Deliverable 2.4

Best Practice Handbook 3

Version 1.0

Date: 31.12.2015

Project co-funded by the European Commission within the Seventh Framework Programme Start date of project: 1st January 2012 Duration: 48 months		
Dissemination Level		
PU	Public	X
PP	Restricted to other programme participants (including the Commission Services)	
RE	Restricted to a group specified by the consortium (including the Commission Services)	
CO	Confidential, only for members of the consortium (including the Commission Services)	

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Overview

The Best Practice Handbook (BPH) follows an easy set of purposes within the BESTFACT project structure:

- To give an overview about current concepts, strategies and actions in freight transport all over Europe
- Disseminating information on successful projects and practices to increase awareness and share experiences
- Enabling knowledge transfer and supporting transferability for best practices

Within the first volume of the handbook (volume of 2013) 12 BESTFACT in-depth surveys were presented in detail. The second edition of the handbook (volume of 2014) offers further 45 inventory and 18 in-depth case descriptions. The third and last Best Practice Handbook focuses on the work done in the clusters over the entire project, with 157 inventory cases and 60 in-depth analyses. After four years of case collection a wide field of solutions is available. This publication offers an analysis of highlighted cases grouped together into specific topic groups (see table below).

	Cluster 1: Urban freight	**Cluster 2:** Green Logistics and Co-modality	**Cluster 3:** eFreight
Cluster topics	The use of low emission and emission free road vehicles	Intermodal services and connections	ICT based collaboration solutions
	Alternative modes instead of road transport	Innovative new technologies	Standardised, paperless information exchange and platforms
	Urban distribution centres, freight consolidation and loading areas	Decarbonising	Port and terminal related IT management tools
	Policy schemes in urban freight	Collaboration	Integrated ITS in freight operations

Within the handbook the main findings of the BESTFACT cases are cross-checked and summarised for each of the cluster topics. The consistent form of collection and information provision within BESTFACT broadens the structural understanding of best practice cases. The synthesis of cases per topic shows that under consideration of barriers and framework conditions replicable impacts are achievable. Most remaining barriers emerging from the analysis relate to missing information on cases, lack of cooperation between private and public actors and, of course, lack of investments or funding for innovative solutions.

The BESTFACT approach served as a communication platform; including a multitude of available cases, networking events, such as workshops, conferences, and initiatives as well as their information proves to be of high value. The project widens the knowledge of case concepts and supports the contacts between involved stakeholders. The timeframe of the project allowed subsequent follow-up on cases that had undergone difficulties and managed to succeed.

Making benefits and key impacts visible in the handbook to a wider audience across actor groups raises sensitivities and fosters the transferability of innovative approaches on the various cluster challenges identified.

All collected BESTFACT cases are available online as Quick Info Sheets as an easy reference via www.bestfact.net. For a quick reference the cases highlighted in this handbook have a link to each respective Quick Info Sheet.

1 Introduction

1.1 Introduction of the BESTFACT project

The objective of BESTFACT is to develop, disseminate and enhance the utilisation of best practices and innovations in freight transport that contribute to meeting European transport policy objectives with regard to competitiveness and environmental impact.

This will mainly be achieved by:

- Development, dissemination and promotion of best practices within logistics that contribute to increasing freight transport efficiency and meeting European transport policy
- Focus on competitiveness and environmental impact
- Provision of a knowledge base simplifying administrative requirements in the freight transport sector
- Provision of recommendations for policy tools for facilitating best practices and simplifying administrative processes
- Support for implementation strategies by market sectors in co-operation with private actors, trade associations, regional bodies and technology platforms
- Support of transfer of best practice between different domains.

The core of the BESTFACT concept is to extend existing best practice methodologies towards implementation strategies within an industrial environment. BESTFACT focuses on the co-ordination and integration of information and know-how on freight transport and logistics solutions. Thus, BESTFACT aims to become an active ‘Single Window’ for freight transport and logistics best practices, contacts and policies.

There are three BESTFACT clusters established to identify, collect and process information and knowledge that will take place in three particular areas addressing:

- Cluster 1: Urban freight transport
- Cluster 2: Green Logistics and Co-modality
- Cluster 3: eFreight

These three clusters have been chosen as they represent the most pressing issues in freight transport and logistics in terms of economic, social and environmental sustainability, as well as being closely linked to important innovations and developments in freight service provision to meet the needs of European economies, and finally as they are in the core of the Freight Transport Logistics Action Plan.

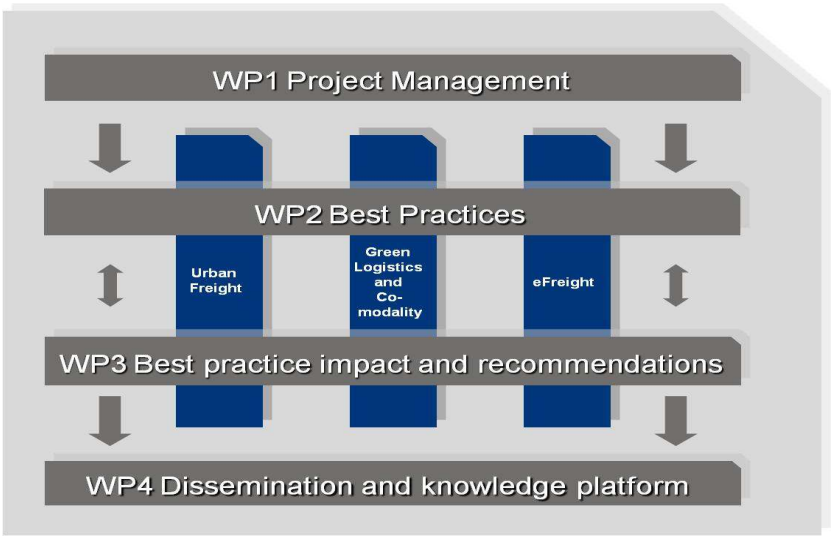

Figure 1: BESTFACT project structure

The BESTFACT clustering is regarded as advantageous and suitable for the following reasons:

- Expertise of field experts can be bundled within the clusters, thereby providing a more focused cluster-related scope as well as a higher level of in-depth expertise. Overall, clustering will enhance the quality of the results.
- Improved, focused clustered results will assist in the work package activities the processing of the data. Moreover, the work package leaders in WP 2 and WP 3 will have an easier task in organising and co-ordinating the material collections having only the cluster leaders as their contact point.
- Clustering allows a more comprehensive view of the broad field of freight logistics. Different facets can be considered by the project in a flexible and efficient way.

All BESTFACT clusters apply a common working approach and carry out the following tasks:

- Established a working group consisting of project partners contributing to the best practice collection and evaluation with their specific expertise in the domain and acting as multipliers for the BESTFACT knowledge base.
- The clusters identify and discuss best practice approaches, evaluate in-depth surveys and suggest policy tools.
- The cluster leader will initiate and co-ordinate the collection of best practices. Based on strategic guidelines and topics defined in the initial project stages each partner of the working group will carry out investigations into national information in order to identify best practices. Best practice collection will take place on two levels. On a general level (collection of inventories) a total of 150 cases will be collected in BESTFACT providing a generic description of the best practice. On a detailed level BESTFACT will produce more than 60 in depth cases. The full methodology of the BESTFACT approach towards the case collection is detailed in ANNEX 3: Overview over the BESTFACT methodology and processes.
- The processing of best practices. Applying the methodology of WP 2 the cluster partners will set up comprehensive best practice descriptions and supply a common presentation format, the Quick Info Sheet (QIS). The QIS are available on the BESTFACT knowledge platform.

1.2 Best practice definition in BESTFACT

The central aspect of the project is the identification and promotion of best practices. Therefore a workable definition of best practice was a core task within the project as a starting point. Best practice in BESTFACT is considered as an existing approach or solution (industrial business cases, measures, administrative procedures, research results) providing a solution for a relevant problem or challenge in freight transport. It is characterised by the following four core attributes:

- **Innovation and feasibility:** Best practice provides an innovative and feasible approach beyond the common practice. Solutions include products, processes, services, technologies, or ideas that are more effective than previous ones and are accepted by markets, governments, and society.
- **Strategic focus:** Best practice addresses both business and policy objectives. It provides value across actor groups and addresses current challenges and problems.
- **Impact:** Best practices have considerable and measurable positive effects on strategic business and policy targets.
- **Transferability:** Best practice should be transferable to other companies, initiatives or contexts.

BESTFACT recognised solutions that are evolving and show strong evidence for their development. Therefore within BESTFACT two stages of best practice are considered:

1. BESTFACT **Evolving Best Practice** describes cases that fulfil the best practice core attributes. They have to be implemented and demonstrate a high potential for positive impacts and transfer to other regions or domains. First indication of success has to be given, a case has to be launched and or a prototype running. BESTFACT has to monitor and evaluate these cases to demonstrate what is the innovation and the impact in the context of current developments.
2. A BESTFACT **Best Practice** follows widely the above definition but requires a matured stage of development. It should demonstrate proof of its transferability through an implementation outside its original field or in a wider context. It has to be fully implemented and a working practice with strong evidence of excelling in the best practice criteria.

This two stages approach in the project allowed BESTFACT not only to consider running best practices but also foster further development. The consideration of evolving cases assures integration of the latest developments and raises attention to current challenges. BESTFACT followed up on considered evolving practices and integrated results of their development whenever possible.

As stated above, in the BESTFACT perspective innovation is one element of best practices. This understanding enables the project to especially focus on solutions which are going beyond the state-of-the-art. In the common interpretation best practices are not necessarily the overall best case in comparison; BESTFACT does not aim at identifying all practices outperforming other, competing solutions. The identification of all existing and comparable solutions is not within the scope of the project. A best practice for one actor might not qualify for others as best solution but might serve as a good solution for specific problems. The BESTFACT cases will indicate outstanding solutions which can be classified in a defined quality scope. A benchmark between cases was never intended; BESTFACT aims at a wide variety of best practice cases which need to be analysed under differing sets of indicators. This does not yield an explicit quantification or ranking of cases. Even though some collected quantitative data is accessible, it is only possible to be used on a per-case basis.

1.3 Knowledge basis

The BESTFACT knowledge basis grew over the entire project duration. When selecting and analysing cases to be included in the best practice handbook the full scope of collected materials factored into the process. This knowledge base consists of:

- Cluster internal case collection lists; within each cluster topic a multitude of cases have been considered and been scanned by the involved partners. Some might not qualify due to not matching the most relevant issues or simply not providing enough reviewable materials.
- Collected inventory cases; these cases are the main foundation of the BESTFACT analysis. 157 cases were collected in the project over four years (see table below). The descriptions feature a comprehensive solution overview, detailing the success factors, benefits and barriers.

Cluster	2012	2013	2014	2015	Total
Urban freight	15	16	9	4	44
Green Logistics and Co-modality	24	14	14	15	67
eFreight	10	13	13	10	46

- In-depth cases extend beyond the inventory cases. More than 60 cases were reviewed in more detail. The process of establishing the in-depth information includes interviews with developers and a focus on costs and benefits of cases. The details of transferability and innovation are highlighted. Additionally specific performance indicators are gathered to measure the success of cases.
- Implementation and policy actions; as a project outcome BESTFACT supports and monitors special actions on private and public initiative where best practices are actively developed. The results are formulated in short reports and are integrated with the cases analysis of related topics within the relevant cluster.
- Workshop presentations, conferences and discussions; the knowledge of the entire BESTFACT network is best reflected within the many BESTFACT events. With the workshops and conferences held, BESTFACT invited highly regarded speakers to present their solutions in day-to-day activities. Case developers, public authorities and satisfied customers alike presented cases which were subsequently integrated into the BESTFACT knowledge and the analysis of the various inventory and in-depth cases.

On these elements the project knowledge pool is built. It serves as the basis for the case analysis per cluster topic in each of the cluster chapters and allows deriving conclusions on higher cluster and cluster topic level.

1.4 Structure of the Best Practice Handbook

This third BPH is the final issue within the BESTFACT project and highlights selected cases provided and presented over the course of the project. The focus of contents is directed towards a critical analysis of the described cases in their respective clusters and a limited frame of topics. The topics were selected by BESTFACT experts considering the total of 157 cases collected between 2012 and 2015. The topics (see table below) are also applicable within the BESTFACT report on Recommendation and Policy Tools (BESTFACT 2015, D3.2).

Cluster topics	**Cluster 1:** Urban freight	**Cluster 2:** Green Logistics and Co-modality	**Cluster 3:** eFreight
	The use of low emission and emission free road vehicles	Intermodal services and connections	ICT based collaboration solutions
	Alternative modes instead of road transport	Innovative new technologies	Standardised, paperless information exchange and platforms
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This handbook does not intend to give detailed implementation instructions, but lends support to gaining a dedicated overview of project developments and innovative businesses across Europe. The analyses per topic in each cluster are based on successful examples taken from the wide range of the BESTFACT knowledge base (see chapter 1.3).

Since the handbook will provide insight into all three BESTFACT clusters (chapters 2, 3 and 4), each cluster follows a common structure to lead readers through the project work.

The clusters are shortly introduced and the collected cases are highlighted, with all available cases which were analysed in the project period per cluster. On this basis the current situation in the cluster fields was analysed, including challenges and developments. The situation in each field is evaluated from the cluster perspective while overall transport and logistics topics are factored into the analysis. The connected case analysis and conclusions per cluster focus on the described per topic approach. For each cluster the four key topics are analysed.

2 Cluster 1: Urban freight

Road-based freight transportation operations provide the goods and services required by companies and final customers, and make an important contribution to employment, thereby playing a vital role for the economy. But goods transport operations also cause social, environmental and economic impacts across the world including traffic congestion, air and noise pollution, greenhouse gas emissions, and the consequences of traffic collisions. These impacts result also in direct and indirect health problems for the population exposed to pollutants and bad air quality.

Urban freight transport is a contributor to all of these negative impacts, and has increased its impacts over recent decades as urban populations and geographical settlement areas have grown while also density within cities increased. This resulted in raised demand for ever-more freight flows to support the inhabitants and the resident businesses.

Over time more data is becoming publicly available, resulting in a greater opportunity to carry out relevant analysis of urban freight transport operations. One of the objectives of sustainable urban freight transportation is to develop policies, business and technological solutions that help to reduce these negative impacts. No single solution is capable of solving all these problems. Therefore, a range of potential sustainable solutions have emerged in recent years. These solutions have been developed by a variety of actors from the public sector, industry and the research community.

The diesel-powered combustion engine continues to dominate the goods transport vehicle market and while efforts have been made to develop clean vehicles and vehicles powered by alternative fuels, these represent a very small percentage of the fleet. Changes in business practices and logistics innovations have the ability to make the entire supply chain and distribution system more sustainable. Companies are increasingly reporting the social and environmental consequences of their activities.

The objective of the urban freight cluster is to better understand why selected urban freight solutions represent innovations that are technically feasible, economically profitable in different contexts, sustainable, transferable, and with tangible beneficial impacts.

2.1 Collected cases

Over the course of BESTFACT 44 best practice cases were collected in the cluster all over Europe. The following table gives an overview of all cases in this cluster. The case numbers are directly linked to the PDF version of the Quick Info Sheets of each case, provided in the project.

Year	Case Name	Case No. and Link
2012	Use of battery-electric tricycles and vans for retail distribution in London: Gnewt Cargo	Nº 1-067
2012	Electric vehicles use in parcels deliveries in Stuttgart-Ludwigsburg	Nº 1-055
2012	Distripolis: Urban Consolidation Centres and battery-electric vehicles for last-mile deliveries	Nº 1-052
2012	CITYPORTO – Last mile deliveries in Padua	Nº 1-014
2012	Electric freight vehicle with trailers: Cargohopper in Utrecht	Nº 1-078
2012	Bentobox and ‘urban freight laboratory’ area in Berlin	Nº 1-034
2012	ILOS - Intelligent Freight Logistics in Urban Areas: Freight Routing Optimisation in Vienna	Nº 1-029
2012	i-Ladezone: Intelligent monitoring of loading bays in Vienna	Nº 1-031
2012	Multiuse lanes for freight distribution in Bilbao	Nº 1-063
2012	Logistic tool for delivery management in exhibition centres, MCH Messe Basel	Nº 1-001
2012	Urban distribution network of four major grocery retailers in Lithuania	Nº 1-060

2012	Route optimisation of waste collection in an urban environment in Maribor	Nº 1-023
2012	Zero emission boat in Utrecht	Nº 1-151
2012	Supermarket stores deliveries using waterways in Paris	Nº 1-051
2013	The Green Link: last mile deliveries with electric cargo cycles and vans in Paris	Nº 1-136
2013	Gothenburg City Logistics Initiatives	Nº 1-137
2013	Urban freight distribution with electric vehicles in San Sebastián	Nº 1-062
2013	Use of electric vehicles for parcel distribution at UPS Karlsruhe	Nº 1-056
2013	City Logistics in Copenhagen using an Urban Consolidation Centre	Nº 1-095
2013	La Petite Reine : Home deliveries using Cargocycles® and electric vans in Paris	Nº 1-091
2013	Marleenkookt meal deliveries in Amsterdam	Nº 1-142
2013	Urban freight delivery B2C solution with clean vehicles: Emakers	Nº 1-087
2013	Clean vehicle and city logistics scheme in Brescia	Nº 1-133
2013	Citylog EMF (efficient, modular, flexible) – Electro-Multifunction-Transportation vehicle	Nº 1-102
2013	New loading/unloading regulation and parking/loading bay surveillance technology in Lisbon	Nº 1-065
2013	GOFER cooperative system for freight management and regulation	Nº 1-109
2013	Fleet Operator Recognition Scheme (FORS) in London	Nº 1-071
2013	Lean and Green Municipalities (Connekt) in the Netherlands	Nº 1-075
2013	Post Receiving Box by Austrian Post AG	Nº 1-090
2014	Urban Delivery Centre (UDC) in Beaugrenelle, central Paris, France	Nº 1-135
2014	SMART URBAN LOGISTICS – National initiative to initiate and support projects (Austria)	Nº 1-139
2014	EMILIA - Electric Mobility for Innovative Freight Logistics in Austria	Nº 1-138
2014	LOGeco − eco-friendly logistics in Rome, Italy	Nº 1-093
2014	Electric Removal Truck, Aad de Wit Verhuizingen, Castricum and Amsterdam, The Nether-lands	Nº 1-140
2014	Barge transport in inner city of Amsterdam, the case of Mokum Mariteam	Nº 1-127
2014	Combipakt – combined passenger and goods transport in Nijmegen, the Netherlands	Nº 1-141
2014	Parcel and small cargo delivery using interurban coaches between Lithuanian urban areas (KAUTRA)	Nº 1-086
2014	Delivery to a C&A store in Berlin with low-noise electric trucks operated by Meyer&Meyer	Nº 1-126
2015	Low emission zone, city of Rotterdam	Nº 1-147
2015	Brussels Strategic Plan for Urban Freight	Nº 1-144
2015	Environmentally friendly paper supply to municipality buildings: the case of Amsterdam	Nº 1-143
2015	Paris LEZ	Nº 1-146

2.2 Cluster challenges and developments

Two of the core problems faced by existing sustainability strategies in urban freight transport are the relatively small market share of clean technologies and the slow diffusion of technical innovations. As in other business sectors, the technology innovation cycle in freight transport and logistics typically starts with a new idea, then progresses to prototype development and trial, and eventually leads to a full-scale industry or citywide utilisation. But when it comes to clean solutions and electric vehicles, there is a tendency for innovations to remain stuck at the level of small-scale field tests. The difficulty in up-scaling good practices is not well understood. The vast majority of the urban freight sector continues to use diesel trucks and vans, and fleet modernisation is slow.

The main novelties and current trends in urban freight in 2015 are related to Information and Communication Technologies (ICT) (Taniguchi et al. 2015). Among several current trends observed in a recent review by Taniguchi et al. (2015), the most important for a sustainable urban freight and logistics policy are:

- Big data and analysis

- Decision support systems
- E-Commerce and home deliveries
- Energy saving and clean technologies
- Combining passenger and freight transport
- 3-D printing and modular offsite construction
- Land use and logistics sprawl
- Road pricing.

Looking at these trends, it must be noted, at the final year of BESTFACT that for most of them, such as 3-D printing or combined passengers and freight transport, the BESTFACT team could not find documented good practices in Europe.

The key practical output of this report is to give decision makers a detailed knowledge base of success stories and a better understanding about why one solution may be more profitable and beneficial than others. In achieving this objective, BESTFACT has revised the existing methodological approach of best practice evaluation to include a wider range of systematic and new information (Browne et al 2012). Emphasis is put on transferability criteria and on costs and benefits for public and private sector initiatives.

2.3 Case analysis and conclusions

The collection of cases has been an important step in the work of BESTFACT. The focus of the best practice collection focuses on four key topics:

1. Low emission and emission free road vehicles
2. Alternative modes instead of road transport
3. Urban distribution centres, freight consolidation and loading areas
4. Policy schemes in urban freight

For each key topic a comprehensive synthesis of relevant cases has been prepared giving an overview on highlights related challenges, solution approaches, success factors and most important impacts.

2.3.1 Low emission and emission free road vehicles

The road infrastructure available in urban areas still provides the densest network for urban deliveries. Therefore solutions in this field are highly regarded in the urban freight cluster. There is a growing market in which former small scale solutions develop around specialised niche markets. In many European cities approaches were seen utilising innovations such as zero or low emission transport technology such as cargocycles, small battery electric vans or even larger electric trucks. Along with up to date business solutions, markets, technology aspects and policy/regulatory frameworks designed to support the uptake of these smaller scale solutions has been continuously developed. BESTFACT was one platform to support and monitor these steps. Within case analyses and workshops a deeper understanding on the conditions for a future sustained growth of this type of business, and the role of electric vehicles in urban delivery have been observed. Obviously, the usage of electric vehicles for urban distribution is closely linked to the usage of urban distribution centres, freight consolidation and loading areas (see 2.3.3).

Out of the BESTFACT activities a classification on vehicles and their employment within urban logistics processes the following structuring can be given

- eBikes; suited for small consignment sizes such as letter and documents as well as small parcels. Normally operating in a range of 10 to 20 km. Typically, employed for last mile delivery in (large) inner city areas
- eVans; suited for parcels and small shipments sizes, extending the fleet of fuel propelled vans, located at distribution centres. Operating in a range of up to 60 km.
- eTrucks; eTrucks up to 12 tonnes as well as hybrid trucks for larger shipment sizes, presently there are prototypes operating in different applications.

Within the best practice collection many cases on eVehicle delivery have been analysed and discussed highlighting the innovations electric vehicles provide to the supply chain and last mile delivery. Based on the policy action carried out by Gnewt Cargo a deeper insight into key issues of eVehicle operations and success factors could be gained. Gnewt Cargo offers a service for efficient last-mile deliveries of goods in London. Through a new transhipment centre electric vehicles and electrically-assisted tricycles are used to make deliveries, while the hub is serviced by larger electric trucks. With sufficient initial volumes to establish operations successfully key of Gnewt today is to combine commercial success and growth with environmental benefits for the city and inhabitants.

Figure 2: Electric vehicles - Gnewt Cargo

In Utrecht, related to their urban freight policy (see also Zero Emission Boat, as part of the Utrecht freight policy in chapter 2.3.2), the Cargohopper is used for zero emission deliveries. The Cargohopper is a multi-trailer solar powered road train riding on pneumatic tires. The SME behind the case was able to transfer the successful concept to Amsterdam where paper deliveries for the municipality have completely switched to the sustainable delivery by electric truck. Here not only the technical solution of electrical truck was a success factor. The initiative led by the city of Amsterdam was composed of several innovative aspects including the transhipment in a warehouse located on the edge of the city-centre, the use of clean vehicles, the inclusion of all municipality buildings in the process, the tender procedure and the use of a new software. While the use of electric vehicles and similar warehouses are more and more common, the combination of all innovations makes the project itself very innovative.

Figure 3: Electric truck of Cargohopper, subcontractor of Transmission

The Green Link in Paris is another profitable case which operates three depots (called 'green hubs') and a fleet of 28 electrically assisted cargo cycles and 2 electric vans. Their main customers are large express carriers and shippers for urgent and important deliveries. The company has developed a business model based on the successful acquisition of private sector contracts, and the cooperation with large parcel service providers. This is supported through the great sustainability of this solution. Due to the substitution of the diesel van fleet through a battery-electric fleet, the supply chain emissions are strongly reduced, as operations are becoming almost completely emission-free for the final distribution in the part of the city that need it the most: the centre. Success factors are the good mix of flows with an efficient transport management as well as the good network of partners and customers. The Green Link is a SME but operates with comparable prices as traditional competitors. The solution is designed for high density cities and shares many aspects with the Gnewt Cargo case.

For sustainable road transports marketing is also a key aspect. A successful case from the Netherlands showed how Aad de Wit who wants to stand out as a frontrunner in the area of sustainability in its industry, first offered CO_2 compensation. However, as this became a standard, the company looked for new opportunities to show their Corporate Social Responsibility with CO_2 neutral removals. Subsequently the company decided to use fully electric removal trucks. This type of vehicles also helps to overcome evolving environmental rules and regulations in the city of Amsterdam. The strategy to communicate the benefits of the electric truck led to B2B-customers accepting prices between 4 and 10% above the market price.

Figure 4: Image of a delivery with an electric truck (Photo: Aad de Wit website)

Relating to the analysed cases the key success factors which were analysed stem from the customers. Their willingness to enable the start of a service is important. Either the support of a higher initial price or contracts securing a critical mass of deliveries can be essential and a rewarding investment. Also the location of transhipment points is important, as central as possible is key, reducing overall trip distance and successively congestion levels.

Green Link, as well as Gnewt Cargo could show that delivery costs are not higher for the client and still, it is a profitable model contributing to the reduction of traffic congestion, noise and air pollution. This statement also holds for the other cases analysed. On the other hand a customer base which is interested in sustainable transports might be also willing to support innovation through slightly higher prices.

Inner city hubs/Terminals are a necessary element of inner city delivery with electric vehicle due to the limited operation range. For small start-ups the issue of dedicated delivery infrastructure might not be of key importance; however during maturing into advanced solutions become of high importance. Public support on planning, land use and partly financial level is needed to establish urban depots. For the delivery business relationships and partnerships are a key. The business model for last mile e-delivery services may change. The role of last mile companies may be in the beginning a carrier´s carrier and develop into a carrier to the end customer. End customers are commercial parties. For home deliveries collecting points could be an advantage for the distributor.

The problems faced by the various solutions concern mainly finding suitable land for transhipment at the right price. The customer awareness needs to be created all around. With the possibility to analyse similar electric delivery solutions and to compare their activity and business model aspects of market success and transferability could be highlighted and deeper insight could be achieved.

2.3.2 Alternative modes instead of vans and trucks

Replacing vans and trucks in urban freight and logistics grants several benefits. Since urban centres are hotspots of traffic road congestion, reliability of deliveries and freight transport is challenged throughout the peak traffic times. Noise associated with trucks especially in dense areas or historic centres is seen as critical. For cities facing similar difficult constraints on road access to the centre alternative modes have to be employed substituting or supporting truck or van deliveries. Within the BESTFACT project multiple solutions incorporating low emission or zero emission modes have been identified. As an innovative solution to the multiple challenges related to road use, the analyses shows a prevalence of cases relying on waterways as urban transport infrastructure. Even though the preconditions to realise these solutions are quite narrow and historically given by the existing waterway networks these are feasible innovations to consider for all urban areas with some form of central waterway access.

Figure 5: Zero Emission Boat in Utrecht

In Utrecht heavy vehicles were a critical nuisance in the historical culture heritage of the city and cause problems in the form of accidents, noise and air pollution. Also the medieval inner

city of Utrecht is characterised by rather narrow streets. The city council has therefore introduced a number of vehicle restrictions in the inner city including time windows for freight traffic to deliver goods and a low emission zone. In the Netherlands traffic over water was the most commonly used type of freight transport before trucks became the common practice. Even now the infrastructure of a number of Dutch inner cities (like Amsterdam, Delft, Rotterdam etc.) still provides interesting possibilities for freight boats.

The Zero Emission Boat, as part of the Utrecht freight policy, handles deliveries to more than 60 clients along the canals of Utrecht, commonly for heavy consignments of brewery products. An electric zero emission boat is used to deliver. The idea also incorporates reverse logistics, picking up garbage from served customers.

Franprix delivers dry food products, drinks and household products by inland waterway to nearly 100 Franprix stores in Paris and the town of Boulogne-Billancourt. 26 containers (450 pallets per day) are transported from the Chennevièresur Marne (94) warehouse every day to the port of Bonneuilsur Marne where they are loaded in barge for 20km on the Marne and then the Seine to the port of Bourdonnais. There, the goods are loaded onto trucks which shows a good example of using the waterways even in urban intermodal logistics chains. Empty boxes make the return journey on the following day. Franprix has an exclusive arrangement for loading the barge and is committed by contract for a minimum period of five years which enables a thorough evaluation of the benefits of this case. The case also demonstrates the importance of access to waterways for heavy good shipments.

Figure 6: Franxprix vessel - www.franprix-entre-en-seine.fr

Mokum Mariteam uses the canals of Amsterdam to transport goods and deliver services. Hereby it reduces the number of small- and medium-sized trucks in the inner-city. The ships are driven by silent and clean electric engines. Goods are transported through the city and delivered at its destination without noise pollution. Using existing transport units like rolling containers, pallets and mesh containers, the system can be implemented by new clients and partners without any problems and does not require any special infrastructure. This makes it possible to scale up the system gradually.

Figure 7: Delivery using the vessel of Mokum Mariteam (photo: Saan website)

Alternative transports need to provide additional benefits over traditional vans or trucks in logistics. An electric boat as used in Utrecht and by Mokum Mariteam is silent and does not emit any CO2. The environmental benefit of low emissions, which is an obvious strength, has to be carefully compared to available low emission road solutions such as electric or hybrid trucks. The growing demand across Europe makes alternatively fueled trucks affordable in comparison to diesel vehicles and in turn also more attractive than the traditional modes in urban freight. It also has to be considered that boats have high initial costs. Obviously, the transferability of a comparable solution depends on the waterway network offered only in few cities. A very high load capacity makes boats attractive for bulk transports. Due to significantly less traffic on waterways it is also possible to anchor a boat next to a loading zone for longer durations e.g. for more complex loading operations. In future use cases boats with high payload can offer the option to serve as an independent transshipment point for last mile deliveries and serve as a mobile hub for other low or zero emission transport options.

2.3.3 Urban distribution centres, freight consolidation and loading areas

Over the course of BESTFACT a wide range of practices were analysed which address urban freight challenges by providing solutions focussing on urban distribution centres, freight consolidation or loading areas.

Following the classification of urban consolidation centres as done in the BESTUFS project three distinct categories of UCC have been identified across the EU and highlighted in the BESTFACT project (BESTFACT D2.3):

Special project UCC	UCCs used for non-retail purposes, for example construction material UCCs. This type of UCC may well serve a single site. However, such UCCs could potentially operate over any given geographical scale of the urban area. This type of UCC may well operate for a given period of time while the specific activity linked to the UCC takes place.

UCC on single sites with one landlord	Examples include UCCs at airports and shopping centres (e.g. Heathrow retail UCC by DHL). These UCCs differ from other retail UCCs in the following ways: i) these sites are built as a single development so the UCC can potentially be designed into the planning of the site, ii) the landlord has the potential to insist that tenants use the UCC, iii) the unloading points at the final destination tend to be located off-street in a specially designed delivery area with access via a single route, iv) the UCC operation can potentially be made self-financing through rent structures and handling charges.
UCC serving a designated city or area	Examples include many German city logistics schemes, La Rochelle in France, and Broadmead (in Bristol, UK). These UCC schemes can vary in terms of: • Geographical area they serve (which can either be large or small. For instance such schemes can, serve a small district such as a narrow, historic centre of an urban area, a specific retail area, or a larger, more diverse geographical area up to an entire town/city). • Number of companies operating the UCC scheme (which can be a single company (e.g. La Rochelle, or several companies (e.g. German city logistics schemes)

Each of these three types of UCC can offer services ranging from basic consolidation services to a wider range of value-added logistics activities such as stockholding facilities, ticketing and pricing, goods collection and return and waste collection services. Similarly, each of the three types of UCC could also potentially offer community collection or other reverse logistics services.

Even though the possibilities in services are rich and the associated, estimated benefits for environment and congestion levels are high many initiatives in city logistics struggled around the turn of the century. Initially public interest in generating possible common benefits spurred investments in UCC and cooperation models to operate them with private partners. It became apparent that competition on the market for urban deliveries and the complexity arising from additional transhipments was a high burden for privately financed operations as intended by the public initiators.

For the three described general UCC schemes the financing arrangements vary. Some UCCs have been dependent on public funding either from central, regional or local government. Some UCC schemes have received funding from EU projects. Meanwhile, other UCC schemes have been funded through a mix of financial support from commercial partners and contributions from receivers using the scheme. The BESTFACT analysis shows a growing number of UCC in recent years that demonstrate that they can operate on a commercial basis without the need for subsidies. It can be concluded that the overall commercial viability and attracting goods volumes to the UCC are key indicators for their success.

Figure 8: Eco-logis UCC (depot) in Brescia | La Rochelle central distribution centre – elcidis.org

Over the course of the BESTFACT project duration also new forms of UCC have been identified, analysed and discussed leading to important conclusions on innovations in UCC approaches. These forms build on the more traditional concepts described but also focus more on integrating innovative aspects. Especially initiatives supporting the use of low or zero emission vehicles added a valuable success factor to UCC solutions.

Binnenstadservice is based on a new business model introducing a “last mile as a service” concept in which the shopkeeper has to pay for the final delivery service. Binnenstadservice is organised as a franchise service that allows for a scalability and transferability of the concept. Public benefits are achieved due to a bundling of shipment at city limits and the consolidated delivery on demand of the shopkeeper. Binnenstadservice demonstrated a potential on saving costs and CO2 emissions of more than 50% compared to conventional delivery patterns.

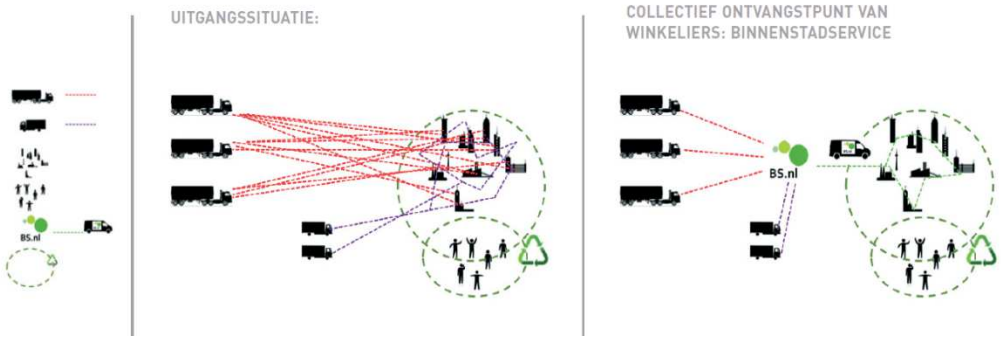


Figure 9: left: situation without Binnenstadservice depot and distribution (before); right: situation with Binnenstadservice depot and distribution (after)

Cityporto Padova is a successful example for a commercial viable UCC starting with public money in the start-up phase and becoming financial self-sustainable after a 3 year period. Planning aspects such as geographical location as well as accompanying support measures are success factors for this UCC. Padova is operated by a neutral management which is different to other successful UCC in Europe. Using low emission LNG vehicles and providing consolidated delivery services reduces emissions within the inner city are. Key success factor is the growth of volumes over the year UCC Padova could achieve. Here a closer look at the services provided is needed (which cargo, geographic area, contractual issues). These seem to perfectly fit for Padova.

Figure 10: Location of the Cityporto depot in the main logistics area of Padova

The Gothenburg City logistics Initiative aims to establish a mirco-consolidation centre in combination with delivery using electric vehicles. Therefore, the Gothenburg case is an approach which is tested in similar layouts in different other cities in Europe, such as Brussels, Berlin. It demonstrates an approach towards CO2 free inner city distribution. Key issue for a successful continuation is to adopt the right business model. Here the initiative is working in different directions; establishing a non-profit based public private partnership or transfer to a private service provider. Key will be to generate (sufficient) transport volumes from logistics service providers and retailers. In this context the role of the city being an open communication point is very important for the success of the approach.

The Copenhagen khb combines aspects of Binnenstadservice with “classical” UCC schemes such as Padova. Last mile operations will be provided as a service as in the Binnenstadservice case while the UCC together with electric vehicles for distribution is operated by a public entity. Again the municipality is playing an active role to bring the practice towards a commercial viable level by means of providing communication platform and start up support.

Overall the **central distribution centres and areas to consolidate freight have a positive effect on urban traffic**. The additional transhipment requirements are offset by innovative concepts to make the last mile delivery either more cost efficient or greener or even both. The consolidated transports allow for avoidance of peak traffic times and a higher reliability. Thus, additional benefits are generated for businesses and the public by reducing congestion levels and emissions.

2.3.4 Policy schemes in urban freight

Main measures included in policy schemes for urban freight in the years 2012-2015 are related to support for clean vehicles and consolidation centres, Low Emissions Zones and wider urban freight schemes that include multiple initiatives.

Support measures for Clean Vehicles and Consolidation Centres

Main challenge for the policies aiming at increasing the use of clean vehicles and consolidation centres in urban area is the very small market development of these sustainable solutions. Currently the market share of electric vehicle and natural gas vehicle in freight transport is estimated to be below 1%. The original root causes for that are purchase price, the technology characteristics such as the limited battery range, and the strong competition. These factors are limiting a broad adoption.

In BESTFACT, few Best Practice examples could be found with successful business models, good support from local authorities and an increased market share for this solution. These cases are ideal candidates for replication in other cities, other businesses and other countries. For example, in cities such as Padova, Brescia, San Sebastian, Copenhagen and Gothenburg, local authorities have started to support logistics businesses that are run with full-electric vehicle fleets. Nevertheless, as of today, only few Best Practice cases of operators and logistics businesses such as Gnewt Cargo in London or The Green Link in Paris, are having developed a fleet of more than 30 vehicles in daily use for parcels deliveries to central area. These two business were running from the very beginning of the start-up phase without direct subvention, but other businesses such as Binnenstadservice, Cargohopper or Distripolis have received direct financial support in their starting years.

Figure 11: The micro terminal Lindholmen in Gothenburg - Stadsleveransen (2013)

The maturity of the technology have improved in recent years, with battery range increasing and a growing number of vehicle manufacturers offering electric vans or natural gas powered trucks. The purchase price has decreased a lot for small vans below 2.5t and the current most favourable purchase model for an electric freight vehicle foresee the lease of an electric vehicle without battery and the lease of the battery as two separate contracts. The overall value is competitive to the small diesel vans of the same capacity, if the fuel use costs are factored in. In BESTFACT, it could be shown that in few cases, local authorities or national authorities, like in France and UK, are supporting the purchase of clean vehicles with a subvention.

Special Best Practice cases for clean vehicles can be considered for replication on specific urban logistics markets, such as the use of waterways and electric barges in Amsterdam, the use of bigger full-electric trucks in Netherlands and Germany, the use of an innovative driverless, connected and autonomous prototype freight van in Austria, and the use of electrically assisted cargocycles in Paris and Amsterdam.

The most important success factors for this type of solution are the good cooperation between the operator and its clients, and between the local authority and the local business community. Another success factor is the relative mature technology for small electric vans below 2.5t. Other important aspects are the application to a certain type of parcels delivery business, which is suitable for relatively small vehicles. For bigger pallet, or bigger volume per delivery round, other types of vehicles are more adequate, such as natural gas or hybrid trucks. Last but not least, the availability of logistics space in city centre is very problematic, due to the high market price of parking and storage facilities. One success factor is the help of the local authority in providing a dedicated area for logistics in central locations at a price well below the market average.

Figure 12: Operative vehicles of Stadsleveransen used in Gothenburg

There are five main impacts related to the use of clean electric freight vehicles and consolidation centres in urban areas. The four most important impacts are CO_2 reduction, air pollutant reduction for NOx and PM, less noise, and distance reduction measured in km per parcel. The reduced distance triggers secondary effects that are beneficial from the public sector point of view: congestion reduction, less infrastructure damage, and less accidents. For business, the costing shows in some cases a slight increase in employment and staff costs, an increase in facility rental costs, and a decrease in fuel cost, taxes and parking fines or fees. Some reports show a decrease in vehicle productivity due to the lower capacity of electric vehicles compared to diesel vans, but this could not be confirmed for all Best Practice cases.

Low emission zones

Today most large cities in Europe face the problem of air pollution with many days per year above health related thresholds, ozone episodes and peaks for particle concentration. The cause of this high pollution is generally a specific weather condition with low wind and stable air mass, in which the emissions cannot be transported away or mixed with the upper atmosphere. Emissions are generated by transport in general, household heating and industry.

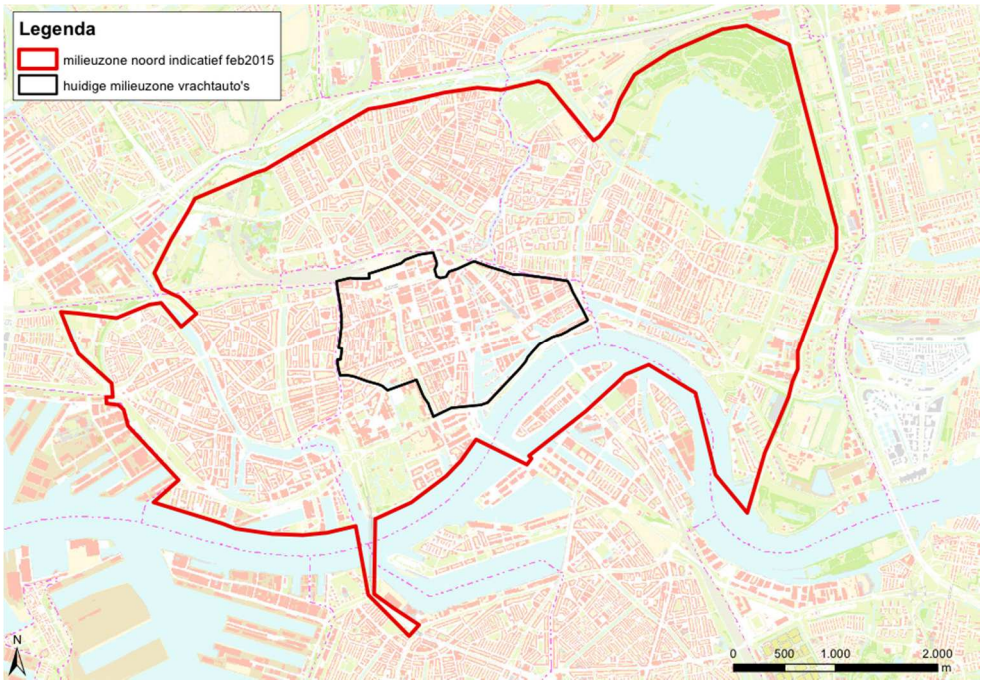


Figure 13: Limits for the Low Emission Zone in Rotterdam (black is the current zone, red is the 2015 extension of the initial central Zone)

To tackle this problem, freight vehicles are targeted in a package of measures aiming at removing the most polluting old diesel vehicles from entering the towns. Low Emission Zones are defined by municipalities and are limited by a clear border beyond which only restricted access is allowed. In most LEZ, banned vehicles are those with Euro 3 or below. In case the owner of such a banned vehicle would like to continue to use it, he or she can upgrade it with a fitted exhaust system. LEZ solutions targeting freight vehicles are in place in Sweden, Germany, London, Rotterdam and Paris. In general, LEZ do not target passenger vehicles or any other emitting sectors. This is due to the relatively low cost and high effect of LEZ when applied to the freight vehicles.

Good and effective control is key. In London, automated number plate recognition system are in place, making sure the LEZ scheme is properly enforced. There is limited evidence on the impacts of LEZ on overall traffic and pollutant emissions, but it is assumed to be substantial. The costs for the municipalities are not very high and acceptable. Despite the existence of LEZ, many cities continue to suffer from bad air quality, so this solution is not showing enough impact for air pollutant concentration to come down below thresholds at all times.

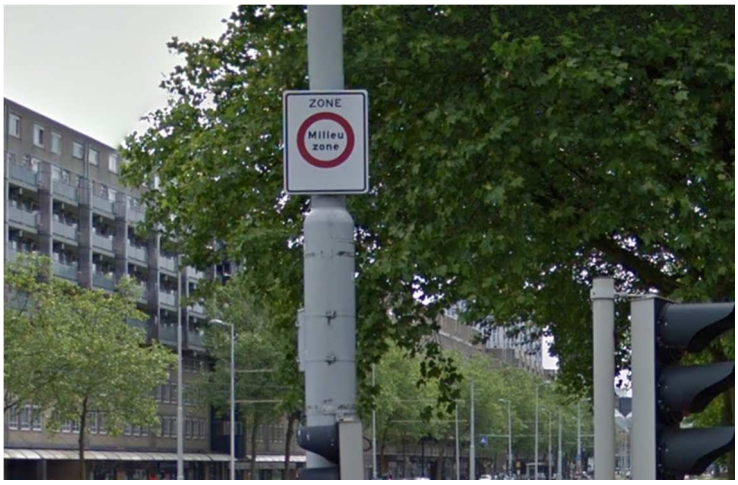


Figure 14: Signage at entrance of the Low Emission Zone in Rotterdam

Wider urban logistics policies

Separated initiatives such as electric vehicles, LEZ or loading bay management are too isolated and most initiatives for sustainable urban freight in Europe remain stuck at a level of small scale and with low impact. If a more effective logistics and freight transport system is to be developed as a whole, there is a need for a more ambitious set of policies coordinated at the local level with a broad range of stakeholders, consisting in more than the municipality services.

Few frontrunner cities in Europe are combining different urban freight policies. The Best Practice of Gothenburg urban freight policies gives an example for this. The City of Gothenburg developed and applies a bundle of city logistics policies and solutions, starting from the regulation of city centre and shopping area, developing new infrastructure, establishing a consolidation centre, promoting the use of clean vehicles, developing trials of innovative solutions, monitoring and data collection on new vehicles and new technologies. The solutions have been developed coherently and are supervised by a well-established network of experts active in different businesses and public sector institutions. The FORS programme in London, and the EMILIA, and Smart Urban Logistics programmes in Austria, are other example of such wider, more ambitious and effective solutions.

Communication and cooperation between partners are key to the success in establishing new city logistics measures such as the consolidation centre and the electric vehicle use. The consultation activities need to be rather extensive and consist in the municipality service and project management team discussing potential solutions and different approaches with receivers of goods/retailers, hauliers and, transport operators. For this is advisable to rely upon a good network of local experts.

The main impacts are the environmental benefits associated with the use of clean vehicles, especially lower pollutants emissions, low noise and reduced CO_2 emissions. Another impact is the high acceptance of the bundle of coherent solutions. The other impacts are in the stakeholder participation that, if institutionalised, enables to react effectively to changes and new developments.

3 Cluster 2: Green Logistics and Co-modality

Co-modality and green logistics are treated as a unified concept throughout the work of this cluster. The focus of co-modality lies on the use of different transport modes on their own and in combination. Co-modality is increasingly linked with green logistics. Green logistics is the integrated management of all the activities required to move products through the supply chain, in a way that it reduces environmental impacts and meets customer requirements at minimum costs. These activities include freight transport, materials handling, packaging, inventory management, storage, waste management and the related information processing. In the past, the externalities produced (e.g. climate change, air pollution, noise and accidents) were not seen as a priority by the companies. Given the high energy prices, the increased congestion (affecting reliability), the requirements of the clients and the stricter legislation by the different governmental entities, more companies have become more active in looking for green solutions for their logistics.

This chapter in the best practice handbook gives an overview of the activities of BESTFACT in this cluster. In the information base all collected and presented cases since the publication of the first handbook are summarised. In this context the challenges and central cluster topics are critically analysed which allows a clustered synthesis of the best practice cases.

3.1 Collected cases

Over the course of the BESTFACT work in this cluster 68 cases were described as best practice. The following table gives an overview of all cases in this cluster. The case numbers are directly linked to the PDF version of the Quick Info Sheets of each case, provided in the project.

Year	Case Name	Case No. and Link
2012	Motorway of the sea Nantes-St Nazaire, Gijon	Nº 2-001
2012	TK 'BLUES Rating Agency taking care of the environmental footprint in the logistics chain	Nº 2-002
2012	VIKING TRAIN (Lithuania, Belarus, Ukraine, Moldova, Georgia),	Nº 2-005
2012	Metrocargo (Italy),	Nº 2-007
2012	New Service: Rail transport between Trieste and Bettembourg	Nº 2-008
2012	CO3 – Collaboration Concepts for Co-modality	Nº 2-012
2012	EcoTransIT World – Ecological Transport Information Tool	Nº 2-013
2012	Photovoltaic Plant (Terminal of Gallarate, Italy)	Nº 2-015
2012	RECODRIVE - Recognition Schemes for Energy Conserving	Nº 2-023
2012	Southampton-Midlands Rail Corridor Loading Gauge Enhancement	Nº 2-027
2012	SimConT - Simulation of Inland Container Terminals	Nº 2-034
2012	Express rail service between North and South of Germany operated by Hellmann rail solutions	Nº 2-038
2012	Green Barge – FloraHolland	Nº 2-045
2012	Green Rail – FloraHolland	Nº 2-046
2012	Trivizor (Orchestration in Horizontal Collaboration)	Nº 2-047
2012	Argonon, LNG Dual Fuel in inland waterway transport	Nº 2-048
2012	Lean & Green	Nº 2-049
2012	Fresh Corridors	Nº 2-050
2012	Walstroom (Shore power)	Nº 2-051
2012	Translifter Cassette system – TTS Liftec Oy, Finland	Nº 2-052
2012	LIPASTO Traffic Emissions Database	Nº 2-054
2012	ContainerMover 3000: rail-road transhipment technology for ISO-containers and swap-bodies	Nº 2-055
2012	Cargo-Pendelzug pendular train with hybrid power operating as a liner train	Nº 2-056
2012	Regionalization and privatization of the railway line "Traisental"	Nº 2-075

2012	Kockums Megaswing pocket wagon with horizontal transhipment for semi-trailer	Nº 2-060
2013	“Objectif CO2” : Voluntary commitments program to reduce CO2 emissions of road freight	Nº 2-105
2013	Franprix: Delivery of dry food products, drinks and household products by inland waterway	Nº 2-009
2013	Vert chez vous, an urban logistics with 100% environmentally friendly vehicle	Nº 2-010
2013	ENUBA2 – Electric mobility in heavy commercial vehicles to reduce the environmental impact	Nº 2-001
2013	CargoObserver - Container Monitoring in Combined Transport	Nº 2-080
2013	International East –West Transport corridor Association	Nº 2-003
2013	Triple-E means Economy of scale, Energy efficiency and being Environmentally improved.	Nº 2-102
2013	Optimisation of packaging waste management in HIDRIA	Nº 2-024
2013	Gasrec/B&Q dual fuel (biomethane - LNG blend) for warehouse-to-store deliveries	Nº 2-091
2013	Operation of GreenWay electric vehicle fleet at a distributor of pharmaceuticals	Nº 2-107
2013	Green Freight Transport	Nº 2-104
2013	Swiss federal CO2 ordinance applied to freight transport policy	Nº 2-085
2013	Green corridor in the North Sea Region High Capacity Transport Corridor (HCTC)	Nº 2-098
2013	Upgrading of Ferrarese waterway to Class V	Nº 2-103
2014	Motorways of the Sea Klaipeda – Karlsham	Nº 2-004
2014	Lekkerland – multi-temperature delivery	Nº 2-040
2014	MOBILER–Innovative transport logistics & Supply Chain Managment of Rail Cargo Austria AG	Nº 2-066
2014	Integrated Central Klaipeda seaport terminal	Nº 2-108
2014	Marco Polo project by Mondelez	Nº 2-109
2014	ISU - Innovative Semi-Trailer Handling Unit	Nº 2-110
2014	Green Rail Logistics for excavated material on construction sites	Nº 2-113
2014	AAE Pocket Wagon. Ahaus Alsatter Eisenbahn Holding AG	Nº 2-117
2014	PLANZER operating an E-FORCE truck	Nº 2-124
2014	Malcolms50’ container for domestic application within the UK	Nº 2-127
2014	LNG RoPax ferry Viking Grace	Nº 2-130
2014	Lorry-Rail: rail motorway Luxembourg –Perpignan	Nº 2-133
2014	Rail Short Haul Operators	Nº 2-135
2014	NIKRASA –Non-crane-able semi-trailers become crane-able	Nº 2-137
2015	Cargo Domizil	Nº 2-019
2015	Intermodability	Nº 2-114
2015	E-FLOWARE	Nº 2-119
2015	CMDU/ Multimodal City Distribution Centre Lille	Nº 2-120
2015	The shipping agents GIE “Pointe de Bretagne”	Nº 2-121
2015	Le Havre Mutual Distribution Service	Nº 2-122
2015	LoginWaste, reverse waste logistics service intended for shops and small businesses	Nº 2-123
2015	Drax high capacity biomass wagon	Nº 2-126
2015	E-CEP-Service-Trial by Schachinger & Greenway	Nº 2-131
2015	Council for Sustainable Logistics	Nº 2-132
2015	SPORTINA - Integrated Management of the Logistics Flow (Sportina Bled Ltd.)	Nº 2-136
2015	CEPIM CG	Nº 2-140
2015	SEAT Catalunia	Nº 2-141
2015	Rail lines creation and network link to National Retail Distribution Centre – the case of Tesco	Nº 2-142
2015	SMILE	Nº 2-143

3.2 Cluster challenges and developments

Innovative transport systems and operations are employed to address the challenge of providing affordable and attractive freight services. At the same time, a significant amount of effort is

paid for sustainable solutions, promoting greener means or shift-from-road solutions. Numerous initiatives have been working towards that direction: from ports and terminal operators work plans and strategies to European research, studies and works. Examples of such initiatives are the strategic plan from Port of Rotterdam to shift to rail and inland water-ways as well as promoting LGN facilities so as to improve its carbon footprint (an example of the port strategy is depicted in the figure below).

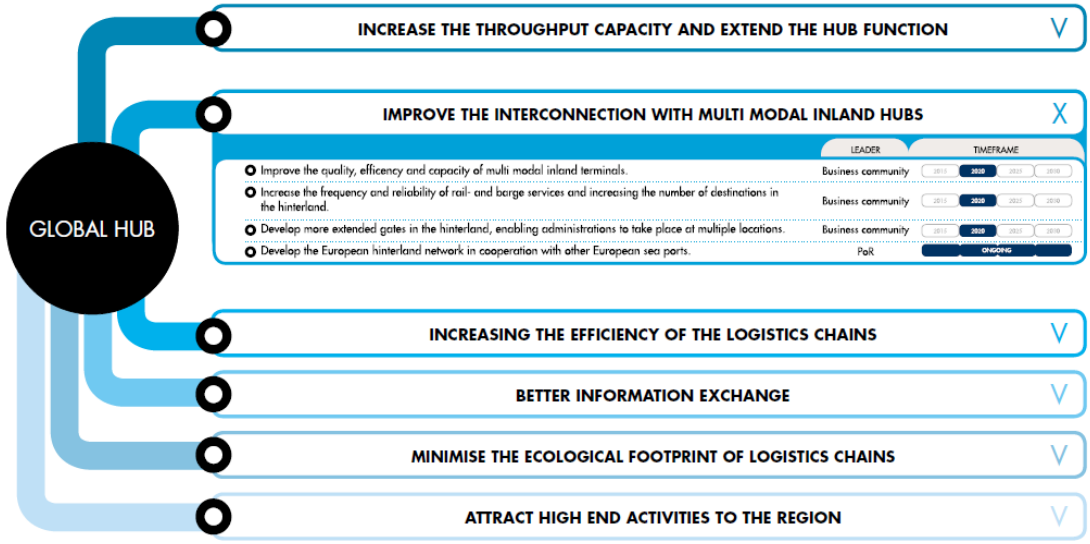


Figure 15: Port of Rotterdam, vision 2030, example from the strategic goals

EU policies have also significantly supported the target of sustainable freight transport. Next to the Regulation (e.g. Reg. 1315/2013 on the TEN-T network), various tools have been considered: the transport part of the Horizon 2020 work program (including the SHIFT2Rail initiative) for research and development of relevant solutions, the support for infrastructure development and services throughout the TEN-T studies and the allocated funds from INEA, Marco Polo etc. as well as other financing tools accelerating the rollout of innovative, sustainable solutions for efficient logistics.

A trend can be seen towards cleaner vehicles and vessels (e.g. using LNG or electric propulsion). The main current barrier is the limited available installations and infrastructure for alternative fuels and propulsion systems. Most of the available identified best practices are also in a starting phase and need further development. The use of electric vehicles has until recently mostly been used for urban distribution due to the limited range of the batteries. However, there are now more best practices identified focusing on the use of electric propulsion for interurban and longer transport distances.

Many of the projects focus on organisational topics such as collaboration schemes, business-to-business solutions and improved communication among stakeholders. The development of organisational processes even though rapidly progressing, can still significantly improve. As it can be seen from the cases, linking the various stakeholders demands clear added value for each one of them. Furthermore, supporting funds may be required to engage stakeholders, like for most private and public funded cases. Network improvements and hubs for aggregating transport flows are examples of such investments. This limits the transferability potential as solutions requiring high funds discourage emulation.

Furthermore, national or local initiatives with strong replication potential (in other domains and countries) due to lack of direct benefits or even lack of awareness, are not visible enough to

be considered under new circumstances, where their adoption could prove beneficial. Increasing the knowledge of such cases is key to improving the transferability of such solutions. However, in many occasions information is sparse for instance due to issues of commercial confidentiality, Intellectual Property or limited trials experience and other relevant data. Overall, better dissemination of solutions and their direct and indirect impacts in the field could improve their transferability potential.

Moreover, the transferability of such practices could be also dependent on the support of a related political framework. Finally, regarding all solutions, the increase in multimodality and the use of greener solutions requires changing the 'business as usual' approach and develop new concepts and technologies. It starts with a 'mental shift' and this is one of the biggest challenges.

There are different possible solutions to achieve benefits for the economy, environment and society. One of the challenges for this BESTFACT cluster is how to maintain an objective and impartial perspective when evaluating a wide inventory of possible candidate projects. This is related to the fact that a solution can be considered as a best practice for one person, while another could consider it to be less innovative. Having different project experts assessing the collected cases based on a specific methodology has helped the selection process to some degree but an objective selection of comparable best of the class solutions is out of reach.

As recognized in all of the work, the commercial considerations still underpin the functioning of the transport and logistics sector with a focus on cost effectiveness, and competitiveness as the key factors which will either lead to the adoption of a project or concept at a wider level or not. Solutions increasing fuel efficiency (i.e. lower fuel costs) or using less expensive alternative fuel can trigger these companies to choose cost-effective and cleaner solutions. In other cases, mandatory solutions are still needed to push the sector into making greener choices.

3.3 Case analysis and conclusions

In the Green Logistics and Co-modality cluster the following key topics were identified.

1. Intermodal services and connections
2. Innovative new technologies
3. Decarbonising
4. Collaboration

The BESTFACT cases were grouped according to these topics and analysed in the following chapters.

3.3.1 Intermodal services and connections

The target of delivering 60% reduction in greenhouse gas emissions by 2050 (EC, Transport White Paper, 2011) can only be achieved with a cleaner, safer, smarter and more integrated transport system. The trend towards this development has also been identified in the Horizon 2020 strategy from the European Commission. The increase in co-modality and the use of greener solutions requires changing the 'business as usual' approach and develop new concepts and technologies. Intermodal services are at the core of the strategies to enable substantial reductions.

The concepts in BESTFACT show that a high focus is on solving the disadvantage of rail versus road transport on shorter distances. This goal is of high importance since this is where the high demand in freight volumes is accumulated. Also this is where the main competition in truck traffic is exceptionally strong. Benefits from shifting cargo to rail will have wide impacts which can be seen among the presented cases.

Cargo Domizil shows how transport by rail proves to be highly efficient, even below 300km distances. Freight is transported in a combined transport system where pre-haulage and last mile distribution is done with trucks while the main haul is executed on rail between 11 hubs in Switzerland served by the system. Cargo Domizil provides door-to-door for general cargo transports within 24 hours all over Switzerland. The operation is defined through the cooperation of the individual truck and rail operations. Especially the combined buying power allows low costs for the rail transport. The societal benefits are significant reductions in emissions of greenhouse gasses due to the shift to rail.

Similarly the Swiss solution of the Cargo Pendelzug replaces traditional railway operations including shunting, local collection and delivery. The aim of the InnovaTrain company that developed the Cargo-Pendelzug was to come up with innovative and economically feasible solutions for freight transport by rail with access on short distance to consigner and consignee. By serving intermediate terminals as well as the combination with a horizontal transhipment technology (see Containermover 3000 in chapter 3.3.2), the concept enables fast drop-off and pick-up of loading units maintains the use of railway transport over the longest possible stretch of the door-to-door route. The trains are able to flow between passenger trains due to their speed and acceleration. This allows for continuous services.

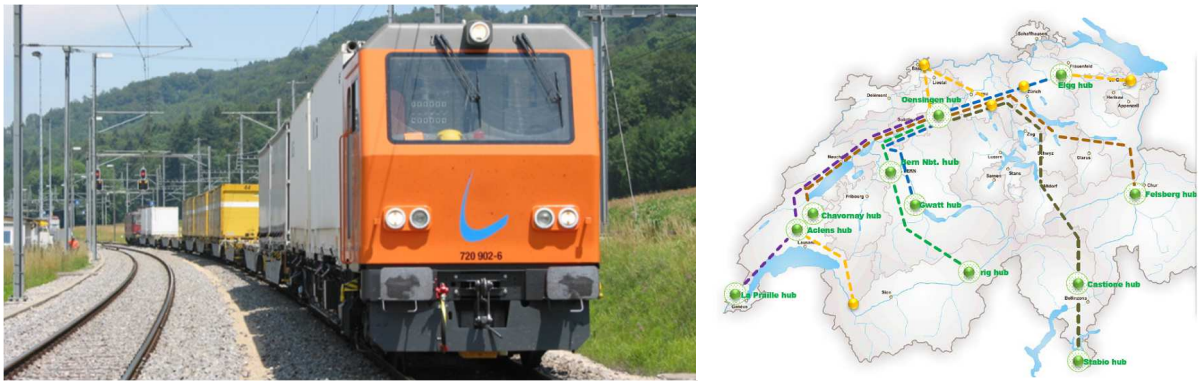


Figure 16: Train and network of the Cargo-Pendelzug in Switzerland

In 2004/2005, the SNCF (French national railway company) decided to refocus gradually its activity on the most profitable segments; namely complete trains. To be able to maintain a railroad service offer to the shippers who do not need a complete train, the public authorities decided to favour the creation of Rail Short Haul Operator (RSHO). Especially for short distances the concept intended to re-revitalize the railroad mode, by grouping the local freight. The operators transport wagons or full load trains on short distances until or from a point of exchange with a long distance railroad operator. They meet the needs of local shippers, e.g. on a territory or for a port. Acting as a transfer point between shippers of a region and the main railway line operators, a RSHO may operate rail and road transport, handling, loading and unloading, and maintain the railway infrastructure. RSHO are more broadly implemented in Germany, USA and Canada. In France, for example, Ferovergne, the RSHO of Auvergne Region in France includes 16 shareholders: eight carrier logisticians who hold 64 % of the shares, big shippers (Volvic, etc.) hold 14 %, GEODIS a SNCF subsidiary 15 %, the managers of the SHO 6 %, and the Regional Chamber of Trade and Industry (CRCI) 1 %. The overall project proved to be beneficial for both, public and private sectors. The main benefit of the project is to boost and widen the rail freight market. For private stakeholders, like local shippers and carriers, RSHOs also keep the choice between rail and road rail local infrastructure. By using railways instead of road, environmental benefits can be achieved.

Figure 17: Presence of RSHO in France (as of 2013)

In Catalonia, the fact that factories are situated right at the railway line was always considered a competitive advantage. This fact along with the increasing costs of road transport and congestions have contributed to the strategic decision to divert transport to rail although investments were required. In 2005 an agreement was signed for the adaptation of the railway line Llobregat-Anoia from the SEAT factory in Martorell and the Port of Barcelona. The adapted railway was prerequisite for the launch of a new intermodal service Autometro (transport of new cars from the factory in Martorell to the Port of Barcelona) in 2008 and a new intermodal service Cargometro (transport of automotive parts from Zona Franca in Barcelona to the SEAT factory in Martorell) in 2009. With these two services new cars and automotive parts are transported between Zona Franca, factory in Martorell and the port of Barcelona to be shipped further. In recent years, the Autometro service has been transporting the vast majority (+90%) of cars being shipped from the SEAT factory to the port of Barcelona. The important success factor contributing to the project was the short distances coverage of the services while operating without losses. The needed experiences for such a project were at hand because there were large companies involved into the project, enabling to plan long-term and, due to their position, are able to carry out long-term agreements.

The Green Rail Logistics for excavated material on construction case for the construction of the Wiener Netze headquarter demonstrated the potential to shift even the most traditional transports from road to rail. Usually the transportation of excavated material is put out to tender without any requirements or additional demands regarding ecological or sustainable demands. Due to the flexibility and availability of the transportation by HGV on road, this solution is preferred in most cases, without considering the possibility of alternative “green transport” solutions. In this context, the Green Rail Logistics project intended to evaluate and implement alternative, smart and sustainable solutions and to build a related “Smart Campus”. Even though only running during a limited time period during the construction work it was possible to significantly reduce traffic and emissions caused by trucks in the urban area around the construction site. The rail solution led also to the optimisation of the intra-logistic processes within the construction site.

The success factors analysed from the cases in BESTFACT specify that overcoming disadvantages of rail on shorter distances are variable but have common aspects. Usually the specific operation situations have to be considered. Even then it is not always possible to provide

a general rail solution which is competitive. **Being able to have a good access to infrastructure is the key success factor.** Therefore either dedicated freight infrastructure is necessary or an operational concept which allows sharing the rail network with commuting or regular rail passenger services. The transported cargo is not a key factor. Between bulk, general cargo and consumer goods working best practices were found. To increase chances of success the cooperation and early communication with all involved partners and stakeholders is a benefit. Showing advantages within a feasibility study, where solutions are evaluated and implementation concepts are developed or checking support of the neighbouring interest groups, residents and the local governing authority to realise ecological transport solutions increase acceptance and in the end support.

The impacts of the shift to rail with innovative intermodal services over short distances mainly benefit the environment. The presented cases all show significant reductions in CO2 emissions mainly by substituting truck traffic. If road transport would rely more substantially on low emission vehicles the benefit of rail would be diminished. Along with these benefits of emissions come the reduced congestion. Especially in areas with high traffic density rail transports provide a benefit to other road users. Economic benefits are more difficult to analyse on a case basis and information is only scarcely available to the public. The general consensus is that intermodal solutions face direct competition from the road transport sector; thus only competitive and low prices will grant success.

A thoroughly managed and innovative transport solution utilising intermodal transport means can be successful even over distances below 300km and can be sustainable in ecological and economic terms.

3.3.2 Innovative new technologies

Individual innovation solutions to logistics processes are commonly tailored for specific use in a range of processes along logistics chains. Their key benefit is making operations and processes more efficient. Efficiency gains in loading and unloading support intermodal transport as a business model.

On the other hand there are some improvements which can generate great qualitative benefits for enterprises. The quality is usually difficult to compare with costs and thus it is important to minimise costs for innovative solutions entering the market. The cases collected in BESTFACT show a clear progress on implementation of technology and processes which aid to become more competitive and advance with low investments needed. Economic benefits which can be realised are closely linked to specific business model or company practices. There are solutions tailor-made for individual practices as well as broad innovation technologies which support the implementation of intermodal transport across the industry.

The Containermover 3000 technology enables the use of cargo pendular trains in Switzerland as shown in the Case Cargo Pendelzug (see also chapter 3.3.1). Where freight trains loaded with the Containermover technology can use rail slots of passenger trains on short distances between terminals (around 90km) and significantly reduce stopping time at terminals. Thus making intermodal transport even on short distances viable. Containermover 3000 itself is a transhipment technology mounted on a truck for horizontal transfer of swap bodies between road and rail vehicles. There is no fixed terminal equipment or infrastructure is needed, so any loading track and lane can be used. Standard containers can be handled which makes the technology versatile and easy to integrate in existing operational models.

Metrocargo is a technical solution to load and unload the trains in a fast and economic way, by using an innovative horizontal handling technique, which can be operated without shunting while the train is under the electricity track. The system is fully automated and very efficient, it is time and cost effective for the distributed intermodal transport over a territory and for processing full trains in port to dry port shuttling. Due to the technology requirement to design dedicated terminals the infrastructure costs are comparably high with other technologies. Therefore the flexibility of the system is low and transferability depends on the willingness to invest.

Figure 18: MOBILER transhipment

Figure 19: Containermover 3000 transhipment

The MOBILER System by Rail Cargo Austria is a horizontal swap-body system operated by the driver. The system combines the benefits of both rail-road systems, bridging the gap for last mile operations, and easing the traffic load on the road, saving costs and improving the greenhouse-gas balance. The solution transported in 2011 more than one million tons with 30

MOBILER trucks and some 650 MOBILER Container. RCA MOBILER switched some 60.000 trucks on the long run from the road to the environmentally friendly railway and offers also the flexibility of the road transports. In the case a new operational and technological solution was implemented. New rail freight services were introduced also for new customers. The solution has won various prizes and awards for innovation and sustainability in the field of intermodality and green logistics. The system is already introduced in some other countries and is therefore considered as an international best practice example for innovative transhipment and supply chain solutions in rail freight. The main challenge for innovative services that are depending on innovative technologies is the pre-investment in the equipment. This was solved when the equipment producer and the rail operator established a successful cooperation agreement.

Craning of non-crane-able semi-trailers onto railway cars has so far been impossible, unless the trailers were specially designed as a crane-able semi-trailer. In past years, many different approaches were made to overcome this limitation and to make combined transport available for all forwarders and operators. All approaches work well in their niche. Thus, making non-crane-able trailer into crane-able without special adaptations of trailers or wagons can contribute to shift goods from road to rail. This is what the NiKRASA-System was designed for. It is made of two parts: a platform in the terminal, and a transport platform. The transport platform fits into the terminal platform. The terminal platform allows adjusting the semi-trailer on the transport platform. The grippers of reach stackers or portal cranes adjust with the transport platform and lift it onto the railway car, together with the semi-trailer. The transport platform remains on the wagon during the railway transport. Thus, it is used for loading and unloading. The terminal platform stays in the terminal and can be moved and stored when it is not used in the terminal. One weakness of the NiKRASA system is the fact that at least two terminals (origin and destination) have to be equipped with NiKRASA terminal platforms.

A different technology to support the transhipment of non-craneable semi-trailer is the Megaswing. The Megaswing is a pocket wagon for the transport of semi-trailers and containers by rail. It can swing out the pocket section - a platform on which the semi-trailer rests during transport - for unloading and loading purposes. Transhipment occurs horizontally by terminal truck in the roll-on-roll-off (Ro/Ro) mode.

Figure 20: NiKRASA transhipment

Another support technology for improving the supply chains efficiency with low costs and minimal intervention is the Cargoobserver technology. The device used in the Cargobserver case allows a maintenance free monitoring of containers in all transport processes. The extended version of the tracker costs less than 2€ per day in operation and allows for permanent control of quality and position of the container and reduces insurance fees due to reduced risks of losing shipments. The Cargobserver excels because it can operate autonomously for several years. Even though comparable solutions have been developed, none proves as useful as the Cargobserver which is in use at multiple companies of different sizes.

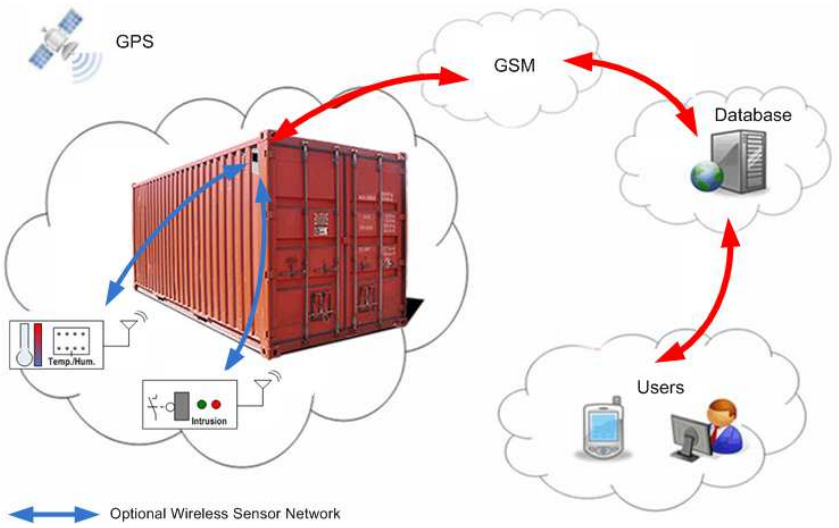


Figure 21: Cargobserver - cargomon.com

Analysing the collected cases central success factors and the most important impacts of the solutions become apparent. Because still the mass of overland transport is using articulated trucks, these non-craneable semi-trailers represent 95% of the market. **To support the shift to rail it is necessary to aid intermodal services in their core to being efficient and economically viable.** The key aspect therefore is the fast cargo transhipment and transfers which enable intermodal transport also on short distances. On these shorter distances the time needed for transhipment is especially critical and thus efficiency gains can be seen as critical benefits.

Viability of shorter distances in intermodal transport will have a significant impact on freight transport, since volumes on shorter routes are much higher than over long distance. If cargo trains are less dependent on fixed terminal infrastructure the related services are benefiting more from flexible supply chains. This also aides the resilience of the rail freight and intermodal transports. If there are interruptions of services within terminals or relevant connected infrastructure some of the presented cases allow fall-back solutions. In this context it is especially important to consider technology solutions enabling monitoring of supply chains with better options of tracking of freight vehicles.

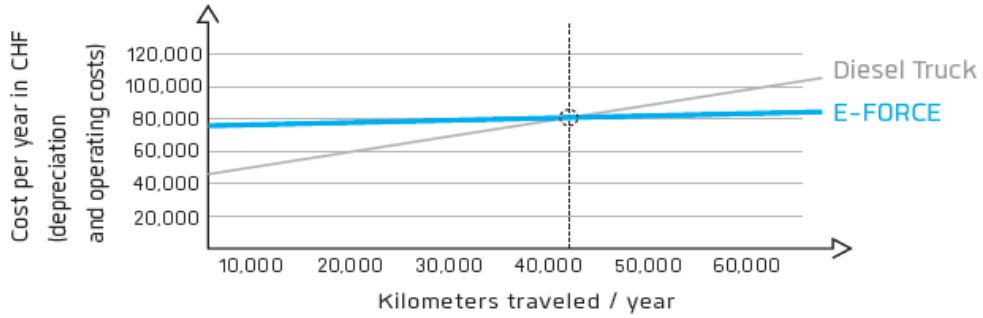
Overall the experiences show that a reduced need for specially adapted trailers, containers and/or wagons boosts the transferability and market penetration of intermodal services.

3.3.3 Decarbonising

Greenhouse gas emissions have decreased in all sectors in Europe between 1990 and 2005 but absolute emissions in the transport sector have grown by 26%. Road transport is by far the biggest transport emission source.

Decarbonising supply chains and freight transport on all levels is a central paradigm in the work of all BESTFACT clusters. The majority of cases collected contribute to this target. No case with adverse effects was admitted. Especially with reference to intermodal transports technological solutions on rails can only contribute a limited share to the overall logistics performance. As detailed in the urban freight cluster (see chapter 2) the last mile solutions and especially also the road vehicle performance play a critical role. In the following cases are presented which relieve logistics operations in terms of CO2 emissions which are not clearly grouped in the intermodal technology section of this report.

Foremost a focus is on innovative truck engines. An important solution is employed by the Swiss transport and logistics service provider PLANZER which operates an 18 tonnes electric truck from the Swiss manufacturer E-FORCE. The truck is fully integrated into the company's transport operations. The integration of the electric truck into the PLANZER operations is intended to generate valuable experiences with the new technology in the general daily business and prepare for future expansion of the fleet. The use of the truck is limited only because of the range issue, which is acceptable as the batteries can power trips up to 300 km; while the average length of the E-FORCE daily tour is about 125km. The use of an electric trucks within the existing fleet of delivery vehicles has an overall positive impact, both on private and public stakeholders. PLANZER is satisfied with the reliability of the new technology which proved to be efficient in real conditions. The single electric truck allows to save 15 tons of CO2 annually.



Due to low operation costs, when exceeding 42,000 kilometer per year, the E-FORCE is the more economic option compared to a diesel truck.

Figure 22: Operational cost comparison E-FORCE vs. Diesel truck - eforce.ch

The Nordic region is a sparsely populated area which translates to long transport distances. To increase the efficiency on the main transport routes which are not serviced by rail the High Capacity Transport Corridor (HCTC) concept was established. It is based on a technological innovation providing a parallel development of alternative fuels and the required infrastructure for long distance transports. The final goal of GreCOR is to create a fully functional High Capacity Transport Corridor between the Oslo and Ranstad (NL) areas. The innovative technological aspects of the HCTC have created a unique pilot, which delivers important reduction on emissions and results in a more efficient system. However, there are required infrastructures and regulatory changes that are needed to expand such a system. This makes its implementation specific to certain areas.

To explore further possibilities for alternative truck technologies the ENUBA project was established to determine whether the existing electrification technologies can be used for different applications in heavy freight transport on highways. In addition, the study examined the potential economic and environmental benefits of implementing an electrified freight traffic system through the use of overhead contact lines above highways (as an eHighway) with trucks connecting via pantographs and hybrid engines as backup systems. Only the combination of the feasibility, a viable market proposition and a working field test prove the innovation potential of this case. Apart from the already proven economic and environmental benefits, ENUBA provided highly promising results in terms of technology. One of the main goals of the solution was easy transferability and implementation of the system on public roads in the hands of administrative bodies at national level. The practice makes sense on highly frequented highways and also in urban areas with high traffic volume. ENUBA 2 and its predecessor are an innovative example of how electrification could be applied in heavy freight-road transport. The system could also be used in other areas (e.g. eBus) and could have an important role to play in densely populated areas in which switching to other modes (e.g. rail) is limited. The pilot in Berlin is following the concept already tested in Los Angeles, and therefore, proves the potential for transferability of the ENUBA system.

Figure 23: ENUBA vehicle by Siemens/Scania - www.siemens.com/press/photo/soicmol201428-09d

Still the last mile operations with high transport volumes end in cities. Therefore the research in urban areas is of certain value for the decarbonisation of the entire transport. The city of Valencia is trialling a new, innovative delivery system thanks to the SMILE (Smart green Innovative urban Logistics for Energy Efficient Mediterranean cities) project. The Valencia project on electric mobility is being coordinated by the “Valenciaport Foundation” along with the participation of the City Hall of Valencia through the InnDEA Foundation. In the framework of this pilot, two electrically assisted tricycles are delivering parcels within the historical city centre. In this area, the distribution of goods is the most complicated link of the transport chain given the complexity of the maze-like streets, one-way system, limited access and passing rights in streets and the saturation of cargo loading and unloading in designated areas. In this context, tricycles offer an agile, silent, flexible and green alternative to traditional delivery vans. The pilot scheme is also supported by the use of a micro-distribution platform that manages the interchange of goods. Logistics operators deliver goods and parcels first thing in the morning to a platform. A key success factor was the involvement of the public sector as well as commitments of the main stakeholders. Additionally, main congested and problematic areas could be identified in which delivery with traditional vans is difficult. The subsidized service during a certain pilot period could convince logistic operators and show them the practical benefits.

The decarbonisation of logistics services through the use of waterway vessels is reflected in the case of Vert chez vous and Franprix. Vert chez vous has a fleet of vehicles for the next-day distribution of goods in the cities of Paris and Toulouse, operating only with bikes or vehicles on electrical power or natural gas for vehicles. A river shuttle ("Vokoli" barge) provides multimodal distribution for packages. The Vokoli makes five stops. At each stop, a delivery team by bicycle leaves to make deliveries in the area (tours of 1½ hours), then re-joins the Vokoli two stops further on.

Figure 24: Vokoli barge in Paris - vertchezvous.com

Efficiency gains are sought by integrating barges and inland waterway transport to circumvent congested roads. The distribution of Franprix is organised similarly, with their deliveries by inland waterway vessel to nearly 100 Franprix stores in Paris and the town of Boulogne-Billancourt. Once the barges reach the city centres the shipments for the stores are loaded onto trucks. Thus congestion in transport is avoided, almost 4,000 truck trips are saved and the reliability is increased. Required investments were made by the Port of Paris to renovate the quay. The cases show an innovation by integrating IWW vessels in green transport chains and reliably linking to the last-mile transportation modes. The cases have been successfully transferred within France and are only limited in their extensibility through the availability of appropriate waterways.

Even the technology on waterways shifts to new propulsion technologies. The research project to develop a vessel for inland waterway transports fuelled by LNG started in July 2009. The first stages of development were completed in the first months of 2010 and it was decided to continue the project. The Argonon is the first vessel on dual fuel in Europe, i.e. LNG as main fuel (80%) and diesel as fuel for ignition (20%). The construction of the vessel was in parts funded by the European Funds and Regional Development. The positive experiences made outweigh the challenges with the resulting benefits:

- Although the fuel consumption remains the same. The Argonon uses a less expensive and more environment friendly fuel type (LNG).
- A strong decrease in CO2 emissions (around 20%): after almost a year in operation, Argonon has saved 157,526 kg CO2.
- It also reduces NOx (around 50%) and PMx emissions (to almost zero) mainly due to the use of micro turbines also pollution of the surface water is not possible
- The micro turbines do not require any lubricants and/or coolants. The micro-turbine emits a low level of sound: 65 dB (within 10 meters)
- Service intervals can be extended due to the cleaner combustion, which decreases the total cost of ownership

To monitor the success of the project Argonon there is an online counter indicating the saved CO2 due to the ship operation on the webpage[1].

Figure 25: Argonon vessel – deenshipping.com

Also conventional propulsion systems together with efficiency optimisations can lead to cleaner transport chains. The 400m long 18,000 TEU vessel Triple-E sails on the Asia to Europe route, which represents business at a current value of several billion Euros for Maersk. Combined with an energy saving propulsion system, its size is a major factor in its efficiency and performance. Between 20 to 50% of GHG emissions savings can be realised compared to other vessels on the route. This comes at an estimated 16% cost increase for the vessel investment.

Reducing emissions at the source is an important part. Within BESTFACT attention was also given to solutions which aim at consolidating calculations of emissions into comprehensive information. The calculation tool EcoTransIT is a standard solution on the market in identifying the environmental impacts of freight transportation in terms of direct energy consumption and emissions from the operation of vehicles during the transport of products. The calculations also takes into account the indirect energy consumption and emissions related to production, transportation and the distribution of energy required for operating the vehicles. EcoTransIT can quantify the environmental impact of a company's logistics activities as part of an environmental balance sheet. Thus, EcoTransIT is a decision-making tool that helps to optimise the logistical chains and networks of a company's distribution activity and deliver reliable data for external communication. EcoTransIT helps companies to meet the environmental performance standards of the Eco-Management and Audit Scheme. The main benefit of the tool is the facilitation of reduced CO2 and other greenhouse gas emissions. Stakeholders also benefit via increased transparency. In the longer term, the structure of the transport chains will be affected, as companies will avoid less efficient solutions, and ask for higher technical standards for the their carriers' vehicles.

Similarly, the TK'Blue case is an example of how to assess the energy efficiencies of transport operators. TK'Blue allows different companies to comply with CO2 reporting requirements and also represents a marketing and Corporate Social Responsibility benefit to those companies using this system. Having an independent agency dealing with the provided data in a transparent way is a positive aspect from this best practice that could be replicated in other countries, depending on the CO2 reporting requirements. The innovative and unique process based approach is one-of-a-kind in Europe and demonstrates the strength of private initiatives based on cooperation and willingness to comply to set standards.

[1] http://www.deenshipping.com/en_US/co2.html

When considering the technological innovations aiding the decarbonisation it becomes apparent that they are still associated with high investment costs. The collection of best practices shows that there is still an abundance of cases working in similar directions with missing coordination. With few exceptions innovations are not stemming from the major industrial leaders in their respective fields. Automotive technology in trucks and road transport is only slowly moving to electric engines. This might be still due to popular demand and reduced pressure on fuel costs in recent years but also hinders a full market penetration. There are many different solutions available, true economies of scale are difficult to achieve until dominant technologies emerge for road transport. Other solutions benefiting the decarbonisation such as alternative modes and logistics services have usually a niche where they function to a high efficiency. Their transferability is more limited but industrialisation of production of CO2 efficient water vessels will contribute a large share to emission free supply chains. The use of cleaner vehicles depends widely on expected additional benefits. Efficiency gains and monetary benefits are the main drivers behind implementation of cleaner vehicles on the private business side. GHG reductions alone do not convince users to switch to new technology.

3.3.4 Collaboration

Collaboration in freight transport and logistics is a traditional focus topic. In the past decades though it became increasingly more important. This is mostly due to ever expanding possibilities to exchange data and coordinate with ease. Communication is a key success factor for new business models. BESTFACT collected cases which focus on collaboration along the transport chains and shows where competitors bundle efforts to reach synergies to strengthen common market positions.

The CO3 project detailed the 'Carpooling for Cargo' concept with the purpose to facilitate horizontal collaboration between multiple independent shippers and LSPs pro-actively working together in clusters or communities to bundle their overlapping freight flows. "Bundling" in this context means that the compatible freight flows of the shippers are consolidated in space, as well as synchronized in time. As in traditional logistics, the actual bundled supply chain of the community is outsourced to and physically executed by a logistics service provider. Revenue models allow multiple shippers to share synergy gains. The horizontal collaboration requires the intervention of a neutral 3rd party to maximize the gains of the community. A trustee is needed when the collaborating shippers are dealing with confidential data or when they operate in competing markets, when they want to redistribute synergy gains or when they need to synchronize operations on a daily basis. CO3 is an innovative attempt at stimulating horizontal collaboration between European shippers. Most of the innovative building blocks for horizontal collaboration already exist, but are not yet widely known and tested in the logistics market.

Less focused on the role of actors is the collaboration approach in transport corridors. Along the East-West Transport Corridor (EWTC), which crosses territories of more than 10 countries belonging to different economic communities and systems, there was a lack of management structure. Since many businesses usually have short-term perspectives coordination of activities on the corridor was necessary for its development and branding. The EWTC Association adds a medium and long-term perspective to the corridor, and contributes to the improvement of its functions and capacity. Moreover, the Association is in dialogue with governmental and international institutions which could not be successfully maintained by individual companies. The EWTC Association is commonly regarded as working successfully, e.g. creating the stakeholders cooperation and business development, such as the *Viking Shuttle* (see dedicated BESTFACT inventory 2012), *Mercury* and *Sun* container trains. The EWTC Association provides a well-established corridor management supporting setup of services. It provides an important impact at reducing administrative and regulatory inefficiencies, giving access to different modes of transportation and enhancing the cooperation and visibility of the different actors involved as well as a link to other transport corridors.

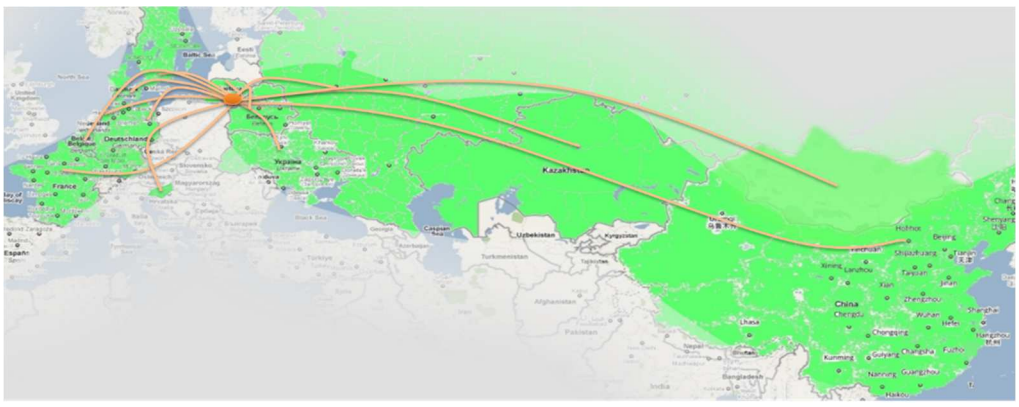


Figure 26: Location of partners of International East-West Transport Corridor - EWTCA Secretariat

A few years ago, the Sportina Group decided to centralize capabilities of servers in one place. The main motivational factors were the achievement of higher efficiency and reliability, an optimized workflow and organisation with less manual input. Therefore Sportina developed its own information management system, incorporating automatic data transmission to its suppliers. Before its implementation, an agreement on ensuring individual destination required packaging with suppliers was reached which translates into a wide collaboration approach. Barriers were at first identified due to the large scope of goods and supplies which make centralisation of logistics in one place appeared to be highly complex and hard to manage. The Sportina Group solved the issue with an automatic data transmission to their partners. After the implementation of the direct supply of goods to the final destination, the need for additional repacking vanished. The main supplier is now producing declarations with all legal requirements and therefore there is no need for additional declarations. All documents needed for business activity within the EU are not printed anymore, full communication and associated documentation is implemented electronically and paperless.

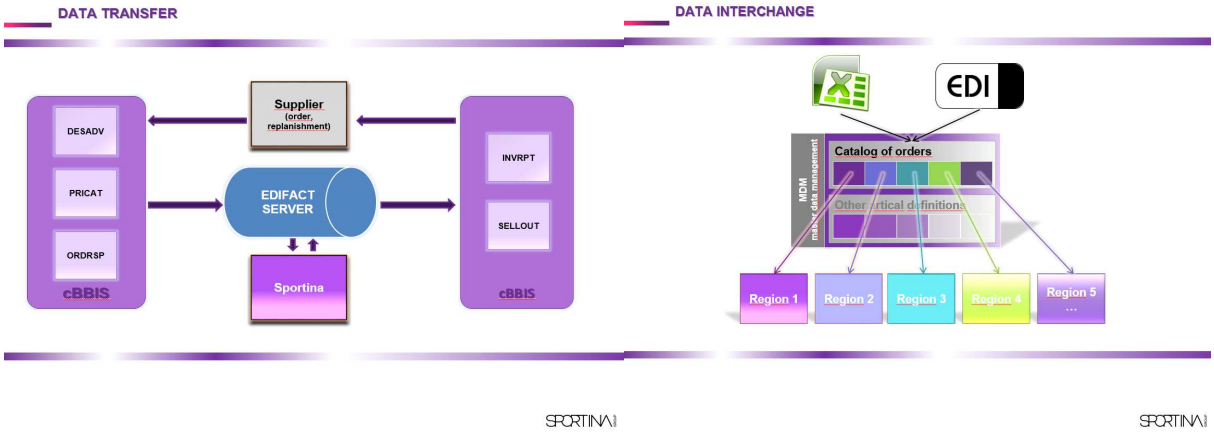


Figure 27: Sportina data transfer and interchange schemes

Today, supermarkets are moving towards a zero-stock policy, meaning parcel deliveries for almost all of the orders. For the supermarkets, delivery pooling is advantageous insofar as it meets their need for just-in-time delivery and can halve the number of deliveries arriving at their depots. However, the policies of the distributors, like those of the carriers, now significantly increase the disadvantage of remote areas. The supermarkets now require those who supply them to send products more frequently and in small batches. This high rate of shipments, imposed on the ultra-fresh market by the very nature of the products, now applies also to the canned and preserved food sector. These producers now have to reorganise their shipments and have to find almost daily delivery solutions to comply with the time limits insisted upon by the distributors. The carriers are in a position to force their pricing policy on isolated producers, whose peripheral location is not profitable, so carriers impose additional costs per lorry. In February 2011, five companies from the Breton region officially agreed to pool their transport systems by signing the statutes of the “GIE des chargeurs Pointe de Bretagne”. “GIE” stands for ‘groupement d’interêt économique’ which means mutual economic interests collective. Their collaboration entails negotiations for logistics services, common use of material resources and a common approach to implement logistics innovations. The GIE does not manage the lorries, just the flow of goods. It involves putting more merchandise into the lorries, a similar principle to that of car sharing. The pooling project had huge benefits for public and private stakeholders since it contributes to maintaining the competitiveness of existing businesses but also makes the local area more attractive: the businesses that join the GIE will be integrated into an attractive and already operating system.

To reduce costs, five hauliers, freight forwarders and shippers have pooled their freight flows departing from Le Havre. The shipping companies, freight forwarders and shippers are working together as a Small and Medium Enterprise (SME) group to manage their import and export flows. This mutual distribution system led to optimised collection and distribution of lots, saving time in organising transhipments and allowing for route optimisation and better capacity utilisation. This mutual distribution service is based on a charter of corporate behaviour, co-written by each of the participants. Companies that might otherwise compete with each other are committed to working within a framework of respect for competitors and exchange of information. The experiment has allowed a mutual distribution system (MDS) to be defined and created for optimised collection and distribution of lots. It saves time in terms of organising shipments, guarantees a better filling rate and allows routes to be optimised. Therefore, the framework in place can respond to a request for transport capacity within half an hour. In the low range, it is estimated that the number of lorries on roads easily decreases by 15-20%.

As an example for larger scale initiatives taken on the private side the organisation of Mondelez gives a practical insight in their optimisation processes. As a true global player they are under close supervision to optimise its operations for efficiency as well as sustainability. In their presentation at the BESTFACT workshop in Vienna “Developing a sustainable impact via road traffic avoidance at European level” Mondelez showed concepts how they manage international transports, mainly between plants and warehousing. Their focus is not only on transport management, but the optimization of the whole process. Mondelez auctions the transports and then orders them. Before this measure, higher tariffs where paid while their transport operators were not fully optimised for their load factors, resulting in inefficiencies. The idea was that by reducing the transport costs, Mondelez would pay less and the transport companies themselves would optimize their transport loading factor (reducing the empty runs). Even though, the transport operators have improved, their benefits are still not optimal. Thus an optimisation is not translated into profits for all the stakeholders.

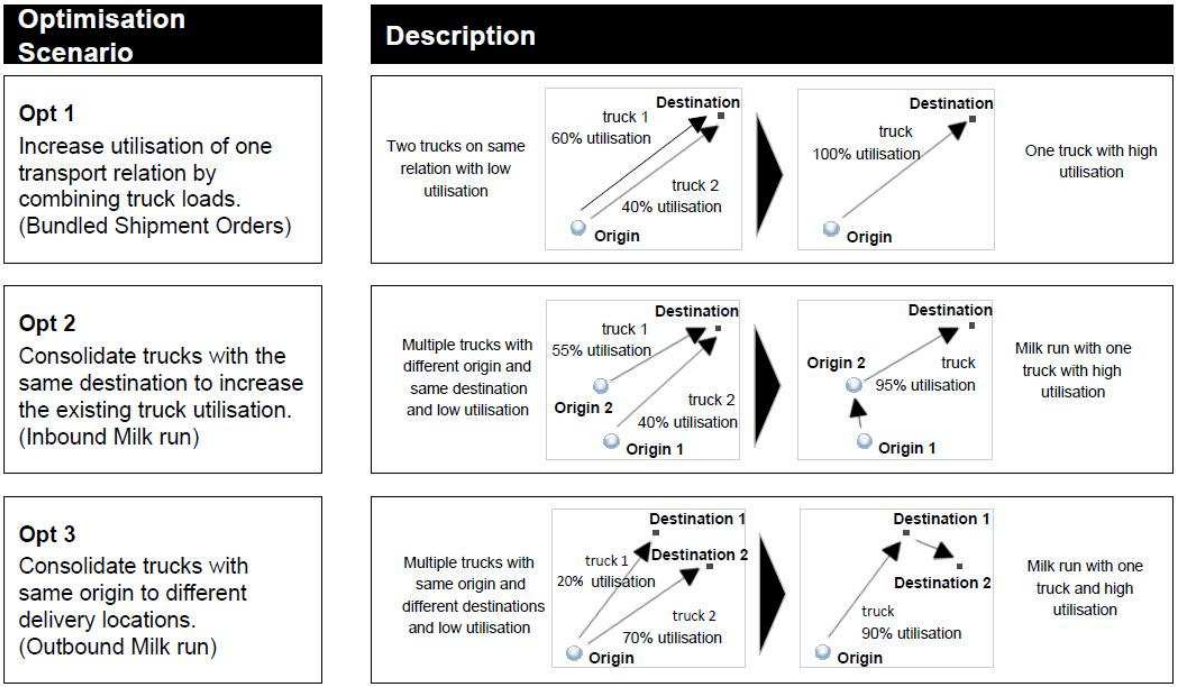


Figure 28: Mondelez Optimisation Scenarios – Marco Polo Project

The multitude of different cases gives an overview on the unique forms of collaboration possible today. The examples of collaboration models have a high level of transferability due to their nature of involving multiple actors, sometimes with different backgrounds. They cater

to some unique situations but considering Europe as one market there are for each solution multiple fields to be replicated.

Unifying effects of regional collaboration demonstrate that businesses can successfully cooperate even though they have a common customer. A thorough understanding of the complete supply chain allows for diverse options to strengthen even competing enterprises by simultaneously improving common aspects of logistics. Mostly this gives even smaller players options to be perceived as a strong negotiation partner when appearing as part of a successful collaboration entity.

4 Cluster 3: eFreight

The term eFreight has been used for EU policy and is the name of an EU-funded research and development project. Consequently, for use in the context of BESTFACT, which is about presenting best practices related to logistics, a clear and unambiguous definition of the scope of the eFreight Cluster was required, so that appropriate projects and systems and solutions which belong in the best practice categorisation of the project can be provided. eFreight provides the common framework for information exchange in multimodal transport of goods. The BESTFACT Cluster 3 'eFreight' observes, reports on, and disseminates information regarding activities that are part of the eFreight developments in order to promote and facilitate the implementation eFreight concepts.

The scope of the eFreight cluster is defined using the reference model for freight transport and logistics as a basis.

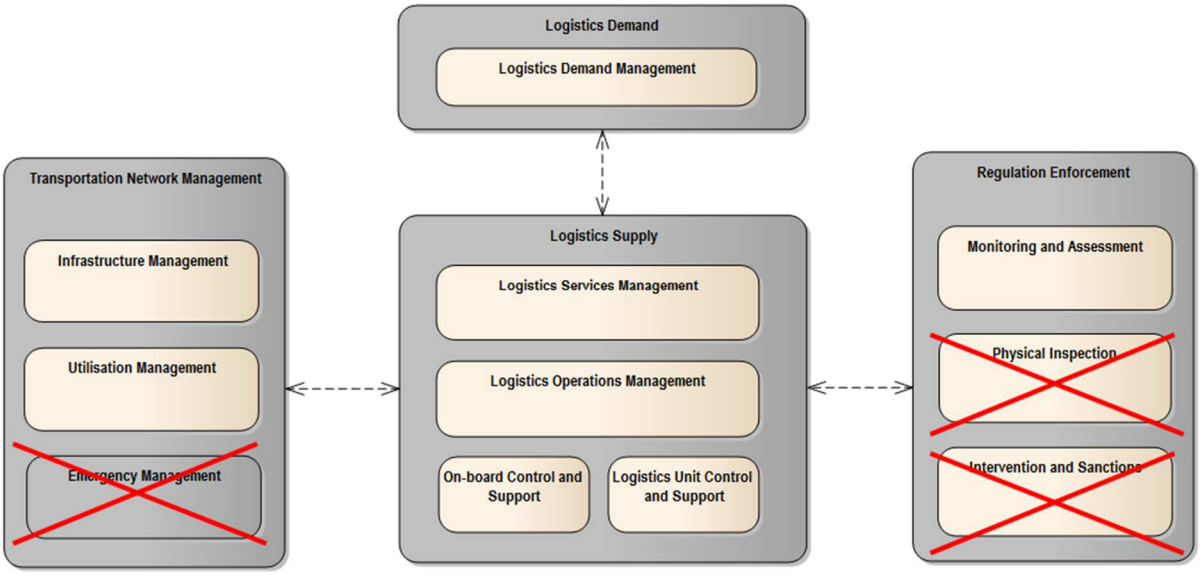


Figure 29: eFreight reference model

The users of the projects/systems/solutions/services that are within the scope of the eFreight Cluster are related to the Logistics Demand and Logistics Supply domains. Logistics Demand is the domain of the transport users, or the Logistic s Services Clients (LSCs). Logistics Supply is the domain of the Logistics Service Providers (LSPs). In this project, LSC comprise Freight Forwarders, Intermodal (or Combined Transport) Operators, Carriers in all modes as well as Terminals of all kinds (ports and inland).

4.1 Collected cases

In the BESTFACT work a total of 49 cases were classified as best practice in this cluster. The following table gives an overview of all cases in this cluster. The case numbers are directly linked to the PDF version of the Quick Info Sheets of each case, provided in the project.

Year	Case Name	Case No. and Link
2012	Visy Access and Area Control	Nº 3-089
2012	ParckR – Information system for truck parking	Nº 3-062
2012	TIEKE Verkottaja Service (TIEKE, The Finnish Information Society Development Centre)	Nº 3-088
2012	Truckinfo	Nº 3-079

2012	Freight and Goods Information System-KIPIS	Nº 3-095
2012	Monitoring and Operation Services for Motorways of the Sea (MOS4MOS)	Nº 3-003
2012	e-Cargo Pouch, Make paperfree global cargo a reality	Nº 3-092
2012	KoKoBahn: Verbundprojekt KoKoBahn Koordination und Kommunikation Bahn	Nº 3-050
2012	FREILOT- Urban Freight Energy Efficiency Pilot	Nº 3-058
2012	Implementation of an IT system based on the APOLLO Framework	Nº 3-098
2013	MixMoveMatch (M3)	Nº 3-007
2013	AMATRAK - Autonome Multiagenten Transport Koordination	Nº 3-100
2013	Italian VTS, focusing on PMIS (Port Management Information System) subsystem	Nº 3-083
2013	Application of a new routing and loading system for road freight transport of pallets – Optrak	Nº 3-133
2013	Single Window Odessa	Nº 3-115
2013	ITS Adriatic multi-port gateway developed by the Northern Adriatic Ports Association (NAPA)	Nº 3-107
2013	Smart Port Logistics at Hamburg Port	Nº 3-105
2013	FREIGHT 4 ALL - A distributed and open FREIGHT transport ICT solution 4 ALL stakeholders	Nº 3-122
2013	Corridor Strategic Planning and Monitoring - CoSPaM	Nº 3-108
2013	FREight Transport Information Technology Solutions (FRETIS)	Nº 3-131
2013	IXSuite	Nº 3-116
2013	Freight Arranger	Nº 3-097
2013	MODINT – Bundling at the source	Nº 3-132
2014	Cargo Monitor	Nº 3-136
2014	Palletways POD (Proof Of Delivery) and PASS (Palletways Archway Scanning System)	Nº 3-145
2014	TRANSit project. E-platform for intermodality	Nº 3-149
2014	Track.Agheera – independent telematics platform	Nº 3-142
2014	Miscobiva – Management Information System Container Binnenvaart	Nº 3-112
2014	Intermodallinks	Nº 3-113
2014	ePort - Port management system incorporating RIS	Nº 3-022
2014	Multimodal Interoperability E-services for Logistics and Environment sustainability – MIELE	Nº 3-154
2014	Black Box	Nº 3-157
2014	ICT system SAIL	Nº 3-153
2014	Rail wagon and locomotive identification, case VR Transpoint	Nº 3-158
2014	Goodpack Bulk Container Tracking System	Nº 3-162
2014	Lithuanian state border crossing online booking system (EVIS)	Nº 3-144
2015	BLU (TaT project) - control system for container-loading stations in intermodal transport	Nº 3-053
2015	LISy - Logistic Information System	Nº 3-152
2015	T-TRACO	Nº 3-161
2015	GAIA-Generalized Automatic exchange of port Information Area	Nº 3-169
2015	ARGES: pAssengeRs and loGistics information Exchange System	Nº 3-170
2015	The Adriatic Port Community (APC)	Nº 3-171
2015	Central Booking Platform CBP	Nº 3-173
2015	GS1 Despatch Advice	Nº 3-168
2015	CargoSpace24	Nº 3-172
2015	Coop@home deliveries	Nº 3-174

4.2 Cluster topics and challenges

The role of ICT in transport and logistics has become increasingly important throughout the last decades. This stems from the increased demand for efficient, fast, reliable, flexible and safe transport operation, and the transport users´ request for readiness of information on shipments and cargo. In transport chains that consist of several legs, several actors are involved. The information flow between the actors along the transport chains is often fractioned. This

causes missing and incorrect data and unnecessary delays. This is especially true for transport chains where more than one transport mode is involved. In particular, there is still a lot of paperwork around all phases of transport (transport planning, execution, and completion), requiring re-entry of data, which is regarded to be an obstacle for correct and efficient information processing.

Moreover, the information flow between the actors is not standardized. This is a result from the fact that many actors each have their own tradition and idea of information exchange and information processing. The diversity of information and communication equipment and data formats used has become a problem for the introduction of advanced ICT systems, as necessary tailor-made interfaces are very costly.

This problem does not only affect the business-to-business (B2B) relationships in the transport-related information flow, but also the communication between businesses and authorities (B2A/A2B) as well as the exchange of information between authorities (A2A). So-called 'one-stop administrative shops' mean that there are single access points that co-ordinate the administration and speed up processes. With these single access points, necessary trans-port-related documents will have to be presented to authorities only once. The implementation of the paperless customs procedures aims in that direction. A variety of advanced ICT solutions has been introduced in the transport and logistics industry. Examples are:

- freight forwarding software with various functionalities,
- route planning systems,
- e-commerce platforms,
- online freight exchanges,
- integration into ERP systems of shippers, or
- GPS-based vehicle tracking and online tracking and tracing for clients

Despite this, there is still a lack of efficiency and consistency in the flow of information regarding the transport documents that are exchanged and regarding the large number of communication relationships among the actors involved. Moreover, Intelligent Transport Systems (ITS) are regarded as an enabler for a paperless information trail in the management of the physical flow of goods, but for this purpose their implementation and usage should be accelerated and co-ordinated across Europe.

European transport policy addressed these issues and introduced the concept of eFreight in the "Freight Transport Logistics Action Plan", which was followed up during the Swedish Presidency in 2009 through development of a roadmap for eFreight. The ITS Action Plan and Directive (2010) also refers to eFreight in relation to interfaces between road transport and other modes. The policy development is continued based on the latest version of the White Paper for transport, where eFreight is identified as one of the important initiatives.

4.3 Case analysis and conclusions

In the eFreight cluster the emphasis in solutions was put on

1. ICT based collaboration solutions
2. Standardised, paperless information exchange and platforms
3. Port and terminal related IT management tools
4. Integrated ITS in freight operations

The cases are analysed grouped into these four topics. Each topic section will also provide a short summary of the impact of the topic on the logistics and freight transport market.

4.3.1 ICT based collaboration solutions

Within the eFreight cluster the integration and role of smaller enterprises with international transports is an important challenge today and for the future. Smaller SME have innovative solutions to integrated aspects of supply chains. Also the majority of logistics providers are small or one-man operations which have to be integrated into freight logistics efficiently. In a modern streamlined logistics environment it is essential that even smaller players are able to offer services which can be requested or integrated into third party offers by all the other actors involved. Cooperation along all supply chain services and with important transport players is quite difficult, thus preventing possible synergies and collaboration between users. The analysed cases show an effective use of ICT in smart freight transport and a progress in collaboration to the advantage of the entire logistics market.

CargoSpace 24 was developed as a user friendly web portal for real time matching of possible transports with the closest available capacity. It is the first independent online system in Europe, where the transport buyer can view and book free capacity close to the cargo position directly on the web in real time. The intuitive interface as well as the easy use of CargoSpace24 was identified as a main success factor. Additionally, the project is based on a simple business model - users only pay for matches made. The fact that the portal works on computers as well as on mobile devices contributed to the success. For its customers, the service offers better profitability – transport buyers can negotiate better prices, transport providers make pure profit while reducing empty space on board their assets. For Cargospace24, the opportunities come from growth both in terms of geographical scope and by extending the functionality (e.g. by allowing companies to monitor their environmental performance). For its customers, the service is a chance to counterbalance the negotiating power of the big players (both shippers and LSP's) by being able to do business directly small business-to-small business. Initial problems were of technical nature. Afterwards, the only problem was (and still is) the number of users and volume. There already are similar cases in other European countries, like Germany (TimoCom Germany) or Belgium (Teleroute Belgium).

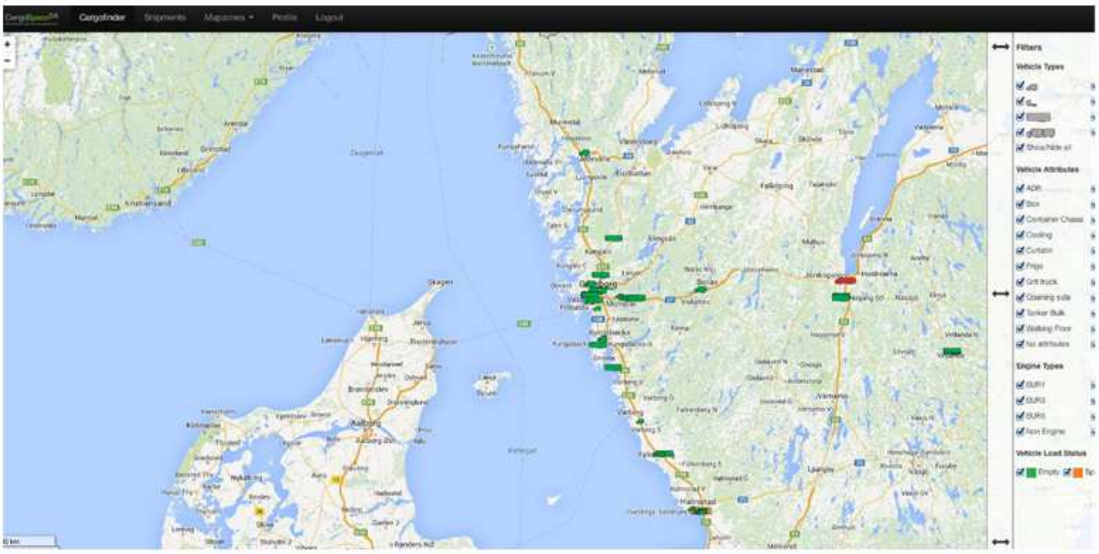


Figure 30: CargoSpace24 Portal for transport buyer

The KoKoBahn (Coordination and Communication Rail) platform facilitates simple and cost-efficient electronic data exchange between seaports and actors involved in intra-port and hinterland-related rail-way transport. All communication partners send their data from their system via existing standardised interfaces to a common platform. There, first, all data destined for the recipients´ systems are checked whether the transaction partners (sender/recipients) communicate using the same data format. If this is not the case, the data will be transformed into XML format and converted coherently from XML into the data format accepted by the recipient. Then the converted data is distributed to the recipient. In addition to the communication benefits KoKoBahn leads to a faster handling of trains which do no longer have to wait for information processing. This increases the dynamic capacity of railway networks such as port railways. Moreover, the risk of delays is reduced, and shorter transit times are expected at interchange points. This leads to an increased quality in transport.

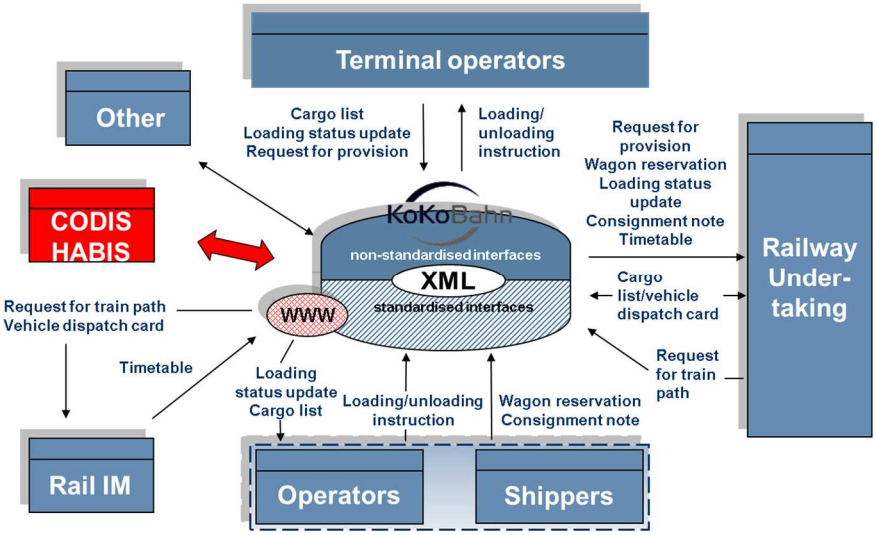


Figure 31: KoKo-Bahn scheme

MODINT provides a good example of how eFreight can improve the efficiency by combining process redesign and IT systems. The approach is based on bundling freight at the source and thus shifting a last-mile logistics challenge to the first mile. Because the first mile in this case is located in China the work can be fulfilled already more cost efficient. Also the overall transport chain waiting times are used more efficiently in the warehouses after production, instead of at the destination, where labour and transport inefficiencies are more costly..

The MixMoveMatch concept was originally developed by an industrial shipper. Now MixMoveMatch.com is provided online as Software as a Service. It is designed to support logistical concepts across company boundaries. Therefore, the data handling becomes a sensitive issue. In turn it can be seen as a collaborative approach for cargo bundling, which benefits from increasing user numbers, while still maintaining data security. Furthermore MixMoveMatch can be simply integrated into TMS, WMS or ERP systems. It addresses both business and policy objectives and shows a high positive impact on both the efficiency and sustainability of the logistics sector.

Figure 32: The MixMoveMatch.com service

FRETIS is a modular software package that provides the user with a complete and comprehensive tool for the management and control of all intermodal transport related operations either in terminals or along the transport chain. FRETIS does also cover e.g. controlling of the terminal gate processes, terminal resource planning, railway transport planning, electronic document handling or administration. Compared to FRETIS, the IXSuite has gained more commercial awareness and its development is more driven by the requirements of general customers. The IXSuite is a co-modal TMS making use of existing standards, providing a wide range of options and possible individualisations. In the topic of co-modal journey optimisation also other BESTFACT cases work along the same principle as the IXSuite. As is the case for IXSuite, terminal gate processing, train loading and truck operations planning are covered. This is where the IXSuite provides an innovative benefit. FRETIS seems to be too sophisticated for the purposes of a medium-sized transport service provider with regard to the integration of the many technologies involved.

Coop@home is the home delivery service of the Swiss retailer Coop. Coop@home implemented the “Pracar” solution by Wanko to despatch their 128 transporters daily for an average of 3500 deliveries to customers. Before the implementation of the new solution, a simple tour planning software was used. This required a large team to provide the same service due to a limited amount of automation. More manual checks were needed and more direct communication between drivers and dispatchers was required. An automation of processes was the goal and a high customer growth rate was anticipated. An automated dispatching grants low costs, which contributed to the success of the project. Another aspect was the adaptability of a dispatching solution which allows an easy integration into existing systems. A good cooperation between developer and customer was proven to be another key factor for the success of the project.

Offering opportunities especially for SME. The identified ICT solutions in the BESTFACT work offer opportunities for smaller companies, especially SME, to work efficiently along supply chains. Solutions which provide interfaces for collaboration and better communication are taking over wide part of identified eFreight cases.

Solutions increasing the efficiency of larger corporations are nonetheless prevalent and companies are constantly developing new approaches to strengthen their competitiveness. It is just the case that as best practice these solutions are rarely visible to outside experts and their transferability proves to be limited. Along with necessary confidentiality requirements the multi-million Euro cases are less attractive for SME and a structured best practice case analysis. The

most successful BESTFACT cases in eFreight offer leverage for SME and a collaborative bettering of logistics.

Cargospace24 is an SME itself and all their customers are SME. Today, Cargospace24 is fully independent of transport buyers and providers. This fact allows for unbiased matching service as well as requested levels of confidentiality. For a market like Sweden, where 43% of transport companies are one man-one truck operations this means that SME can find cargo without being at the mercy of the big players. For further communication means and participation in more complex logistics schemes KoKoBahn supports SME to easily take part in the system. KoKoBahn's purpose is the secure, real time and detailed communication of rail-relevant data in form of services and formats, in order to gain synergy effects and more efficiency at railway companies and railway customers to enable them to make use of railway transport services to/from the seaports. There is the chance of equal access to relevant information for all actors involved. The involvement of (smaller) private railway undertakings in automatic data transfer increases their competitiveness in the sector of port-related railway transport.

In the MODINT case the solution benefits SME at the end of the supply chains. The collaboration of European partners leads to a significant volume of demand in shipments. Thus, through favourable conditions even smaller actors and SME can participate in the efficiency gains and economic benefits.

Even though solutions like Pracar for coop@home remain of limited usability for small enterprises (because a significant amount of traffic is required until a comparable dispatching tool is useful and efficiently used). Most other presented cases in this topic enable a more independent participation in freight transport and logistics for even for smaller actors. A one for all solution is not available, a more in-depth evaluation for interested parties is necessary and commonly a will to participate in collaborative approaches is required for SME to successfully increase their business in freight transport and logistics.

4.3.2 Standardised, paperless information exchange and platforms

A key challenge identified in the eFreight cluster is the problem along border crossings or with international transports. There are significant cultural differences related to legal issues, procedures or just language involved in most transport activities today. The focus is on data exchange in standardised formats, crossing system barriers as well as language barriers to allow efficiency gains in co-modal transport chains.

In the current typical multimodal transport scenarios the different actors involved in the transport chain, interact using various information and communication protocols or transport logistics back-end systems. Their current ICT capacities have great differences and a significant fragmentation. Furthermore, some of them have a low technological capacity: they don't have IT solutions or they don't use specific tools for their communications; the exchange of information takes place only via fax, e-mail or, phone calls. Thus each player is able to produce information which cannot be used by all the other actors involved. Furthermore, the direct control on the cargo, for the freight integrators or transport managers, is quite complicated as the process is not transparent and smooth. Also the cooperation with other important transport players is quite difficult, thus preventing the possible synergies and collaborations framework between users. For the presented cases the challenge is the interaction between all transport and traffic functions in the ecosystem.

Within the BESTFACT project "Simplifying Standard Message Exchange" the Finnish Information Society Development Centre TIEKE developed possibilities for companies located in different EU countries to take electronic data interchange (EDI) faster and easier into use. The

target of this project was to create a web site containing standardized implementation guidelines of four main information flows (Transport Order, Waybill, Despatch Advice and Transport Status) by utilizing knowledge and experiences of TIEKE. This enables companies to build standard interfaces in electronic data interchange between partners in the transportation branch. The materials created in this project are suitable for all companies, but especially SME companies can benefit greatly due to reduced development efforts. The output contains directions on how to exchange information contents of the four main documents by electronic messages between partners in a structured form. A developed guide gives information on how to take electronic data interchange into use effectively taking into account all the matters required while building electronic connections. TIEKE build a repository for the documents created in the BESTFACT project, which is now a European source of recommendations and guidebooks for standard based electronic data exchange for logistics and all available to the public online[2].The messages are based on international standards and they are suitable for all industry sectors taking into account their special needs. Uniform implementation guidelines support and encourage organizations in European Union to use these standards in their daily business and in cooperation within the Union.

GS1 developed, in conjunction with supermarket chains, a uniform approach to connect suppliers to their system. The system describes guidelines for sending and receiving information through EDI messages and information on pallet labels and how to make sure they match. The goal was to have suppliers get the ‘GS1-deliverynote’. This is a sort of certificate that shows that they deliver goods according to guidelines set by GS1. These guidelines are developed together with parties in the food sector (which represent 90% of the “clients” of GS1), but are also used by companies in the DIY (Do It Yourself) sector and medical sector. FrieslandCampina started implementing the use of GS1 pallet labels in 2014 in cooperation with Jumbo supermarkets. At the end of the year they have successfully realised the first shipments under GS1 guidelines with the use of pallet labels and a corresponding EDI message. This will contribute greatly to quicker unloading trucks at the Jumbo warehouse, which in turn helps reduce logistic costs. GS1 (EDI-type message) is a well-known ‘language’ for communicating between logistics partners.

Figure 33: Pallet label and EDI message in GS1 despatch service

Palletways is an express palletized freight network, which consists of 300 members across Europe. The company's distribution networks are made up of independent transport companies which share each other's resources to deliver small consignments of palletized freight to market. To scan pallets the Palletways Archway Scanning System (P.A.S.S) is used. It consists of an array of cameras to take a high definition photo of every consignment handled. In addition, the POD system (Proof of Delivery) allows customers to obtain directly (without paper) the Proof of Delivery as a download from the customer’s portal. The Palletways solution is highly

[2] http://www.tieke.fi/display/bestfact/Bestfact+-+Data+Exchange+Handbook

innovative as there are no similar cases which integrate a recognition systems of loads with cameras as well as reception of paperless documents which is used by stakeholders throughout Europe. The Enterprise Resource Planning (ERP) is the 'core business' of Palletways, and ultimately responsible for dealing with all information sent and received by Mobile POD. All information is sent to the Palletways website where all members of the network can access all the information about all entrances and exits of all haul trucks in all hubs.

Figure 34: Picture of the Palletways Archway Scanning System

As can be seen in the highlighted collected BESTFACT cases the current typical multimodal transport scenarios, the different actors involved in the transport chain, interact using various information and communication protocols or transport logistics backend systems. Exchange of information takes place via fax, e-mail or phone call, which does not leave a visible trail and does not allow for an automated processing of information. Thus each player is able to produce information, which might not be used by all the other actors involved.

The Multimodal Interoperability E-services for Logistics and Environment sustainability (MIELE) project aims at designing and developing pre-deployment pilots allowing interoperability between ICT systems (i.e. maritime single windows, port community systems) in the logistic chain. One of the goals of the project is to pave the way to the implementation of EU Directive 2010/65, on reporting formalities for ships arriving in or departing from ports of the EU Member States. In order to facilitate maritime transport and reduce the administrative burdens for shipping companies, reporting formalities resulting from legal acts of the Union and of Member States MIELE promotes simplification to those operations that can be supported by Internet based-services. As a consequence, some of the major success factors are the enhanced ship operation services (such as e-Navigation, e-Maintenance, e-Rules, e-Certificates) and enhanced port/terminal operations e-services (such as traffic management, optimisation of movements of cargo, freights and passengers, inspections coordination port security management). The innovative aspect of the MIELE initiative lies in the middleware which aims at developing optimal solutions to interoperability obstacles leading to a middleware that will be deployable on both new and existing systems and that will provide interoperable access to data, information and knowledge across heterogeneous platforms and systems that can be useful to be interfaced to manage the entire flow of goods (such as VTS, VTMIS, AIS, RIS, ERMTS, etc.).

Efficiency in data and information sharing and handling can virtuously increase the efficiency in all processes along the supply chain. Resources are not spent in receiving or transmitting messages which have to be translated and adopted into systems. They can be invested in optimising physical processes which in turn can support data collection, e.g. by running through scanners or automatically transmitting data to following transport chain links or customers. All stakeholders thus benefit from the high level of on-time deliveries (or at least precise information on deliveries), due to consistency and accuracy in scanning and automatic data transfers. Transparency and traceability are added by offering real-time information to customers.

The experience in many countries with single windows and interoperable systems suggests a great simplification of the communication burden for the operators, a huge saving in equipment, traffic and manpower, an increase in efficiency and competitiveness, and a dramatic reduction of handling errors. The ambition to transfer formerly only national solutions to the European scope with a high acceptance across many cultures is on a good track.

4.3.3 Port and terminal related IT management tools

The eFreight cluster in BESTFACT delivered substantial solutions with focus on port and terminal IT management tools. The topic shows the widest spread of cases across Europe. Especially in Eastern Europe innovative solutions strengthening port communities and management of the operations were collected which, as the analysis shows, deliver great progress and transferability potential.

An excellent example can be found in the Klaipėda sea port, which is the most important and biggest node in the Lithuanian transportation system connecting the roads of sea and land between the Eastern regions of Eurasia and the West. The transportation of goods through the harbour is being regulated by various EU, IMO (International Maritime Organization) and national legal documents. All goods must be declared and presented for the inspection of customs and other national institutions following international convention. Cargo, goods and ships are being controlled by 7 national institutions; around 40 types of different types of documents circulate. While an estimated 70-80 percent of the data on these documents is just duplicated; many institutions required copies of the original files as well. The KIPIS system officially launched in 2007 is designed for transferring and processing information on freight movement via the port of Klaipeda. The main functions of KIPIS are provision of information required by customs and other state authorities via internet; data exchange amongst the system users to conduct procedures such as temporary storage of goods, import, export and transit, or any other customs formalities; electronic data exchange with the stevedoring companies for the purpose of placing and executing orders for handling operations. Its use provides the means to facilitate, improve, and accelerate the process of freight traffic moving through the port.

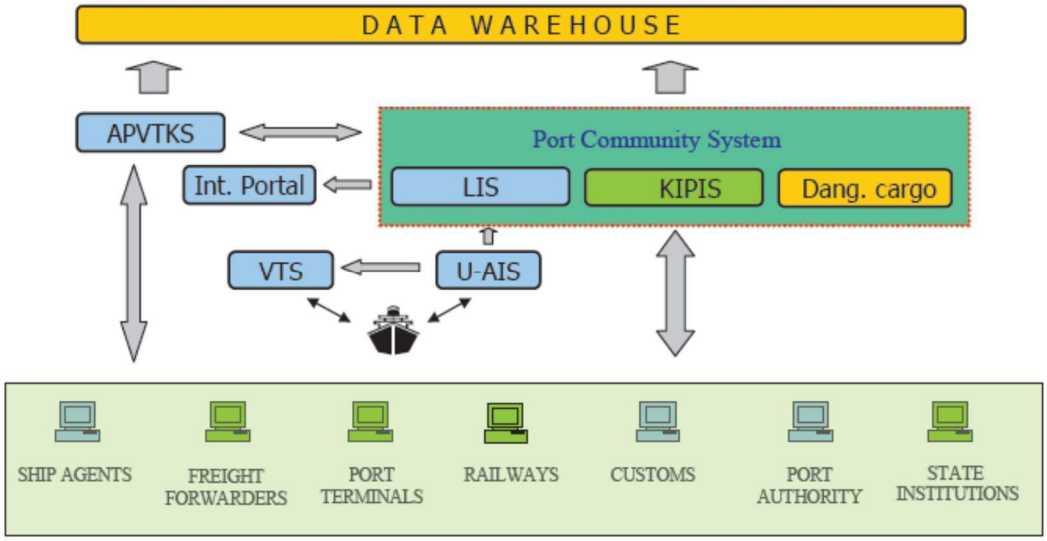


Figure 35: KIPIS scheme

The Single Window Odessa provides a similar case for the port operations on the Ukrainian coast. The single window allows all involved parties in all related transport processes and the state regulatory authorities to send and receive information from a single source (single information system), in a single format, on the basis of one-time submitted data (i.e. there is no need for re-entering of information). Before the implementation the entire document workflow in the Ukrainian ports as well as the planning of the workflow for import goods in the ports was carried out paper-based. The true innovation thus also results from the scope of the practice and the common practices in place. Now, the solution makes it possible to stamp permit marks in electronic documents and data. As these functions streamline the communication and administrative processes it is also important to note, that the solution is easy to integrate in comparable markets.

The Smart Port Logistics case from Hamburg is in principle an ITS platform as a PPP which improves the access to port facilities while also relieving the city infrastructure. This is truly a unique approach within Europe. Since in Hamburg the port infrastructure is interwoven with the city and constantly highly utilised infrastructures an efficient management is especially important in avoiding conflicts and increasing acceptance with the public. The solution is easily transformable to other ports or similar areas, e.g. airports and rail-freight terminals. The HPA Smart Port Logistics solution can be seen as a “Cooperative System” in the sense of the eFreight framework.

A solution more focused on the management of freight flows in order to optimise internal terminal processes is the BLU control system, operational mainly at DUSS terminals in Germany. This system for intermodal terminals provides assistance with all operative procedures at large and small sites. Data regarding loading units can be communicated to BLU electronically for both inbound and outbound trains, also for HGV. Once checked, crane requests for the loading units are generated automatically, with the system providing loading positions in a graphic form for the HGV. In this way improved management of flow-oriented planning and shorter crane times and processing times for HGVs are achieved. The practice has a long standing implementation in a number of DUSS terminals but at the same time is being developed in an evolutionary way by adding new features as network capability, with the most recent major update in 2014.

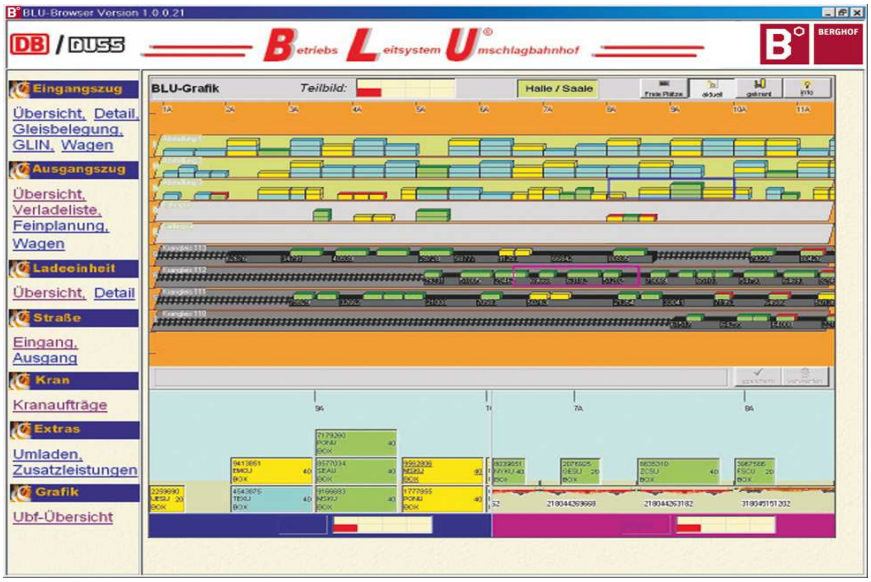


Figure 36: BLU overview screen - www.berghof.com

A challenge the port of Trieste was faced with is that only some of their users have an ICT system. Commonly the different used ICT systems show a great difference and a significant fragmentation. Furthermore, some of them have a low technological capacity. The Black Box solution is a novel and specific ICT system managed by the Port Authority of Trieste in order to enable the traceability of all the goods and cargos arriving in the free port area of the Port of Trieste by maritime, rail and road transportation. The system enables the identifications of the subject that manages the goods in each moment of the flow and therefore always identifies the responsible actor in the logistic chain. This ICT system does not directly interact with the Customs Authority system, but acquires all the information concerning the entrance of the goods in the free port area and follows and supports all the exchanges between the different involved operators till the exit of the goods from the port area. This allows the Port Authority to fulfil its role as an information-guaranteeing entity. It assures data integrity, operations management, and cooperation between operators, information gathering and collection.

Central management optimisation benefits all port and terminal stakeholders. In general less time and money is needed to perform logistics and administrative operations for all involved actors: port authorities, shippers, logistics service providers, administration and authorities. For the business actors the common early data transfers and pre-authorisation of shipments translate to reductions of number of physical cargo inspections, filing of transport papers and especially time savings in transhipment and port/terminal processes.

The state institutions involved benefit from improvements in quality of services with an attractive logistics location with competitive advantages. A more reliable control of goods and papers and a central management of all relevant documentation; a better, paperless information flow.

4.3.4 Integrated ITS in freight operations

Wherever information flows are not entirely standardised or cannot be integrated actively into services of logistics service providers a smart solution is necessary to bridge these gaps. In practice these solutions are designed as simpler assistants to tackle common problems along the infrastructure and improve logistics and related processes.

Most motorways provide parking facilities, accessible from the motorway only. These parking facilities provide parking capacity to private car and truck drivers alike, to rest between journey legs. In particular for long haul truck drivers these facilities are important, as truck drivers need

to comply with driving time regulations. In practice this means that truck parking areas (TPA) along major transport corridors quickly fill up in the evening. PARCKR supports truck drivers to find a suitable slot on time. The PARCKR application gives an overview of all truck parking areas along the route. Per truck parking area, it indicates the expected occupancy at time of arrival, as well as useful information on facilities. It also shows reviews of particular truck parking areas, which is a strong communal aspect among drivers. PARCKR was successfully implemented as a pilot in the southern part of the Netherlands, on the corridor connecting the ports of Rotterdam and Antwerp to the Ruhr area. With the initial success the solution was further developed and the full application for mobile devices is available in the respective markets for download. The system provides a low-cost and scalable alternative to traditional traffic counting and forecasting systems also integrating the community feature which proves a highly relevant feature for the majority of drivers.

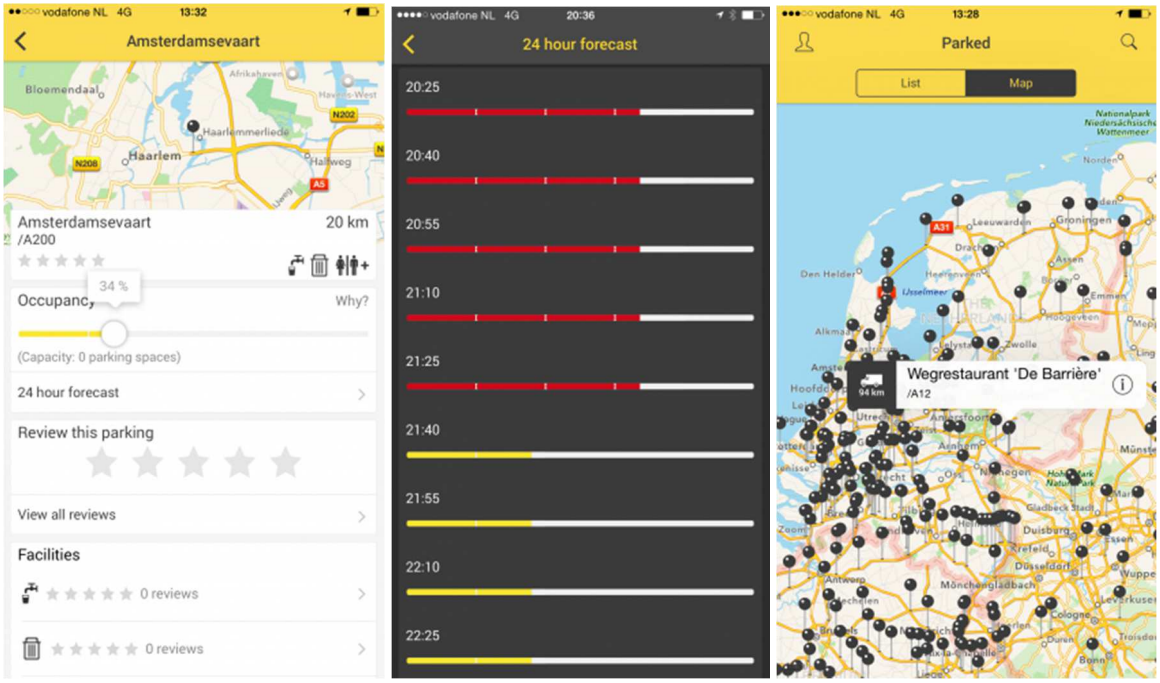


Figure 37: PARCKR screens - http://www.parckr.com/en/

AMATRAK has the goal to reduce freight traffic by using intelligent control and by charging freight vehicles in the procurement and outbound logistics efficiently. The solution relies on an artificial intelligence and a software-based, self-controlling multi-agent system while being based on open source software, eliminating all licensing costs. A multi-agent system is a system of several different specialized units, which collectively solve a problem. In this case the reduction of mileage through an intelligent route planning and disposition tool. At the same time the average truck load is increased by bundling and vehicle assignment in real time. Changing customer order data and vehicle conditions can be incorporated dynamically. The work of a dispatcher is supported in real time and the planning and decision capacity improved.

Optrak also is basically a tour planning tool, but especially allows interconnected planning including trip scheduling with customer notification. The case is specifically interesting because of the data quality, the openness of the system provider and the client regarding the data publication, the clear benefits obtained and the easy transfer that is made possible by the use of a standard product that has a proven market record.

As the cases show optimisation through ITS on the road generates benefits. When reaching borders the limitations in transport meet a constraint that cannot be met with a pure business

solution as highlighted above. Therefore solutions which address the public optimisation of freight transport were identified in BESTFACT as well.

On the borders of Lithuania were long queues by the border crossing points. Generally no waiting or parking areas and no coordination of border procedures with the traffic flow, which led to traffic bottlenecks by the border crossing points and severe delays for all traffic and especially for freight transports, as they required more thorough checking. The motivation in finding a solution was to accelerate the procedures at the crossings. The EVIS system now provides an opportunity to reserve in advance a place in the queue of the vehicles waiting to cross the state border of the Republic of Lithuania. It also manages the movement of the queues in the border crossing points. EVIS allocates pre-registered and unregistered vehicles to the virtual queue.

Kybartai border checkpoint	**Kybartai A/B** Show called vehicles	**Kybartai C** Show called vehicles	**Kybartai D** Show called vehicles
Waiting time in live queue	up to 1 hour	~10 h	up to 1 hour
Number of vehicles in the live queue	7	77	0
Total number of reservations	106	199	0

Figure 38: Status monitor of the EVIS system www.lithuanianborder.eu/yphis/borderQueueInfo.action

Smart ITS solutions support operations and benefit the overall transport system. As was shown in the BESTFACT work some of the ITS solutions provide solutions to problems which are not easily integrated into wider solutions as presented in the other topics in the eFreight cluster. The systems disseminate useful information and, as can be seen in the mentioned cases, do this in more and more intelligent ways, addressing the right users at the right time. The PARCKR case showed how important it is to reach the practitioners first. Without the acceptance of the driver community the entire system would have been lacking a valuable service.

5 Concluding remarks for decision makers

The work in the BESTFACT project over four years showed significant developments in the individual clusters and their related cases. At the same time common observations about the development in the field of best practice developments were made. The combination of the extensive case work with a methodological framework applicable to all three clusters highlighted some difficulties as well as important learnings. Following all these Best Practice case presentations and analysis, conclusions for decision makers are drawn as a summary. For more details and clear recommendations on the cluster topics, see the BESTFACT Report D3.2.

5.1 Reaching the target of integrating business and public sector interests

The handbook provides systematic information and a structure to better understand why each solution is an innovation that is technically feasible and economically profitable in different contexts, while at the same time, makes sure that it is a sustainable solution with a tangible beneficial impact. The main public benefits are in the contribution to reduce the negative externalities of transport, a question that is at the core of local policies and public sector interests. The Best Practice Handbook also informs decision makers about limitations that would need to be taken into account when one would try to reproduce the same solution in a different context. It identifies certain conditions that might be necessary to be put in place if the solution should lead to a success story.

5.2 Overcome the barriers for implementation

In the cases presented in this handbook, most of the barriers that needed to be overcome have to do with information and cooperation, with investments and with decision-making, in order to become successful solutions. There is however little evidence that a typical model exists that would enable to overcome all existing barriers. Probably the most cited problem solving approach is the dialogue between city authority and multiple stakeholders, integrated together with a good preparation of public support for private initiatives (Holguin-Veras et al. 2005). But even if this is a successful approach, when dealing for example with the implementation of a new urban distribution centre, this seems not appropriate when dealing with routing software or with a cooperation among supermarket chains. Therefore, it is appropriate to continue to search for solutions to overcome barriers for the implementation of these beneficial solutions. Further solutions to overcome the barriers for implementation are: Make benefits become visible to a broad public; decide with a clearer understanding of costs; be aware of the replicable dimension of the success stories. These recommendations are explained below.

5.2.1 Visibility of benefits

The positive impacts are one of the key reasons why the solutions have been developed in the first instance.

The results show a medium level of detail on what are the benefits that could arise from most Best Practice cases. The benefits from the use of clean vehicles are, among all cases, the ones that are the most clearly evidenced, publicised and demonstrated. The urban policies, City Logistics concepts and combination of initiatives e.g. in Gothenburg and elsewhere are also beneficial for both public and private sector. The level of detail of the cases presented, and the information available online at www.bestfact.net, should be enough to allow decision makers to replicate most trials in their countries, cities or in their businesses.

To make the benefits visible to a broad audience promotes a good practice and tends to increase its transferability.

5.2.2 Decisions based on understanding of costs

Experimentations show that if costs are affordable for the customers and profitable to the operator, this increases the chance of success. At the same time, together with the analysis of transferability, the cost analysis of freight trials is a point where the understanding is the least developed. A prototype, or a solution tested at a very small scale, is always expensive, when looking at the costs per item delivered in the starting phase. The starting investment is commonly a big economic hurdle. Though it has to be carefully considered whether to take them into account when calculating the long-term costs that will be on the market when the solution becomes viable or ignore them for the realisation a longer term benefit which can only be reached by establishing an innovation with additional funds.

Not every trial is designed to demonstrate the economic viability. Most cases are designed to showcase the technical feasibility of a solution, and eventually tangible, beneficial impacts. However, if confronted with the question of extending the trial in case of success, the question of costs is crucial and the absence of real cost data means that decisions are taken on the basis of theoretical assumptions, which is risky. Cost-benefit data obtained with a trial under real market conditions are beneficial for the future transfer of Best Practice solutions.

Ideally, beside managerial tools such as cost-benefits analysis or Net Present Value calculations, the cost dimensions would be calculated together with freight data such as costs per item delivered, for the client, or in costs per km driven, for the variable costs, and/or in total costs per vehicle per year, for the operator perspective. This type of information could be collected for some cases such as The Green Link or Donostia San Sebastian, but it remains an exception.

These costs would need to be compared in a before-after analysis with the situation before the solution was implemented, so the economic impact for the business and the profitability of the solution become very clearly visible, as transparent as possible. So far, even for the best information level, such a transparent before-after cost-benefit analysis has not been implemented yet; therefore, to implement such an analysis remains a recommendation for future innovative policies and freight activities.

5.2.3 Replication of success stories

The first part of the analysis of transferability is not to look at already implemented transfers, but to analyse how the case observed demonstrates in itself its potential replicability.

If, for example, a company that initiates a new solution invests a lot of effort and finance into a new project, and claims that it has become self-sustaining after a short period of time, this seems to suggest that the solution could be easily replicable.

However, to be more certain, the conditions need to be looked at more in detail: Questions to be asked in this context are: what is the size of the business? Is it a typical case for a general cargo operator, or is it a much-specialised market? Further questions are needed to understand under which conditions the success story can be replicated with similar chances of succeeding in achieving its targets.

The common elements and key findings of the collected and analysed BESTFACT cases give a wide initial overview. In order to replicate their success stories each new context and framework might prove as a different challenge which has to be carefully approached. Therefore, the Best Practice Handbook can serve as a starting point in finding solutions for the most pressing issues in freight transport and logistics.

Questions and remarks concerning this handbook are welcome. Please direct your input or comments to info@bestfact.net.

ANNEX

ANNEX 1: Glossary: Abbreviations used in the BPH and referenced case descriptions

Abbreviation	Explanation/Text
A2A	authorities to authorities
A2B	authorities to businesses
AES	Automated Export System
Ah	Ampere-hour
ALU	Aluminium
ANPR	Automatic number plate recognition
ANSI	American National Standards Institute
API	Application Programming Interface
ASTRA	Swiss Federal Roads Office
ASYCUDA	Automated System for Customs Data
AVI	Automatic vehicle identification
AWB	air waybill
B2A	businesses to authorities
B2B	business-to-business
BESTFACT	Best Practice Factory for Freight Transport
BESTUFS	Best Urban Freight Solutions
BHT	Bremer Hafentelematik (export declaration system in Bremen port)
BPH	Best Practice Handbook (this document)
CB radio	citizens' band radio
CBA	Cost-Benefit Analysis
CCTV	Closed Circuit Television
CH	Switzerland
CL	Cluster
CL1	Cluster 1 (of BESTFACT project, dealing with urban freight)
CL2	Cluster 2 (of BESTFACT project, dealing with urban freight)
CL3	Cluster 3(of BESTFACT project, dealing with urban freight)
CO2	Carbon dioxide
CO_2e	Carbon dioxide – equivalent
CRM	Customer relationship management
DE	Germany
DPD	Dynamic Parcel Distribution
DSRC	Dedicated Short Range Communication

eBXML	Electronic Business using XML
EC	European Commission
EDI	Electronic Data Interchange
EDIFACT	EDI For Administration, Commerce and Transport (UN)
EGNOS	European Geostationary Navigation Overlay Service
EMKEP	Elektrifizierung von MB Kleintransportern in Entwicklung und Produktion (Electrification of Mercedes Benz Vans in Development and Production)
EnBW	Energie Baden-Württemberg
ENS	Entry Summary Declaration
ERP	Enterprise Ressource Planning
ES	Spain
ESB	Enterprise Service Bus
ETC	Electronic Toll Collection
EU	European Union
EUR	Euro
EXS	Export Summary Declaration
FAL	Facilitation of International Maritime Traffic
FHL	Freight House Manifest
FI	Finland
FKZ	Förderkennzeichen (project identification code in German research funding system)
FR	France
FVD	floating vehicle data
FWB	Freight Waybill
FZB	House Waybill Message
GHG	Green house gas
GIP	Graph Integration Platform
GIS	Geographic Information System
GPS	Global Positioning System
GS1	Global Standards One (Organisation)
GSM	Global System for Mobile Communications
HEATCO	Developing Harmonised European Approaches for Transport Costing and Project Assessment
HGV	Heavy goods vehicle
IATA	International Air Transport Association
ICE	Internal Combustion Engine
ICT	Information and Communication Technology
IFCSUM	Forwarding and consolidation summary message
IKONE	Integriertes Konzept für eine nachhaltige Elektromobilität (Integrated Concept for a Sustainable Electro Mobility)
ILOS	Intelligente Güter-Logistik im Städtischen Gebiet

IMO	International Maritime Organisation
IRR	Internal Rate of Return
ISO	International Organization for Standardization
IT	Information Technology
ITS	Intelligent Transport Systems
Kg	Kilogramme
Km	Kilometre
Km/h	Kilometre per hour
KPI	Key performance indicator
kW	Kilowatt
kWh	Kilowatt-hour
LEZ	Low Emission Zone
LPG	Liquefied Petroleum Gas
LPR	license plate recognition
LSP	Logistic service provider
LT	Lithuania
LTL	Litas (Lithuanian currency)
LU	Luxembourg
m^3	Cubicmetre
MCA	multi-criteria analysis
mill.	Million
MoS	Motorways of the Sea
MRN	Movement Reference Number
NCTS	New Computerized Transit System
NL	The Netherlands
NO_x	Generic term for mono-nitrogen oxides NO and NO_2
NPV	Net Present Value
NVOCC	non-vessel operating common carrier
OASIS	Organization for the Advancement of Structured Information Standards
OCR	Optical Character Recognition
OSGi	Open Service Gateway Initiative
PE	Polyethylene
PET	Polyethylene terephthalate
PL	Poland
PLDA	Paperless Customs and Excise
PM_{10}	Particulate Matters (particles of ~10 micrometres or less)
POI	Point of Interest
PPP	Public private partnership
PROMIT	Promoting Innovative Intermodal Freight Transport

PS	Polystyrene
QIS	Quick Info Sheet (BESTFACT publication format)
R&D	Research and Development
RFID	Radio-frequency identification
ROI	Return on Investment
SAD	Single Administrative Document
SDTS	Summary Declaration for Temporary Storage
SME	Small and medium-sized enterprise
SOA	Service Oriented Architecture
T2L	Document for Proof of Community status (SAD)
TAF-TSI	Technical Specifications for Interoperability for Telematic Applications for Freight
TEN-T	Trans-European Transport Network
TEU	Twenty Foot Equivalent Unit (20' container)
Tkm	Tonne kilometres
TMS	Transport Management System
TPA	truck parking area
UBL	Universal Business Language
UK	United Kingdom
V	Volt
WADIS	Wagendispositions- und Informationssystem (rail wagon management and information system)
WMS	warehouse management system
WP	Work package (referring to the BESTFACT working structure)
WP2	Work Package 2 (of BESTFACT project, dealing with Methodology)
XML	Extensible Markup Language
ZEB	Zero Emission Boat

ANNEX 2: Sources used in the deliverable

The described cases were provided by the project partners within the BESTFACT consortium in cooperation with the case owners and developers. For further information and contact details please see the information provided with each individual case or consult the Quick Info Sheet prepared for each case, which are available for download on the BESTFACT webpage (www.bestfact.net).

- BESTFACT (2012): D2.1 Main challenges in freight logistics
- BESTFACT (2013): D2.2 Best Practice Handbook 1
- BESTFACT (2014): D2.3 Best Practice Handbook 2
- BESTFACT (2015): D3.2 Recommendation and policy tools

- BESTFACT (2012): IR2.1 Methodology for BESTFACT Best Practice and Working Instructions [internal document]
- BESTFACT (2013): IR2.2 BEST Practice implementation action 1 (Guidelines for Best Practice Implementation Actions and Policy Tools)
- BESTFACT (2012): IR3.1 Best Practice Impact Evaluation Methodology [internal document]
- BESTFACT (2012): IRCL 1.1 Urban Freight Innovations and Solutions for Sustainable Deliveries [internal document]
- BESTFACT (2012): IRCL 2.1 Inventory of Green logistics & Co-modality [internal document]
- BESTFACT (2012): IRCL 3.1 Inventory of eFreight [internal document]
- BESTFACT (2013): IRCL 1.2 Urban Freight Innovations and Solutions for Sustainable Deliveries [internal document]
- BESTFACT (2013): IRCL 2.2 Inventory of Green logistics & Co-modality [internal document]
- BESTFACT (2013): IRCL 3.2 Inventory of eFreight [internal document]
- BESTFACT (2010): Description of Work – Annex I [internal document]
- Browne, M., Allen, J., Nemoto, T., Patier, D. and Visser, J. (2012): Reducing social and environmental impacts of urban freight transport: A review of some major cities. Procedia-Social and Behavioral Sciences 39, pp. 19-33
- Holguín-Veras, J., J. Polimeni, B. Cruz, N. Xu, G. List, J. Nordstrom, J. Haddock (2005): Off-peak freight deliveries: Challenges and stakeholders' perceptions. Transportation Research Board of the National Academies Issue 1906, pp. 42-48
- Leonardi, Jacques; Michael Browne; Julian Allen; Simon Bohne and Martin Ruesch (2013): Best Practice Factory for Freight Transport in Europe: Demonstrating how ‘good’ urban freight cases are improving company profits and public sectors benefits. International Conference on City Logistics, Bali, June 2013
- Taniguchi, E., Thompson, R.G. and Yamada, T. (2015) : New Opportunities and Challenges for City Logistics. In : The 9th International Conference on City Logistics, Tenerife, Canary Islands, Spain, 17-19 June 2015, 1-11.

ANNEX 3: Overview over the BESTFACT methodology and processes

The methodology for the BESTFACT Best Practice collection, evaluation and processing was developed within WP 2 of the project. A multi-step process was established that will be repeated over the course of the project duration each year. As a result the three Best Practice Handbooks are produced to summarise the project developments in a comprehensive format.

The evaluation of best practices is based upon the research into strategic targets and challenges in the field of freight transport and logistics previously conducted in BESTFACT (cf. D2.1 Main challenges in freight logistics). The results of the process contribute to the evaluation approach used to identify and select suitable cases for BESTFACT. Over a multi-step process proposals were evaluated according to the best practice criteria mentioned above.

The following charted process steps were defined to collect and consolidate all available information into the cluster case descriptions and this handbook.

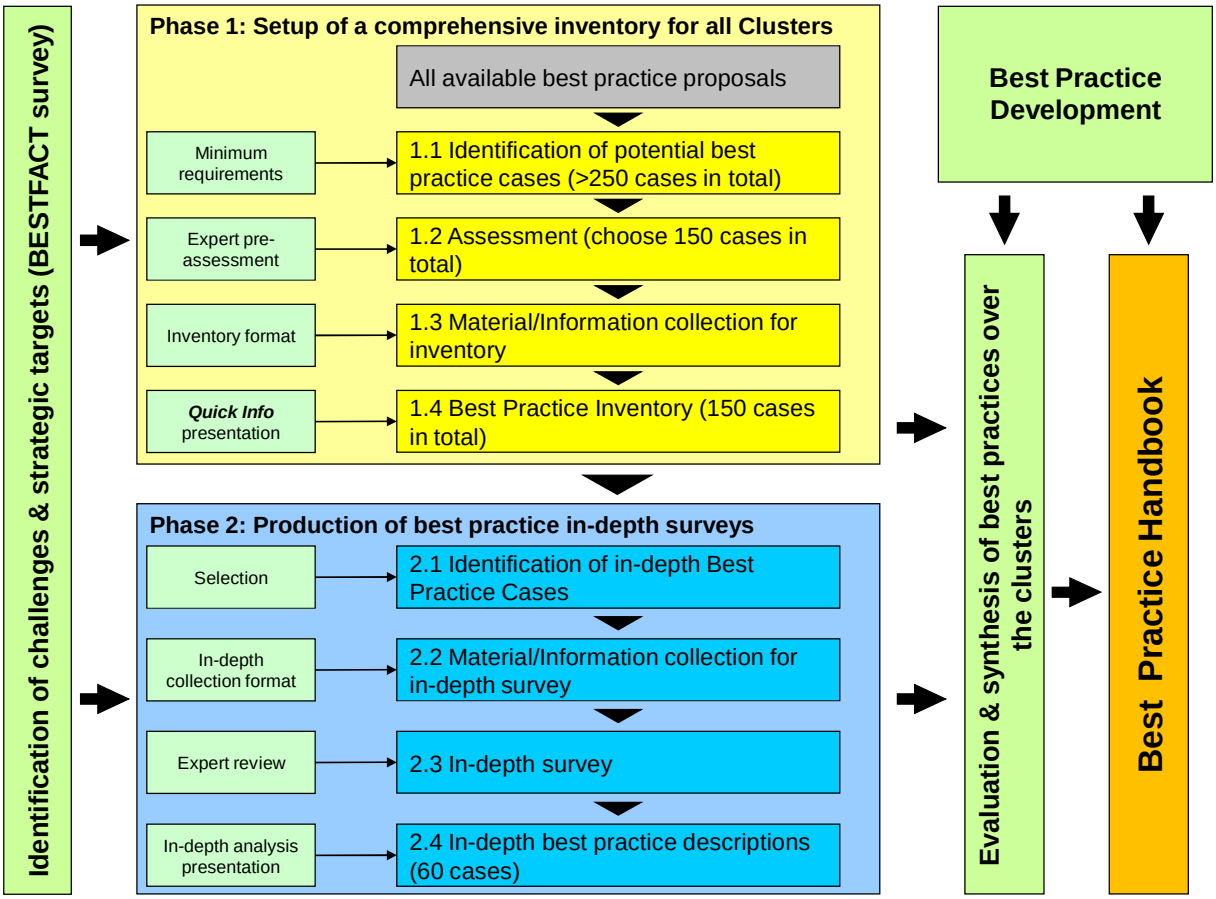


Figure 39: BESTFACT WP2 working steps and best practice methodology

The phase 1 comprised of the first identification round resulting in a collection of cases that do generally fulfil the requirements of BESTFACT within each cluster. A closer expert evaluation determined which cases would be reviewed in the first year of BESTFACT activities as inventory cases, leading to an extensive information collection and structured compilation for each case, performed by consortium members of the project. Given the nature of the expert evaluations in the case selection and description process, biased assessments might be possible. Throughout the work within the project double-checks and four-eye-principles are employed to the benefit of quality and independence of the work.

The evaluation of cases considers a simple multi-criteria approach analysing four central best practice aspects. Within the criteria an expert ranking is performed evaluating the fulfilment on a level between 0 and 3. The level 0 leads to an exclusion of a case. Because BESTFACT cannot assess cases on a comparable quantitative set of performance indicators cases are not ranked and the expert scorings are not published.

For the expert evaluation as a first step the **information accessibility** is checked. For further consideration within the process a minimum of information and access to this information is needed. This information has to allow an assessment and evaluation of the additional criteria for the inventory consideration.

Level	**3**	**2**	**1**	**0**
Segment and rating guidelines	**Full**: access to all needed information, readily available (e.g. direct download) or helpful contacts or affiliated partner	**Broad**: access to first basic information and details available on request, further sources available and free of charge	**Limited**: access on request possible, access only for limited user group, charges to receive information, anticipation of availability issues	**Not available / accessible**: Possibility of review of the item is highly doubtful due to restricted information and / or (repeatedly) no response by developer or responsible contacts

Further on cases are evaluated for their level of **innovation and technical or economic feasibility**. Solutions should be innovative and include products, processes, services, technologies, or ideas that are more effective than previous ones. They should be accepted by markets, governments, and society. The experts rate the expected level of innovation (low or high) and also estimate the technical or economic feasibility of a practice (low or high) in one criterion.

Level	**3**	**2**	**1**	**0**
Segment and rating guidelines	High level of innovation and high feasibility	High level of innovation and low feasibility -or- low innovation and high feasibility	Low level of innovation and low feasibility	Not feasible or not innovative

An important factor within BESTFACT is the **impact of cases on both strategic business and policy targets**. The potentiality of each case is evaluated separately for a set of indicators. Since impacts will not occur on a comparable, quantifiable scale across cases the judgement is based on expertise in the field and relevant experiences with the set of strategic targets.

Level	**3**	**2**	**1**	**0**
Segment and rating guidelines	**High potential**: Positive impact of the practice. High potential for positive effects and justifiable (quantifiable) results.	**Medium potential**: Medium potential (good indication) for positive effects and positive impacts.	**Low potential**: Prognosis of effects difficult but positive impact expected. Anticipation of risks.	**None**: No indication that measurable effects will occur through implementation. Sources that prove that no effects will occur.

As mentioned above the transferability of best practice cases is also used as a main criterion for the distinction between an evolving case and a best practice. The transferability of cases to other domains, situations, framework conditions or business structures has to be secured. At least a partial implementation with certain (necessary) adjustments should be possible outside of the originating environment.

Level	**3**	**2**	**1**	**0**
Segment and rating guidelines	**Robust**: Case is ready for broad implementation, documented transfer between different domains occurred. Framework for transfer is known.	**Realistic**: New solution implemented in few cases. Case successfully adopted by other domains.	**Expected**: Documentation that suggests transferability through reason and figures. Good prototype/idea but not tested or applied outside of original source.	**Not applicable**: No indication that a case can be transferred

After the expert evaluation the cases are described and collected for the BESTFACT inventory of cases (see below).

It is important to note that the application of the multi-criteria approach does not yield a universal scoring of the cases. The nature of the cases, their field of application and the expert judgement are too arbitrary and differing to be considered as a valid ranking criterion. BESTFACT strives to promote best practice cases and ensures that cases excel the threshold levels of the best practice definition. Evolving cases are integrated into the processes to foster their development and help to realise their potential. Cases that offer the potential for further consideration, providing substantial benefits and presenting high levels of innovation are referred to the second phase of case evaluations.

The second phase of case evaluations determines which cases are accessible and relevant for the BESTFACT in-depth surveys. The in-depth evaluation required a deeper understanding of cases and involved developers, owners or users to provide more detailed information; interviews or demonstrations were conducted. The results of the in-depth surveys are presented in this handbook adjacent to the cluster sections.

As the outcome of the two phases BESTAFCT evaluated 50 cases for the case inventory until the publication of this first handbook. In total 12 in-depth surveys were prepared and are presented in this handbook. Within each clusters a synthesis across the cases was performed and the results are presented in the following main chapters dedicated to each cluster. In the coming years BESTFACT will expand its inventory of best practice cases. The following table gives an overview of the goal of cases which were to be evaluated.

Cluster **Cases**	**Cluster 1:** **Urban Freight**	**Cluster 2:** **Co-Modality and Green Logistics**	**Cluster 3:** **eFreight**	**Total**
BESTFACT aim of inventory cases (2015)	45	60	45	150
BESTFACT aim of in-depth cases (2015)	17	26	17	60

To provide an additional benefit to the public, businesses, authorities and other users the Quick Info Sheets (QIS) were produced for every case evaluated. These will provide a short overview of solutions, implementation and further useful information. These QIS are linked within this document for each case and can be downloaded from the BESTFACT webpage at www.best-fact.net.