Evaluation of Sustainable Solutions in Logistics and Supply Chain Management in Europe

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Talk objective Bottom-up and/or Top-down solutions

- **Bottom-up** approach to decarbonise supply chain operations:
 - Talk objective: Understanding of sustainable operations out of case studies, tests, innovations
 - First develop a case; assess if the change is effective at reducing emissions; if yes then develop a replication and a supportive strategy for long term development
 - No general rule how to develop a decarbonised operation in freight, logistics, and SCM, all cases are specific
 - Tentative coordinated bottom-up?
- **Top down** strategy: increase taxes first and see later how the sector is developing
 - Hypothesis after cancellation of French eco-tax for trucks: did all top-down strategies have failed so far?
 - Coordinating top-down and bottom-up approach?

What are sustainable supply chains and logistics?

Final sustainability objectives

- Profitable businesses
- (net)Zero emission transport
- Zero emission warehousing and fulfilment
- Zero emission production and manufacturing
- Clean air, water and soils
- "Near-natural" ecosystems and recovered, high biodiversity
- Regenerative resources and energy sources
- Limited congestion, accidents, noise or other negative external effects
- Good salaries for staff and drivers, high HDI
- Robust data, information and reporting, CSR

Towards sustainable supply chains and logistics?

How do we arrive at a sustainable stage?

- Develop the solutions we don't have yet
- Scale up the good solutions we have
- Use all the tools, methods, surveys, data and statistics
- Case studies and models
- Bottom-up or top-down, inductive or deductive steps

Emissions and conversion factors for electricity



Source: European Environmental Agency (EEA), 2022. CO2 Intensity of Electricity Generation

Fleet change in UK, annual transport CO₂ emissions



https://www.gov.uk/government/statistical-data-sets/energy-and-environment-data-tables-env

Where did we develop sustainable logistics, supply chain and transport operations?



Source: Rushton A, Croucher P, Baker P (2014)

Sustainability, decarbonisation & low pollution solutions (1)

- Urban logistics
 - Loading bays: design, loading bay rules
 - Urban Consolidation Centre (UCC) for single user
 - UCC for multiple users
 - Cargo bikes: cycle lanes, cycle parking, access rules for cargo bikes
 - Spatial **planning** for urban logistics
 - Access restriction by weight, size or vehicle type
 - Access restriction by emission class (e.g. EURO VI)
 - Congestion charge, urban toll for trucks
- Long distance freight
 - Electric vehicles: funding for electric vehicles
 - Other alternative fuels, CNG, biofuel, H2 vehicles
- Purchasing of clean delivery services
- Load pooling: Online exchange/offer of free capacity

Sustainability, decarbonisation & low pollution solutions (2)

Logistics, retail and supply chain management

- Delivery and Servicing Plans DSPs
- Parcel locker boxes
- Off-peak deliveries
- Multifunctional lanes for private and business transport
- Boat/waterways deliveries
- Enforcement, police, control: traffic, congestion, speed, access, parking and loading bays

Cooperation of industry, public sector, academia

- Cooperation and logistics expert network
- Pilots and tests, monitoring and data collection, impact assessments

Supply Chain network change = value change

Case of coffee import to Europe, value distribution for a 60 kg coffee bag



Note: CB = Connective Business; Source: Inma Borrella, Carlos Mataix and Ruth Carrasco-Galleg, 2015. <u>Smallholder Farmers in the</u> <u>Speciality Coffee Industry: Opportunities, Constraints and the Businesses that are Making it Possible</u>, IDS Bulletin Volume 46, 3, 29-44



Interporto Padova: Consolidation and Clean Vehicles for Urban Deliveries

Cityporto



- Cityporto transit point is located inside the freight village area of Interporto Padova
- 2 miles outside the City Centre, close to the major highways
- Urban delivery of goods with a fleet of hybrid and CNG vehicles

Key facts on CITYPORTO PADOVA

- 60,000-100,000 deliveries/year for 60 clients
- 4 parcels per delivery instead of 1.3
- 11 CNG/electric trucks and vans
- Favourable access rules to city centre
- 1000 m² Urban Consolidation Centre



Barriers, success factors and transferability

Market barriers removed:

- Key success factor was to allow a special regime for Cityporto CNG vehicles with no time windows for loading/unloading in the ZTL (Limited Traffic Zone).
- Also key was the independent manager enabling trustful cooperation with new customers, and excellent stakeholder involvement/ participation at city level

Transferability:

- Aosta and Modena have started a similar Cityporto scheme, other cities have implemented new initiatives in Europe.
- Why not more scale up?

Binnenstadservice Consolidation with business model of shopkeepers

- Binnenstadservice operates a warehouse and distribution service on behalf of the joint retailers and other organizations located in the (inner) city.
- It started in Nijmegen and now covers many cities in Netherlands.



- Basic approach is that goods are delivered at a distribution centre just outside the city. From there the goods are bundled and brought to shops in the city centre. Simultaneously empty handling equipment, packaging or paper is taken back to the distribution centre.
- Binnenstadservice does not operate their own vehicles, but this is subcontracted to one logistics service provider per city.

Case of Binnenstadservice: Before-After comparison of UDC

Situation without Binnenstadservice



Collective receiving point for shopkeeper: Binnenstadservice



Benefits (Business Case)



Financial benefits:

- Shop keeper: reduced stock at expensive shop floor, reduced time needed to receive/ship goods
- Transport company/shipper: reduced time loss for last mile delivery, thus cost reduction

Benefits in the field of services:

 Shop keeper: pays a little fee for time consuming activities such as emballage, empties, paper

Benefits for society:

• Less congestion, more liveable city centre.

Environmental benefits:

• Reduced CO₂ and particle emission due to bundling of freight and cleaner vehicles.

London Construction Consolidation Centre

The LCCC was financed in 2006 by Transport for London (£1.85m), Stanhope and Bovis Lend Lease (£1.35m) and was managed by logistician Wilson James



Main impacts (May 2007 report)

- Reduction of 68% in the number of construction vehicles
- Reduction of CO₂ emissions of about 75%
- Today dozens of CCs in operation in London



San Sebastian Donostia, Spain, UCC + Clean vehicle Public Costs data 2010 to mid-2012



- San Sebastian Donostia, Spain
- Tests of parcels business « Txita »
- UCC + Cargobikes and electric vans
- Data on costs and benefits for the period 2010 mid-2012
- Accounting balance as public document!

Concept	2010	2011	2012
Expenses	-69,920.05	-164,553.08	-55,851.06
Suppliers	-33,759.83	-53,486.40	-15,719.71
Staff	-36,160.22	-111,066.68	-40,131.35
Incomes	67,294.85	108,643.88	34,581.22
Invoices	23,294.85	71,78 <mark>1</mark> .38	34,581.22
Subsidy CIVITAS	40,000.00	30,000.00	-
Subsidy EVE	4,000.00	5,690.00	-
Subsidy Webpage	-	1,172.50	-
Partial result	-2,625.20	-55,909.20	-21,269.84
Other incomes	41,432.70	121,463.59	7,655.84
Result**	38,807.50	65,554.39	-13,614.00
TOTAL*			90,747.89

IT for joint logistics function at shopping mall Emporia Malmö, Sweden



- 75 000 sqm shops & restaurants
- 200 tenants
- 300 deliveries/day
- 500 internal transports/day to/from tenants
- Highly valuable goods
- 20 tons waste/day

250 sqm joint logistics function space in basement

Goods handling process in Emporia



4. Goods are delivered and signed for by the tenant, in the store



Source: CITYLAB & Logistik Bolaget http://www.citylab-project.eu/presentations/170607_Malmo/Ivarsson.pdf

Benefits of shopping mall consolidation



Innovative traffic/street space management



before



22

Automated vehicle access control

- Control by number plate recognition with cameras to verify trucks' compelling with access restrictions:
 - London congestion charge zone
 - London Low Emission Zone
 - Italian city centres
 - Barcelona and Madrid historic centres
 - Many others
- Digital control by geofencing technology currently in the testing phase for e-scooters, busses, cars, not trucks yet

Environmental zones, access regulations, noise and off-peak (night) deliveries



Ultra Low Emission Zone (ULEZ) Expansion on 25 October 2021



ULEZ Limited up to, but not including, the North Circular Road (A406) and South Circular Road (A205).

New limits don't apply to Congestion Charge zone: New charge: £15/day, 07:00-22:00, every day

Source: TfL 2021 https://tfl.gov.uk/modes/driving/ultra-lowemission-zone/ulez-expansion

London LEZ and ULEZ

Did regulation trigger any beneficial effect?





Key: PM10 Particulates (reference equivalent)

statistics/concentrations-of-particulate-matter-pm10-and-pm25

Supermarket deliveries using waterways in Paris

- 300 Franprix stores are supplied by XPO Logistics in an intermodal chain:
 - J-2 order; J-1 start of operations: In the warehouse in Chennevières, pallets are loaded in containers and transported by gas-powered 7 trucks to the port of Bonneuilsur-Marne (8 km) by road.
 - 2. In Bonneuil-sur-Marne, 44-48 containers are transhipped to an inland vessel and carried on the waterway up to the Paris river port of 'La Bourdonnais', near the Eiffel Tower (about 20 km, 3 hours trip duration one-way, arrival time about 19:00)
 - 3. Delivery day (J), 05:00: Containers loaded to 10 trucks for delivery to stores in Paris.
- Reduction of the impacts of the operations:

 \rightarrow Road congestion in Paris (-500,000km), Energy use, GHG emissions, noise and accidents.

• Challenge: Costs are 20 Euro/pallet instead of 15 Euro average retail delivery in Paris

Source: Trecan G., 2022. <u>https://www.republik-supply.fr/transport/multimodal/xpo-logistics-les-volumes-transportes-par-notre-barge-representent-10-000-camions-en-moins.html</u>





XPO logistics operations via waterways Paris, 2018





Source: Author, 2018. Paris

3PL business model Retail logistics: single-carrier deliveries for a set **BEFORE** starting using Gnewtcargo **AFTER** starting using Gnewtcargo of retail Pull&Bear LSP Zara LSP Zara LSP LSP Depot Depot clients Enfield depot Enfield depot Farmdrop Gnewt depot Gnewt 2017 Farmdrop Consolidation depot Centre Street 3 Street 2 Street 1 Street 2 Street 3 Street 1 Diesel van round, peak Truck trip off-peak Key Electric van round, peak

Gnewt: Testing new clean vehicles 2010-2020



















Congestion, traffic & mileage reduction

Impacts when using a central depot (UCC)

Before: Hermes delivery trip, depot in Enfield



After: Hermes trip to Gnewt Cargo UCC



Metres per parcel delivered

Gnewt Cargo trials, London, 1st July 2015 – 30 June 2016 (n = 13,358) one dot = average distance in metres per parcel for one delivery route, one driver, one day





New depot and new bigger vehicles in 2018

Menzies distribution purchased Gnewt Cargo in 2017, but the trade name remains

Moved to bigger depot 2018

EO charging installed 63 chargers 2019 with smart charging solutions including advance load management, priority charging and demand side response.

Bigger Voltia vans

Source: EO, 2019. EO Charging powers Gnewt Cargo https://www.eocharging.com/case-studies/gnewt-cargo

Concluding remarks

- Innovations: Many solutions, dominance of consolidation and clean vehicle projects
- **Transferability**: Very few large scale transfer, mostly limited to another company, upscale within a company or transfer to another city
- Impacts and Benefits: Very high benefits but difficulty with quantification of robust impacts estimates
- **Data availability**: Biggest difficulty is with data on the 'Before' situation, in order to obtain the business case information out of the trials and tests
- Rare assessment of transfer or **up-scaling** of innovation to entire supply chains: Prototype→Trial→Industry Scale
- When will be my first project with true upscaling quantification attempt?

Project references in Europe

- SULPITER Sustainable Urban Logistics Plans (2017-2019) https://www.interreg-central.eu/Content.Node/SULPiTER.html
- CITYLAB City Logistics in Living Laboratories (2015-2018) www.citylab-project.eu
- NOVELOG New Cooperative Business Models and Guidance for Sustainable City Logistics (2015-2018) http://novelog.eu/
- BESTFACT Best Practice Factory (2012-2016) www.bestfact.net
- SMARTFUSION (2012-2015) www.smartfusion.eu
- FIDEUS 'Freight Innovative Delivery in European Urban Space' (2005-2008)
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