# STRAIGHTSOL

*Strategies and measures for smarter urban freight solutions*


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# Introduction

The Straightsol project has demonstrated the use of seven different smart urban freight solutions.

This booklet presents:

- An overview of Straightsol's evaluation framework
- Summary results from evaluations of the Straightsol project's seven demonstrations

  1. DHL Supply Chain - Urban Consolidation Centre - L'Hospitalet de Llobregat, Spain
  2. TNT Express - City Logistics Mobile Depot – Brussels, Belgium
  3. Oxfam - Remote bring-site monitoring for sustainable logistics - United Kingdom
  4. Kuehne+Nagel - Rail tracking and warehouse management – Thessaloniki, Greece
  5. GS1 (Norway) – Information sharing in last mile distribution – Oslo, Norway
  6. EMEL – Loading/unloading operations management and regulation – Lisbon, Portugal
  7. Colruyt and Delhaize – Night-time distribution – Brussels, Belgium

- More detailed descriptions and findings from each demonstration

We hope you find it interesting reading.

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# Straightsol urban freight evaluation framework

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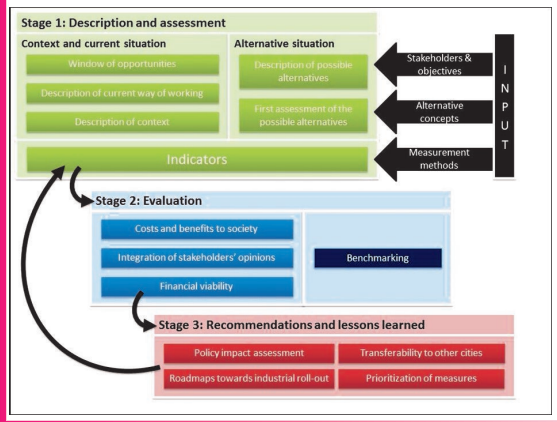
## INTRODUCTION

The Straightsol project developed its own evaluation framework to ensure that all involved stakeholders were considered (e.g. shippers, receivers, logistics service providers, local authorities and citizens). The framework includes social cost-benefit analyses, identification of key performance indicators, business models and multi-actor multi-criteria analyses (MAMCA). The framework is designed to be used by any private company or city authority who want to compare alternative operating methods.

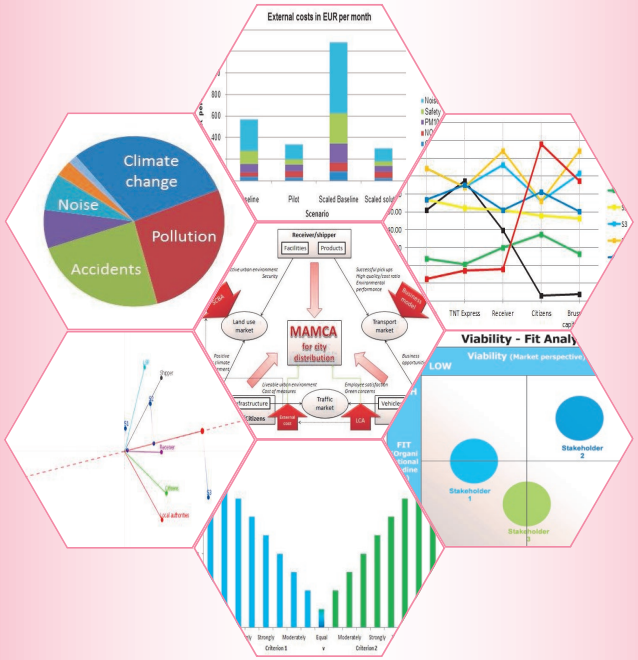
## WHAT THE EVALUATION FRAMEWORK INVOLVES




## KEY PERFORMANCE INDICATORS

A list of sixty KPIs relating to the economy, environment, society, and quality of service was devised. This can be used as a checklist for any freight project evaluation. The main KPIs identified were associated with:

- *Economy* - costs (investment, operating, enforcement) and benefits (revenues)
- *Environment* - air quality, emissions, noise (both perceived and actual)
- *Society* - acceptance level, attractiveness of urban environment, accessibility, traffic safety, employee satisfaction
- *Quality of service* - punctuality and accuracy of deliveries, supply chain visibility, suitability of service, security of goods, operator's green concerns.

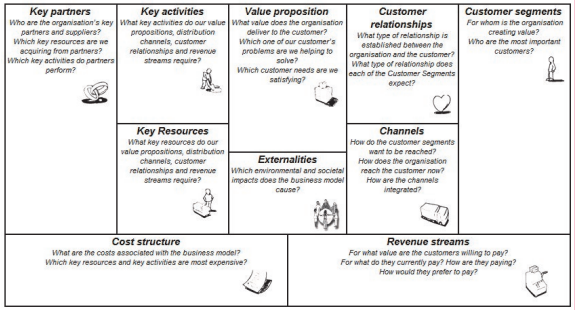



## STEPS OF THE MULTI-ACTOR MULTI-CRITERIA ANALYSIS

1. Identify the alternative freight strategies to be compared
2. Identify the stakeholders and their criteria
3. Assign weights to each stakeholders' criteria (e.g. by interviewing stakeholders)
4. For each criterion, decide upon the key performance indicator(s) and how they will be measured
5. Analysis and ranking (the PROMETHEE-GDSS method was used in Straightsol but others are available)
6. Results and sensitivity analyses: classification of the proposed alternatives, revealing strengths and weaknesses; ranking of the alternative schemes for each stakeholder.
7. Recommendations for implementation

## BUSINESS MODELS

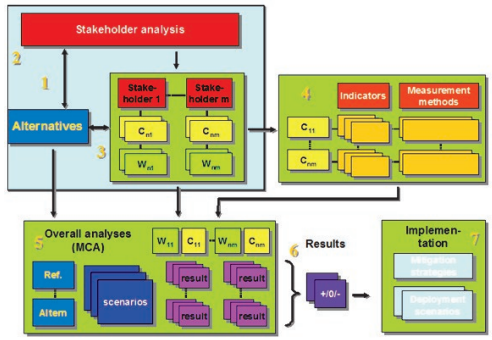
Business models were developed for each demonstration to identify the key components and to examine financial viability.




Business model canvas

## MULTI-ACTOR MULTI-CRITERIA ANALYSIS (MAMCA)

This analysis method, developed by Cathy Macharis (Vrije Universiteit, Brussel), permits a comparison of alternative freight strategies and their impacts on the various stakeholders involved, according to their various objectives.





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# Better supply chain visibility and 'smarter' operations

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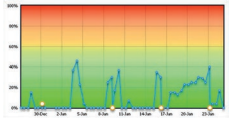
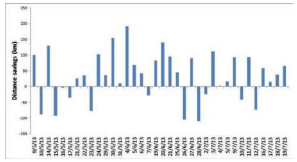
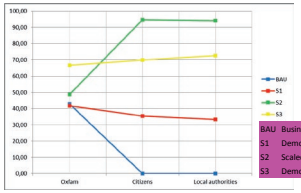
## OXFAM - Remote bring-site monitoring for sustainable logistics

Textile banks were equipped with remote monitoring technology to observe daily fill rates. Dynamic vehicle collection schedules were devised to reduce vehicle mileage, based on the remote bank data.



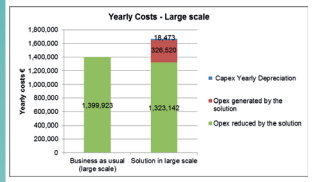


Travel distance saved during demo

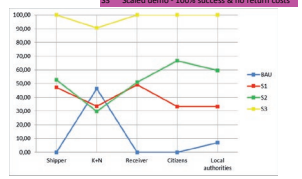



MAMCA evaluation of scenarios

## Kuehne+Nagel demo results



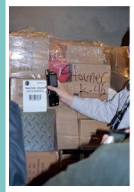

Financial cost of service

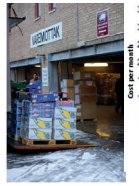


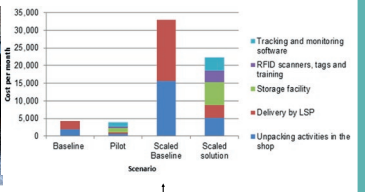

MAMCA evaluation of scenarios

## GS1 Norway —Information sharing in last mile distribution

Automatic data capturing (Auto-ID), standardisation and sharing of event information for deliveries to shops at the Stovner Shopping Centre in Oslo were combined with a buffer storage service at the shopping centre to improve the quality and efficiency of deliveries.

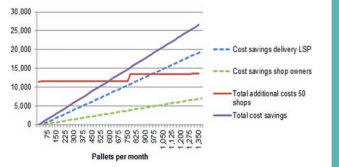






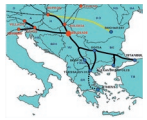

Estimated financial benefits

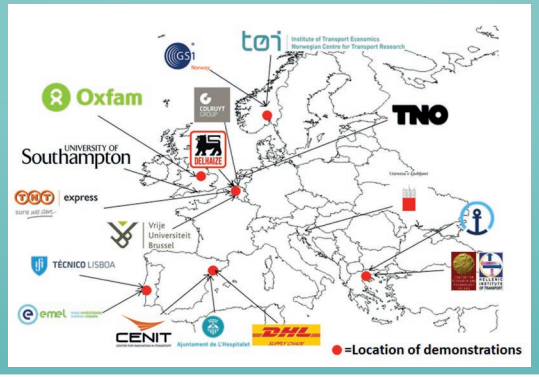

MAMCA evaluation of scenarios




## Kuehne+Nagel - Rail tracking and warehouse management

The movement of railway wagons delivering goods to Kuehne and Nagel transport hubs was monitored using of GPS devices to inform the warehouse management system of freight arrivals. This also benefited last mile distribution due to the improved provision of information to carriers collecting goods from terminals.



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Ajuntament de L'Hospitalet
DHL Supply Chain
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TNT express sure we can
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# Policy and business initiatives for improved urban logistics

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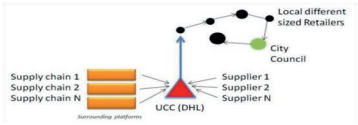
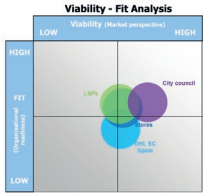
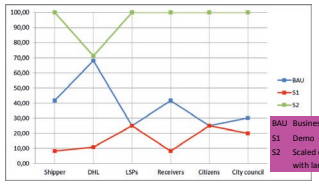
## DHL Supply Chain's Urban Consolidation Centre in L'Hospitalet de Llobregat

The key objective was to consolidate goods outside the urban area to improve 'last mile' distribution.



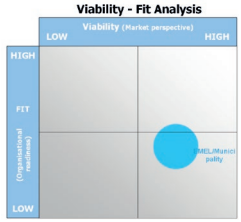



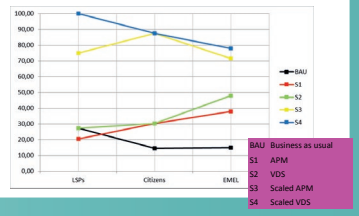





## EMEL - Loading / unloading operations management and regulations in Lisbon

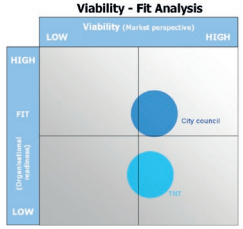
Alternative technological solutions (adapted parking meters (APM) and vehicle detection sensors (VDS)) and policies/regulations were compared for the management of freight loading and unloading in Lisbon.

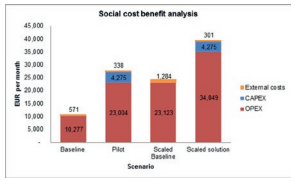


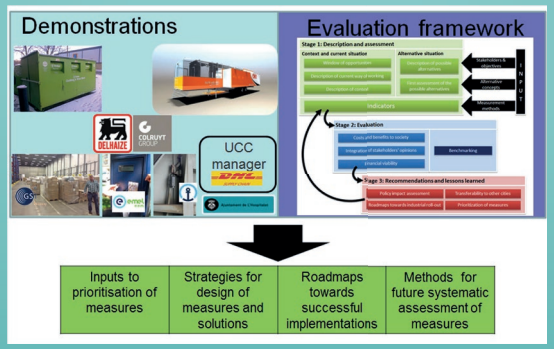




## TNT Express in Brussels - City Logistics Mobile Depot

TNT Express used a mobile depot in the centre of Brussels to consolidate goods flows and eliminate the use of vans, replacing them with tricycles and an electric vehicle.

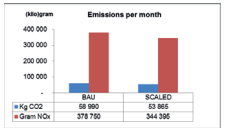



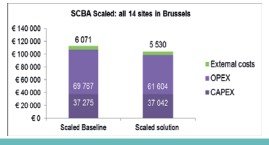




## Colruyt and Delhaize - Night-time distribution in Brussels

Deliveries to supermarkets in Brussels are shifted from daytime to the late evening or night. There is focus on reducing noise to maintain good relations with local residents: CNG trucks and Euro 6 diesel trucks, silent trailers, silent pallet trucks, covered unloading docks and the education of staff are all used.







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# Mobile depot for last-mile deliveries and pick-ups

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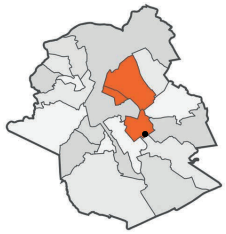
## WHAT DID WE DO?

- Used a **Mobile Depot** (trailer with warehouse and office facilities) and **cyclocargoes/electric vehicles for last mile delivery and pick-up** in the Brussels city centre
- **Tested the whole operational process** from start to end, including transport from and to TNT's depot at Brussels airport (Brucargo)
- Tested alternative ways of sorting the parcels; sorting at Brucargo and sorting at the mobile depot in Brussels city centre
- Collected data before and during the pilot for evaluation
- Pilot period: **June - August 2013**
- Postal codes 1030 (Schaarbeek), 1040 (Etterbeek) and 1210 (Sint-Joost-Ten-Node) in the **Brussels-Capital Region**
- Approximately **110 stops per day** were delivered and picked-up in the pilot area



Demonstration area
Postal codes 1030, 1040 and 1210

Mobile depot location (Parc du Cinquantenaire)

## WHY DID WE DO IT?

- To anticipate expected future environmental measures on transport taken by cities
- To identify the optimal operational process using the mobile depot
- To improve the efficiency of TNT Express' operations and service to customers
- To contribute to a better environment in the city centre

## KEY CHALLENGES FACED

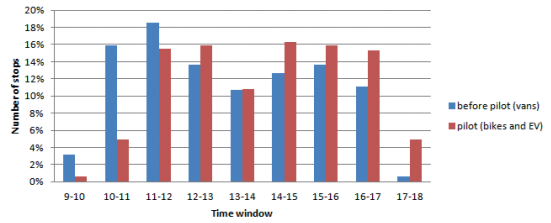
- Finding the right parking location in terms of size, accessibility and access to electricity
- Finding our way through various local authorities for permissions
- Small loading capability of cyclocargo compared to a van; difficult to transport larger parcels
- Limited sorting space in mobile depot

## WHAT DID WE FIND?

- **Savings of diesel kilometres**: 0,92 km/stop before and 0,52 km/stop during the demonstration
- **Emissions savings**:

| Pollutant | Savings |
|---|---|
| $CO_2$ | 23% |
| $SO_2$ | 24% |
| PM2,5 | 59% |
| PM10 | 22% |

- **Increase in operating costs**: deliveries and pick-ups through the mobile depot are twice as expensive compared to the initial situation with vans
- Freight profile delivery area should match load capacity of the cyclocargoes to make the concept efficient
- Mobile depot needs to be located within delivery area to minimize the stem time of the cyclocargoes
- **Slight impact on the quality of service**: stops are performed slightly later during the day compared to the initial situation with vans (due to longer stem time of mobile depot in the morning)
- NOx emissions were estimated to increase by 48% during the demo, due to a low utilisation rate of the mobile depot (40%). Increasing the load rate will have a positive impact on the savings of diesel kilometres, emissions and operating costs.




Number of stops per time window—before and during demonstration

## WHERE DO WE GO FROM HERE?

- TNT Express are currently planning whether and how to go forward with the mobile depot concept in Brussels and in other cities having suitable drop densities and freight profiles. They are also exploring the idea of using electric vans in combination with the mobile depot.
- Potential exploitation of concept by other carriers

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QR code to demo webpage

# DHL's Urban Consolidation Centre for L'Hospitalet de Llobregat

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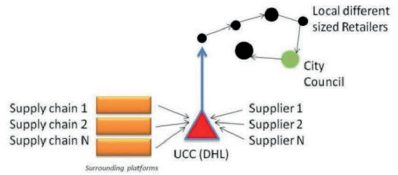
## WHAT DID WE DO?

- Tested and demonstrated a hybrid Urban Consolidation Centre (UCC) (18/2/13 to 31/5/13):
  - Multi-customer supply chains already managed, individually, by DHL Supply Chain (Spain)
  - Small retailers located in the city centre and buildings of the City Council




- Key Implementation Steps:


Retailers Survey | UCC Location and Demo Area | Extensive dialogue with store managers & merchants associations

## WHY DID WE DO IT?

- L'Hospitalet de Llobregat suffers common urban distribution problems:
  - High numbers of commercial vehicles, oversaturated loading/unloading areas, low vehicle utilisation factors, high operational costs, excessive GHG emissions, noise pollution and congestion
  - L'Hospitalet is a municipality with one of the highest population densities in Europe, and neighbourhoods have a large concentration of commercial stores of a wide variety
- There is a lack of clear and uniform regulation to favour efficient urban delivery strategies
- There is a clear willingness from the city council to improve urban distribution

## KEY CHALLENGES FACED

- Enrolment of stores was difficult and time consuming. Incentives for participation included free advertising in the local media, stickers showing environmental and social responsibility. Stores were reluctant because:
  - It is not their main business; not aware of urban distribution problems
  - Transport cost is included in product cost and is not perceived as a cost itself
  - The economic crisis deeply affected commercial activity
  - Benefits are in the long term, but it is a nuisance during the test phase due to the change of shipment direction
- Financial viability is essential once DHL and EU funds are over.

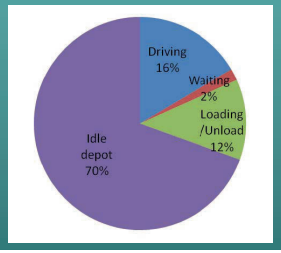
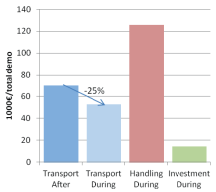



Figure 1—Vehicle time distribution during the day

## WHAT DID WE FIND?

- Flexibility and synergy are key concepts to make a UCC viable:
  - Flexibility to mix different types of shipments
  - Synergy to combine and optimize the whole supply chain
- Big end-to-end supply chains are nearly fully optimized but allow inclusion of small volumes
- The use of an existing infrastructure is also a key for the success because it reduces investment costs
- Involving the municipality is essential to involve retailers and for dissemination aspects




**Economic indicators:**

- Transport costs in urban delivery are reduced by approximately 25%
- Handling costs of the terminal (staff and IT/Engineering) are high and difficult to compensate
- Investment costs are low

**Environment & Society indicators:**

- Simulation results (using the AIMSUN model) gave $CO_2$ savings of 25%
- Space devoted exclusively to UCC is only 42.12m$^2$

AIMSUN screenshot

**Transport indicators:**

- Quality of service offered was 100% satisfactory
- Customer perspective was varied. The ones with most participation were satisfied with the service, but others experienced some problems when changing "shipping direction", or one-day delays
- 3.08 vehicles/day (1.93 trucks/day + 1.15 vans/day)
- Kilometres are reduced proportionally to transport costs (25%)
- Load factor has risen from 68% to 73%
- Total deliveries 727, with more than 350,000 packages. Corresponds to 9.7 deliveries/day
- 7% of total deliveries from small retailers
- Total vehicle time: driving 276 min, waiting 30 min, 205 min loading/unloading (Figure 1)

## WHERE DO WE GO FROM HERE?

- To continue the pilot on a larger scale it is essential:
  - To involve more small stores in the city centre or nearby neighbourhoods
  - Or involve other big customers: hospitals, administrations or university, big supermarket,...
  - Consciousness raising from the municipality
- Business model needs revenue streams to compensate costs. For instance:
  - Other logistics service provider may pay a fee to UCC managers
  - Retailers may pay a tax if city council could partly reimburse through other tax reductions

DHL SUPPLY CHAIN

Ajuntament de L'Hospitalet

CENIT
CENTER FOR INNOVATION IN TRANSPORT

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QR code to demo webpage

# Rail tracking and warehouse management

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## WHAT DID WE DO?

- Installation of GPS-based monitoring system for tracking and tracing rail wagons and cargo during the interurban transportation leg
- Connection of the new monitoring system to K+N's intranet to provide real time location information to the warehouse management system and to each stakeholder or partner
- Use of E-PoDs in last mile distribution based on live feed from the GPS-based monitoring system
- Integration of the monitoring system with K+N's existing tracking and tracing system to monitor the entire supply chain, achieving considerable time and financial savings for K+N and other stakeholders

**Demonstration area**

K+N's main terminal (SRS) in Sindos, 20 km from the city of Thessaloniki: 5000 m²

Size of urban area: 1455.62 km²

Total demonstration area (including urban area of Thessaloniki and interurban area of Sindos Industrial Zone): 3000 km²


## WHY DID WE DO IT?

- To enable better organization of last mile distribution based on updated and reliable rail cargo location and estimated time of arrival (ETA) information, to eliminate unnecessary waiting at terminals and avoid vehicle routing problems during the urban distribution leg
- Reliability issues can affect K+N's level of customer service relative to their competitors
- The automation of several processes (e.g. vehicle and cargo tracking and tracing) gives the opportunity for better human resource management and improved customer service

## KEY CHALLENGES FACED

- Limited battery life of GPS devices (7-8 days max), causing power supply problems especially when the duration of the rail trip from Sopron to Thessaloniki lasts for more than 7 days (including delays)
- The GPS devices were not plug 'n' play—needed adjusting for the demonstration
- Differences and gaps in the communication protocol between neighbouring countries during the transmission of data causing low data transmission rates (36% successful runs)
- Using personnel in Sopron railway station to affix the GPS devices onto rail wagons and switching them on at train departure


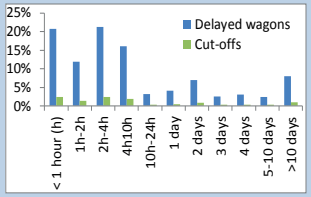


Figure 1: Rail wagons' typical delays

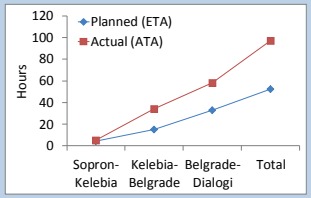


Figure 2: Time deviation between ATA and ETA

## WHAT DID WE FIND?

**1. Former situation (without GPS)**

- 26,9% of wagons were delayed for more than 24 hours (Figure 1) with growing delays along the route from Sopron (Hungary) to the marshalling yard at Dialogi, near Thessaloniki (Greece) (Figure 2). These delays would typically lead to false truck assignments at terminals.
- 11,5% of wagons were cut off
- K&N were unable to purchase 202 GPS mountable devices with their GSM cards at first stage. Opted for a small-scale implementation: monitoring of 24 rail wagons (3% of total) using 6 GPS devices.

**2. Current situation (demonstration deployment)**

- High investment (~1650€ for 6 GPS devices and GSM cards) and operational costs outweigh the benefits in transport, environment and customer satisfaction .
- Operational costs per month:

| Cost category | "Before" (without GPS) | "After" (with GPS) |
|---|---|---|
| Wagon renting | 720 € | 720 € |
| Tracking&tracing of cut–offs | 35 € | 0 € |
| Data communication | 0 € | 90 € |
| Truck renting | 1,170 € | 1,080 € |
| Fuels | 2,329 € | 2,219 € |
| Loading / unloading | 100 € | 95 € |
| Excess personnel | 60 € | 56 € |
| Return of GPS | 0 € | 720 € |
| Accidents | 69 € | 66 € |

Monthly financial outcome:
**-560 €**

**3. Results—main benefits**

- 4,5% reduction in total truck km/month and of respective $CO_2$ emissions/month
- 9% time savings and 4% increase in punctual deliveries
- Gradual increase in customer satisfaction/stakeholders' attitude towards environmental impact and demonstration concept acceptability

## FUTURE PROSPECTS: WHERE DO WE GO FROM HERE?

- Challenge: Technical issues concerning communication standards' incompatibility, energy autonomy and data transmission rate must be faced in order to acquire an exploitable added value service.
- Opportunity: joint venture between VTG & K+N creates EU's largest private rail logistics provider.
- The Hellenic Railways (infrastructure, equipment and rolling stock provider) have already expressed their intention to use the demonstration's GPS-based monitoring concept and incorporate it.
- K+N: to decide whether to offset system costs by charging customers for the improved service.


**Kuehne+Nagel** (Greece)

www.straightsol.eu

**CERTH**

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# Remote bring-site monitoring for sustainable logistics

STRAIGHTSOL
Strategies and measures for smarter urban freight solutions

## WHAT WAS THE PROBLEM FACED?

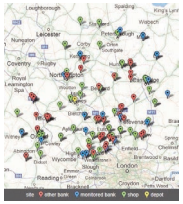
Daily scheduling and routing of vehicles making collections of textiles from Oxfam donation banks and High Street shops.

With the previous fixed collection days some donations banks were visited either:

- Too early - banks virtually empty - wasted vehicle trips
- Too late - banks full to overflowing - lost donations - messy sites

## WHAT DID WE DO?

- Installed infra-red remote monitoring sensors (40 banks, 21 sites)
- Collections from 35 other unmonitored bank sites and 68 shops
- Live demonstration over 36 working days between 9 May and 19 July 2013
- Sensors reported fill levels twice a day via smartbin webserver (www.smartbin.com)
- Used a purposely designed vehicle routing and scheduling algorithm to schedule 5 lorries and 1 van given:
  - Banks cannot be visited until at least 50% full
  - Service time windows must be maintained for some shops due to access restrictions and fixed collection days
  - Maximum round time of 10 hours per day
- Vehicle rounds from algorithm manually adjusted by Oxfam's transport manager for various reasons:
  - Concern about missing time windows if vehicle delayed
  - Balancing workloads between vehicle crews
  - Avoiding sending two vehicles into same area
  - Preferring to delay or maintain a bank collection



Demonstration area
56 bank sites, 68 shops

## KEY CHALLENGES FACED

- Vandalism and theft of bank contents, bank locks and remote monitoring equipment
- Reliability of transmissions from remote monitoring sensors
- Fixed collection days for shops inhibited opportunities for dynamic scheduling
- Adapting to the new way of working (dynamic scheduling is challenging)

## KEY STATISTICS FOR BUSINESS AS USUAL CASE

- Distance travelled = 5,000 km per week (3,107 miles)
- Average round distance = 223 km (139 miles)
- Average time spent driving = 4.2 hours
- Average driving speed = 53 kph (= 33 mph)

A bank full of clothes weighs ~270kg with estimated value €200

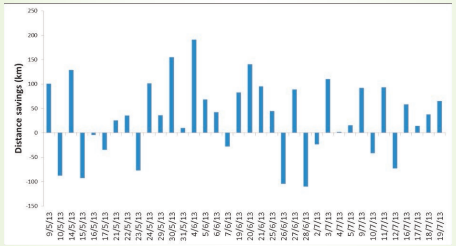




Figure 1 - Travel distance saved during demo

## WHAT DID WE FIND?

### Quantitative statistics

- 28% reduction in total number of bank visits made — 36 out of 56 bank sites were visited less often
- The total estimated mileage savings over all 36 days was 1159km (720 miles), an average of 32km (20 miles) per day across the vehicle fleet and equating to a 3.2% reduction (see Figure 1)
- Estimated time savings over the 36 days were 1152 minutes, an average of 32 minutes per day across the vehicle fleet and equating to a 2.8% reduction
- However, the transport manager reported needing about two hours per day longer than usual to organise the vehicle rounds during the demonstration
- Total estimated $CO_2$ savings over the period were 464kg, based on assumed average emissions factors Lorry: 400g/km; Van 215g/km
- Reported incidences of overflowing banks were unchanged (average = 1.2 reports/week)

### Qualitative information

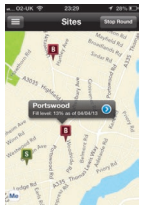
Oxfam's transport manager and drivers stated what they liked and disliked about the demonstration:

| | Likes | Dislikes |
|---|---|---|
| Transport manager | "The flexibility of the new rounds allowed me to schedule extra shop (and other) visits" | "The added time pressure on top of my 'normal job' to plan and organise the dynamic routes" |
| Drivers | "I sometimes finished work an hour early"<br>"Nearly all banks were at least 60% full when I visited"<br>"There was a better division of labour"<br>"The technology prevents drivers from only partly emptying a bank" | "Sometimes I had to go out of my way to visit a bank" |

## WHERE DO WE GO FROM HERE? / CONCLUSIONS

- Modest benefits in the Oxfam demonstration due to fixed shop servicing culture
- Much more promising with unconstrained collection days (~25% average mileage reduction)
- The vehicle scheduling and routing algorithm may be used by Smartbin as an added service
- Smartphone app (developed in www.sixthsensetransport.com may be used to improve visibility of bank and shop collection requirements

Screenshots from
Smartbin web interface
Smartphone app




Oxfam

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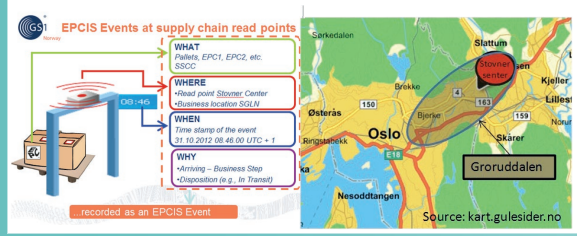
# GS1 Norway: Information sharing in last mile distribution

STRAIGHTSOL
Strategies and measures for smarter urban freight solutions

## WHAT DID WE DO?

- Demonstration at Stovner Shopping Centre, Oslo, over six weeks in October/November 2012
- Automatic data capture (Auto-ID), standardisation and sharing of event information associated with freight transport enabled increased effectiveness and reduced environmental impact of deliveries to the shopping centre. This was combined with the use of a buffer storage service area close to the unloading area, operated by Securitas. This reduced delivery times for carriers.
- Value chains were set up with monitoring for 5 retailers from their distribution centres to the shop floor by using Event Monitoring of pallets/roll cages with Radio Frequency Identification (RFID) and barcode enabled shipment information (SSCC—Serial Shipment Container Code)
- The basis for event monitoring was EPCIS—Electronic Product Code Information Services—and the use of global GS1 standards for information sharing
- Shop managers could decide when products should be brought to them from buffer storage
- GPS monitoring was used with interrogated GPS zones to inform distribution centres and shops of transport events, which enabled easy tracking and tracing of shipments
- Automatic message (SMS & E-mail) transition to stakeholders in the value chain proved valuable in-formation to prepare actions upon delivery

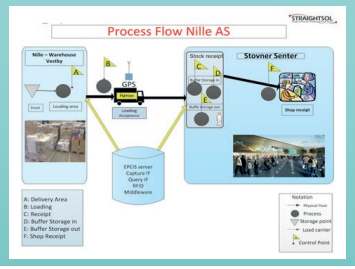



## WHY DID WE DO IT?

- Event information from 'checkpoints' in the transport value chain makes planning easier for shops
- Trucks occupy freight reception areas in shopping centres for long periods of time because the norm is that the driver has to accompany the goods from the unloading area to the individual stores
- It is difficult to ensure the accuracy of inbound transport flows to shops in the shopping centre (e.g. what and how many items to be delivered to each shop)

## KEY CHALLENGES FACED

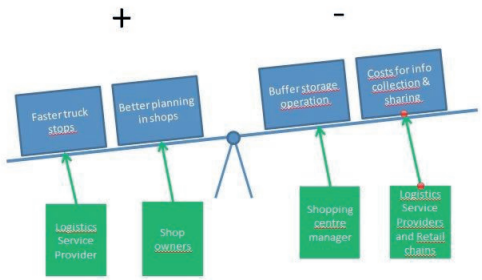
- To get 100% focus from stakeholders in the demonstration period
- Some minor technical problems with mobile RFID/barcode terminals and Event Monitoring
- The change in delivery process was challenged by truck drivers


Process flow from Nille Distribution Centre to Stovner Shopping Centre

## WHAT DID WE FIND?

- Dwell time of trucks could be reduced by up to 15 minutes per pallet
- Shops were happy because they had better information and could choose when they had their items delivered
- The direct environmental effects were positive, but limited in scale
- More significant environmental effects can be obtained with a large-scale implementation where the logistics service providers may re-optimize their distribution due to the savings obtained
- Benefit to cost ratio was positive
- Organisational and business aspects important for further roll-out




Advantages and disadvantages for stakeholders

## WHERE DO WE GO FROM HERE?

- GS1 Norway have been discussing the results from the demonstration with other distributors who want to discuss possible implementation of the solutions
- The results from the GS1 Norway Oslo demo are being taken forward by other projects e.g. value chain for electrical and electronic waste
- Steen & Strøm, the owners of the Stovner Shopping Centre, will develop the ideas further in their planning of the new Økern centre in Oslo during the next years.
- There is discussion with stakeholders and others about possible implementation of Auto-ID and Event Monitoring solutions by the use of EPCIS

GS1 Norway

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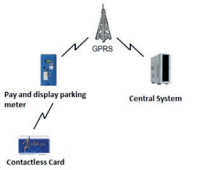
# Loading/Unloading operations management and regulation

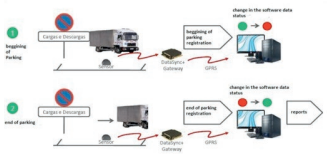
STRAIGHTSOL
Strategies and measures for smarter urban freight solutions

## WHAT DID WE DO?

- Alternative technologies to control loading/unloading activities in the city of Lisbon were tested:
  - Adapted Parking Meters that issued special tickets for 30 minutes of unloading/loading operations when users exposed a contactless card
  - Vehicle Detection Sensors installed on the ground which are activated by the presence of a vehicle in the parking place. These sent a message to EMEL's Parking Control Centre, which then gave the operator 30 minutes to finish unloading/loading and leave the parking place
- The demonstration took place in Guerra Junqueiro Avenue, Lisbon, chosen due to the diversity of shops and of loading and unloading procedures used (by hand, in pallets, in trolleys, etc.). The demonstration started on Dec 5th, 2011 and lasted until April 31st, 2012. The two technological schemes were applied simultaneously, one on each side of the avenue.




Adapted Parking Meters



Vehicle Detection Sensors

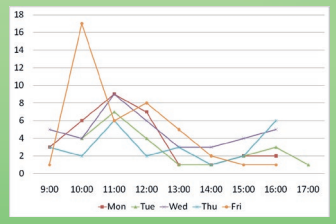
## WHY DID WE DO IT?

- To tackle several problems related to unregulated loading/unloading activities (road congestion, blockage and illegal parking)
- To find a technological solution that supports the revision and implementation of new municipal regulations on loading and unloading operations
- To ensure that parking surveillance becomes more efficient and can be done remotely in real time

## KEY CHALLENGES FACED

- Teaching operators and shoppers how to deal with the new scheme
- Involving local authorities (the local borough authority and the different municipal departments)
- Making normal road users deal with the routine changes (regarding parking, circulation and loading and unloading operations) while the technology was being implemented
- Dealing with illegal parking assistants


Sensor live reporting




Number of card users

## WHAT DID WE FIND?

- The adapted parking meters proved to be functional, although they didn't facilitate surveillance
- The vehicle detection sensors detected vehicle arrivals and departures, enabling calculation of time spent and the issue of alerts to the enforcement officer on duty in that area, in real-time
- Most of the deliveries took 5 to 10 minutes to complete, but there were also a lot of delivery vehicles parked for more than 30 minutes
- The number of deliveries remained fairly constant throughout the working week, with a sharp decrease on Saturday
- There was a peak of deliveries in the morning (at around 11 am) and a more spread peak in the afternoon, from 3pm to 4pm
- Illegal parking was almost constant throughout the day, with a slight increase towards the end of the afternoon
- The enhancement of the road markings in the parking spaces for loading and unloading improved legal parking in the demonstration area
- The demonstration also enhanced and validated the need to adapt the technology to the legislation, including regulating the supervision activity. The enforcement activity involves legal requirements which make the presence of an enforcement officer compulsory.

Loading areas, Guerra Junqueiro Avenue, Lisbon

## WHERE DO WE GO FROM HERE?

- The findings from the demonstration allowed Lisbon City Council to propose and implement new municipal parking regulations which consider loading and unloading activities
- The main challenge in the near future is the implementation of a new control system for the management of loading/unloading operations in the city of Lisbon. The system should be designed with the following features:
  - Be user-friendly for freight operators;
  - Be fully reliable;
  - Have a centralised management system.
  - Allow communication in real time of the required operational information.

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# Night deliveries to Brussels supermarkets

STRAIGHTSOL
*Strategies and measures for smarter urban freight solutions*

## WHAT IS THE CONTEXT?

- **Difficulties for retailers to deliver to their urban supermarkets**
  - Traffic congestion leads to productivity losses (1)
  - Legislation (time windows, environmental permits, road infrastructure, urban parking policies, road pricing) (2)
  - Truck manoeuvres in narrow streets and densely populated areas (3, 4)
  - Stressed truck drivers
- **Citizens and authorities want freight transport to be as sustainable as possible**
  - Less traffic congestion
  - No noise nuisance
  - Traffic safety
  - Lower emissions

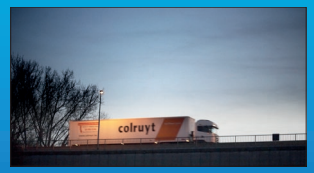
## WHAT WILL WE DO?

- Shift the deliveries to 5 supermarkets in Brussels from the day to the late evening or night (6, 7)
- Evaluate the impact on all stakeholders
- Focus on low noise solutions to maintain good relations with local residents
- On-site investment (covering delivery quays, safety investments, gates, maintenance costs, etc.)
- Two-phased demonstration periods:
  - August + September + October 2013: noise measurements on each demonstration site during 1 night and of 1 delivery routine
  - Based on these measurements, the Brussels Environmental Agency decided to allow Colruyt to shift deliveries to the night for one week (at each shop) and decided to change the environmental permit of 1 Delhaize shop.
  - January - April 2014: a temporary shift of the deliveries to the late evenings, early mornings and to the night
- The five demonstration sites offer a wide variety of delivery circumstances. Their exact locations are indicated on the map below.

2 Colruyt and 3 Delhaize demonstration sites in the Brussels-Capital Region

- Colruyt Veeweyde in Anderlecht
- Colruyt in Sint-Pieters-Woluwe
- Delhaize Flagey in Elsene
- Delhaize Fort Jaco in Ukkel
- Delhaize Debroux in Oudergem

- To decrease the noise impact of the deliveries, the supermarket will test several low noise measures:
  - CNG trucks (5) and Euro 6 diesel trucks
  - Silent trailers
  - Silent pallet trucks (6)
  - Covered unloading docks
  - Education of staff
- Multiple noise measurements on each site to measure the noise impact



## KEY CHALLENGES

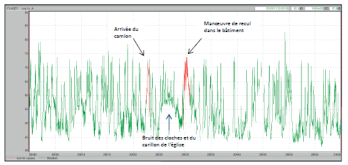
- Approval of the local authorities to test the night deliveries on the 5 demonstration sites
- Operational challenges

## WHY ARE WE DOING IT?

- Contributing to sustainable urban deliveries
- More flexibility in routing and planning of store deliveries
- Maintaining the good relations with local residents
- Anticipating possible road pricing measures
- Avoiding conflict between manoeuvering trucks and clients at supermarkets

## EXPECTED KEY RESULTS

- A cost reduction for fuel for CNG deliveries during the off-peak hours compared to diesel deliveries during the peak hours
- Time gains because peak traffic can be avoided
- No noise complaints by local residents
- Smoother operations at the distribution centre due to a better spread of departures
- Smoother and safer loading and unloading at the shop as it can be done before or after opening hours
- A viable business case that can balance the cost reductions (time gains, fuel gains, etc.) and the increases in costs (labour costs, investment costs, etc.)
- Reduced $CO_2$, NOx and PM10 emissions with 20%, 40% and 40% respectively
- A positive impact on overall traffic safety and traffic congestion



Noise measurements

## WHAT WILL HAPPEN AFTER THE DEMONSTRATION?

- Analysis of the demonstration results
- Final conclusions
- Can night deliveries to supermarket stores become an everyday practice in Brussels?

colruyt

DELHAIZE

Vrije Universiteit Brussel

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