Action 4 Task 3
Sustainable Logistics Best Practice Guidelines

SEStran document prepared in conjunction with Greening Logistics: Sustainable Best Practice

November 2014

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SUSTAINABLE LOGISTICS FOR EUROPE

SEStran
South East of Scotland Transport Partnership

Investing in Opportunities

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Introduction

About the Guide:

This document forms Task 3 of Action 4 of the North-West Europe Region's WEASTflows INTERREG IVB project. There is a large selection of transport modes that a logistics purchaser can use to move freight and it is essential that for future selections, sustainable modes have been considered.

SEStran has created this guide for logistics purchasers looking to move freight and for transport logistics operators they may use, in conjunction with the Greening Logistics: Sustainable Best Practice report produced by SEStran in partnership with TRI and forms Task 2 of Action 4 of the WEASTflows project.

This guide is designed to promote sustainable freight movements through multiple modes and to promote a modal shift towards the sustainable modes. The aim is to ensure that the logistics purchaser has considered all sustainable possibilities prior to making an informed decision on how to move their freight.

The environmental sustainability considerations for Road, Rail, Inland Waterways and Short-Sea Shipping (SSS) / Maritime have been displayed in the grids below. Air freight has not been considered due to the specialised nature and limited overall usage associated with this mode. However studies have been completed by our partners at the Irish Exporters to improve the sustainability of air freight, particularly in Ireland. Further to this, their study reveals an under-usage of aircraft storage that could be utilised by freight companies.

The grids below are to be used as a checklist to ensure the most sustainable modes have been considered for any given freight movement and also that all potential modifications to individual modes as well as relevant management options have been given careful thought. This includes aerodynamic improvements, efficiency improvements, ICT management and environmental considerations.

This guide should not be seen as criticism of any individual logistics operator but is aiming at promoting and informing about alternative sustainable modes prior to selection. SEStran hope to encourage a modal shift towards more sustainable modes to improve the environment and the efficiency of freight movements in the future. This in turn would benefit local communities through a reduction in local air and noise pollution.

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Mode Selection

There are five main forms of transport for moving freight which include air, inland waterways, maritime / short-sea shipping, rail and road. For this study, air transport was not considered due to the speciality of goods transported using this mode. Considering the variety of freight transport options available, it is important to select a mode that fulfils the logistics purchasers need but also ensures that the freight is moved sustainably.

Choosing the right mode can be difficult and there are many different factors to consider including environmental impacts, sustainability, reliability, time constraints and "mode image".

Prioritising factors can be difficult however Scottish Enterprise has created a hierarchy of priorities based upon the aim to reduce the carbon intensity produced by freight transport. This is highlighted in Figure 1 below and at each level the relevant responsible operator is indicated. Changing any factor below will impact the sustainability of the given mode in the short or long term.

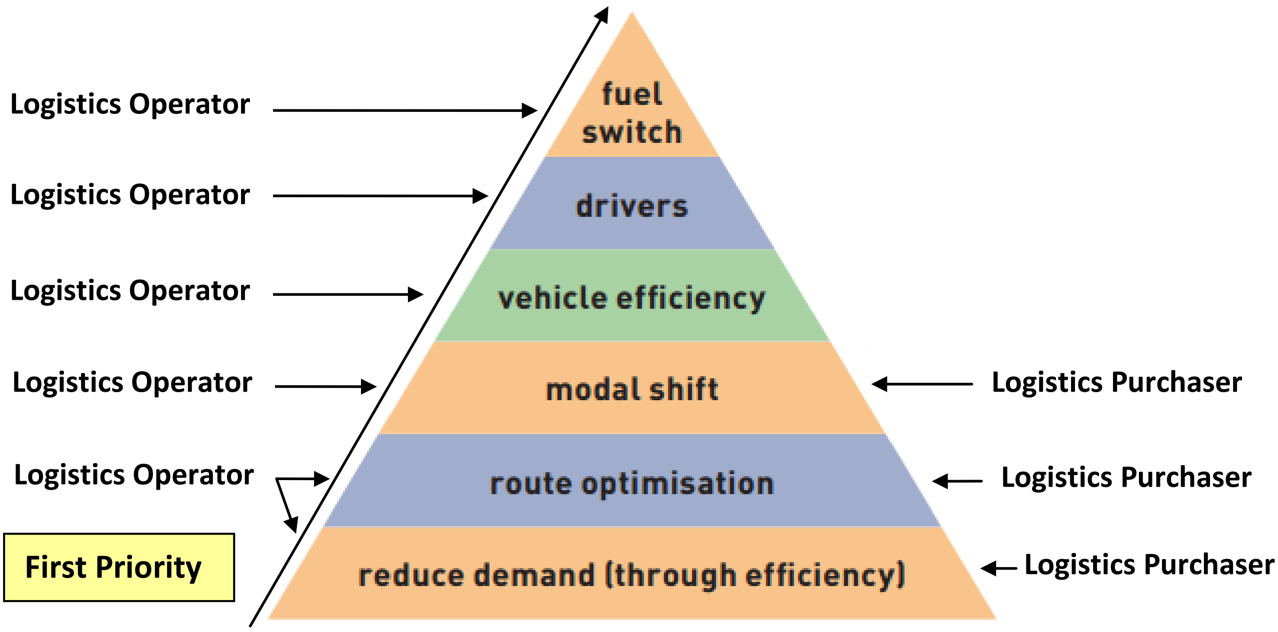

Figure 1 shows a freight transport hierarchy to reduce carbon emissions (source: http://www.scottish-enterprise.com/knowledge-hub/articles/insight/logistics-low-carbon-opportunities-report)

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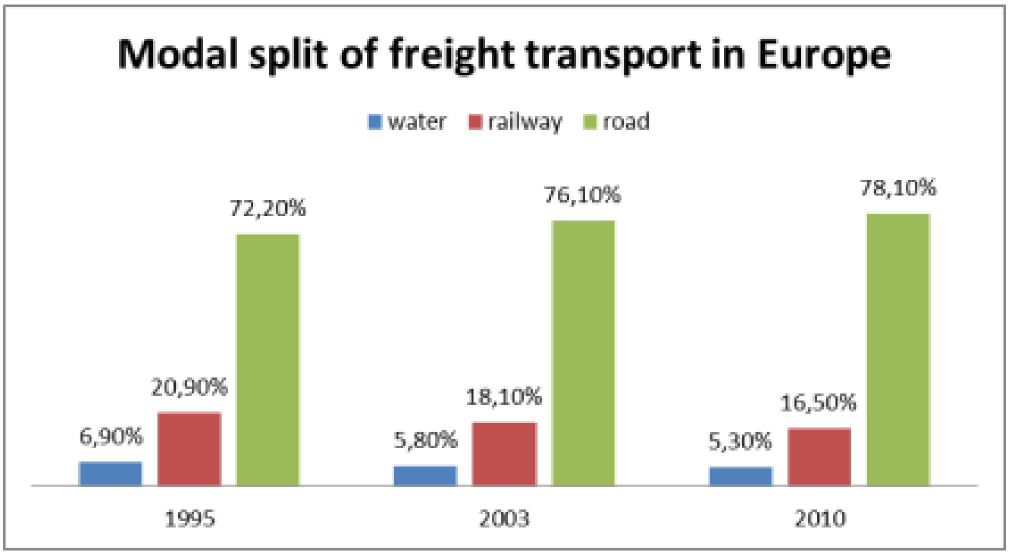
Over the past 15 years, the proportion of freight moved via rail and inland waterways has shifted towards road. Figure 2 below shows the modal split based upon the tonne-kilometre figures on Eurostat for the past 15 years.



http://epp.eurostat.ec.europa.eu

Figure 2 shows the modal split in Europe over a period of 15 years (source: Eurostat)

Below in Figure 3 shows the modal split in Scotland in 2010 and this data was sourced from Transport Scotland. The original dataset also included pipeline movements which were removed due to this mode not being considered in this report.

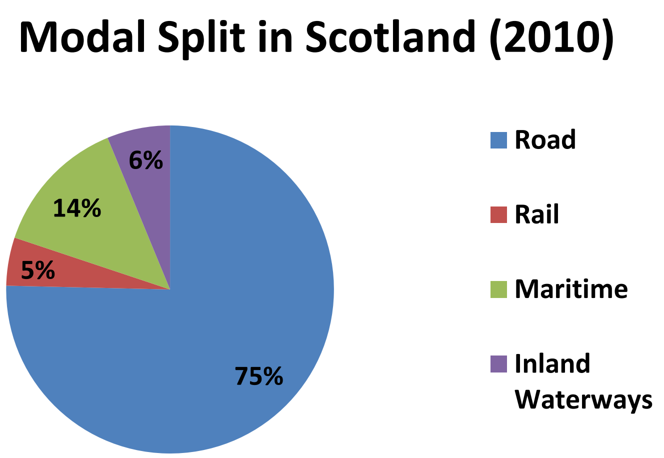


Figure 3 above shows the modal split in Scotland in 2010 (Source: Transport Scotland)

It can be noted that the inland waterways figures for Scotland includes tonne-kilometres in estuarial regions that are usually counted as maritime in many reports. Further to the above, the environmental impact and a CO_2 comparison study between the various modes is presented below.

CO_2 Comparison

A good indicator for sustainability is the fuel consumption of each mode. Table 1 below shows the average grams per tonne-kilometre of CO_2 produced by each mode from 1995-2009.

Freight	Inland Waterways	Maritime	Rail	Road
1995	26.60	13.71	24.86	125.53
1996	26.69	13.83	24.39	123.88
1997	26.84	13.77	23.96	121.63
1998	27.53	13.80	23.75	119.57
1999	28.95	13.83	23.54	118.14
2000	31.91	13.87	23.14	116.60
2001	31.93	13.84	23.13	115.59
2002	31.95	13.86	22.91	114.69
2003	31.97	13.88	22.72	114.13
2004	31.94	13.90	22.58	113.69
2005	31.94	13.92	22.41	113.30
2006	31.78	13.93	22.14	112.44
2007	31.63	13.95	21.89	110.96
2008	31.51	13.97	21.66	109.51
2009	31.40	13.98	21.44	108.08

http://www.eea.europa.eu/data-and-maps/figures/specific-co2-emissions-per-tonne-1

As it can be noted above, out of the four modes of transport, road produces the most CO_2 per tonne-kilometre. However, these emissions do not take into account other harmful emissions like sulphur dioxide, and the rail values are based upon a diesel train, rather than an electrified train. The lowest emissions are produced by the maritime sector although this table above does not take into account the sulphur dioxide emissions. Due to the new EU Sulphur Directive 2012/33/EU being introduced from 1st Jan 2015, the typical CO_2 emissions from ships could increase markedly.

Logistics Operator Considerations:

From a logistics operator's perspective, it is important to consider all environmental and efficiency upgrades that are available across the relevant modes of transport. In particular, any improvements to road-based vehicles that can help to increase efficiency in the short term should be considered alongside the possibility of using a more sustainable mode. In addition, other modifications to rail, inland waterways and maritime can help to improve the sustainability of the given mode even further.

Below are a series of grids that will help logistics operators choose suitable upgrades to further their modes sustainability for the future. In the reference column, the Section numbers are referencing to the document "Greening Logistics: Sustainable Best Practices".

Rail:

Area of Improvement	Example	Description	Reference(s)
Vehicle Characteristics	Aerodynamic / Carriage Design	• Reducing aerodynamic drag at speeds greater than 100km/h is crucial and can be achieved through streamlining. • Minimising the gap between wagons decreases the drag. • For diesel trains, triggering engine shutdowns if idling for 15 minutes or more.	Section IV.4(ii)
	Electrification	• Electrifying the track has multiple sustainable benefits including; - 6 times more energy efficient than road - Improved acceleration and top speeds - lower noise pollution and emission pollution (even if electricity is produced by fossil fuels) - will not suffer from fluctuating fuel prices • Dual fired engines may be considered as well.	Energy, Environmental and Economic Benefits Of Electric Rail and Dual Mode Transportation
	Vehicle Maintenance	• Maintenance regime set out and abided by. • Maintenance checks including oil, engine and design to improve efficiency. • A set driver(s) to one vehicle ensures good knowledge of any maintenance issues.	Section IV.2.1.(iii)
Driver Training	Driver Training	• Advanced training courses help to improve the efficiency of the driver through using efficient braking and accelerating as this promotes eco-driving.	Section IV.6
Computer Logistics	Information and Computer	• The collection of acceleration and braking data can be used to improve efficiencies.	Section IV.2.2; DHL Rail Tracking

	Technology (ICT)	• In-cab communications can be used to contact the driver to avoid potential delays.	
Environmental Systems	System Management Issues	• The correct management of all systems and establishing the right priorities for the companies needs, can be difficult. A balance should be struck between sustainability and cost efficiency since very few offer both simultaneously (fuel efficiency being the exception). • Selecting the correct upgrades for the vehicles is important since interventions are not cumulative and therefore careful consideration is needed.	Section IV.4.8; Fuel Efficiency Intervention Trials;
	Infrastructure Management	• The infrastructure manager has a significant role in allocating slots for freight, minimising delays, allowing maximum axle weights on the wagons, increasing the allowable train lengths and raising the maximum speed.	Railway Infrastructure manager

Inland Waterways:

Area of Improvement	Example	Description	Reference(s)
Vessel Characteristics	Fuel / Propulsion Alternatives	• Possible fuels include: - Gas filled (natural gas (NG), compressed NG and liquid petroleum gas (LPG)) - Biofuel (including biodiesel and bioethanol) - Hydrogen gas. - Hybrid lead gel batteries. - Low sulphur marine fuel	Exxon Mobil Marine Fuel
	Efficiency Improvements / Hull Design	• Upgrades such as newer engines, propeller nozzles and alterations to the ends of push-tow vessels can improve efficiencies by up to 14%. • Ensuring the hull is clear from fouling will reduce skin drag.	Futura Carrier Case Study
	Vehicle Maintenance	• Maintenance regime set out and abided by. • Maintenance checks including oil, engine and design to improve efficiency.	Maintenance of Inland Waterways Vessels
Captain / Crew Training	Captain / Crew Training	• Advanced training courses help to improve the efficiency of the captain and crew.	Operational Efficiency Research
Computer Logistics	Information and Computer Technology (ICT)	• The collection of engine data and fuel consumption data can be used to improve efficiencies. • Weather information systems and in-cab communications can be used to contact the captain to avoid potential delays at ports, locks and on popular corridors.	Inland Waterway Security
Environmental Systems	System Management Issues	• The correct management of all systems and establishing the right priorities for the companies needs, can be difficult. A balance should be struck between sustainability and cost efficiency since very few offer both simultaneously (fuel efficiency being the exception). • Selecting the correct upgrades for the vessels is important since interventions are not cumulative and therefore careful consideration is needed. • Combining policies on the various training schemes and upgrades, could improve the overall efficiency of the fleet.	*Fuel Efficiency Intervention Trials;*

Maritime:

Area of Improvement	Example	Description	Reference(s)
Vessel Characteristics	Alternative Fuels	• Possible fuels include: - DME or Dimethyl, that requires little engine adaptations and is virtually pollutant free (still in testing phase). - Gas filled (natural gas (NG), compressed NG and liquid petroleum gas (LPG)) - Biofuel (including biodiesel and bioethanol) - Low sulphur marine fuel.	Section IV.5.1(i-iv); Exxon Mobil Marine Fuel
	Efficiency Improvements / Hull Design	• Ensuring the hull is clear from fouling will reduce skin drag. • Shore-based power at ports removes the use of auxiliary engines whilst docked. • Waste heat recovery improves thermal efficiency by between 5-10%. • Filters and scrubbers can be used to remove toxic engine emissions produced. • Using larger diameter propellers increases the efficiency through lower optimum speeds required. • Optimising port efficiency through: - Efficient terminal operations - Ease and cost of vessel access from the sea - Charges and uncongested road and rail access to the port	Section IV.4(iii)
	Vessel Maintenance	• Maintenance regime set out and abided by. • Maintenance checks including oil, engine and design to improve efficiency.	Section IV.2.1.(iii)
Captain / Crew Training	Captain / Crew Training	• Advanced training courses help to improve the efficiency of the captain and crew.	Operational Efficiency Research
Computer Logistics	Information and Computer Technology (ICT)	• The collection of engine data and fuel consumption data can be used to improve efficiencies. • Weather information systems and in-cab communications can be used to contact the captain to avoid potential delays at ports and on popular corridors.	Section IV.2.2; Portsmouth Port Tracking
Cooperation between shippers	Cooperation between shippers	• Cooperation between a number of shippers which are all located near the inland waterways of south east Brabant. These entrepreneurs are committed to combining their freight volume to modal shift 700 HGVs to barge in the next 2	BERZOB from the Netherlands

		years. • There is support of the Dutch government to give priority to a number of investments in the needed infrastructure. This priority follows the commitment of the shippers to cooperate with each other and their investment in ICT infrastructure and software.	
Environmental Systems	System Management Issues	• The correct management of all systems and establishing the right priorities for the companies needs, can be difficult. A balance should be struck between sustainability and cost efficiency since very few offer both simultaneously (fuel efficiency being the exception). • Selecting the correct upgrades for the vessels is important since interventions are not cumulative and therefore careful consideration is needed. • Combining policies on the various training schemes and upgrades, could improve the overall efficiency of the fleet.	Section IV.4.8; *Fuel Efficiency Intervention Trials;*

Road:

Area of Improvement	Example	Description	Reference(s)
Vehicle Characteristics	Alternative Fuels / Fuel Cumulative s	• Possible alternative fuels include: - biofuel (including biodiesel and bioethanol), - hydrogen, - gas filled (natural gas (NG), compressed NG, and liquid petroleum gas (LPG)), - Electrical. • Fuel cumulative s may increase the overall fuel efficiency. • The Euro VI engines require the use of the AdBlue system which lowers the NOx emissions.	Section IV.5.1 and IV.5.2; First Electric Truck
	Aerodynamic / Cab design	• Aerodynamic and cab design modifications can reduce fuel usage by 6-20%. • Possible upgrades include cab / trailer streamlining, over-cab spoilers, rounded edges and air dams. • Altering the trailer design can decrease the drag and can increase the load capacity.	Section IV.4(i); Marks and Spencer's case study
	Vehicle Maintenance	• Maintenance regime set out and abided by. • Maintenance checks including tyres, engine and design to improve efficiency. • Allocating drivers to one vehicle ensures good knowledge of any maintenance issues.	Section IV.2.1.(iii)
	Vehicle Utilisation	• Using the appropriate sized HGV and type for a particular load, will help to reduce empty running and increase the efficiency and potential of each load. • Double-decker vehicles can save both fuel and CO_2 on conventional vehicles (approximately 22% saving using 2 double-deckers as opposed to 3 standard trailers)	Section IV.2.1(i) and Section IV.2.1(iv)
Driver Training	Driver Training	• It is reported to reduce fuel usage on average by 9-10%. • Advanced training courses help to improve the efficiency of the driver through using the correct gears, braking and accelerating etc as this promotes eco-driving. • Engages the driver to 'buy-in' to the company with efficiency league table incentives.	Section IV.6: Driver Fuel Usage; Eco Driving Training

Computer Logistics	Information and Computer Technology	• The collection of vehicle and driver data can be used to improve efficiencies. • Traffic information systems and in-cab communications can be used to contact the driver to avoid potential delays.	Section IV.2.2; Walkers Case Study
	System Management Issues	• Through IT management systems, route and fleet management can be used to increase efficiency from both business and environmental perspectives. • Implementing multiple upgrades such as tyre pressure monitoring, driver training programmes or aerodynamic fairings are not cumulative. Therefore, thorough analysis is required to ensure any upgrades are cost effective based upon the businesses needs. • Combining policies on driver training, anti-idling and aerodynamics can improve the fuel efficiency of an entire fleet by 60%	Section IV.4.8; Fuel Efficiency Intervention Trials; Wal-Mart case study
Environmental Policies	Environmental Reporting	• Logistics operators can voluntarily take part in the FTAs carbon reporting initiative known as the Logistics Carbon Reduction Scheme to record and report emissions. The scheme reports an annual aggregated carbon footprint for the LCRS membership each year.	LCRS Information
	Government Grants	• Government grants such as 'Plug-in Van' in the UK can help to subsidise and encourage operators who are looking to upgrade their fleet to more eco-friendly vehicles.	Plug-in Van Grant
	European Advice	• ECOSTARS free advice and ideas to operators to help improve their environmental footprint. This raises the companies profile through recognition of being environmentally responsible.	ECOSTARS

Logistics Purchaser Considerations:

From a logistics purchaser's point of view, their main goal is to move freight as cost effectively and efficiently as possible to meet their requirements regardless of mode. Some of the key issues they may be concerned with are identified in the initial grid below. However, the logistics purchaser may need to consider how these and other concerns are affected by mode choice and the further grids identify these in more detail, helping decisions about the alternative options may be available that could potentially be cheaper and more sustainable for the future. The grids listed below for each mode details the considerations that should be taken into account to move freight as sustainably as possibly.

In the reference column, the Section numbers are referencing to the document "Greening Logistics: Sustainable Best Practices".

Non-Mode Specific

Area of Improvement	Example	Description	Reference(s)
Computer Logistics	Information and Computer Technology (ICT)	• Asset tracking and satellite navigation can be used to track the products, whilst providing added security.	Rail: DHL Rail Tracking
			IWW: Inland Waterway Security
			Maritime: Portsmouth Port Tracking
			Road: Section IV.2.2; Walkers Case Study
	Capacity Utilisation	• Carrying a maximum payload, as opposed to half-loads, can maximise the efficiency of each journey and reduces the emissions through fewer journeys required.	Rail: Globalisation, Transport and the Environment
			IWW and Maritime: EcoTransIt Background Report
			Road: Section IV.2.1(i), Section IV.2.1(iv)
Loading and	Backloads	• Backloads involve bringing goods from suppliers, waste or equipment	Road, Rail and Maritime: Section IV.2.4

Arranging		etc. on the return journey. This creates a circular rather than unidirectional journey and will maximise the efficiency of the return journey through reducing fuel intensity.	IWW: Sustainable Development of Inland Waterways
	Consolidation	• Similar to backloads, consolidation can be used for combining small loads from different companies into one container going to the same place / area.	Rail, Maritime and Road: Section IV.2.5 IWW: ECMT Round Tables
Warehouse / Manufacturing Locations	Warehouse / Depot Location	• The location of the warehouse / depot used should be evaluated on a periodic basis. This is to ensure that the requirements of the business are aligned to the depot constraints.	Rail and Road: Section IV.2.6; IKEA case study IWW and Maritime: Warehouse Location Case Study
	Manufacturing Location	• It is common for manufacturers to relocate to areas to minimise labour costs, however this could result in high transportation costs across different modes. • Where the location is abroad, other factors must be considered as well including import and export taxes and industrial strikes. • The risk of unexpected transport delays due to port, road or rail congestion on route must be considered.	Rail, IWW, Maritime and Road: Section IV.2.7

Rail:

With the extensive rail network in the UK and in mainland Europe, there is a degree of focus to promote freight transportation via the rail network. Rail provides a green solution and in particular if the track is electrified, the electricity can be generated using sustainable sources and can completely remove the local environmental pollution aspect. For freight forwarding in the UK try: http://freightarranger.co.uk/

Area of Improvement	Example	Description	Reference(s)
ICT Scheduling	Routing and Scheduling	• ICT can be used to maximise the assignments of payloads through assigning time windows for both arrivals and departures. This allows for decreasing in train downtime also. • Scheduling backloads will help to decrease the number of train movements. • Dynamic route planning minimises congestion by avoiding unexpected events. • Intermodal route planners are being developed to optimise transportation across road, rail, short-sea and barges dependent on time or cost restrictions.	Section IV.2.3; Rail Logistics Chain
Environmental Polices	EU / Government Policies	• Appropriate to select a company that aims to actively future proof from EU and governmental policies, to avoid potential carbon-emission taxation, vehicle taxation etc. • An example: all new rail locomotives should be sulphur free from the 1st Jan 2012 under the EU Fuel Quality Directive.	Section V.4; Section IV.5.2

Inland Waterways:

Inland waterways and barge networks are extensively used in Germany, France, Belgium and the Netherlands. However it is hoped to expand further the usage of this mode as a sustainable mode for moving freight. A common misconception is that it can be difficult to move freight via the inland waterway network but thanks to websites like www.freightbywaterdatabase.org, it is becoming easier for the logistics purchaser to locate and utilise freight via the inland waterways network.

Area of Improvement	Example	Description	Reference(s)
ICT Scheduling	Routing and Scheduling	• ICT can be used to maximise the assignments of payloads through assigning time windows for both arrivals and departures. This is crucial to ensure that the vessel is not affected by the tidal rivers or by lock opening times. • Scheduling backloads and route planning minimises congestion by avoiding unexpected congestion and waterway closures. • Intermodal route planners are being developed to optimise transportation across road, rail, short-sea and barges dependent on time or cost restrictions.	Inland Waterway ICT
Environmental Polices	EU / Government Policies	• Appropriate to select a company that aims to actively future proof from EU and governmental policies, to avoid potential carbon-emission taxation, sulphur-emission penalties etc. • An example: tighter sulphur emission standards have been introduced and the need for retrofitting scrubbers or using very low sulphur diesel is required for existing vessels (possibly overcome using low-sulphur fuel developed by Exxon Mobil).	The EU Sulphur Directive; Exxon Mobil Marine Fuel

Maritime / Short Sea Shipping:

Similar to that of inland waterways, maritime and short-sea shipping are seen to be more sustainable when compared to road freight transportation. With ports allowing 24 hour access and with larger container ships, the ease of using maritime and short-sea shipping for transporting goods over great distances has never been better. Using the freightliner planner, allows for freight to be planned across multiple modes (http://www.freightliner.co.uk/).

Area of Improvement	Example	Description	Reference(s)
ICT Scheduling	Routing and Scheduling	• ICT can be used to maximise the assignments of payloads through assigning time windows for both arrivals and departures. This allows for decreasing in vessel downtime also. • Used to avoid port congestion at set times. • Intermodal route planners are being developed to optimise transportation across road, rail, short-sea and barges dependent on time or cost restrictions.	Section IV.2.3; Maritime ICT
Environmental Polices	Environmental Reporting	• Prominent for all UK quotes companies for Scope I and Scope II emissions. The logistics operators will report fuel usage and the FTA will convert this to CO_2 emissions. • Enables the logistics handlers to set policies that will actively promote sustainable freight and reduce their CO_2 emissions. • Logistics purchaser perception of the company's environmental policies is becoming more prominent and can influence their final decision.	Section IV.7; Tesco Case Study
	EU / Government Policies	• Appropriate to select a company that aims to actively future proof from EU and governmental policies, to avoid potential carbon-emission taxation, sulphur-emission penalties etc. • An example: tighter sulphur emission standards have been introduced and the need for retrofitting scrubbers or using very low sulphur diesel is required for existing vessels (possibly overcome using low-sulphur fuel developed by Exxon Mobil).	Section V.4; Section IV.5.2; The EU Sulphur Directive; Exxon Mobil Marine Fuel

Road:

The final mode presented is moving freight via the road network. The following grid details improvements and considerations to help improve the sustainability of road freight where alternatives are unfeasible.

Area of Improvement	Example	Description	Reference(s)
ICT Scheduling	Routing and Scheduling	• ICT can be used to maximise the assignments of payloads through assigning time windows for both arrivals and departures. This can decrease the HGV downtime. • Scheduling backloads and route planning minimises congestion by avoiding unexpected congestion and road closures. • Intermodal route planners are being developed to optimise transportation across road, rail, short-sea shipping and barges dependent on time or cost restrictions.	Section IV.2.3; WEASTflows Route Planner; Australian Case Study
Environmental Polices	Environmental Reporting	• Prominent for all UK quotes companies for Scope I and Scope II emissions. The logistics operators will report fuel usage and the FTA will convert this to CO_2 emissions. • All UK quoted companies have a legal requirement to report Scope 1 and 2 emissions. Further to this, there is also a requirement for non SMEs to conduct energy audits which include transport, by the 5th December 2015 and then every 4 years after that. • Enables the logistics handlers to set policies that will actively promote sustainable freight and reduce their CO_2 emissions. • Logistics purchaser perception of the company's environmental policies is becoming more prominent and can influence their final decision.	Section IV.7; Tesco case study
	EU / Government Policies	• Appropriate to select a company that aims to continually review their technologies and emissions to ease into changes to EU and governmental policies, to avoid potential carbon-emission taxation, vehicle taxation etc.	Section V.4

Summary

This guide recognises that for a modal shift to occur, the logistics purchaser should have explored all possible sustainable modes of transport prior to making their final decision. It is intended to assist with this through exploring all the sustainable possibilities for each mode and thus promoting alternatives to road-based freight.

The origin and destination of the freight must also be considered. With the majority of journeys using road transport at least once during a journey, it is important to maximise the efficiency of this journey. Location selection of manufacturing / warehouse / hub is vital to this and can help to encourage other modes of transport if located near to a port or rail terminal.

Where the possibility of shifting from road-based transport is not possible, this guide highlights alternative sustainable upgrades that will increase efficiency and lower emissions of the road-based mode. This will contribute to meeting the CO_2 targets set by the UK government and the EU and improve the local environment as well as promoting the "green image" of the logistics purchaser.

Need To Find More Information?

Greening Logistics: Sustainable Best Practices
http://www.weastflows.eu/media//Action-4-Task-2-Sustainable-Best-Practices.pdf

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Freight Forwarders Websites

Intermodal Route Planners:

http://www.intermodalrouteplanner.com/

http://www.nationaltransport.ie/projects-schemes/projects/journey-planner/

http://www2.vvs.de/vvs2/XSLT_TRIP_REQUEST2?language=en

Rail:

http://en.wikipedia.org/wiki/List_of_companies_operating_trains_in_the_United_Kingdom

Inland Waterways:

https://www.waterways.org.uk/news_campaigns/freight/waterways_freight

Maritime:

http://www.aferryfreight.co.uk/freightlogistics_operators.htm

Road:

http://www.freightex.com/road-transport/freight-rates

Multimodal:

http://freightbywater.fta.co.uk/

http://www.modeshiftcentre.org.uk/

http://www.multimodal.org.uk/htm/s20111018.722192.htm

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Marks and Spencer's Case Study - http://www.lowcarboneconomy.com/profile/the_carbon_trust/_case_studies_and_projects/marks_spencer_green_growth_case_study/13071

Walkers Case Study - http://www.shdlogistics.com/news/view/walkers-reduce-fuel-by-20

Wal-Mart (ASDA) Case Study - http://www.ppiaf.org/freighttoolkit/sites/default/files/casestudies/Walmart.pdf

IKEA Case Study - http://www.elabestlog.org/sites/default/files/cases/Ikea%20Reconfiguration%20Supply%20Chain.pdf

Fatura Case Study **–** https://fenix.tecnico.ulisboa.pt/downloadFile/395137488147/resumo.pdf

Tesco Case Study - http://www.biofuelwatch.org.uk/docs/greenergy_factsheet_2.pdf

Australian Case Study - http://galinzhelyazkov.com/wp-content/uploads/2012/05/The_impact_of_ICT_systems_on_road_FINAL.pdf

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DHL Rail Tracking - http://www.dhl.co.uk/en/logistics/customer_resource_area/freight_tracking_and_applications/road_and_rail_freight_tracking.html

Fuel Efficiency Intervention Trials – www.fors-online.org.uk/resource.php?name=FBP_FUEL_EFFICIENCY

First Electric Truck - http://www.eia-ngo.com/wp-content/uploads/2010/05/EIA_Intermodal-achievements-2013_TrendWatch-2030.pdf

Driver Fuel Usage - http://uk-roadsafety.co.uk/safed.htm

Eco Driving Training - http://www.jaupt.org.uk/

LCRS Information - http://www.fta.co.uk/policy_and_compliance/environment/logistics_carbon_reduction_scheme.html

Plug-in Van Grant - https://www.gov.uk/government/publications/plug-in-van-grant

ECOSTARS - http://ecostars-europe.eu/en/The-Scheme/Join-the-scheme/

Railway Infrastructure Manager - http://www.publications.parliament.uk/pa/ld200809/ldselect/ldeucom/90/9006.htm

Exxon Mobil Marine Fuel - http://www.exxonmobil.com/MarineLubes-En/Files/exxonmobil-premium-hdme-50.pdf

Maintenance of Inland Waterways Vessels - https://www.gov.uk/standards-for-the-construction-and-maintenance-of-inland-waterway-vessels

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