DELIVERABLE D.T3.3.2
CARGOBIKE PILOT IN BERLIN
(INCLUDES D.T3.2.1 AND.T3.3.1)

Final assessment of greening transport measures for cargobike-rail pilot in Berlin

Version 2

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1. Introduction

The Intermodal Cargobike-Rail Pilot in Berlin is one of 7 pilot actions of the InterGreen-Nodes project. To demonstrate the infrastructure and technological possibilities for the application of clean fuels at the local level, meaning the last mile, and at the terminal, measures to make transport greener have been assessed and validated through stakeholder inputs.

This concluding report is the final assessment report for the pilot activity (D.T3.2.1 + D.T3.3.2) and includes the evaluation of technical performance and environmental impact measurements, as well as lessons already learned from the mid-term evaluation D.T3.3.1).

In this pilot activity, an intermodal transport chain consisting of rail transport to Berlin and subsequent Cargobike transport on the last mile of consumer goods ares demonstrated.

2. The Basics of the Cargobike-Microhub Pilot in Berlin

A parcel service providers uses an inner-city transhipment point with micro-depots operated by a neutral provider, the “Berliner Hafen- und Lagerhausgesellschaft mbH” (BEHALA), at the Westhafen port. The microhub is, for reasons of simplicity and low costs, comprised of shipping containers. The containers are used as short-time storage and transhipment point for the last few kilometers of shipment, for the delivery with the company's own cargo bikes.

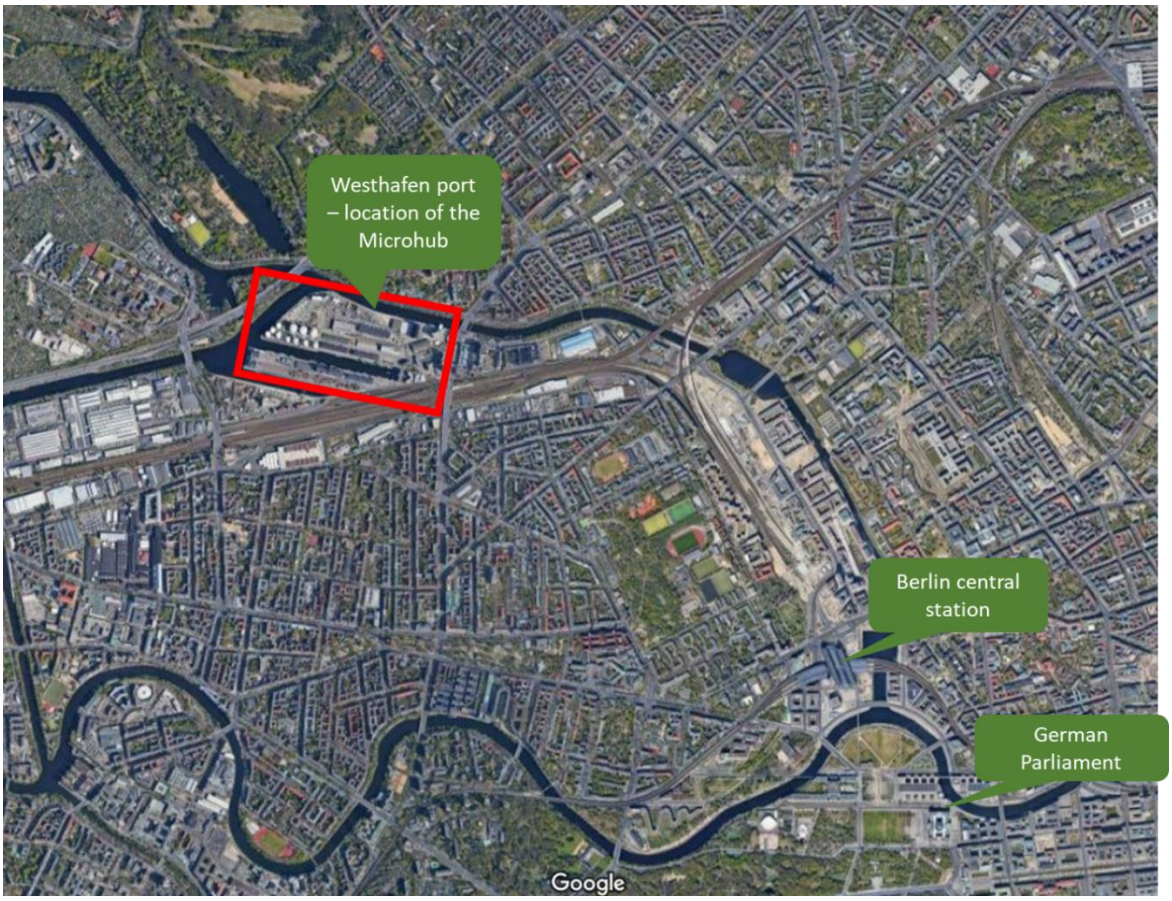

Figure 1: Central location of the Microhub, close to a number of points of importance in Berlin

The central location of the Westhafen port is especially well suited as a location for a microhub for a number of reasons:

- First and foremost, the Berlin Westhafen is located centrally in Berlin, close to the city center and in close vicinity to a densely built-up area with a large number of dwellings and businesses.
- The Westhafen is publicly owned (by the public owned company BEHALA), making it a neutral location for a private logistics provider.
- The Westhafen, as any port is also a specialised logistic area, with connections to other transport modes and equipment and facilities for transhipment and storage.

The micro-depot is the central starting point for deliveries to the surrounding delivery area. The parcel provider acts independently and within his delivery system - from the morning delivery of the shipments to the micro-depots, through interim storage, to the subsequent delivery to the end customer. The parcel service provider delivers daily and locally emission-free to business and private customers in the vicinity of the Miko depot.

3. Step by Step description of the implementation and Lessons Learned and Experiences

Setup:

The suitability of an area for setting up a micro-depot location depends on various criteria, so that every location decision must be considered as an individual case. Criteria include a high volume of consignments in the delivery area, a high number of stops, the consignment structures of the respective companies and the connection and accessibility of the location by road. Furthermore, the space costs (rent or similar) must be economically viable, especially from the company's point of view.

With regard to the micro-depot location, various requirements regarding the container and site equipment, the workplace ordinance and the safety precautions on site must be met. The location should have a permanent connection to the power grid, if necessary this must be established. In addition, the area should be made available to companies for a reasonable period of time. As a guide, guaranteed land use for two to five years is considered sensible. This is necessary above all in order to enable the actors involved to plan with certainty and thus to increase interest in the area and the implementation of the concept.

Any available, public or private area would be suitable as a potential location, even for a limited period of time. The space requirement depends on the planned design of the micro-depot. The area for setting up a container plus maneuvering areas can be set as the minimum size for each service provider involved. A general calculation of the space requirement proves to be difficult, as various requirements are placed on the use of space.

Specific requirements must also be met with regard to site equipment, which should always be taken into account in the case of temporary land and infrastructure use. When setting up a micro depot location, ensure adequate lighting and a suitable power connection. For the use of sea containers as micro-depots in the CEP area, ramps with a minimum width of one meter and, if necessary, standard racks for shipments must also be provided. In addition, the use of technical devices for heating the living room must be taken into account and a roof drainage system must

be installed. These are particularly necessary for operation in bad weather or in winter. The ground conditions on the site must also be adapted for operational use, e.g. with cargo bikes. In addition, separate lanes should be provided on the site so as not to restrict the operations of several cooperating actors. The construction of e-charging infrastructures to enable operation with e-delivery vehicles also seems advantageous in the future.

Further requirements result from the work and business premises ordinance. For example, a gender-appropriate toilet with water connection must be available. In addition, a changing room with a place to retreat and as a lounge for delivery staff must be provided. The premises are to be equipped with heating and cooling technology to regulate the temperature on hot or cold days. Also various areas of law and regulations must be observed during operation. The municipal business premises ordinance requires a series of standards that are temporarily quite difficult to implement: disposal, air conditioning/heating, sanitary facilities, occupational safety and fire protection. These are areas that require competent support and advice when implementing the project.

From the point of view of safety precautions, a locking device for access to the site and a lockable storage facility for cargo bikes and vehicles must be provided. In addition, a stable fence around the site is necessary to protect the micro-depots and vehicles from vandalism and theft. However, turning and maneuvering processes should be as unrestricted as possible in order to ensure a high level of efficiency in the logistics processes. The site should also be monitored by cameras. Among other things, the General Data Protection Regulation must be observed.

Figure 2: General setup of the hub

Operations:

Starting from the distribution centers of the parcel service providers, the shipments for the tour area around the micro-depot were delivered to the Microhub location. The distribution centers are predominantly located on the outskirts of the city. The feeder traffic was implemented using delivery vehicles with a permissible total weight of 3.5 t to 7.5 t. In many cases, the shipments were already pre-picked for the day trips of the cargo bike deliverers. At the location, the shipments were transhipped and stowed in the respective micro-depots of the parcel service provider. Corlettes were sometimes used for this in order to speed up handling. However, consignments that were too large or bulky remained in the delivery vehicle of the feeder traffic and were delivered conventionally during the day.

The delivery personnel began their day tour by preparing the cargo bike and stowing suitable shipments in the cargo bike according to the planned tour. The smaller dimensions of the cargo bike had to be taken into account, which meant that only some of the shipments could be stowed in the cargo bike. For this reason, the micro-depot was sometimes approached several times per day tour in order to fill the cargo bike for the further course of the tour. The operative business took place within the scope of the project on five working days per week. After the day's tour, all

undelivered shipments and returns were transported back to the micro-depot and finally back to the distribution center.

4. Cost and emission effects

The initial costs for setting up the microhub (without land-plot costs), comes down to about 100.000 €:

Cost per kg potential payload and 10.000km:	Construction costs
Planning and Administrative Tasks:	1.000,00 €
Technical equipment:	3.900,00 €
Container:	59.000,00 €
Construction-work:	36.100,00 €
Total:	**100.000,00 €**

Vehicle costs are highly dependent on the exact operational structures and constraints. So the actual costs of a cargobike can vary widely and be above as well as below a typical diesel-driven freight vehicle.

To allow at least for some form of comparison, a cargobike with a maximum payload is compared with a truck with a gross weight of 3.5t (which equals a payload of about 1.400 kg), in the following:

	Typical 3.5t vehicle	Cargobike
Yearly depreciation	12.000 €	2500
Energy price per 100 km	20 €	1 €
yearly mileage (km):	90.000	90.000
Maintenance costs per year:	2.000 €	150 €
Driver costs per vehicle an year:	55.848 €	55.848 €
Maximum payload:	1.400	250

Cost per kg potential payload and 10.000km:	Typical 3.5t vehicle	Cargobike
Depreciation	0,9524 €	1,1111 €
Energy	0,0016 €	0,0004 €
Maintenance	0,1587 €	0,0667 €
Driver costs	4,4324 €	24,8213 €

Emission-effects, just as costs, depend very strongly on the operational boundary conditions, but also on the layout of the logistics-system. However, vehicles and their emissions per kg payload can be calculated and compared as follows:

	Typical 3.5t vehicle	Cargobike
Diesel consumption per 100 km (l):	11	0
Electricity consumption per 100 km (kwh):	0	2,5
kg CO2-emission per 100 km*:	29	1
Maximum payload:	1.400	250
kg CO2-emission per 100 km and 100 kg payload:	2,06	0,40
*at an emission factor of 3.165 for Diesel and 0.4kg per kWh electricity (based on the electricity mix for Germany in 2020).		