

GLEAM NSR

Interreg
North Sea



Co-funded by
the European Union

Making construction logistics greener

24 February 2026

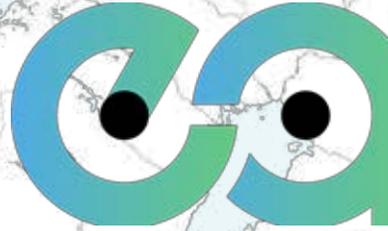


Agenda

1. Understanding construction logistics in Mechelen - Roos Lowette and Esmée H. (Stad Mechelen)
2. Urban construction logistics: from data to policy recommendations - Nicolas Brusselaers (VUB Research)
3. Enabling decarbonised last-mile construction logistics in Rotterdam - Sam van Hooff (Dura Vermeer)
4. Construction logistics and urban consolidation centres - Mark Goossenaerts (Shipt)



GLEAM NSR



Knowledge partners



Public authorities



Policy partners



LNC



Copenhagenize



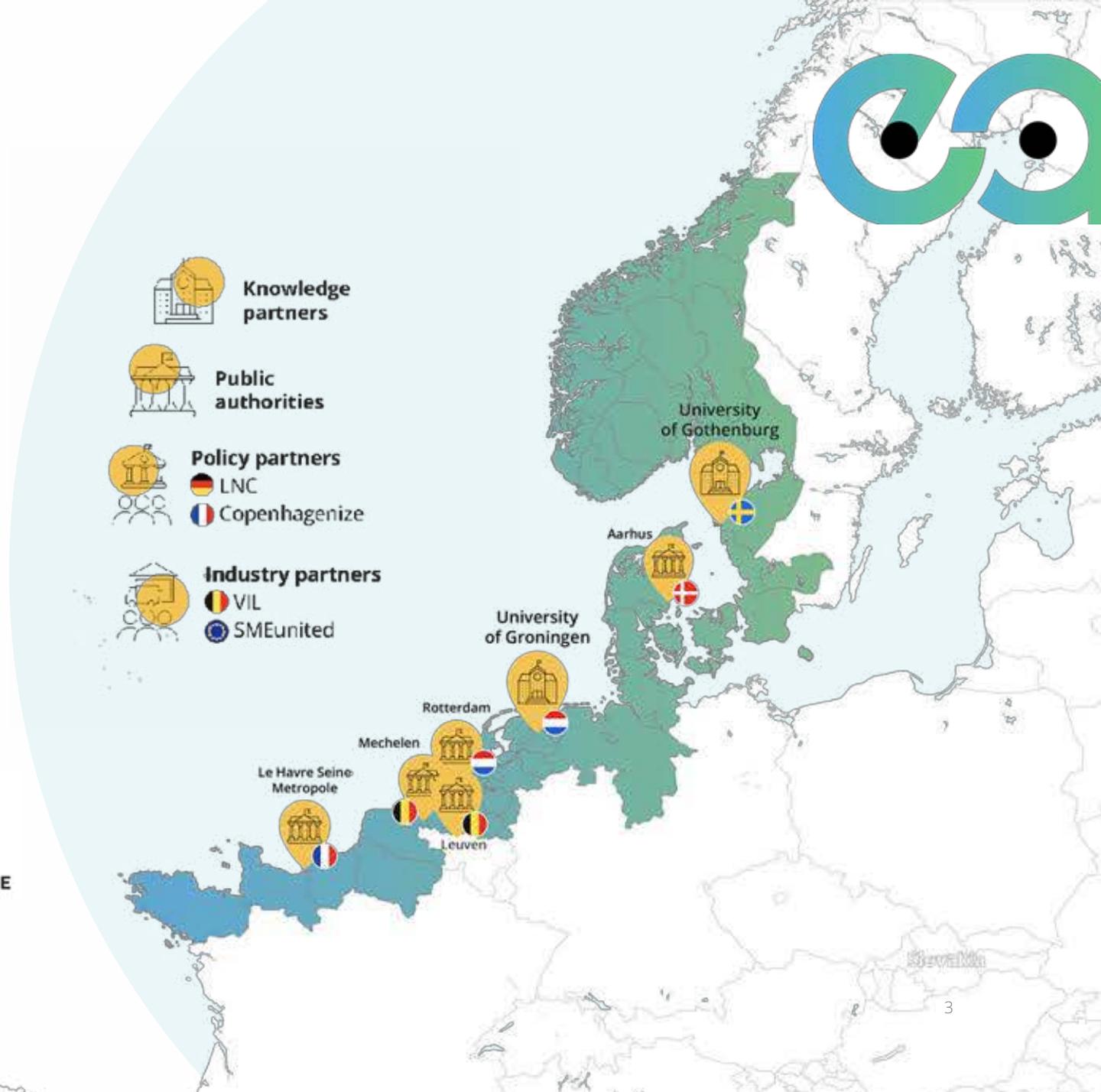
Industry partners



VIL



SMEunited

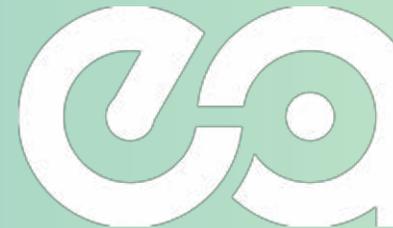


Upcoming GLEAM NSR webinars



- Zero emission zones: how, when and for whom do they work? – 21st Jan 2026
- Construction logistics – 24th February 2026
- Consumers in sustainable urban logistics – June 2026 (date tbc)
- Green procurement – 30th June 2026
- Cyclelogistics – 9th February 2027
- Service logistics – 23rd March 2027

GLEAM External Alliance - currently 15 cities and regions. We need 5 more!



Stay informed and connected

- Regular GLEAM NSR Lunch & Learns
- Project Journals
- GLEAM NSR Website
- Follow us on LinkedIn
- Email gleamnsr@copenhagenize.eu

- Sign up for our mailing list:



<https://www.interregnorthsea.eu/gleam-nsr>



<https://www.linkedin.com/company/gleam-nsr-interregnorthsea/>



Construction logistics in Mechelen

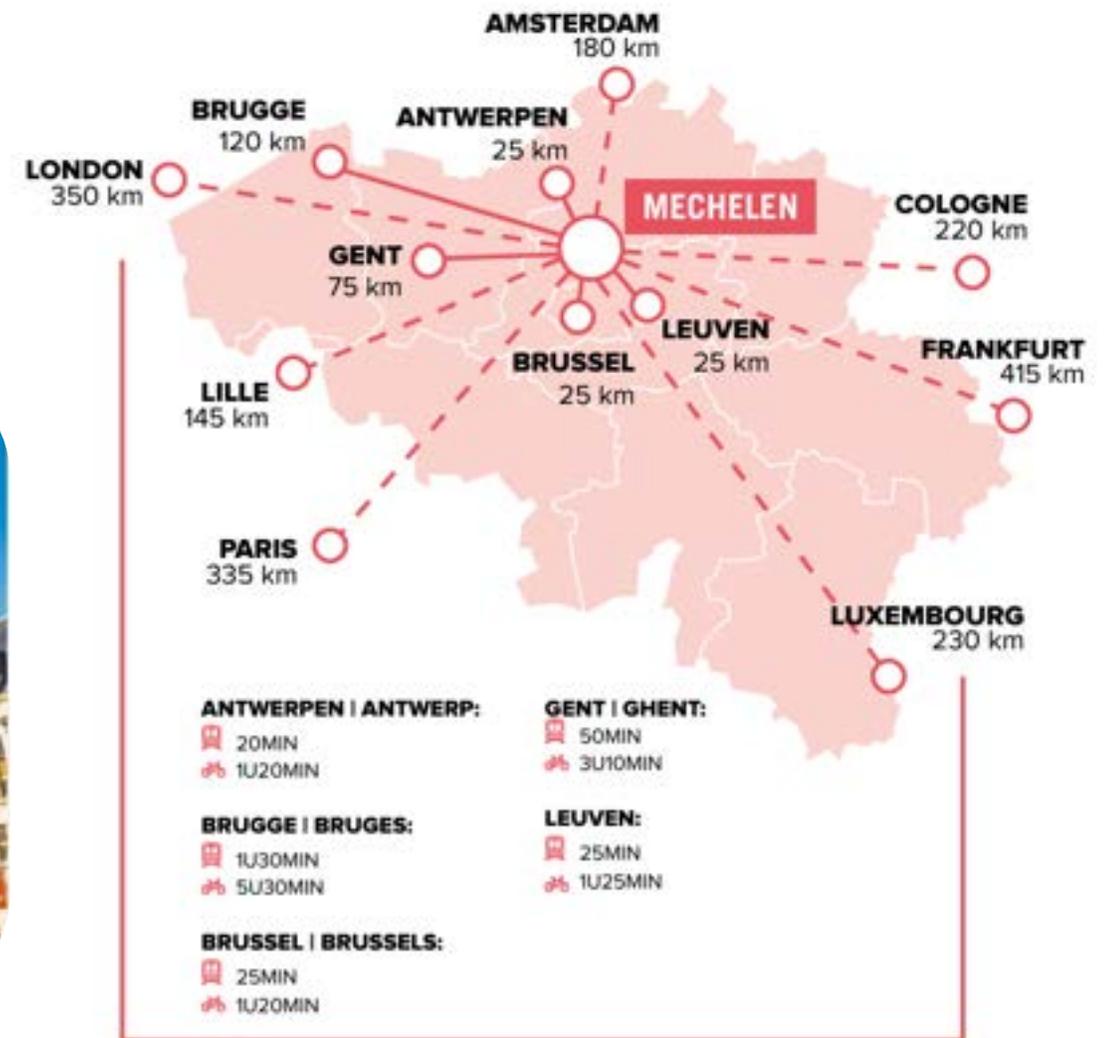
Medium-sized city in Belgium

= beating heart of Flanders → on the major urban and industrial axis Brussels-Antwerp



Number of inhabitants: 89.561

Area: +/- 6600 ha



MECHELEN IN BELGIUM

A livable, sustainable, safe and ↪ accessible city for all



→ our city has to be supplied with goods

GOALS

- Goal: zero-emission logistics in our city center by 2030
 - Covenant on Sustainable Urban Logistics
 - By using the 4Vs
- Numerous pilots thanks to EU-projects
 - Main focus: e-commerce & deliveries in the inner city (shops, restaurants,...)
- However...

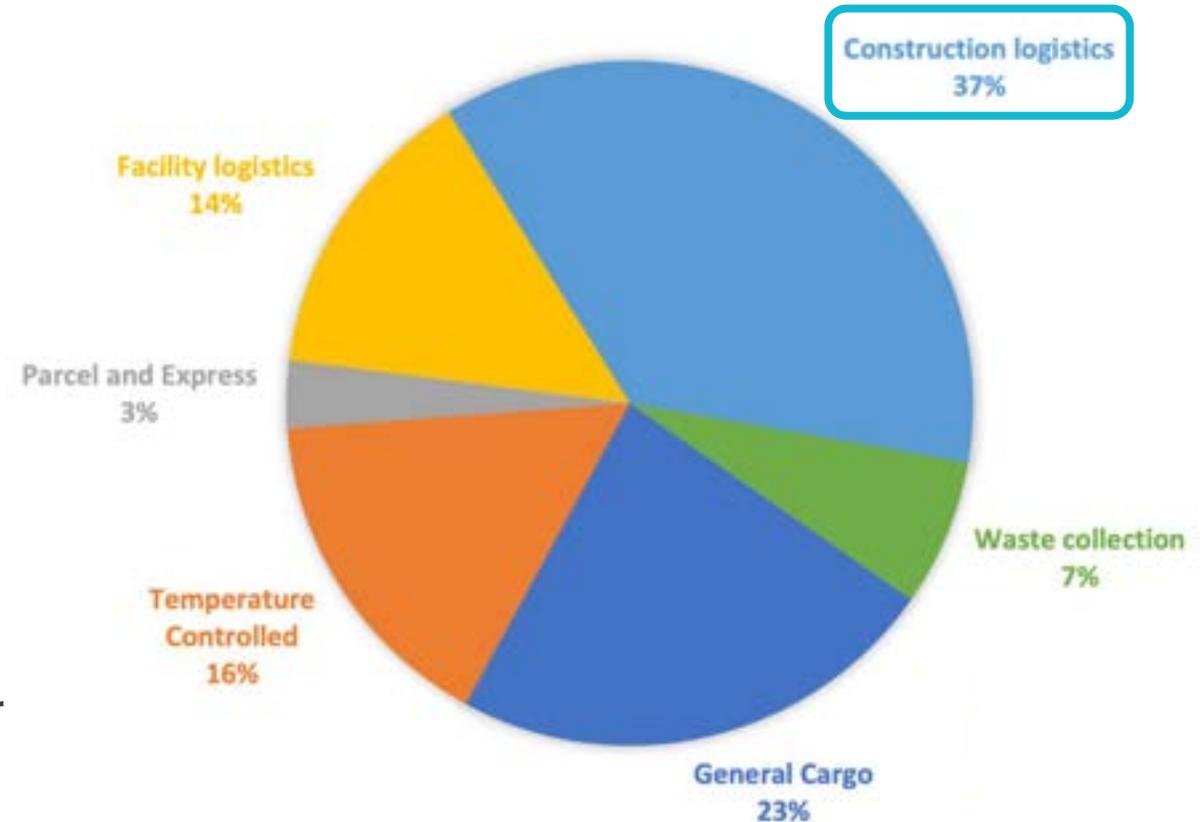


4Vs of logistics:

1. Avoiding kilometres (Vermijden)
2. Shifting to more sustainable modes of transport or times (Verschuiven)
3. Shifting to zero-emission vehicles (Verschonen)
4. Connecting with stakeholders (Verbinden)

- Goal: zero-emission logistics in our city center by 2030
 - Covenant on Sustainable Urban Logistics
 - By using the 4Vs
- Numerous pilots thanks to EU-projects
 - Main focus: e-commerce & deliveries in the inner city (shops, restaurants,...)
- Largest logistics flow in our inner city: construction logistics (37%)

SHARE OF VKT PER SECTOR



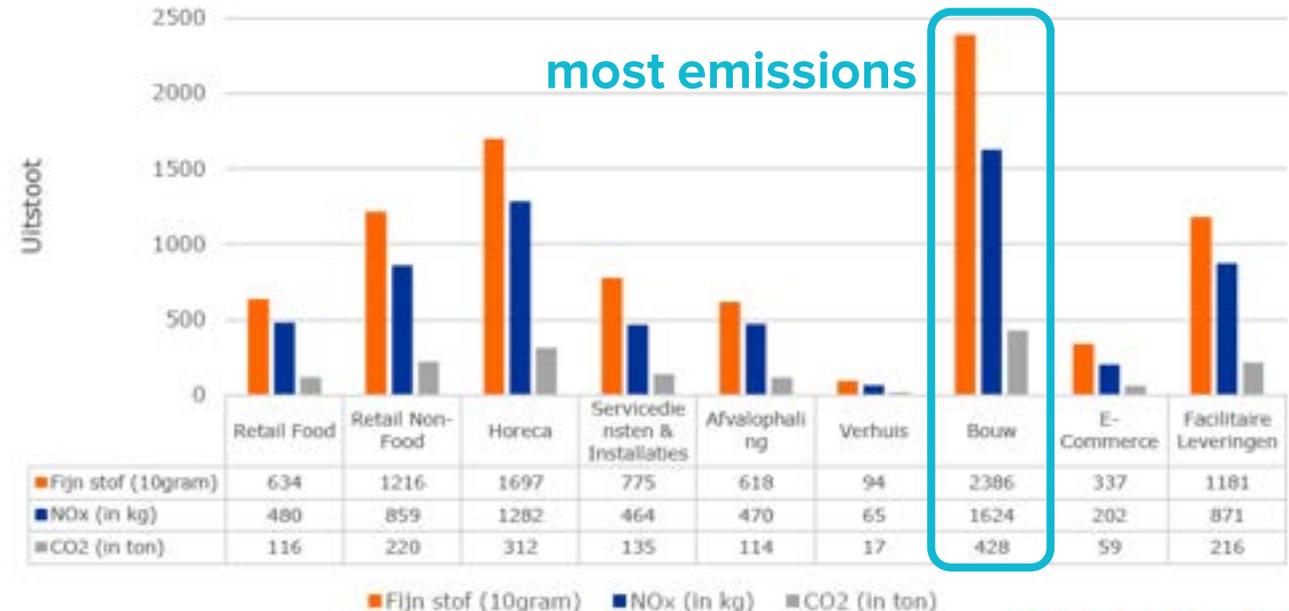
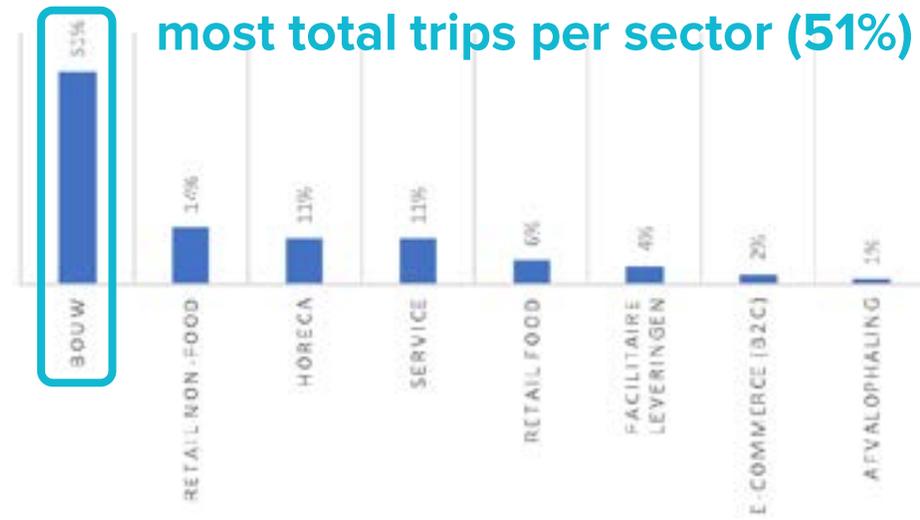
Research by University of Antwerp



LOGISTICS IN MECHELEN

IMPACT ON:

1. Livability
2. Accessibility
3. Congestion
4. Traffic safety
5. Air quality
6. Noise pollution
7. ...



Research for MOW by VUB, The New Drive and Rebel



CONSTRUCTION LOGISTICS IN NUMBERS



EXAMPLES IN MECHELEN



EXAMPLES IN MECHELEN

**A livable,
sustainable, safe
and accessible
city for all**



Population growth



Renovations

**Spatial Policy
Plan Mechelen**

We aspire to significant population growth and consider it our duty to alleviate pressure on the region by **facilitating strong growth in urban housing supply**. We consider a future with **120,000 inhabitants** in Mechelen to be a possibility for 2040.

The city also aims to increase the renovation rate of buildings within its territory. (**renovation acceleration**)

CONSTRUCTION SECTOR = ESSENTIAL



Focus on large
construction companies



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North Sea



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GLEAM NSR

Focus on SME's



INITIATIVES

- **Participation:**
 - Mapping most important stakeholders involved in large construction works
 - 2 workshops & survey with stakeholders
 - Engaging them to sign covenant
- Collect **data**
- Study on **long** (>11m) and **heavy vehicles** (>10t) in the inner city
- **Tenders** for own construction sites



INITIATIVES – UNCHAIN

- **Set up:**
 - City dialogues with SME's
 - Direct contact with diverse group
 - Same worries, same needs

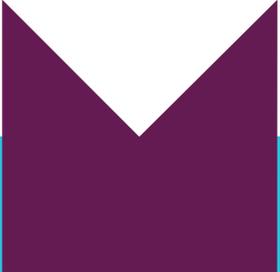


What cities think is needed vs what SME's actually need



INITIATIVES – GLEAM

- Cities have **little knowledge** about construction reality
- European funding provided capacity to **understand the current reality**
- Stakeholder meetings (UNCHAIN) and city dialogues (GLEAM) - **valuable input**
- Change is **sensitive issue**, what can cities do?
 - Limit the administrative burden
 - Focus on technical feasibility
 - Support & unburdening
- 2 different groups – same remarks + different capacity



MAIN TAKE AWAYS - UNCHAIN & GLEAM

Urban construction logistics: from data to policy recommendations

Nicolas Brusselaers

GLEAM NSR Seminar
24 February 2026



Future city



Inre Hamnen, Norrköping

Construction logistics, inevitable during the works

Current city

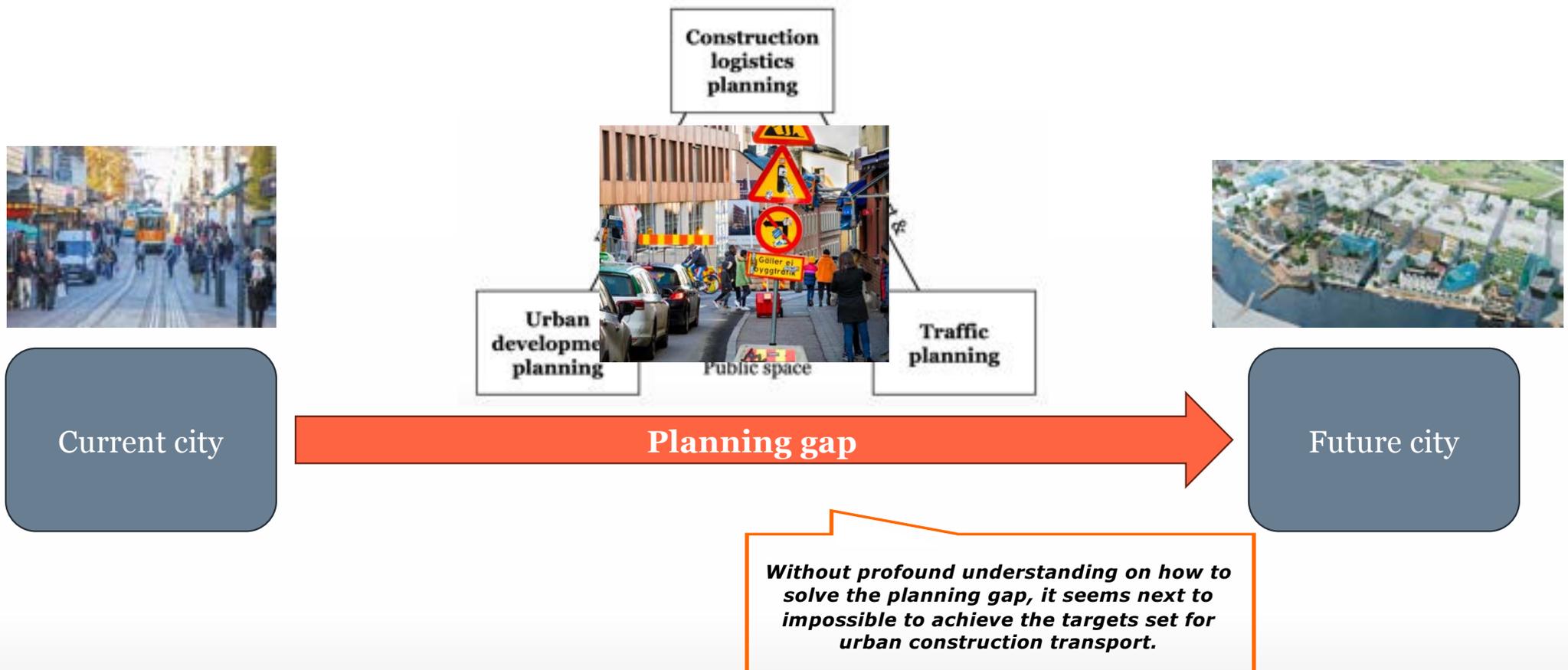


Inre Hamnen, Norrköping



Kungsgatan, Norrköping

The “planning gap”



This presentation



Dataset 1

Construction transport
planning

Dataset 2

Urban development
planning

Dataset 3

Traffic planning

A real-world holistic transport dataset

- **GPS points every 30 seconds**
- **Every truck (HGV >3.5t) in or through Belgium**
- **Entire road network**
- **Calculation-variables: vehicle type, EURO norm, time stamps & velocity**



Illustration: own work visualized using ArcGIS; Viapass, 2022.

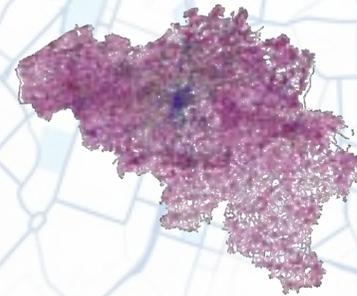
Transport data: OBU (GPS)



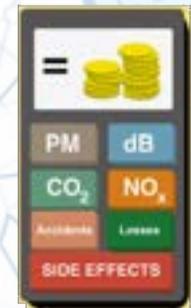
Construction vehicles identification algorithm (R)



Routing and vehicle-kilometre data (GIS)



Environmental impact assessment (external costs)



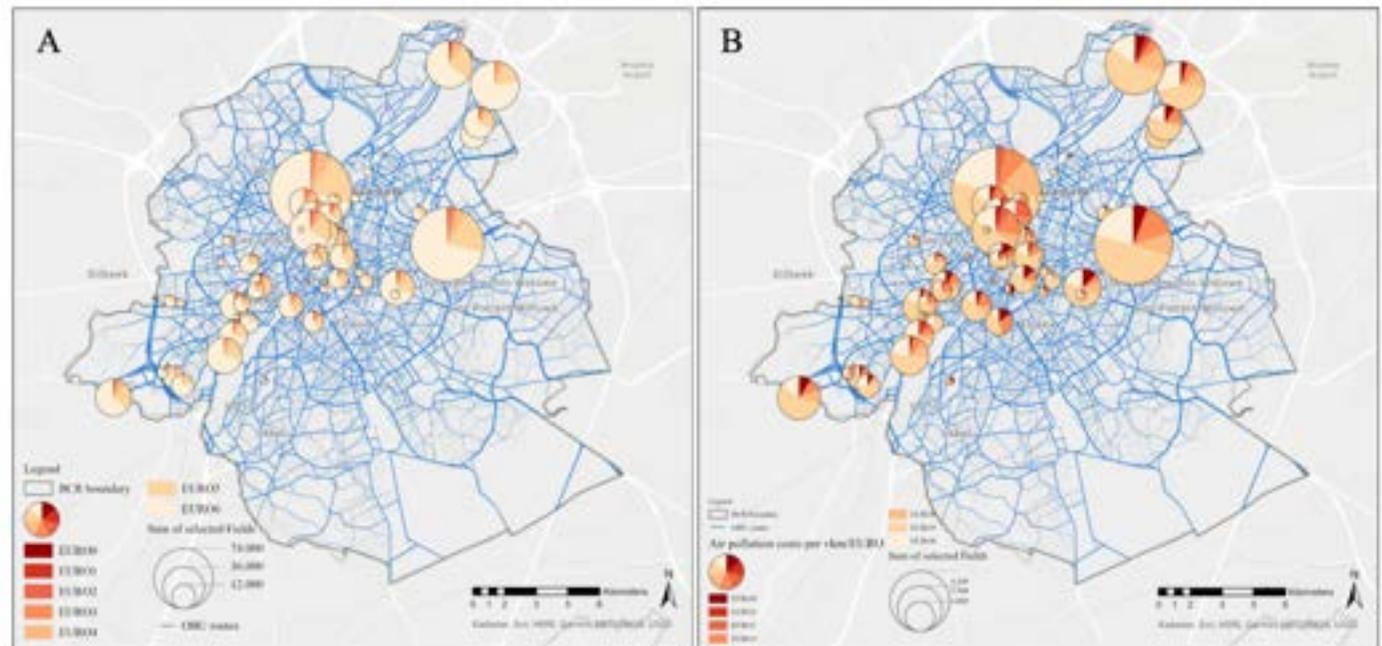
The impact of construction transport on city level

- **26.40%** of all HGV traffic
- **968,041.96** monthly driven vkm
- **34-50t truck-trailers** (>31% of fleet)
- **45,631.85 EUR** of daily external costs in the BCR

Transport attraction in number of vehicle-kilometres per construction site

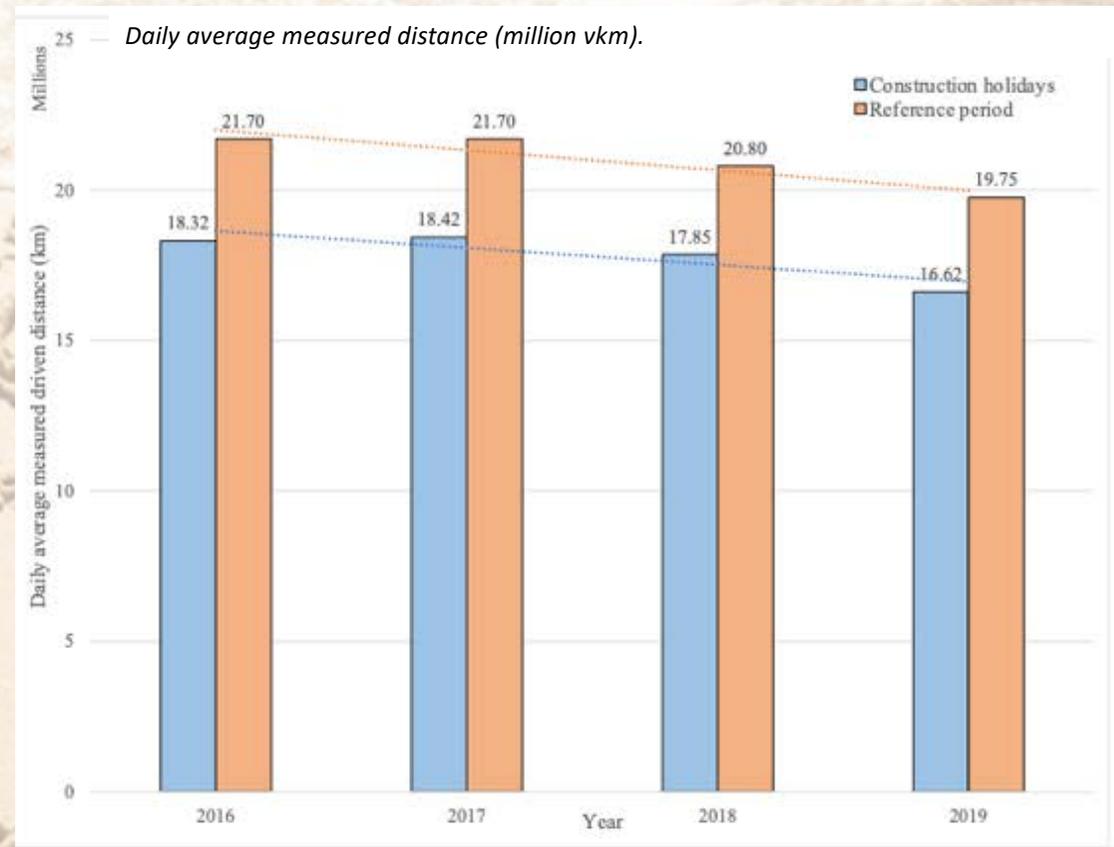
Total vkm/EURO-norm

External costs of air pollution/EURO-norm

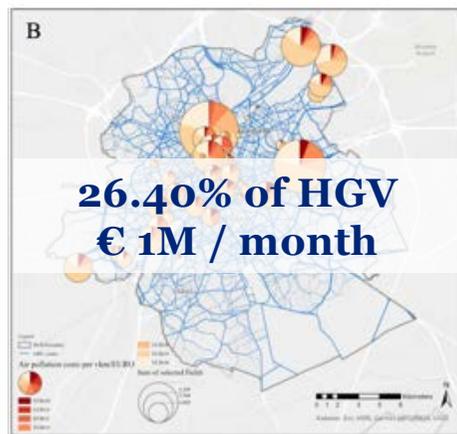


THE IMPACT ON NATIONAL LEVEL

- **17.58%** vkm in total HGV traffic
- **54.38%** >32t
- **EURO 5&6 = 54.89%** of vkm
- **€1.45mio** external costs daily



This presentation



Dataset 1

Construction transport
planning

Dataset 2

Urban development
planning

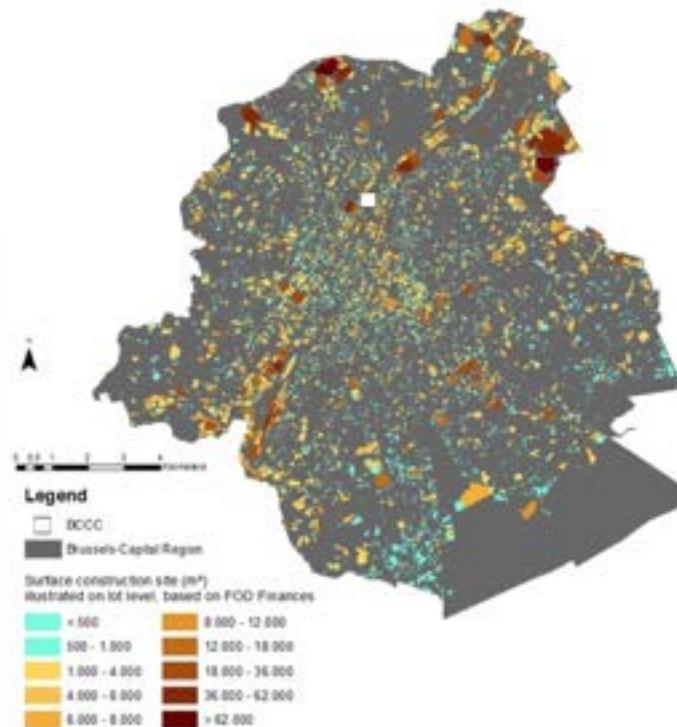
Dataset 3

Traffic planning

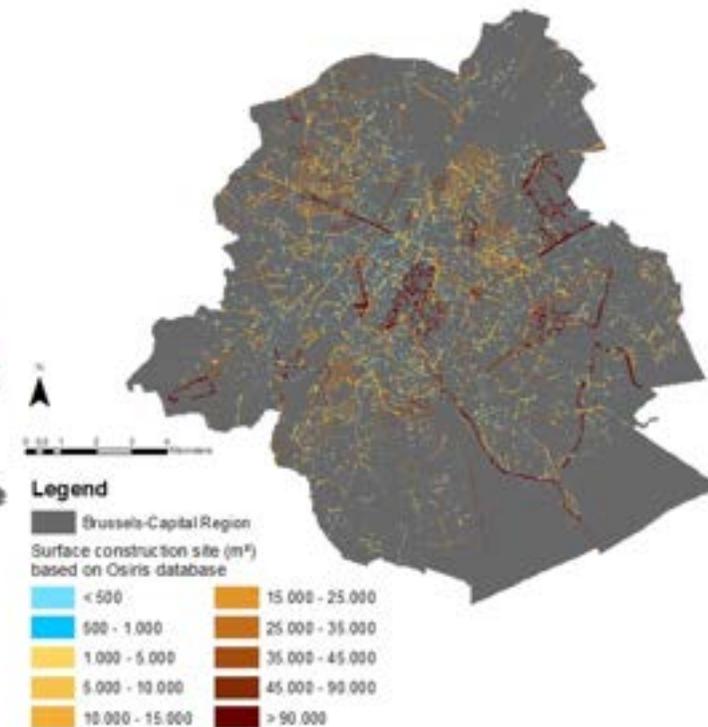
Transport demand and strategic buffer zones

- >200,000 geocoded construction and renovation site records in the Brussels-Capital Region (2015–2020)
- Neighborhood-level proxy for construction-material demand
- Congested-network location–allocation to evaluate candidate construction logistics facility locations

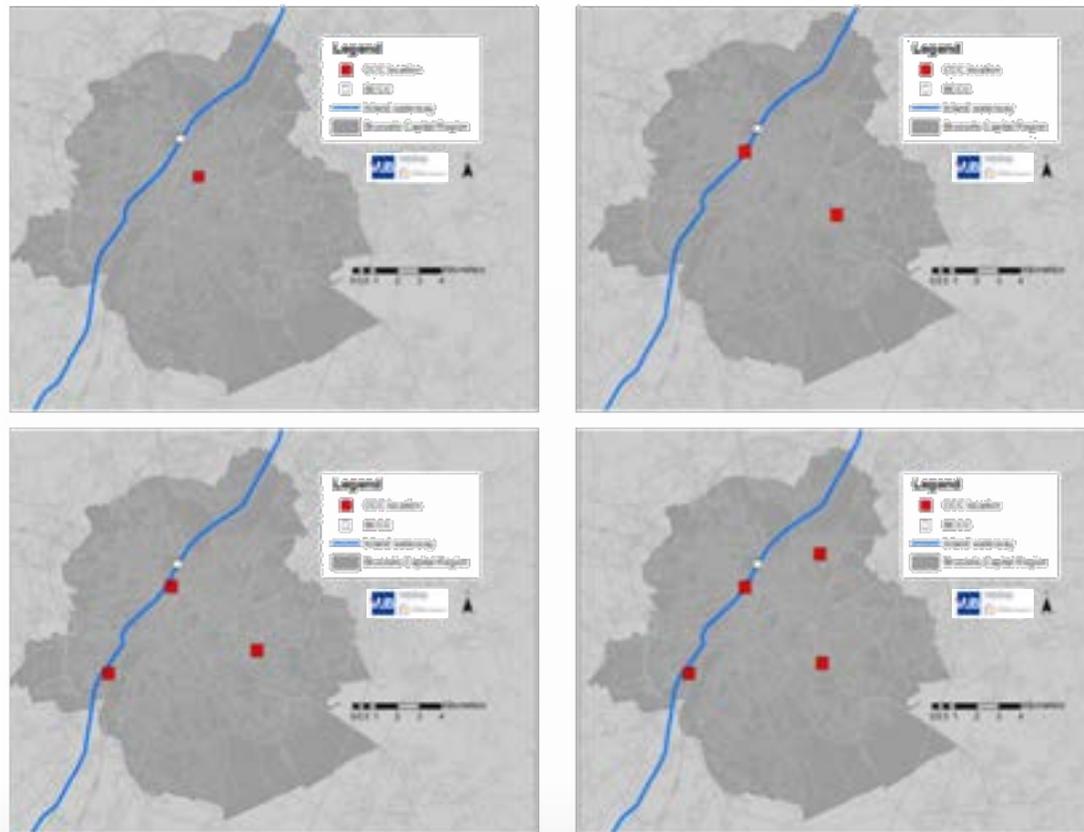
Surface of construction sites on lot level



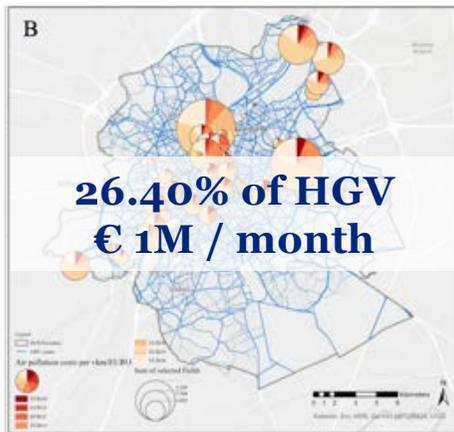
Surface of infrastructure construction works



Transport demand and strategic buffer zones

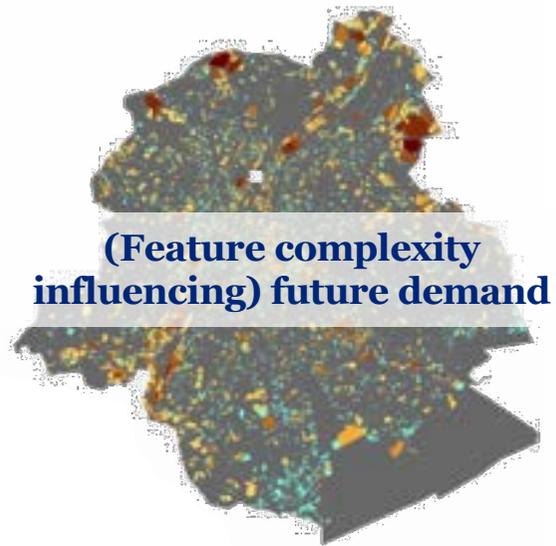


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Dataset 1

Construction transport
planning



Dataset 2

Urban development
planning



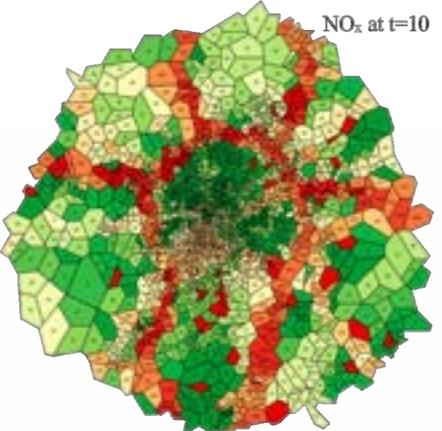
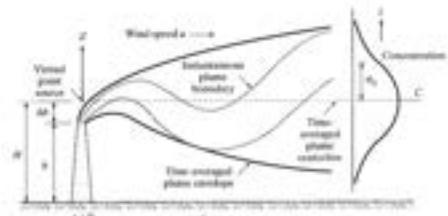
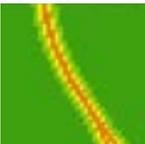
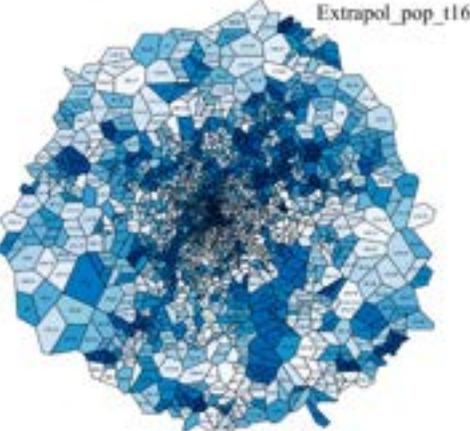
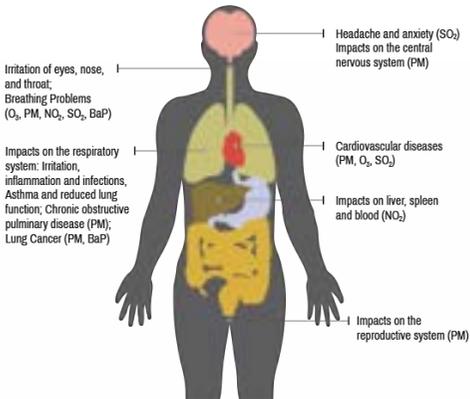
Dataset 3

Traffic planning

The dynamic impact of air quality: MSP data



Dynamic impact-pathway approach

(1) TRansport Agent-BAsed Model (TRABAM)	(2) DISPERSION	(3) DYNAMIC RECEPTOR DENSITIES	(4) DOSE-RESPONSE FUNCTIONS
<p>NO_x at t=10</p>  <p>Source: Mommens et al. (2018)</p>	<p>Point Source Gaussian Plume Model</p>  $C(X_r, Y_r) = \frac{Q}{\sqrt{2\pi} u z \sigma_z \cos \theta} [\text{erf}(t_1) - \text{erf}(t_2)]$ $\sigma_x = 0.14x (1 + 0.0003x)^{-1/2}$ $\sigma_y = 0.16x (1 + 0.0004x)^{-1/2}$ $t_1 = \frac{(X_r - Y_1) \cos \theta - X_r \sin \theta}{\sqrt{2}\sigma_x(x)}$  <p>Source: Lefebvre et al. (2013), Venkatram and Horst (2006).</p>	<p>Extrapol_pop_t16</p>  <p>Source: Brusselaers (2018), based on data from Brussels Mobility</p>	<p>HEALTH EFFECTS OF AIR POLLUTION</p>  <ul style="list-style-type: none"> Irritation of eyes, nose, and throat; Breathing Problems (O₃, PM, NO₂, SO₂, BaP) Impacts on the respiratory system: Irritation, inflammation and infections, Asthma and reduced lung function, Chronic obstructive pulmonary disease (PM); Lung Cancer (PM, BaP) Headache and anxiety (SO₂); Impacts on the central nervous system (PM) Cardiovascular diseases (PM, O₃, SO₂) Impacts on liver, spleen and blood (NO₂) Impacts on the reproductive system (PM) <p>Source: data from UZ Brussels, Devos et al. (2015), MCCOG (2019), WHO (2014)</p>

Rerouting construction transports around air pollution hotspots

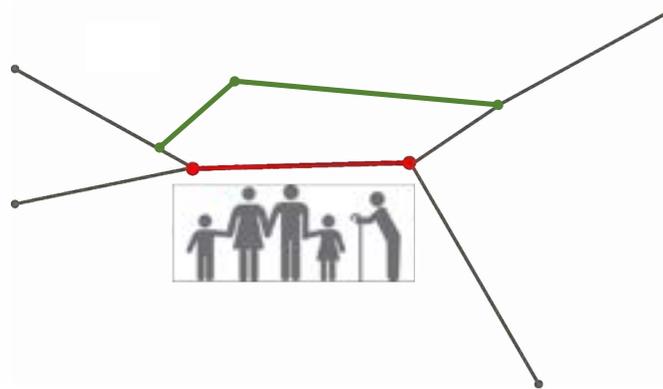


Dynamic population: mobile service provider data
(Brusselaers, 2018; Mommens et al., 2019)

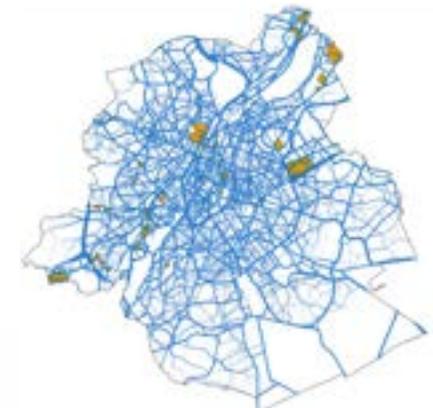


Vulnerable population TRAP hotspots
(Brusselaers et al., 2023a)

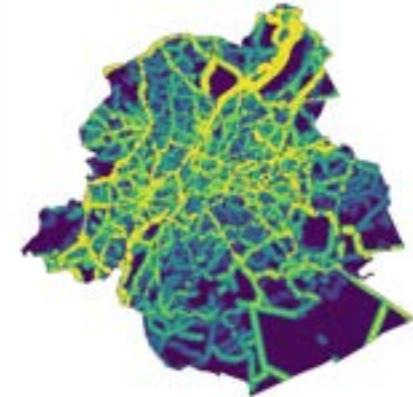
Health impact mitigation potential of urban construction transport?



CL routes **with** and **without** hotspot avoidance barriers



Construction transport HGV traffic: OBU data routed in GIS environment
(Brusselaers et al., 2022; 2022a; 2023)



Point-level CL emission dispersion (NO_x, PM) w/ differentiated vehicle fleet (HBEFA)
(Brusselaers et al., 2023b)

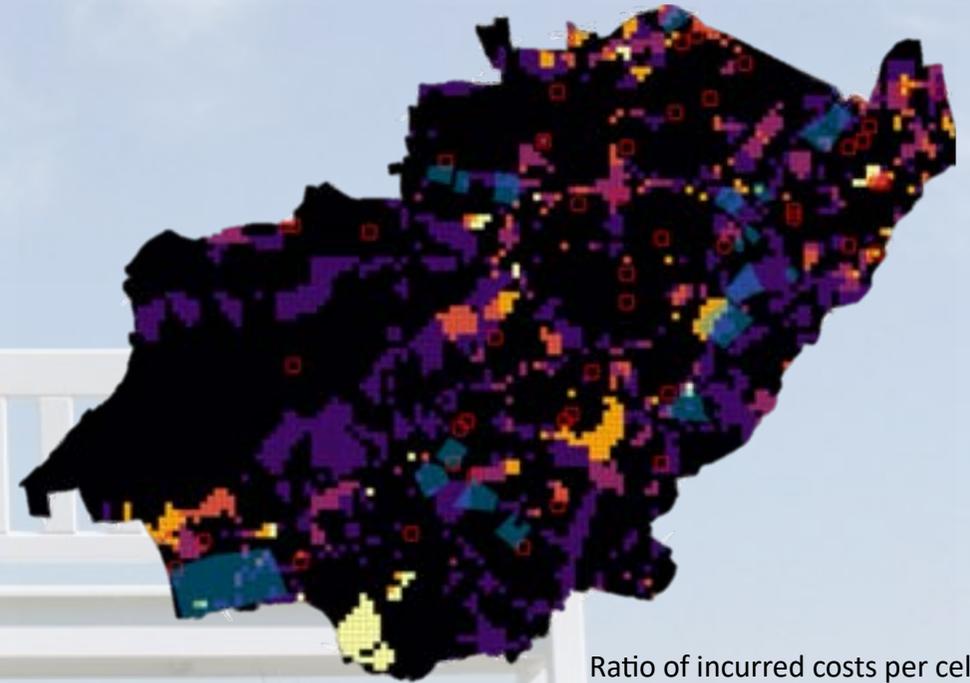
Rerouting construction transports around air pollution hotspots



5.56% NO_x and PM

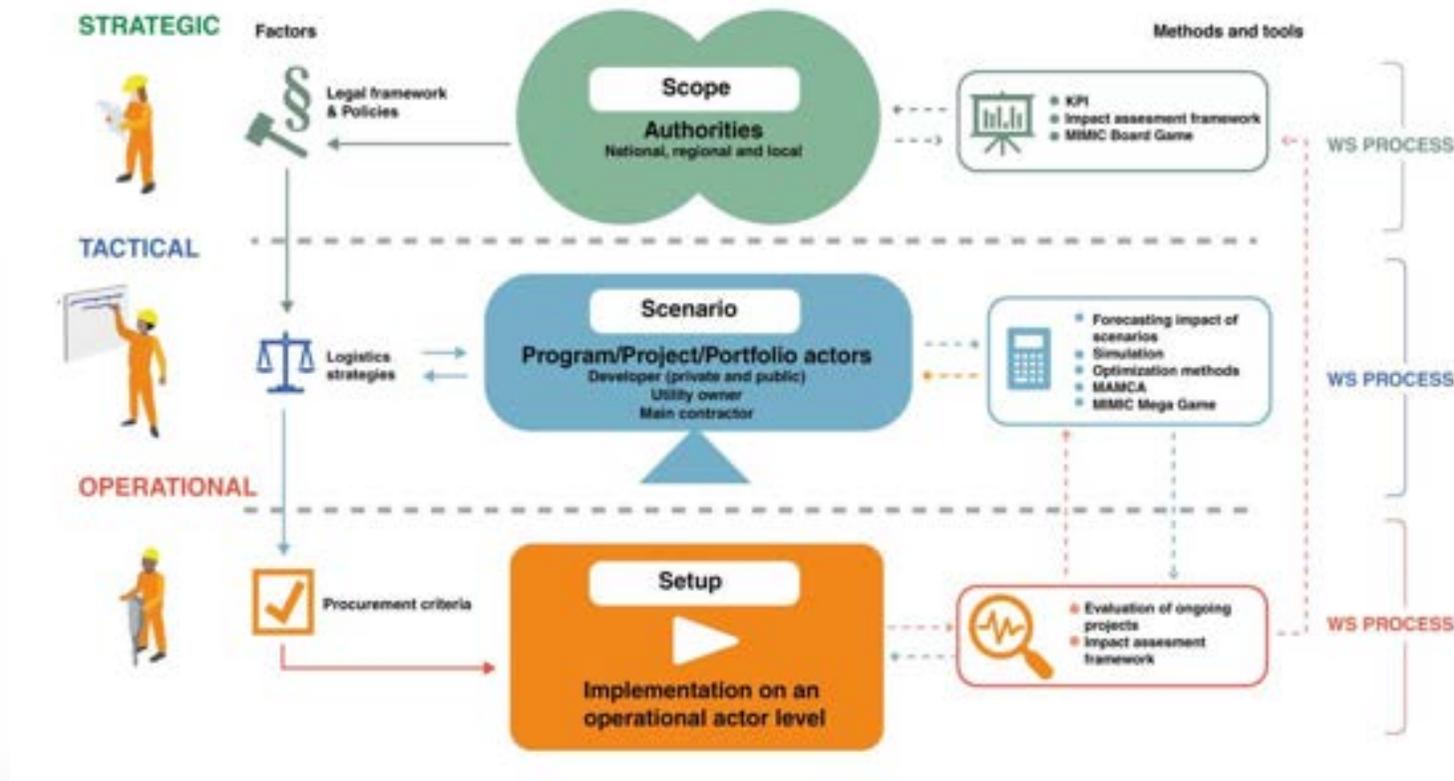


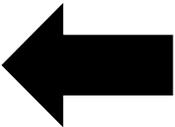
25.53% health costs



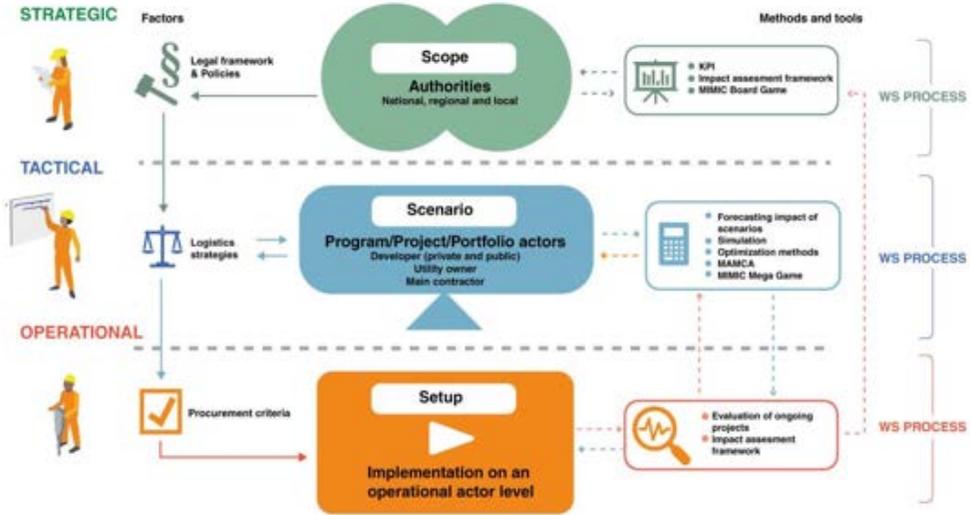
Ratio of incurred costs per cell
(Brusselaers et al., 2023b)

What lies ahead





Smart governance concept



L'accent est mis sur la manière dont les autorités peuvent influencer sur le champ d'application en définissant des politiques et des cadres réglementaires sur la manière d'aborder la logistique de la construction.

Identifier la portée (scope) et les objectifs de la logistique. La portée est liée aux limites géographiques et l'objectif aux parties prenantes impliquées.

L'accent est mis sur les acteurs et sur la manière dont ils mettent en œuvre les stratégies par le biais de scénarios logistiques (définition de scénarios logistiques territoriaux)

Identifier des scénarios qui incluent des considérations contextuelles et logistiques (b.a.u., consolidation, JIT, etc.).

L'accent est mis sur la mise en œuvre d'un dispositif au niveau inter-acteurs dans les projets et sur l'évaluation de l'impact du dispositif mis en œuvre

Identifier et mettre en œuvre une organisation logistique spécifique.

Réglementaire : ce qui se rapporte aux enjeux stratégiques des politiques et réglementations de la logistique et de la mobilité du secteur de la construction.

Comment le cadre réglementaire bruxellois peut/doit évoluer pour accueillir des activités logistiques et réduire l'impact de la mobilité du secteur de la construction ?

Territoire : ce qui se rapporte aux enjeux territoriaux de la logistique et de la mobilité du secteur de la construction.

Comment l'aménagement territorial urbain peut-il accueillir des activités économiques et logistiques du secteur de la construction et contribuer à réduire l'impact du secteur ?

Opérationnel : ce qui se rapporte aux enjeux d'expérimentations (activités et acteurs) de la logistique du secteur de la construction.

Comment les initiatives logistiques contribuent-elles à réduire l'impact de la logistique et de la mobilité du secteur de la construction ?

Métabolique : ce qui se rapporte aux impacts de l'évolution de la logistique de la construction (flux et stocks, mobilité, constat et perspectives, etc.).

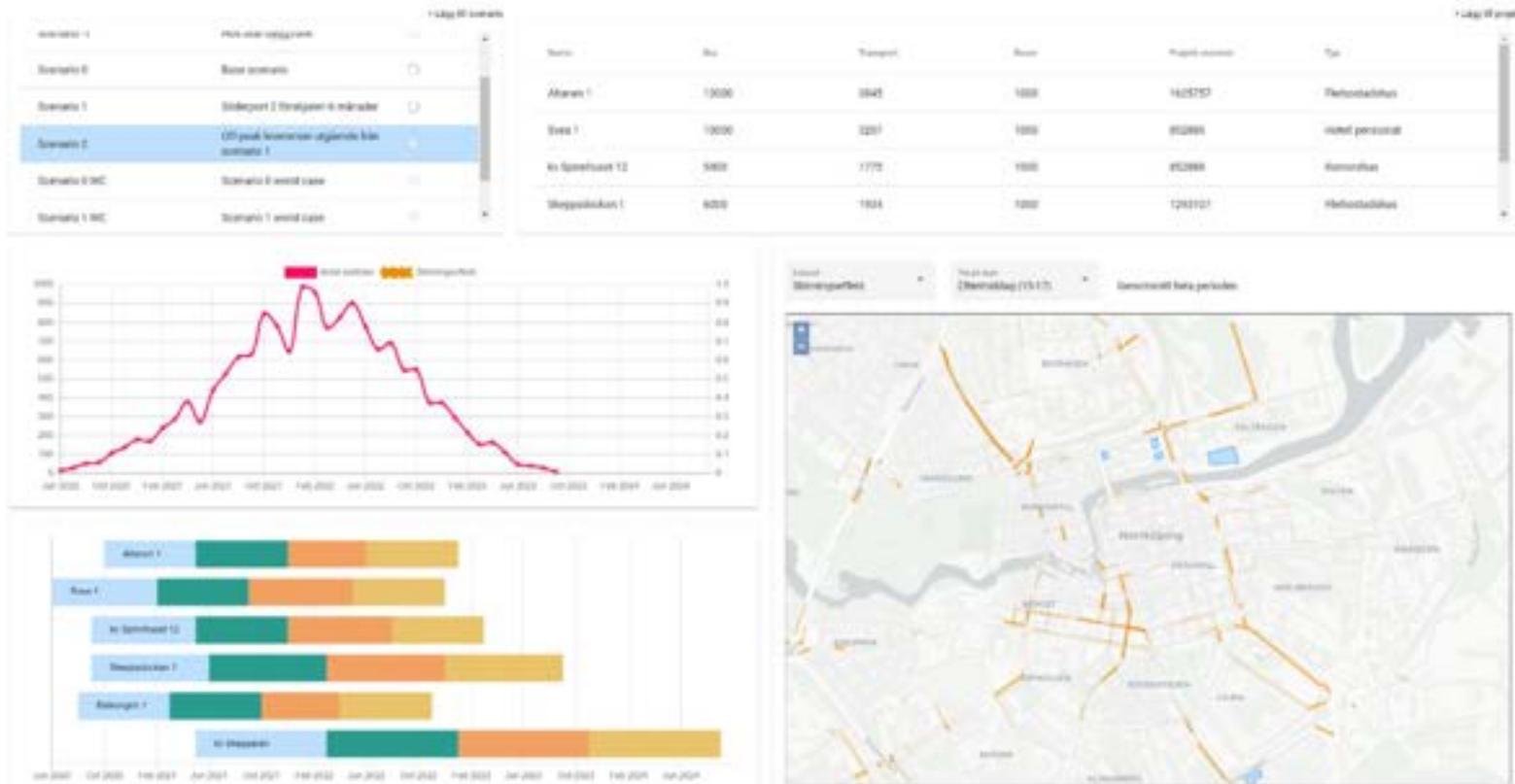
Evaluation impact
KPI



Atelier Logistique

Métabolique

Interactive visualization



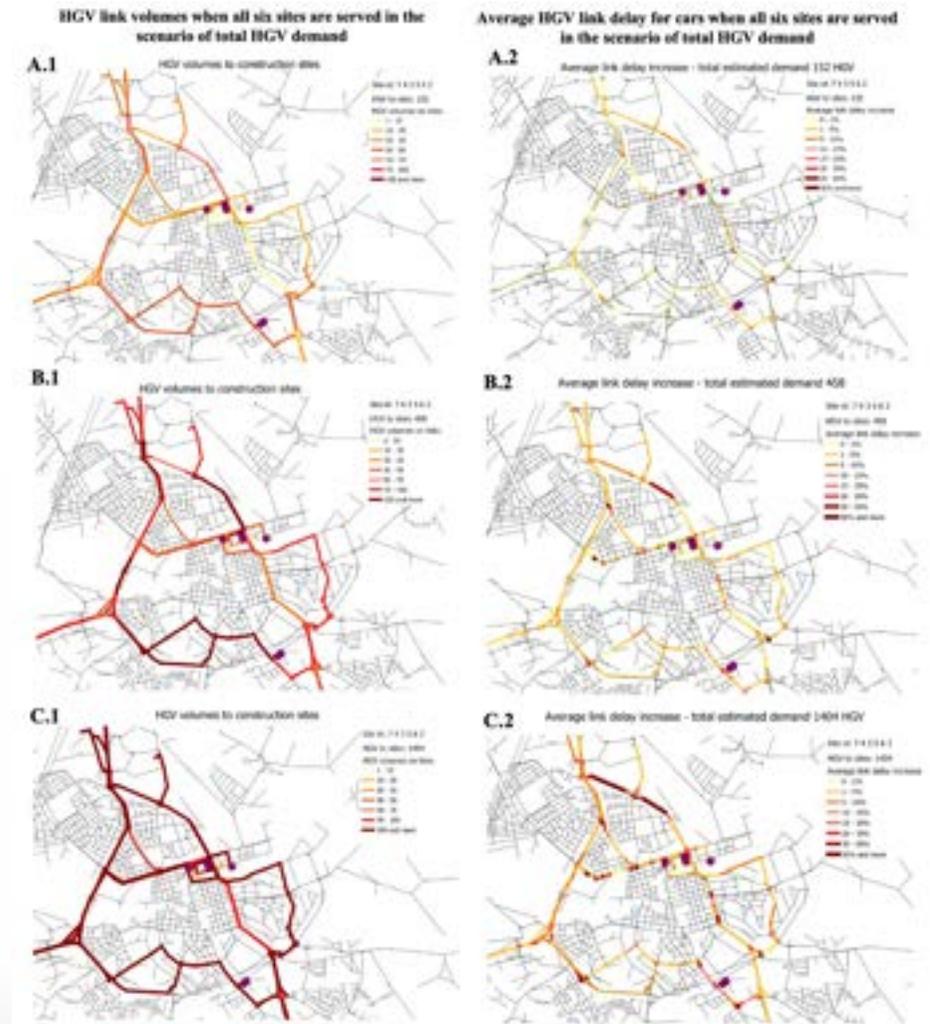
3D model



Digital twin

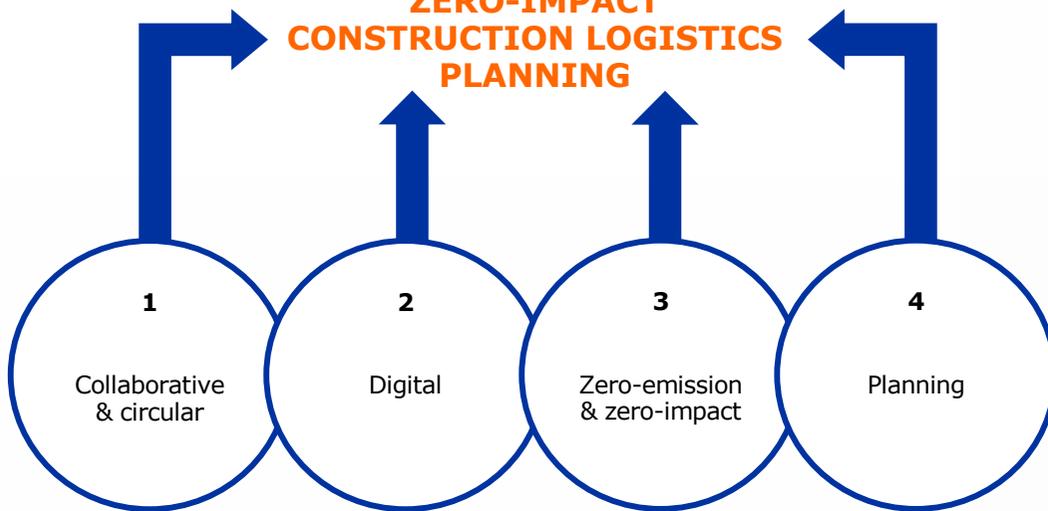


<https://www.youtube.com/watch?v=sJOYq4mUf0U>



Our research group

ZERO-IMPACT CONSTRUCTION LOGISTICS PLANNING



Dr. Nicolas BRUSSELAERS



Vrije Universiteit Brussel (Belgium)

Senior post-doctoral researcher in zero-impact construction logistics
Faculty of Economic and Social Sciences & Solvay Business School
Mobilise Research Group & House of Sustainable Transitions
Nicolas.Brusselaers@vub.be (+32497327322)
Office: 1050 Brussels, Pleinlaan 5, Room 4.33



Université Libre de Bruxelles (Belgium)

Co-promotor and senior researcher in circular construction logistics
Brussels School of Engineering (École Polytechnique de Bruxelles)
BATir - Building, Architecture & Town Planning
Sustainable Urban Futures Institute (SUFI)



Network on European Communications and Transport Activities Research

Co-chair NECTAR Cluster 3: Transport & Freight
Website: <https://nectar-eu.eu>



Linköping University (Sweden)

Voluntary researcher
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Office: Luntgatan 2, Norrköping, Office SP8212



Construction Logistics and Supply Chain Management

We are researching how to create long-term sustainability and effectiveness in the built environment with a focus on logistics, digitalization, and resource-efficient construction.



Traffic Modeling and Simulation

Our research includes both the development of new types of models, and the application of models to new situations. The models studied include both the demand and supply side of the problem and...



Transport Analytics

We are currently working with data from stationary radar sensors which measure speed and flow of traffic, GPS data from vehicles driving around urban areas, and mobile phone location data extracted from the mobile phone network.



Urban development and logistics

The research focus on decreasing environmental impact and disturbances of city development, as well as utilization of capacity of time and space within the city in such a way that both goods and person transport can work efficiently and effectively.

ENABLING DECARBONISED LAST-MILE CONSTRUCTION LOGISTICS

A Case study in Rotterdam/The Hague



Sam van Hooff



INTRODUCTION



- Housing & utility construction
- Renovation & transformation
- Real estate development
- Infrastructure

Sam van Hooff | Sustainability Manager

- Sustainable building materials
- Circularity & Biobased construction

CASE STUDY

Witte Anna - The Hague

Renovation of 166 social housing units

- Kitchen, toilet, bathroom
- Windows & windowframes
- Facade clean-up

- High-density urban location
- Right next to central train station
- Very small construction site



CASE STUDY

Urban Miner: Circularity & Logistics Hub

- Logistics, storage & harbour access
- Recycling of asphalt & concrete
- Circularity: used building materials & sawmill
- Located near Dordrecht (56 km from construction site / 25 km from Rotterdam)





BUSINESS AS USUAL

25+ subcontractors

- Building materials
- Personnel
- Company-specific planning, space occupancy, safety measures, etc

Situation

- 8 large diesel trucks / week
- Various smaller diesel vans / week
- Planning difficulties: just-in-time
- Very limited capacity for storage & waste



SOLUTION

Use the hub as a buffer location

- Various small deliveries → 1 big delivery
- Day- & week-packages
- Quality control
- Just-in-time & Just-what-you-need

Resulting in:

- 1 Electric truck / day
- 1 Diesel truck / two weeks
- Construction waste on return trip
- Less nuisance & emissions in the neighbourhood

IN CONTROL

Taking ownership of logistics

Logistics were planned and controlled by ourselves

- Software solutions for planning deliveries & returns
- Easy scheduling & changing





CHALLENGES

Practical

- Charging facilities
- Touching everything twice
- Capacity of electric truck

Financial

- Extra costs without directly quantifiable returns
- Touching twice = paying twice
- Costs of preparing day- & week-packages
- Buffer location costs can't be allocated



QUESTIONS & NEXT STEPS

Next steps

- Changing subcontractors business models
- Quantifying non-financial advantages

Questions

- How to deal with unquantifiable advantages?
- How can municipalities contribute?

QUESTIONS?

Sam van Hooff | Sustainability Manager

s.v.hooff@duravermeer.nl



SOLUTION

Urban Miner: Circular & logistics Hub

Renovation of 166 social housing units

- Kitchen, toilet, bathroom
 - Windows & windowframes
 - Facade clean-up
-
- High-density urban location
 - Right next to central train station
 - Very small construction site

OP NAAR NET ZERO

SOLUTION

Urban Miner: Circularity & Logistics Hub

Results

- Diesel trucks: 400 → 25
- Efficient waste transportation

ACTIVITEIT

Zeepkisten Challenge

Annelot Overbeek
Arzu Çetin
Casper de Leeuw
Daan Vreeswijk
Franke de Haan
Maarten Buitelaar
Mark Strookman
Mees van de Pas
Mehmet Ersahin
René van Meerkerk
Roos Eggengoor
Stan Keizer
Tim Rolleman
Björn Valstar
Joris Lemette
Sam van Hooff
Sanne van der Sluijs
Teska Eekema

Kookworkshop PAO

Al Waili
Cheryl Schop
Davina Annim
Frédérique Batelaan
Ilvia Hederik
Joris Stolk
Jorn van Akker
Matthijs Muntendam
Michiel Rockx
Nadi Morsink
Sanne Reumermann
Simone Jeurissen
Tessa Eveleens
Tiffany Trampe
Koen Schmitt

Ecosysteemtherapie

Annemiek Braunius
Carmen van Megen
Daniel Dobrovinski
Duarte van Gijzelen
Gerardo van Meerkerk
Iris Kamphuis
Jurrian Versteeg
Ky Krijkamp
Mark Kanters
Nienke Collet
Rick Niemeijer
Roan Faber
Wim Vendrig
Yorrim Wijnbergen
Caroline Albers

Construction logistics and urban consolidation centres

CITIES CAN MAKE THE CHOICE...

NOT to become a hell hole!



WHERE PEOPLE DO **NOT**... IN THE STREET





WHERE CARS & TRUCKS HAVE **NOT** TAKEN OVER



The financial angle...

Cost of congestion

The total economic cost of congestion, expressed in millions of euro or as a percentage of GDP (%). The economic costs generated by congestion relate to time lost, excess fuel consumption and the cost of additional emissions from vehicles. They are converted into monetary values.

Last month cost

October 2025

605M €

+7%
vs. October 2024

Year to date cost

Jan-Oct 2025

4709M €

+3%
Jan-Oct 2024

Year to date cost over GDP

Jan-Oct 2025

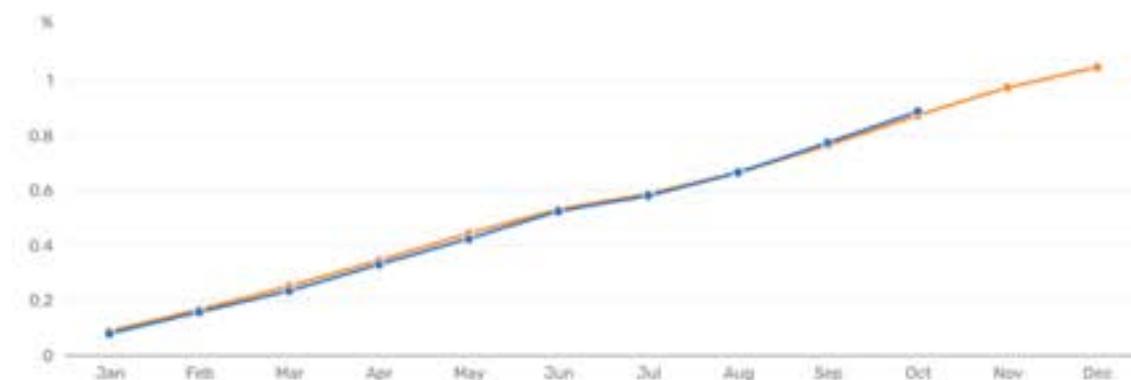
0.89%

+2%
Jan-Oct 2024



Cumulative cost vs. GDP

2024 2025



Cost breakdown

By vehicle, year to date

Car Light truck Heavy truck

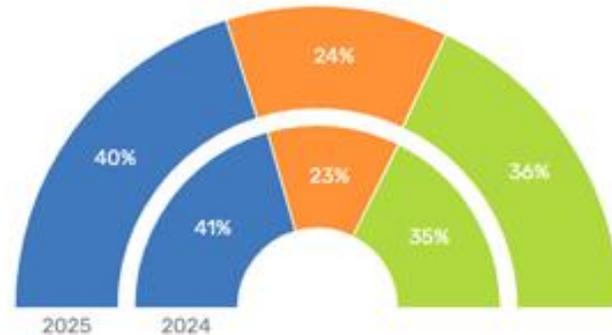


Goods transport represents **only 17%** of total traffic, yet...

Cost breakdown

By vehicle, year to date

Car Light truck Heavy truck



They stand for **60%** of the congestion cost

Construction related transport stands for **+/-30%** of goods transport in a city

- Goods transport stands for **60%** of congestion cost, or **+3 Billion €**...
- And/Or **+0,9 Billion € (30%)** is due to **construction related** transport...
- Antwerp pays: **EACH YEAR +50 Million €**, congestion costs due to **inefficient Construction Related Transport**

Daily estimate for Antwerp *		
#	<u>Modality</u>	<u>% construction</u>
11.000	trucks	30
18.000	vans	49

The human angle...



Efficiency* of a person in the industry

80%



Efficiency* of a person in construction

30%

Average distance walked per day
8 à 10 km

Number of times a product is
handled
6 à 8

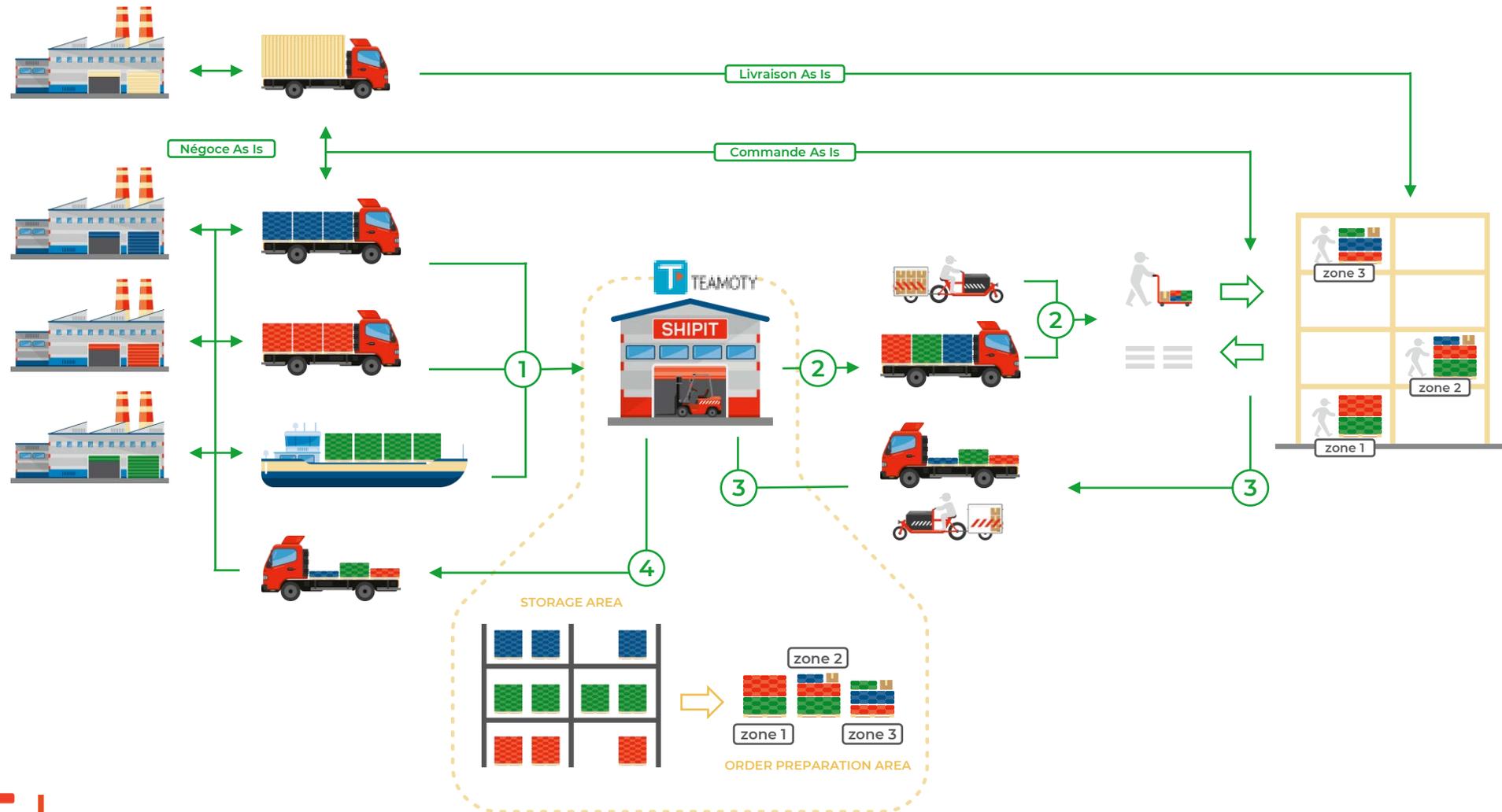
1 accident out of 2 is due to
handling

37% suffer from dorsal problems

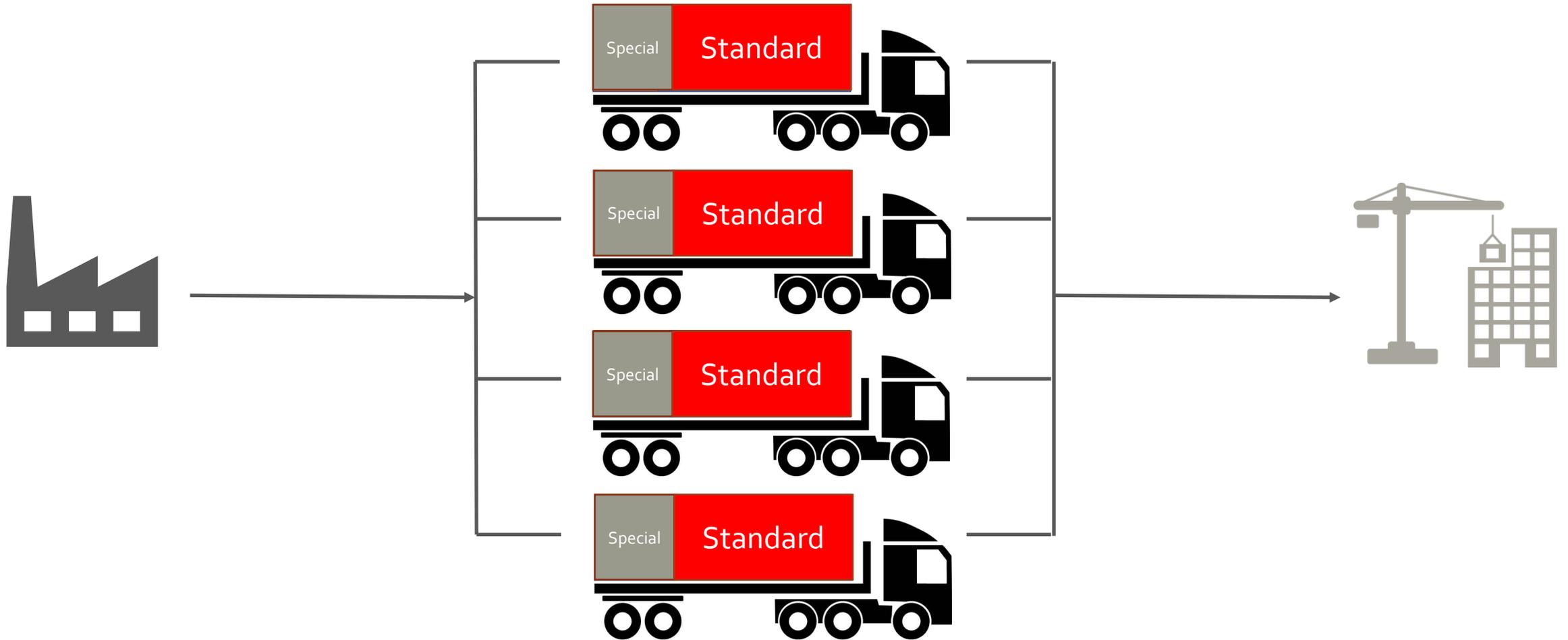
Supply chain innovation is needed!



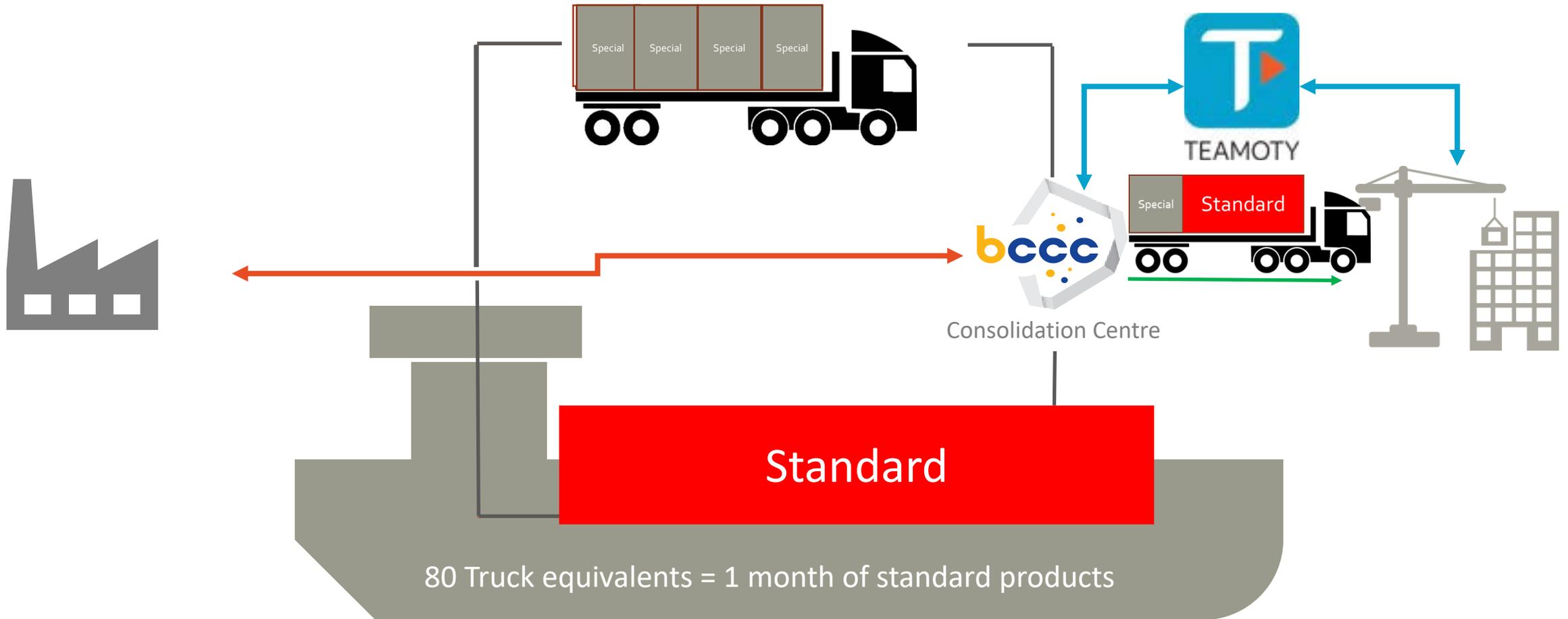
That's why we created a solid logistics backbone



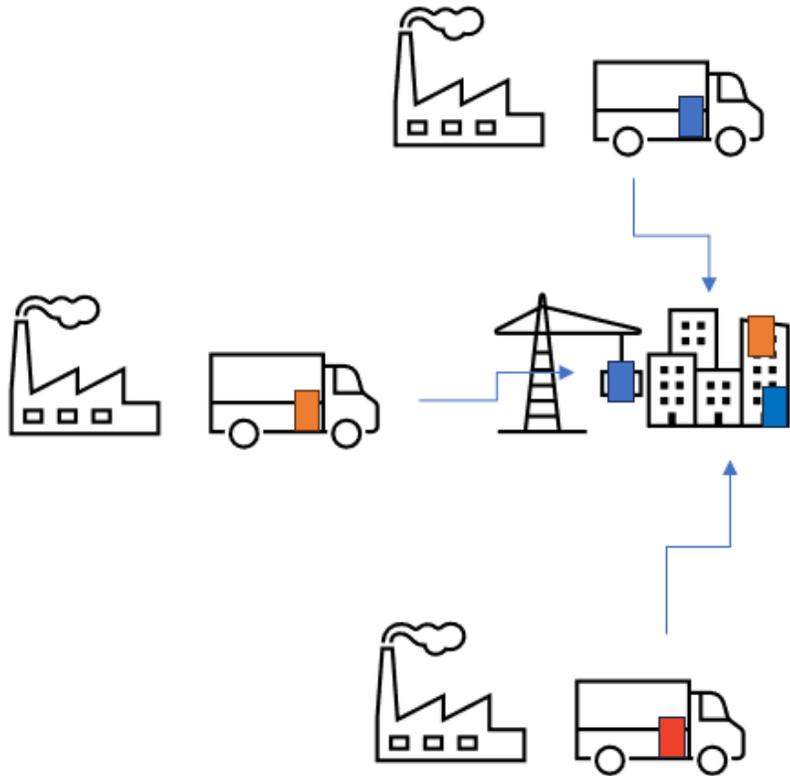
For structural works



Standard pieces via ship, specials via truck + *supply chain digitalized, last mile consolidated*



And for finishing,



Where badly organised supply chains lead to

- Only a few pallets per truck
- Delivered somewhere around the construction site
- Manual internal logistics
- Unexpected deliveries
- Too much space taken on site
- Non conform deliveries

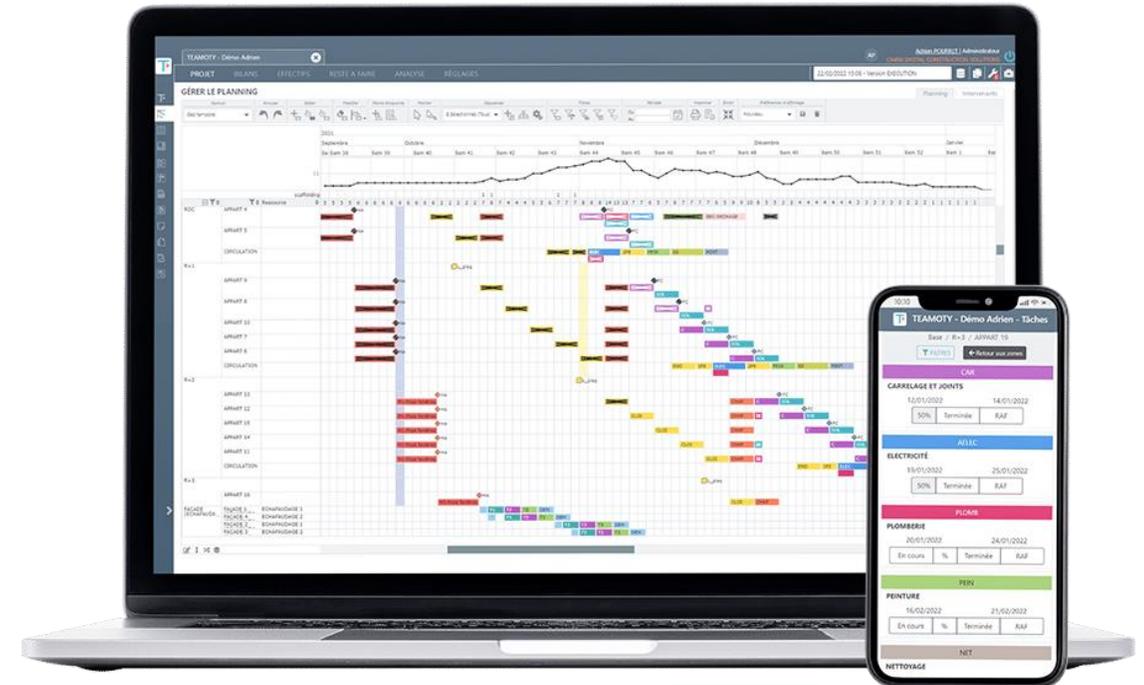


We organised logistics...



Accompanied by a fully integrated IT planning system

- A collaborative tool to manage site logistics
- A tool to simplify flow traceability
- A configurable solution designed to our customers needs
- A software solution that adapts to different types of construction projects

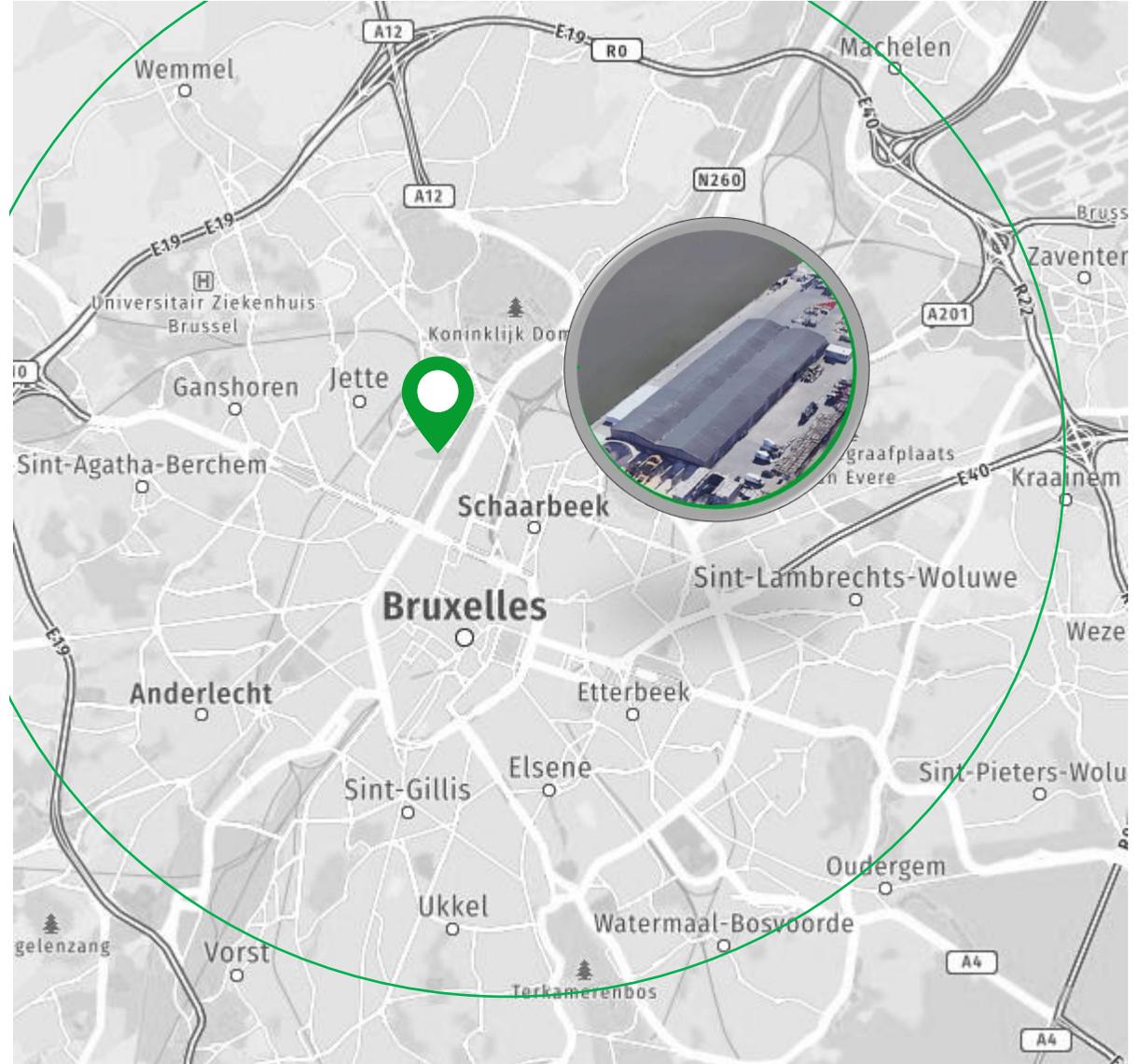


An urban terminal

Consolidation centre for construction material

- Arriving by boat
- Arriving by truck

Covers **70%** of construction sites in less than **30 minutes**



SHIPIT URBAN TERMINAL

Havenlaan 67 - 1000 Brussel

new... ReloAD

Return logistics Afval
Déchets



On site sorting

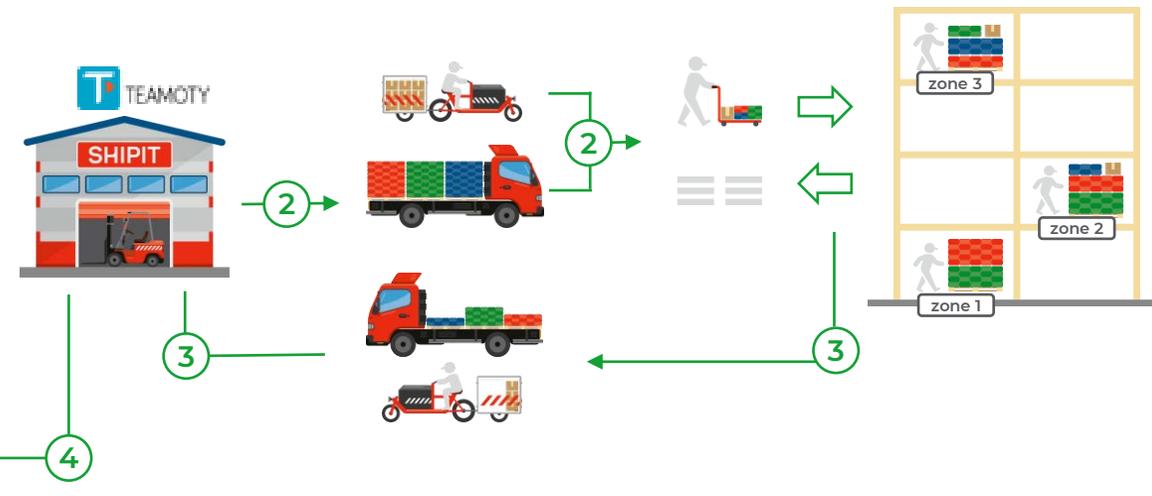


Reverse Logistics



Massification

- Installing waste sorting centers on site
- Regular pick-ups (up till 3 times weekly) when delivering « kits »
- Training & coaching of the on site teams



Primeur for Belgium...



Sorting reduces cost



Fewer waste movements, higher recycling performance.



Smart, Sustainable Logistics Solutions



Reload, developed by Shipit Multimodal Logistics and Vanheede, integrates inbound/outbound transport with recyclable and residual waste collection.

The result: fewer empty kilometers, lower costs, improved environmental performance - all via one point of contact.

Some of our operational streams today



INERT



WOOD



METALS



RESIDUAL WASTE

We are capable to offer up to 18 streams collaborating with different industry pioneers



How does Reload work?

2. Design of combined routes

Shipit optimizes your transport flows while Vanheede plans the collection of your waste and recyclable materials.

3. Implementation & coordination

A single planning, shared trucks, clear agreements. Your operations keep running smoothly.

1. Analysis of your flows

We map your current deliveries and waste streams: volumes, frequencies, locations.

5. Reporting & improvement

You receive clear data on CO₂ savings, recycling rates, and cost benefits – and we continuously optimize.

4. Collection & processing

Vanheede collects your waste streams via Reload and processes them in line with the highest recycling standards.

Benefits for you

- ✓ Reduce transport costs.
- ✓ Cut CO₂ and empty kilometers.
- ✓ Increase recycling performance.
- ✓ Simplify operations with one integrated solution.
- ✓ Receive clear reporting and full traceability.

SHIPIT
URBAN LOGISTICS

Contact us for a free analysis of your flows.



planning.bru@shipit.be



Havenlaan 67, 1000 Brussel



Well re-organised logistics leads to...

50%

Less trucks

Less CO2

Better quality & *Less accidents*

Some projects

Zin In Noord



Hotel Astoria



Commerce 46



Erasmus Grd.



Universalis



Kanal



Twin Falls



Infrastructure



Our customers...



Herpain



SHIPIT - GROUP - IN A NUTSHELL

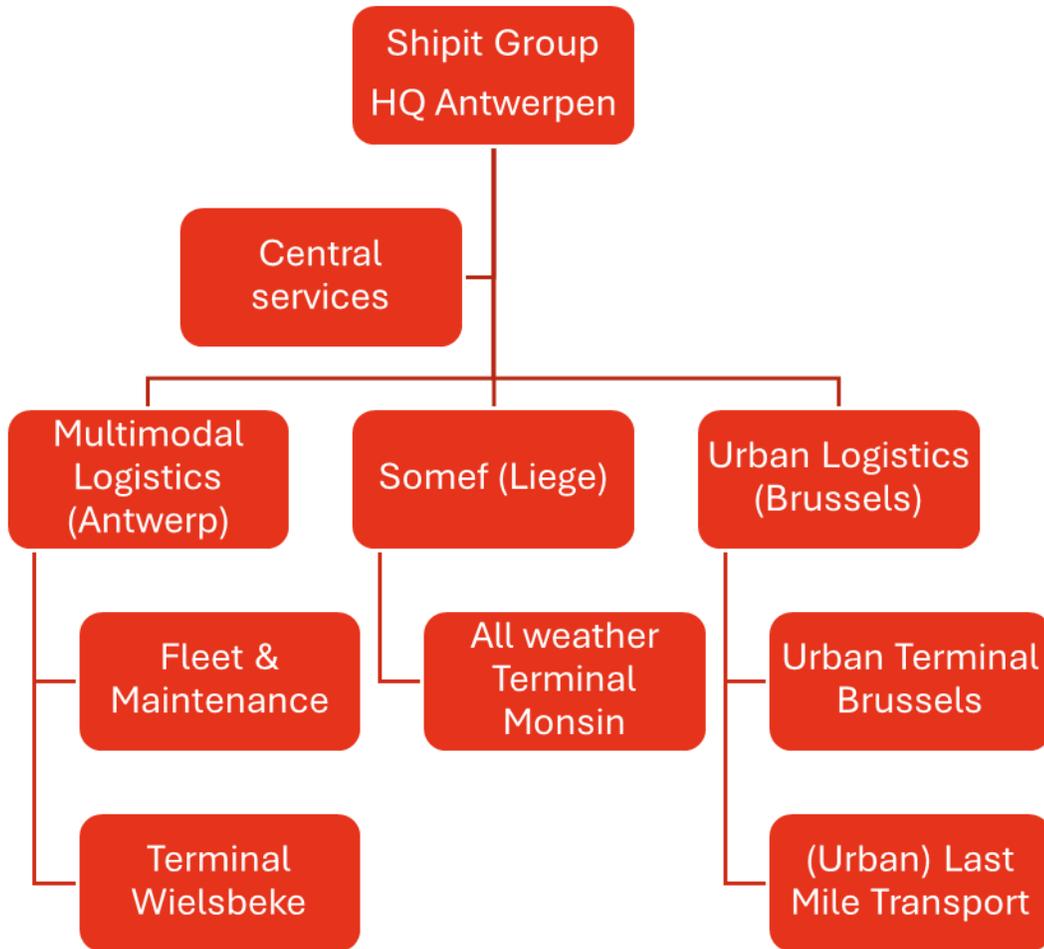


SHIPIT

Member Green Deal
urban logistics for
the Brussels region



Winner : Trends
Impact Awards 2023
Category Mobility



Started in 2004
10 owned ships
Group revenue: 30 Mil €
Liquidity (CR): 2,55

Brussels HUB
Avenue du Port, 67 1000 Bruxelles
Havenlaan 67 1000 Brussel



SHIPIT

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