrate an understanding of the urban context within which IRRT takes place
78	Cristea et al.,	2013	Trade and the greenhouse gas emissions from international freight transport	Journal of Environmental Economics and Management	Quantitative	Modelling	Unstated	Worldwide	Policy	Extensive world trade data is used to model international output and transport comparisons. Study identifies international transport as responsible for 33% of emissions. Strengthens the body of work on coupling between economic growth, freight transport and emissions with some important considerations for policy makers.
79	Dablanc, L.	2007	Goods transport in large European cities: Difficult to organize, difficult to modernize	Transportation Research Part A: Policy and Practice	Qualitative	Observation/ Review	Unstated	Europe	Policy	Slowdown in logistics infrastructure and facilities is attributed to cost considerations, further exacerbating the logistics urban distribution problem. Two principal administrative policy recommendations are made; simplification of planning process for city access and practitioner focused approach to policy development for urban freight.

80	Eom et al.,	2012	We keep on truckin': Trends in freight energy use and carbon emissions in 11 IEA countries	Energy Policy	Quantitative	Modelling	Unstated	IEA Countries (11)	Policy	Analyses trends in freight CO2 emissions in 11 IEA countries from the earliest year of data availability to 2007–2010. Presents counter evidence for coupling as opposed to decoupling. Identifies policy driven intermodal measures as more viable means for decarbonising freight.
81	Léonardi, Jacques; Baumgartner, Michael	2004	CO2 efficiency in road freight transportation: Status quo, measures and potential	Transportation Research Part D: Transport and Environment	Mixed	Survey	Unstated	Germany	Policy	Survey of trucking in Germany in spring 2003, found the mean CO2 efficiency (E) is 10.4tkm/ kg CO2. Emission efficiency shows a large variation between 0.8 and 26tkm for 1kg CO2. Identifies deficiencies in implementation measures for improving transport efficiency and makes a case for policy driven information dissemination as well as OBCs for monitoring the success of other operational efficiency measures
82	Li et al.,	2013	Trends in road freight transportation carbon dioxide emissions and policies in China	Energy Policy	Quantitative	Modelling/ Decomposition analysis	Unstated	China	Policy	Used decomposition analysis to estimate freight transport and economic relationships, with a highlight of policy measures around vehicle specification, modal infrastructure and tolling charges as instrumentation for addressing road freight externalities
83	Liimatainen et al.,	2012	Energy efficiency practices among road freight hauliers	Energy Policy	Quantitative	Survey	Unstated	Finland	Policy	Examines energy efficiency practices amongst road hauliers within the Finnish haulage industry. Common actions include speed limitation, vehicle monitoring and effective deployment. Size is highlighted as a determining factor in energy efficiency amongst firms. Also it provides evidence that voluntary environmental agreements need to be complemented with rethinking the institutional settings that the agreements fit in, in order to overcome barriers of the technological lock-in.
84	Liimatainen et al.,	2014	Decarbonizing road freight in the future - Detailed scenarios of the carbon emissions of Finnish road freight transport in 2030 using a Delphi method approach	Technological Forecasting and Social Change	Mixed	Delphi Technique	Unstated	Finland	Policy	Delphi method is used to forecast the changes of GDP and seven indicators, which determine the CO2 emissions of road freight. Scenarios are used to forecast demand and reductions with the most positive results yielding 74% decline in CO2 emissions and at least 26% reduction in the worst case; base year is 2010 and projections were for 2030.
85	M'raihi et al.,	2015	Carbon emissions growth and road freight: Analysis of the influencing factors in Tunisia	Transport Policy	Quantitative	Decomposition Analysis	Unstated	Tunisia	Policy	Uses decomposition analysis to examine the driving factors of CO2 emissions in Tunisia. Identifies economic growth as a main driver of CO2 growth with emphasis on limitations of decoupling as a viable strategy due to the fall out the 2010 revolution. Modality, technology and incentivizing are presented as more viable mechanisms
86	M'raïhi et al.,	2014	Road Freight Transport and Carbon Dioxide Emissions: Policy Options for Tunisia	Energy and Environment	Quantitative	Modelling	Unstated	Tunisia	Policy	Decomposes the CO2 emissions in the Tunisian road freight transport system, identifying fossil fuel as a main factor. Advocates the combination of various policy, operational and decoupling mechanisms for address the emissions problems. Extends a caveat on the limitations of decoupling strategies in the face of infrastructural and intermodal deficiencies.

87	Magaritis et al.,	2016	Electrical commercial vehicles: Practical perspectives and future research directions	Research in Transportation Business and Management	Qualitative	Review	Unstated	Europe	Policy	Paper examines the use of electric commercial vehicles within the spectrum of “green” transport, provides a critique of their key technical specifications and identifies the main operating conditions that influence their effectiveness. It advances policy adjustments for the wider take-up of electric commercial vehicles in daily transport operations within the EU area
88	Massara, V.M	2012	Brief Synopsis of the Brazilian Freight Transport and Future Development	Journal of Infrastructure Development	Qualitative	Review	Unstated	Brazil	Policy	Regulation, Inter-modality and Infrastructure directions for advancing the Brazilian freight transport system
89	Matos and Silva	2011	The rebound effect on road freight transport: Empirical evidence from Portugal	Energy Policy	Quantitative	Modelling	Unstated	Portugal	Policy	Discusses the rebound effect syndrome and the potential implications for energy consumption and road freight intensity. Findings suggest that operators are more likely to adopt operational objectives over technological efficiencies. Estimated 24.1% rebound effect identified in some case. Implications can extend to overestimated energy consumption savings.
90	Mattila and Antikainen	2011	Back casting sustainable freight transport systems for Europe in 2050	Energy Policy	Quantitative	Modelling/ Back casting	Unstated	Europe	Policy	Adopts a back casting technique to model freight transport over long distances. Model identified gaps and short comings in current trends and the authors advocate complimentary strategies as critical to achieving sustainable road freight transport by 2050. Study also identifies the need for specific technology road maps that balance costs and benefit distributions
91	McKinnon, A. C.	2009	Benchmarking road freight transport: Review of a government-sponsored programme	Benchmarking: An International Journal	Qualitative	Review	Unstated	UK	Policy	Benchmarking SRFT from a government perspective. Policy impetus and convergence with industry benchmarking outcomes
92	McKinnon and Piecyk	2009	Measurement of CO2 emissions from road freight transport: A review of UK experience	Energy Policy	Quantitative	Survey/ Secondary Data	Unstated	UK	Policy	Paper highlights some key considerations for improving CO2 measurement using the UK experience as a point of reference. They advocate for greater transparency, common measurement values and data consistency.
93	Piecyk and McKinnon	2010	Forecasting the carbon footprint of road freight transport in 2020	International Journal of Production Economics	Quantitative	Survey/ Delphi	Unstated	UK	Policy	Paper presents research undertaken to determine the baseline trends in LSCM and associated environmental effects up to 2020. Factors affecting freight transport demand, truck fuel consumption and related CO2 emissions are classified into six categories in relation to different levels of logistical decision- making. These complexities in the decision-making process and perceptions amongst practitioners lead to different BAU scenarios where the mid-range BAU scenario indicates that the most likely outcome is a marginal reduction in CO2 emissions from road freight transport of around 10% against a 20% increase on road freight intensity from a 2006 base.

94	Pitera et al	2017	The complexity of planning for goods delivery in a shared urban space: A case study involving cyclists and trucks	European Transport Research Review	Qualitative	Case Study	Unstated	Europe (Norway)	Policy	Road stakeholders' evaluation focusing on interaction outcomes between trucks and cyclists. Highlights safety implications from the lack of coordination by city planning departments. Councils or city departments lack dedicated urban freight planning capabilities.
95	Steenhof, Paul; Woudsma, Clarence; Sparling, Erik	2006	Greenhouse gas emissions and the surface transport of freight in Canada	Transportation Research Part D: Transport and Environment	Quantitative	Survey/ Decomposition Analysis	Unstated	Canada	Policy	A decomposition analysis framework is applied to the Canadian freight sector to better understand processes leading to changes in GHG emissions. The framework demonstrates that GHG emissions increase was driven by road freight intensity and countered by multimodality between 1990 and 2003. Policy augmentation for modal shift is advanced.
96	Stelling, P.	2014	Policy instruments for reducing CO2 emissions from the Swedish freight transport sector	Research in Transportation Business and Management	Qualitative	Review	Unstated	Sweden	Policy	Analyses policy instruments for reducing CO2 in Sweden's logistics and freight sector. Economic, Legal, Knowledge and Societal instruments are reviewed with different time implications and relevance for economic and legal (short term), knowledge and societal (long term)
97	Winebrake et al.,	2012	Estimating the direct rebound effect for on-road freight transportation	Energy Policy	Qualitative	Review	Unstated	USA	Policy	Paper provides a critical review of the literature related to the HDV rebound effect. Results reveal gaps in terms of focused studies in this area. The combination of this gap, the variability and heterogeneity of the trucking sector serve to limit understanding of the rebound effect in the HDV operations
98	Zanni and Bristow	2010	Emissions of CO2 from road freight transport in London: Trends and policies for long run reductions	Energy Policy	Quantitative	Survey	Unstated	UK	Policy	Examines the trends and projections for freight transport in the city of London. Raises concerns about the viability of policy and logistics solutions to curb the emissions problems in London by 2050. Analysis of historical emissions shows that from 1996 to 2005 emissions from HGVs and LGVs in London increased by around 18%. Projections show that without further policy interventions these CO2 emissions may increase by an additional 109% by 2050. Combinations of behavioural, technology and policy interventions are commended to aid performance.

Appendix A2 – Database Search Structure and Pre-analysis records (Stage 1)

Date	Search Words		Date Range (2001-2016)															Database Hits								
Last update			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Science Direct	Emerald	Taylor & Francis	Sage	Google Scholar	Results Total			Cummulative
24 February 2016	"Sustainable Freight"	SD	2	0	0	0	2	0	1	0	2	4	8	14	7	36	9	5	90					90	SD		
24 February 2016	"Sustainable Freight"	E	0	0	0	0	0	0	0	0	0	0	0	1	2	3	2	0		16*				16	E		
24 February 2016	"Sustainable Freight"	T&F	0	0	0	0	0	0	1	0	1	0	0	1		1	1	0			5			5	T&F		
24 February 2016	"Sustainable Freight"	S	0	0	0	0	0	0	0	0	0	0	0	0	2	1	1	0				4		4	S		
24 February 2016	"Sustainable Freight"	GS																					965	965	GS		
																								1080			
24 February 2016	"Green Freight"	SD	0	0	0	0	0	0	0	0	0	0	0	3	5	9	3	1	21					21	SD		
24 February 2016	"Green Freight"	E	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0		3				3	E		
24 February 2016	"Green Freight"	T&F	0	0	0	0	0	0	0	0	0	0	0	2	1		0	0			3			3	T&F		
24 February 2016	"Green Freight"	S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				0		0	S		
	"Green Freight"	GS																						0	GS		
																								27			
25 February 2016	"Road freight"**	SD	10	9	11	9	20	16	27	31	49	46	44	73	72	123	120	34	695					695	SD		
25 February 2016	"Road freight"	E																		133				133	E	25^	
25 February 2016	"Road freight"	T&F																			274			274	T&F		
25 February 2016	"Road freight"	S														1						56		56	S		
	"Road freight"	GS																						0	GS		
																								1158			
28 March 2016	"Road freight"	SD	0	2	0	1	2	1	5	6	4	5	6	14	11	22	12	7	98								2265
28 March 2016	"Road freight"	E	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0								
28 March 2016	"Road freight"	T&F	0	0	0	0	0	0	0	0	0	0	0	0	0		1		1								
28 March 2016	"Road freight"	S	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1								
28 March 2016	"Road freight"	GS																									
02 March 2016	"Sustainable road freight" OR "sustainable haulage" OR "road freight sustainability"	SD	0	0	0	0	0	0	0	0	0	0	0	0	0	3	4	2	9								
02 March 2016	"Sustainable road freight" OR "sustainable haulage" OR "road freight sustainability"	E	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0								
02 March 2016	"Sustainable road freight" OR "sustainable haulage" OR "road freight sustainability"	T&F	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0								
02 March 2016	"Sustainable road freight" OR "sustainable haulage" OR "road freight sustainability"	S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0								
02 March 2016	"Sustainable road freight" OR "sustainable haulage" OR "road freight sustainability"	GS																									
NOTES	^Road Freight search in Emerald yielded 133 results, of which 26 were research papers, 6, case studies, chapter items 6, general review 4, conceptual papers 3, review 1 and 2 literature reviews		Of this we took 6 case studies and 26 research papers and 4 general reviews					Green freight search for emerald yielded 3 results. One was an index. 2 papers from 2014 reviewed						** No restrictions/ quotes						*9 items were chapter items that were undated. Of the remaining 7, two items in 2014 were editor profiles						