Instruction guide

This guide shows feasible logistics solutions for small-scale construction projects in urban areas to be prepared for the upcoming zero-emission zones.

TU Delft

TNO innovation for life

Why this guide?

This guide shows feasible logistics solutions for small scale construction projects in urban areas executed by SMEs, to be prepared for the upcoming zero-emission zones. Please browse through this guide first to see how it is set up.

Zero emission zones
Not yet familiar with the zero-emission zones? The Dutch climate agreement has recently been signed, which indicates that the 30 to 40 largest municipalities will have zero-emission zones. From 2025, it is prohibited to drive into the municipalities with fossil fuel passenger vehicles and fossil fuel delivery vans and from 2030 with fossil fuel heavy vehicles (trucks, tractors). A transitional arrangement has been made in such a way that Euro VI trucks older than 5 years and Euro VI tractors older than 8 years are not allowed to enter the zero-emission zones. The exact areas of the zones still have to be determined.

For who is this guide?
Contractors
Wholesalers
Transporters
Municipalities

It is primarily written for contractors as they will be the first to be confronted with the zero-emission zones but the guide is also written for the other stakeholders necessary for the solutions.

Content
This guide is organized as follows:

- Description of small-scale projects
- How to use the guide
- Overview of logistics solutions
- Timeline logistics solutions
- Logistics solutions:
  - Personnel transport
  - Material transport
  - Tool transport
  - Heavy quipment transport
  - New construction

Zero-emission zones in 30 to 40 largest municipalities

2025

Passenger cars
Delivery vans

Example of a possible zero emission zone. The zones are not yet known.

2030

Box trucks
Trucks
Tractors

Description of small-scale projects

Small-scale projects are grouped into different sizes. This is based on gross floor area and total construction costs. It is an indication so there are no hard limits. The grouping has been applied to renovation construction. New construction is a special case and is less relevant in this guide because it is often carried out by large contractors.

The transport movements are divided into four categories:
- Staff
- Tools
- Material
- Heavy equipment

Micro renovation project

< 150 m²
< €0.3 mln

The project can be seen as a single house renovation / extension. The contractors working on these projects are usually freelancers and sometimes SMEs. Freelancers can have three or four projects in one day. That is why they have to drive to the different locations during the day. Personnel transport in micro projects is a very important aspect and the most challenging to encounter. Furthermore, the tools the personnel bring is also crucial. The contractors need to have their tools at the construction site, otherwise they cannot execute their work. The material transport can be picked up or delivered. The ratio between the two is 50/50%. Heavy equipment is rarely used for micro-renovation projects.

Small renovation project

150 - 1,000 m²
€0.3 - €3 mln

Typical small building renovation projects are residential blocks or low terraced houses. The owners of these buildings are often housing corporations, because they own multiple houses close to each other, that are renovated simultaneously. SME contractors are main contractors in these projects that oursource specific work to freelancers (or smaller SME contractors).

Medium renovation project

1,000 - 10,000 m²
€3 - €20 mln

These projects are still part of small-scale construction projects and are the 'large' small-scale projects. Examples are transformation projects of utility to residential houses. The main contractor is often a larger SME contractor or a small large contractor. There are many transport movements of delivery vans from contractors for personnel and materials supply. These projects contribute significantly to nuisance to the environment of the construction site.

How to use this guide

This page will describe how to use this guide now that you know what the definition of small-scale construction projects are.

The guide's content is focussed on the set of feasible logisitcs solutions to describe what the solutions are, what requirements are necessary to make them feasible and what the costs and benefits are to implement them.

The set of solutions is grouped on personnel, tools, material and heavy equipment. That means that multiple logistics solutions can be combined within one project. The next page will provide three examples of solutions combinations to show what is possible.

To make it more easy to understand how to use the guide, the following steps should be applied.

1. Be aware of the zero-emission zones

You should know about the upcoming zero-emission zones and how it will affect you.

2. Know the definition of small-scale construction projects

You should understand what is meant with micro, small and medium construction projects to know how the solutions have been determined.

3. Stakeholder specific solution

You should read if a logistics solution is applicable to you. This is described at each solution under application.

4. Projects identification

You should identify what projects you normally work in (micro, small or medium) or where you are about to work in to know what logistics solutions might be applicable to you. The overview of logistics solutions is a good tool to use for this step.

5. Collaboration

You should know what stakeholders are necessary to collaborate with.

6. Organization time

You should know in which phase during a construction project you need to start organizing the solution.

7. Implementation

You are now ready to implement one or more logistics solutions.

Combination examples

There is chosen to give three combinations of logistics solutions to show that logistics solutions do not stand alone and even can help each other to create synergy. The combinations are given for a micro construction project (combination 1), a small construction project (combination 2) and a medium construction project (combination 3) and the synergy will be explained.

Combination 1 (micro)

Own zero-emission vehicle + mobile hub + combine with other sectors

The synergy is that the personnel and tools transport is being performed together with a zero-emission vehicle. There are no problems for contractors to reach the construction site with their own tools. The ordered material transport can be combined with the mobile hub and possibly be delivered with a zero-emission vehicle. In that case, the entire transport (personnel, material, tools) is zero-emission. The synergy of the mobile hub lies in the economies of scale. The more the mobile hub will be used for small orders, the higher the vehicle's load factor will be.

Combination 2 (small)

Trolley + shuttle bus + construction consolidation center

The construction consolidation center will bundle the contractor's order together with orders either of the same construction project or orders in the neighborhood. This will increase the load factor of the vehicle for last mile deliveries and decrease the total distance driven in urban areas because transport is dedicated to a neighborhood within the city. The trolley and shuttle bus have a good synergy because in this way the contractor can bring his own tools within the shuttle bus. A construction consolidation center has high synergy because it combines orders of different suppliers.

Combination 3 (medium)

Public transport + locker + building tickets + waiting area for deliveries

The transport of tools is not possible with public transport. Therefore, lockers combine excellent with public transport because the personnel transport and tools transport are disconnected from each other. Waiting area for deliveries mostly go along with building tickets because the stakeholder responsible for delivery needs to receive a sign that they can come to the construction site. Furthermore, the combination of waiting area for deliveries and building tickets works the best in medium-sized projects because the vehicle's cargo is dedicated to this project and does not have to deliver to other locations.

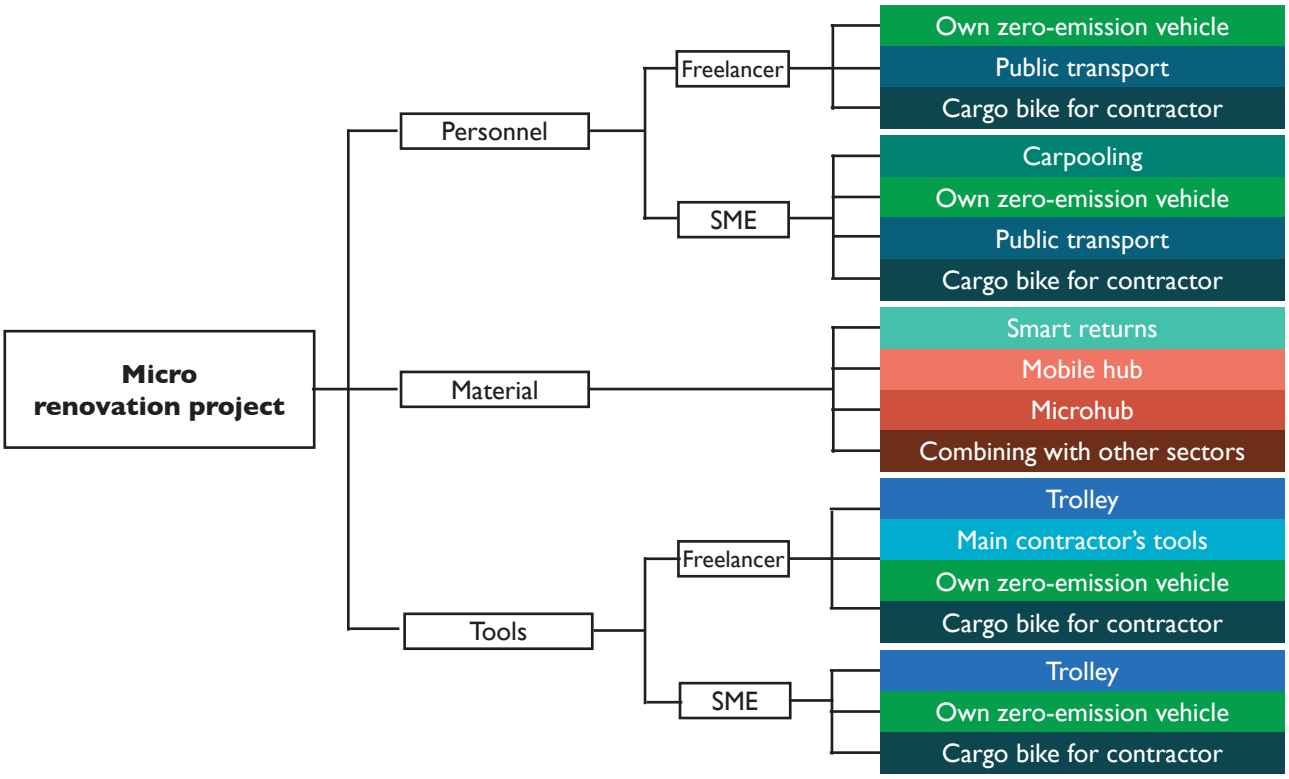
Overview of logistic solutions

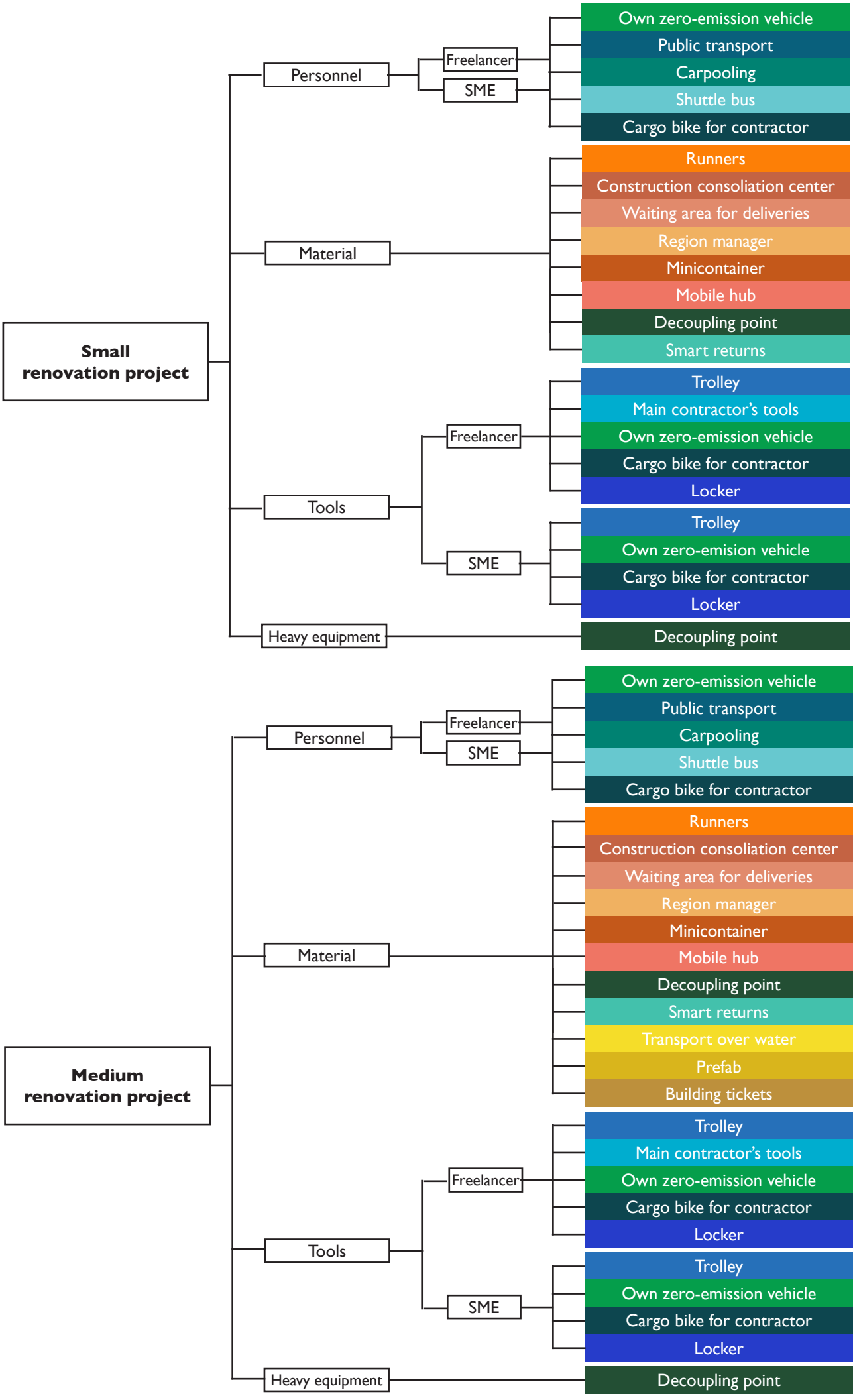
This is a representation of all found feasible logistics solutions grouped on micro, small and medium renovation projects.

Personnel and tools transport are split up into freelancers (who are the subcontractors) and SME (who are the main contractor's personnel).

Each logistics solution has an own color in this overview. This is because logistics solutions can be applied in multiple circumstances to visualize these different applications. For example, if an own zero-emission vehicle is used as logistics solution it can be used to transport personnel to the construction site but also their tools. And this zero-emission vehicle can be used for micro, small and medium renovation projects.

This overview is to visualize on which transport movement and on what size of project the solution can be applied. The way it should be read is that you know what project you will be working on (micro, small or medium) and afterwards, you can check what the solutions are, grouped on type of transport movement. At that moment, you know the possible logistics solutions and can check the logistics solutions' details in this guide.




Small renovation project
Personnel
Freelancer
SME
Own zero-emission vehicle
Public transport
Carpooling
Shuttle bus
Cargo bike for contractor
Material
Runners
Construction consolidation center
Waiting area for deliveries
Region manager
Minicontainer
Mobile hub
Decoupling point
Smart returns
Tools
Freelancer
Trolley
Main contractor's tools
Own zero-emission vehicle
Cargo bike for contractor
Locker
SME
Trolley
Own zero-emision vehicle
Cargo bike for contractor
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Heavy equipment
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Medium renovation project
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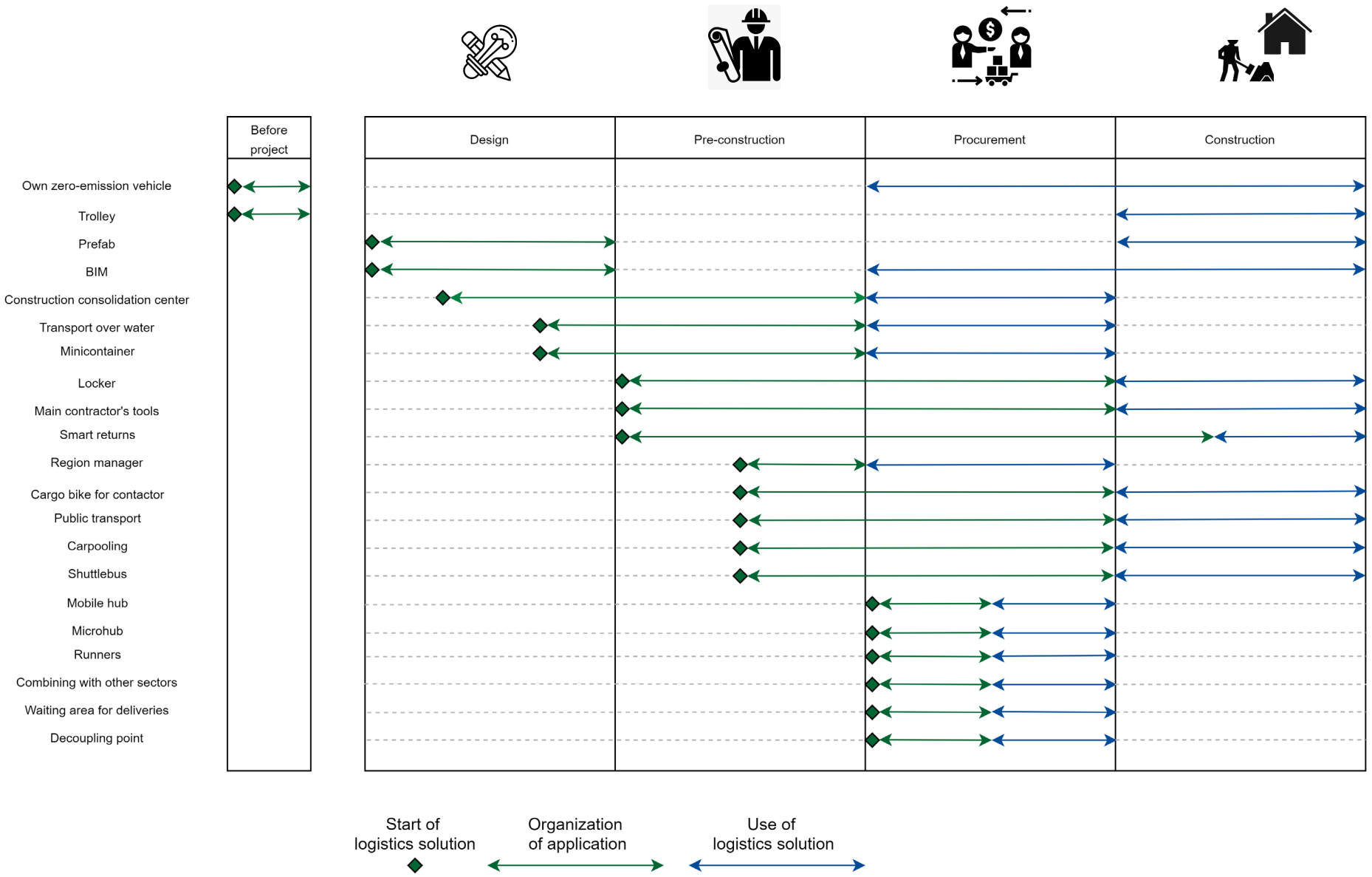
Construction consolidation center
Waiting area for deliveries
Region manager
Minicontainer
Mobile hub
Decoupling point
Smart returns
Transport over water
Prefab
Building tickets
Tools
Freelancer
Trolley
Main contractor's tools
Own zero-emission vehicle
Cargo bike for contractor
Locker
SME
Trolley
Own zero-emission vehicle
Cargo bike for contractor
Locker
Heavy equipment
Decoupling point

Timeline of solutions



Explanation timeline
This timeline shows at what time the organization of the logistics solution must start. That moment is shown with the green diamond in the timeline. Afterwards, the time spent to set up the solution is represented with the green arrow. Finally, the logistics solution will be applied in either the procurement phase, construction phase or both phases with the blue arrow. Two logistics solutions (own zero-emission vehicle and trolley) are already in possession before the project if the solution has been applied. The application of an own zero-emission vehicle is for both procurement and construction because the vehicle can be used to pick up materials (procurement phase) and to use for contractors to drive to the construction site (construction phase).

Note
See in the explanations of the solutions to who the solution applies and which other stakeholders are required for a collaboration.

Design
The design of the project is made. The tendering process starts in this phase and is completed at the end.

Prefab and BIM have to be designed by the architect. Construction consolidation center must be taken into the tendering process and arrangements must be prepared to communicate afterwards to the subcontractors. Transport over water and minicontainer must be communicated with the municipality thus also requires an early start.

Pre-construction
The main contractor has been selected and will assemble his project team and subcontractors at this phase.

Locker, main contractor's tools and smart returns all have to be initiated by the main contractor and this must start at the beginning of pre-construction. Region manager requires less organization time and must be done halfway during pre-construction. Cargo bike for contractor, public transport, carpooling and shuttlebus are all personnel transport solutions and must be performed during the assembly of the project team.

Procurement
The materials are purchased during this phase.

The blue arrows starting in the procurement phase are solutions that apply on the supply of materials. Mobile hub, microhub, runners, combining with other sectors, waiting area for deliveries and decoupling point must be started organizing from this phase because that can only be organized if the materials are ordered at the suppliers.

Construction
The project is being executed.

The blue arrows in the the construction phase are mostly present there because these are applications of personnel and tools transport solutions: own zero-emission vehicle, trolley, locker, main contractor's tools, cargo bike for contractor, public transport, carpooling and shuttle bus. Prefab and BIM change the way of construction. Smart return is the return flow of waste.

Personnel transport

Logistics solutions

Own zero-emission vehicle (personnel)

Application

• Micro, small, medium
• Contractor, municipality

A private electric vehicle gives freelancers the freedom to move wherever and whenever they want in urban areas after the zero-emission zones have been initiated. Freelancers can have several projects a day at different locations, making this the best possible logistics solution for personnel transport in micro projects. Moreover, if the freelancer has many tools that he all needs during a day, he will want his own vehicle.

The SME contractor has its own vehicle fleet. This fleet consists out of several vans of different ages. A complete zero-emission fleet is not necessary. Part of the fleet is sufficient.

Requirements

• Financial support to purchase the zero-emission vehicle.
• Charging infrastructure throughout the country needs to assist that charging while at work is possible.
• High density of charging stations in urban areas.
• Loading infrastructure at the contractor's establishment to charge the vehicles outside working time. (SME personnel)
• Planning of zero-emission vehicle use. (SME personnel)

Costs

• High purchase price
• Limited range
• Depending on charging infrastructure

Benefits

• Ability to enter zero-emission area
• No emissions
• Flexible to travel between projects
• Less material planning required
• Less maintenance costs
• Storage space for tools

Public transport

Application

• Micro, small, medium
• Contractor, municipality

Freelancers SME contractors' personnel can go from home or from the city's edge to the location by public transport.

Requirements

• Good public transport connections within the zero-emission zone.
• Locations at the city's edge must be organized in a way that they can park their vehicle and walk to the public transport.
• The necessary tools need to be provided on the location or the freelancer needs to carry it with him.
• Behavioral change of contractors.
• Material transport must all be delivered by wholesaler/ transporter.
• Contractors must plan their work and procurement.
• Public transport travel time between projects must not exceed own vehicle travel time significantly.

Costs

• Extra travel time
• Walk to projects
• Inflexible to travel between projects
• Inflexible to buy materials
• Limited number of own tools

Benefits

• Ability to enter zero-emission zones
• Lower emissions
• No parking costs
• No additional transport movements

Personnel transport

Logistics solutions

Carpooling

Application

• Micro, small, medium
• Freelancer (not for micro because then they have several projects), SME contractor, transporter

SME contractor personnel are colleagues and can share the use of their vehicle by carpooling. The vehicle's occupancy rate increases, resulting in fewer transport movements. Carpooling is impossible for freelancers in micro projects because they can have multiple jobs in one day.

Requirements

• Planning of work performed at one single location needs to be adjusted in order that all personnel driving together at the project have enough tasks to perform during the day.
• The delivery van needs to be zero-emission from 2025.
• Personnel needs to live close enough to each other or live on the way to the location.

Costs

• Extra travel time
• Inflexible to travel between projects
• Inflexible to buy materials
• Difficult during epidemics

Benefits

• Ability to enter zero-emission zones (if the vehicle is zero-emission)
• No emissions (if the vehicle is zero-emission)
• Shared use of zero-emission (if vehicle is zero-emission)
• Fewer transport movements
• Shared parking costs
• Shared transport costs

Cargo bike for contractor

Application

• Micro, small, medium
• Contractor, transporter

With a cargo bike (can be electric) you can cycle from the city's edge to the construction site. The contractor's vehicle can be parked at the bicycle location. It is also possible to take an ordinary electric bike in case the tools and materials are on the construction site.

Requirements

• Organization of the cargo bike's business model.
• Behavioral change that contractors take a bicycle.
• Tools and materials must fit in the cargo bike if the tools and materials have to be carried.

Costs

• Limited number of own tools
• Unattractive in bad weather

Benefits

• Zero-emission transport
• No parking costs
• Flexible to travel between projects

Personnel transport

Logistics solutions

Shuttle bus

Application

- Small, medium
- Contractor, transporter

A shuttle bus (possibly electric) drives from the city's edge to the construction sites. The more people who use a shuttle bus service, the less time it will take to arrive at the destination because the shuttle buses can be grouped by neighborhoods.

Requirements

- Location at the city's edge to park the contractors' vehicles. Can be a parking lot (P+R) or a wholesaler's establishment.
- Organization of the shuttle bus.
- Main contractor must communicate that this is an option for the freelancer subcontractors and how they can make use of it.
- Contractor must move his tools easily from own vehicle to the shuttle bus.
- Tools need to fit in the shuttle bus.

Costs

- Inflexible to travel between projects
- Inflexible to buy materials
- Limited number of own tools

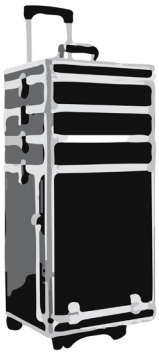
Benefits

- Ability to enter zero-emission zones (if the vehicle is zero-emission)
- No emissions (if the vehicle is zero-emission)
- Shared use of zero-emission (if vehicle is zero-emission)
- Fewer transport movements
- No parking costs

Tools transport

Logistics solutions

Trolley



Application

- Micro, small, medium size
- Contractor

A trolley can be used to store all the necessary tools. The contractor is not limited to use his own delivery van to bring his tools.

The tools needed for SME contractors' personnel is even less because the personnel can combine their tools.

Requirements

- Trolley must be able to store all the necessary tools.
- Contractor must think better about which tools are needed in a day.
- Behavioral change of contractors.

Costs

- Limited space

Benefits

- Not dependent on own delivery van
- Flexibility to move to different locations

Main contractor's tools

Application

- Micro, small, medium
- Contractor

The main contractor provides his tools to his subcontractors. Freelancers are more flexible if they only have to bring their own small tools. Large tools such as a circular saw table must be available on site.

Requirements

- Main contractor willing to share his tools.
- Trust between main contractor and the freelancers.

Costs

- Extra costs for main contractor
- Possible theft

Benefits

- Subcontractors not dependent on own tools
- Possibility to share personnel transport
- Shared use of tools

Tools transport

Logistics solutions

Own zero-emission vehicle (tools)

Application

- Micro, small, medium size
- Contractor, municipality

Tools transport is possible without problems if a contractor owns a zero-emission vehicle.

Requirements

- Financial support to purchase the zero-emission vehicle.
- High density of charging stations in urban areas.
- Loading infrastructure at the contractor's establishment to charge the vehicles outside working time. (SME personnel)
- Planning of zero-emission vehicle use. (SME personnel)

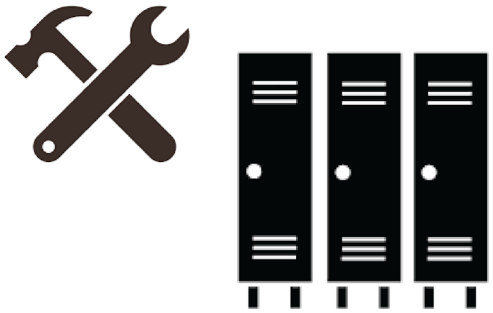
Costs

- High purchase price
- Limited range
- Depending on charging infrastructure

Benefits

- Ability to enter zero-emission zones
- No emissions
- Flexible to travel between projects
- Less material planning required
- Less maintenance costs
- Storage space for tools

Locker



Application

- Small, medium
- Contractor

The necessary tools can be stored and locked at the construction site.

Requirements

- Main contractor's personnel and subcontractors must not have multiple projects during one day.
- Main contractor must provide and manage the lockers.

Costs

- Inflexible to work on multiple projects
- Storage area on construction site

Benefits

- No transport of tools
- No theft

Tools transport

Logistics solutions

Cargo bike for contractor

Application

- Micro, small, medium
- Contractor

With a cargo bike (can be electric) you can cycle from the city's edge to the construction site. The contractor's vehicle can be parked at the bicycle location. It is also possible to take an ordinary electric bike in case the tools and materials are on the construction site

Requirements

- Organization of the business model of the cargo bike.
- Behavioral change that contractors take a bicycle.
- Tools and materials must fit in the cargo bike if the tools and materials are to be carried.

Costs

- Limited number of own tools
- Unattractive in bad weather

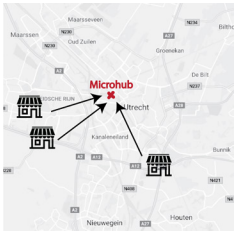
Benefits

- Zero-emission transport
- No parking costs
- Flexible to travel between projects

Material transport

Logistics solutions

Microhub



Application

- Micro
- Wholesaler, transporter, municipality, contractor

A microhub is a location with space for completion construction materials and not for large heavy materials. This hub acts as a decoupling point between construction sites and suppliers. The last mile can then be transported zero-emission by electric vehicles or a cargo bike or contractors can pick it up themselves.

Requirements

- Contractors must plan their work and procurement.
- Organization of the microhub.
- Tactical location for an establishment.
- Order handling IT system needs to know when an order can make use of the microhub in terms of volume, length sizes and stackability of the orders' products.
- Universal materials data usage.
- Material transport must all be delivered by a wholesaler/transporter.
- High use of the microhub to increase load factor.

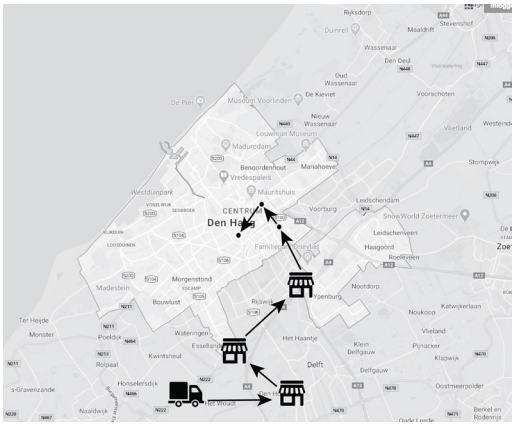
Costs

- Storage costs
- Last mile delivery costs
- No delivery by supplier's driver

Benefits

- Fewer transport movements
- Shared use of zero-emission (if last mile vehicle is zero-emission)
- Ability to deliver overnight
- Freedom of choice for supplier

Mobile hub



Application

- Micro, small, medium
- Wholesaler, transporter

A mobile hub is a large vehicle that picks up from various suppliers and supplies to multiple construction projects.

Requirements

- Contractors must plan their work and procurement.
- The organization of the mobile hub.
- Order handling IT system needs to know when an order can make use of the mobile hub in terms of volume, length sizes and stackability of the orders' products.
- Universal materials data usage.
- Material transport must all be delivered by wholesaler/transporter.

Costs

- Last mile delivery costs
- No delivery by supplier's driver

Benefits

- Fewer transport movements
- Shared use of zero-emission (if last mile vehicle is zero-emission)
- No competitor's logo on vehicle

Material transport

Logistics solutions

Combining with other sectors

Application

- Micro
- Wholesaler, transporter

Small materials that are ordered can be delivered quickly when it is combined with other sectors. Last mile can be performed with cargo bikes or electric vehicles.

Requirements

- Materials need to fit in the vehicle.
- Order handling IT system needs to know when an order can make use of shared vehicle in terms of volume, length sizes and stackability of the orders' products.
- Universal materials data usage.

Costs

- Only small materials

Benefits

- Fewer transport movements
- Ability to make rush trips
- Shared use of zero-emission (if vehicle is zero-emission)

Smart returns

Application

- Micro, small, medium
- Wholesaler, transporter

The loader crane truck can be used directly after the supply of materials to take back waste or incorrectly delivered materials.

Requirements

- Communication and collaboration between the waste transporter and contractors. The contractor needs to share that they have full big bags or waste containers that can be taken away.
- The vehicle used for supply needs to be able to transport the full waste container.

Costs

- Operational costs

Benefits

- Fewer transport movements
- Less waste on the construction site
- Lower costs for road block permits
- More storage space on construction site

Material transport

Logistics solutions

Runners

Application

- Small, medium
- Wholesaler, transporter, contractor

Runners can move the materials to the exact location where they are needed. The person responsible for transport or the contractor himself can do this. Contractors do not longer have to search for and carry the materials themselves and can work directly with the materials when they arrive at the location.

Requirements

- Main contractor has to indicate what materials are needed at which location on the construction site.
- Contractors must plan their work and procurement.

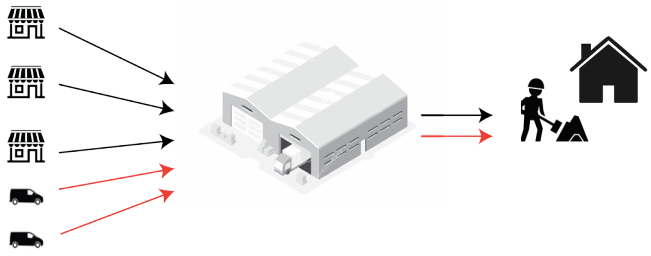
Costs

- Labor costs

Benefits

- Increased work efficiency of personnel
- Lower hourly rates for runners than for contractors
- Possibility for delivery outside construction time

Construction consolidation center



Application

- Small, medium
- Wholesaler, transporter, contractor, municipality

All material transport uses the construction consolidation center to store the material at the city's edge. Afterwards, the materials will be bundled and delivered to the construction sites. An additional service can be a place for contractors to park their car and be transported from the construction consolidation center to the construction site.

Requirements

- Procurement must be performed centralized.
- Contractors must plan their work and procurement.

Costs

- Storage costs
- Operational costs

Benefits

- Fewer transport movements
- No emissions (if last mile vehicle is zero-emission)
- Shared use of zero-emission (if last mile vehicle is zero-emission)
- Just-in-time deliveries

Material transport

Logistics solutions

Waiting area for deliveries

Application
• Small, medium
• Main contractor, transporter

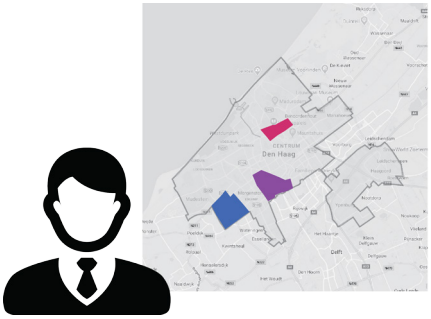
Trucks are waiting on the city's edge and wait for a sign to deliver the materials. This logistics solution is advantageous if limited storage space is available on site.

Requirements
• Available location on city's edge close to the construction site where vehicle can be parked for free.
• Planning by main contractor.
• The driver is willing to wait.
• Truck is dedicated for the construction project and not for other projects. Otherwise, conflicts will arise to deliver other projects.

Costs
• Waiting costs

Benefits
• Just-in-time deliveries
• Less traffic jams
• Less nuisance

Region manager



Application
• Small, medium
• Main contractor, municipality, wholesaler

An independent person who knows the projects in a city and who can manage the coordination between the projects. The supply of materials can be synchronized and delivered together in a neighborhood.

Requirements
• Contractors must plan their work and procurement.
• Organization of the region manager.
• Contractors need to share information about their orders.
• Different suppliers need to be bundled together.
• Order handling IT system needs to know when an order can make use of the mobile hub in terms of volume, length sizes and stackability of the orders' products.
• Universal materials data usage.
• Material transport must all be delivered by wholesaler/ transporter.

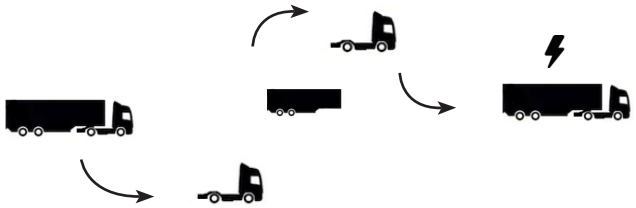
Costs
• Labor costs
• Inflexible delivery period

Benefits
• Fewer transport movements

Material transport

Logistics solutions

Decoupling point



Application

- Small, medium
- Transporter

Materials are delivered on the city's edge and loaded directly with outgoing materials without intermediate storage. Trailers can be disconnected from tractors and the last mile can be driven with a zero-emission tractor. Construction consolidation centers can offer this as a service to transport last mile zero-emission.

Requirements

- Decoupling point needs to have zero-emission trucks and tractors.
- IT logistics system needed at decoupling point.
- Charging infrastructure available at decoupling locations.
- Technologically feasible to decouple and couple trailer.

Costs

- Operational costs
- Extra last mile delivery costs
- Extra travel time
- No own driver for delivery

Benefits

- Zero-emission transport
- No storage costs
- Ability to coordinate Just-In-Time deliveries

Minicontainer

Application

- Small, medium
- Wholesaler, transporter, contractor, municipality

A small container dedicated to a construction project. Projects have temporary housing and waste containers, usually in parking lots and this minicontainer can be added to this set of temporary housing. Tools can also be stored in the minicontainer.

Requirements

- Materials must fit in the container.
- Enough space available in public space to place the container.
- The supplier and the contractor need to have a key to open the container.
- The municipality must give a permit.

Costs

- Costs for the public space area

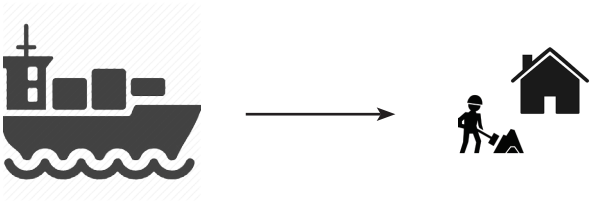
Benefits

- Fewer transport movements
- Ability to deliver overnight

Material transport

Logistics solutions

Transport over water



Application
• Medium
• Wholesaler, transporter, municipality

A change in modality from road to water. The last mile in urban areas can be transported by water. A common practice is that water transport is combined with a construction consolidation center for optimal loading capacity of last mile deliveries.

Requirements
• Construction site must be close to water.
• Additional actions are needed to hoist the materials from the boat to the building.
• Boats must be allowed to dock close to the location.

Costs
• Action to transport materials from water to land
• Only possible for construction sites near water
• Extra last mile delivery costs

Benefits
• No material transport movements by road
• Extra storage space
• No sagging quays
• More material stock per movement

Prefab

Application
• Medium
• Transporter, producer

A part of the construction project is prefabricated before going to the construction site. Medium-sized renovation projects are large enough that prefab can be a feasible solution.

Requirements
• Producer must be capable of producing the materials prefab.
• The materials must fit in a truck or on a trailer.
• The materials need to be able to be placed at the right location on the construction site.

Costs
• No customer specifications
• Extra costs for special transport

Benefits
• Fewer transport movements
• Shorter construction time on site
• High quality control
• Less construction time on construction site

Material transport

Logistics solutions

Buildingtickets

Application
- Medium
- Transporter, main contractor, producer

The supplier is given a signal from the main contractor at what time and which materials are needed in the main contractor's planning. This works in combination with a construction consolidation center or waiting area for deliveries.

Requirements
- Contractors must plan their work and procurement.
- Communication between the main contractor and supplier that an approval is given when the supplier may deliver the materials.
- Truck is dedicated for the construction project and not for other projects. Otherwise, conflicts will arise to deliver other projects.

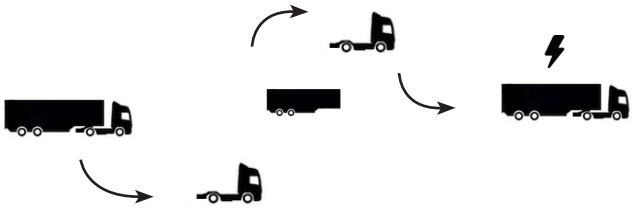
Costs
- Administrative effort
- Wrong information on ticket in case of delay
- Not always adhered to

Benefits
- Just-in-time deliveries
- Less traffic jams

Heavy equipment transport

Logistics solutions

Decoupling point



Application
- Small, medium
- Transporter

Heavy equipment is often placed on a trailer. A decoupling point allows the last mile to be zero-emission.

Requirements
- Heavy equipment can fit on a trailer.
- Decoupling point needs to have zero-emission trucks and tractors available.
- IT logistics system needed. The decoupling point's organizer needs to incorporate this in their operations.
- Charging infrastructure available at decoupling locations.
- Technologically feasible to decouple and couple trailer.

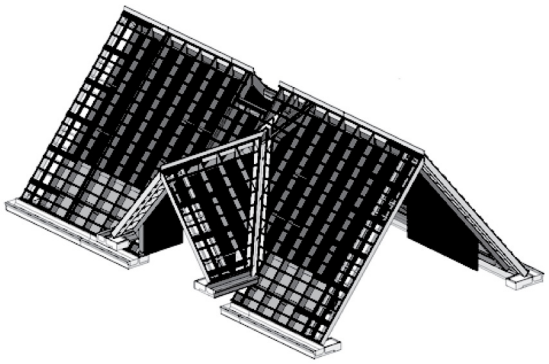
Costs
- Operational costs
- Extra last mile delivery costs
- Extra travel time
- No own driver for delivery

Benefits
- Zero-emission transport
- No storage costs
- Ability to coordinate just-in-time deliveries

New construction

Logistics solutions

BIM



Application

• Small, medium (new construction)
• Main ontractor, architect, suppliers

All solutions applied on medium renovation projects can also be applied on new construction. BIM is the only solution for new construction

The work to be performed has been digitized in a 3D model and the materials required are in this model. The construction work can be combined with the planned materials required. In this way, the material flow can be coordinated to have a just-in-time offer. In addition, the materials can be bundled better because the entire process is placed in the model.

Requirements

• Architect must be familiar with BIM.
• Logistics coordinator to communicate the material output of BIM with the suppliers.

Costs

• High architect costs
• Additional design time

Benefits

• Precise material requirement
• Improved just-in-time deliveries
• Less lead time at construction site
• Less construction mistakes

Research

The results of the research that led to this guide were conducted through interviews with stakeholders in the construction logistics chain. Questions were asked what the current logistics structures are for small-scale construction projects, how the relevant stakeholder operates and how they look at logistics solutions. The logistics solutions that were asked were based on previously conducted research on large-scale projects, carried out by TNO.

Sources pictures

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