Mokum & Maritiem Shanks, 2016

DELIVERING THE FUTURE OF URBAN FREIGHT

Towards a ***strategic framework*** for multimodal consolidation in the MRDH

Student: Marcel de Groot
Mentors: Ulf Hackauf & John Baggen
P5 presentation 29 october 2020

Mokum & Maritiem Shanks, 2016

van Duivenbode, 2014

top: *author; Evofenedex, 2019; Google Maps, 2019* ***bottom:*** *Google Maps, 2019; author; Jesper Neleman, 2017*

"In cities we just expect things to be there: a cup of coffee in the morning, blood in the hospital if we need it"

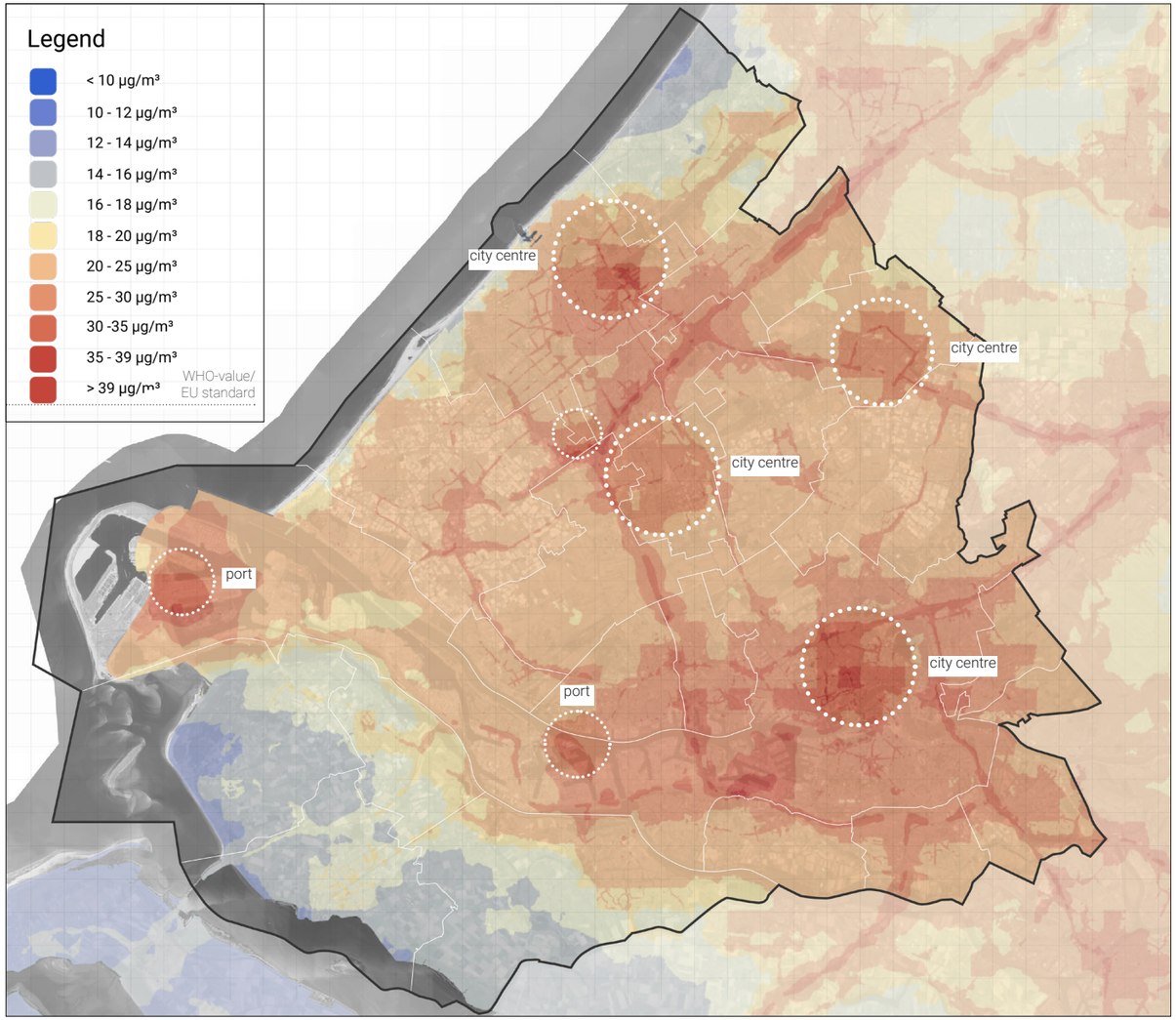
"But probably **90 percent** *of everything we consume, live in and wear was delivered over the road."*

Ian Wainwright, freight manager London, Olympic Games 2012

top: *author; Evofenedex, 2019; Google Maps, 2019* ***bottom:*** *Google Maps, 2019; author; Jesper Neleman, 2017*

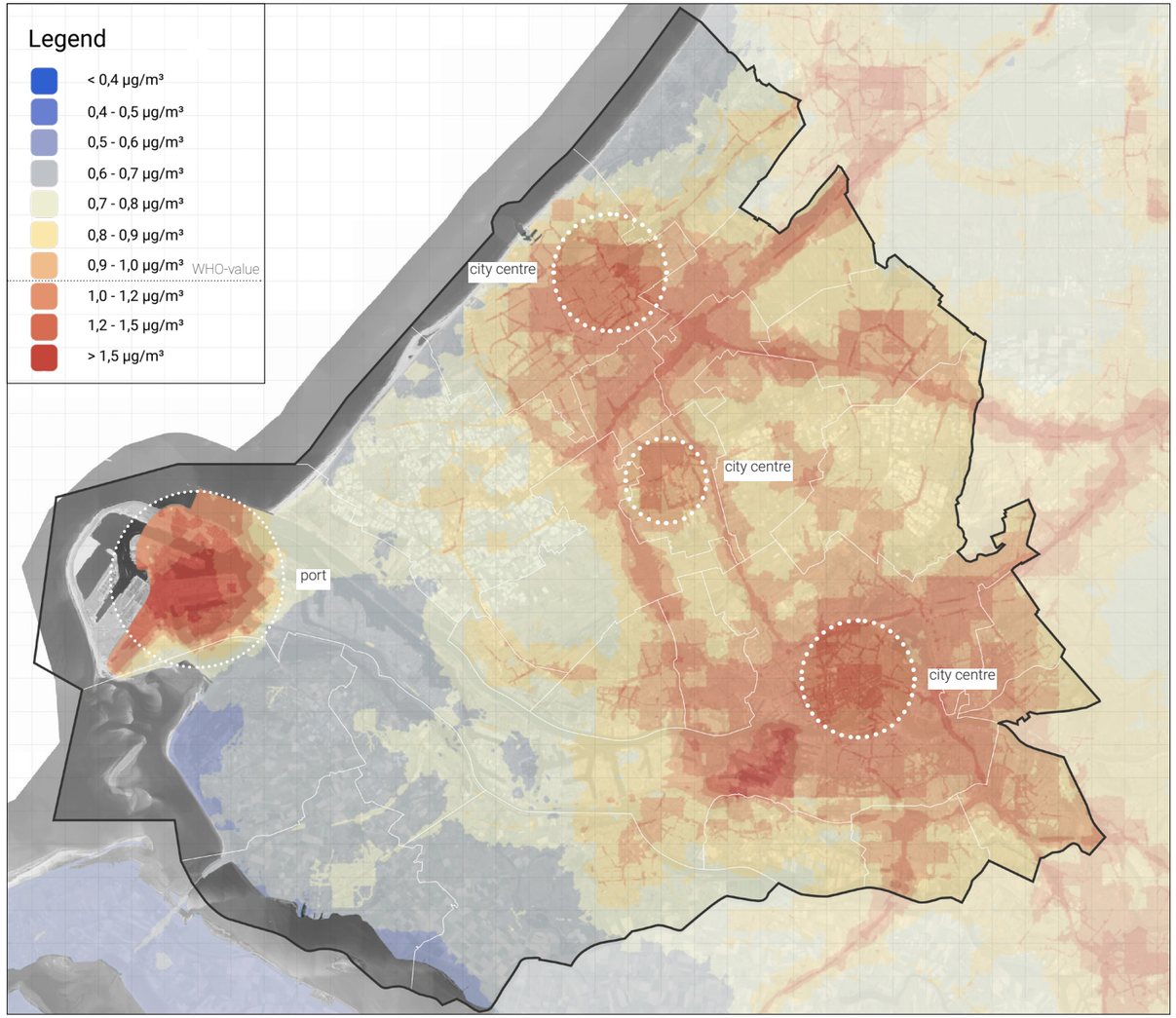
NO_2 pollution

(source: Atlas Leefomgeving, 2019)



Soot pollution

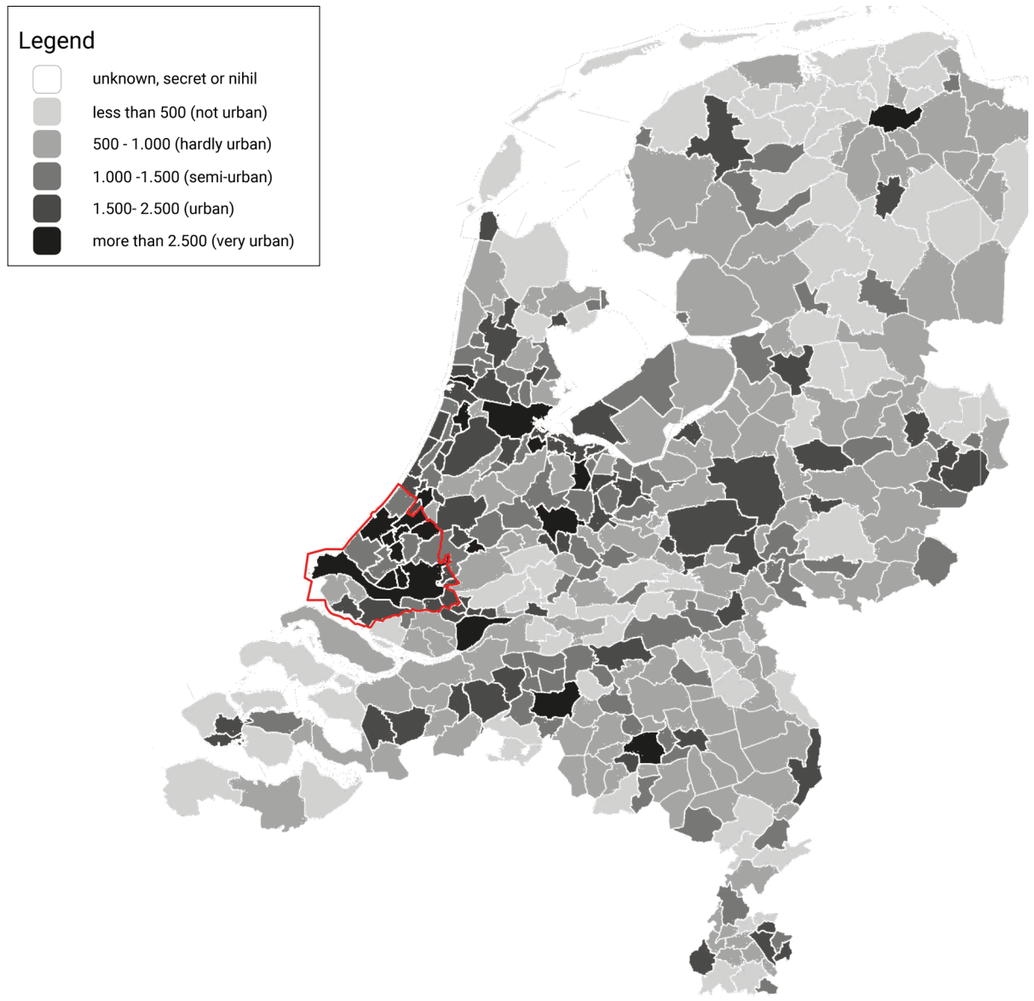
(source: Atlas Leefomgeving, 2019)



25% of the street traffic in typical cities and **16-50%** of the air pollution *(dependent on the pollutant)* (Lindholm, 2012)

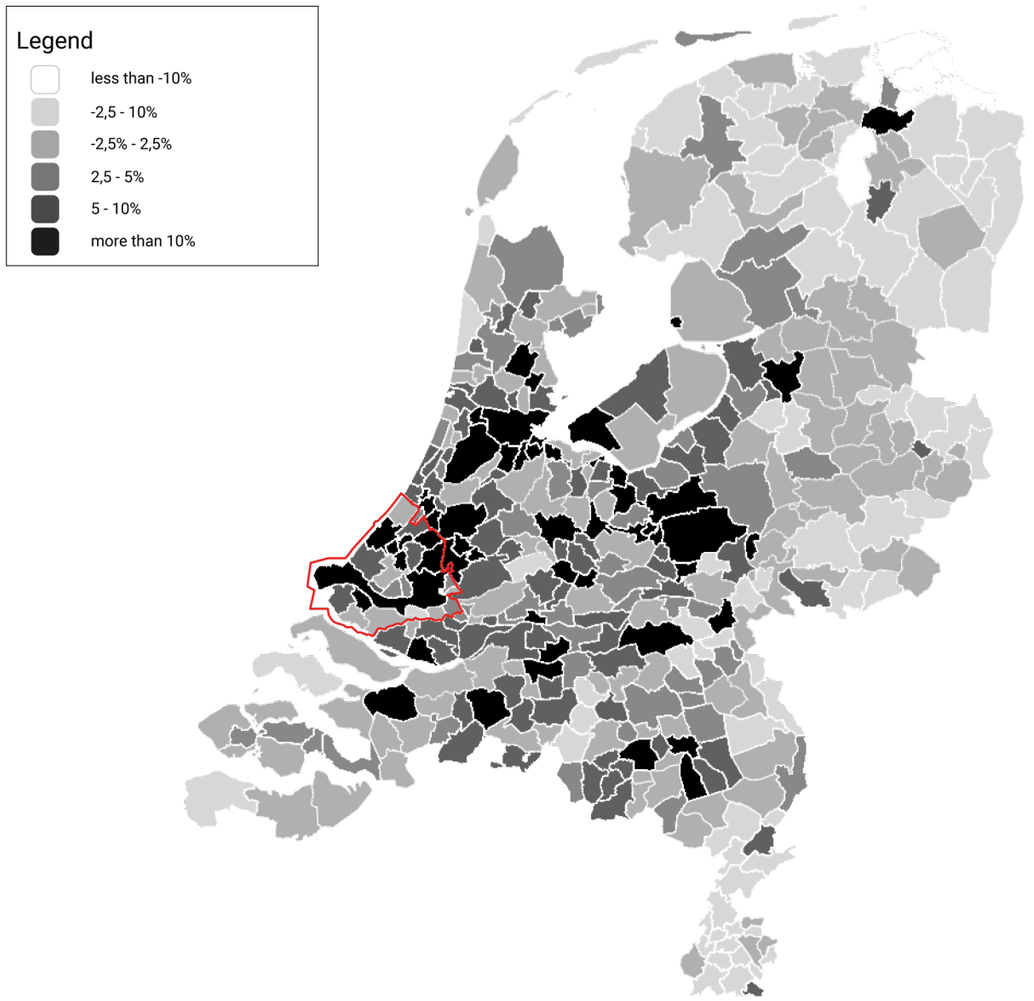
Household density per km² in the Netherlands

(source: CBS, 2018a; Retrieved from QGIS)



Urban growth prognosis 2035 in the Netherlands

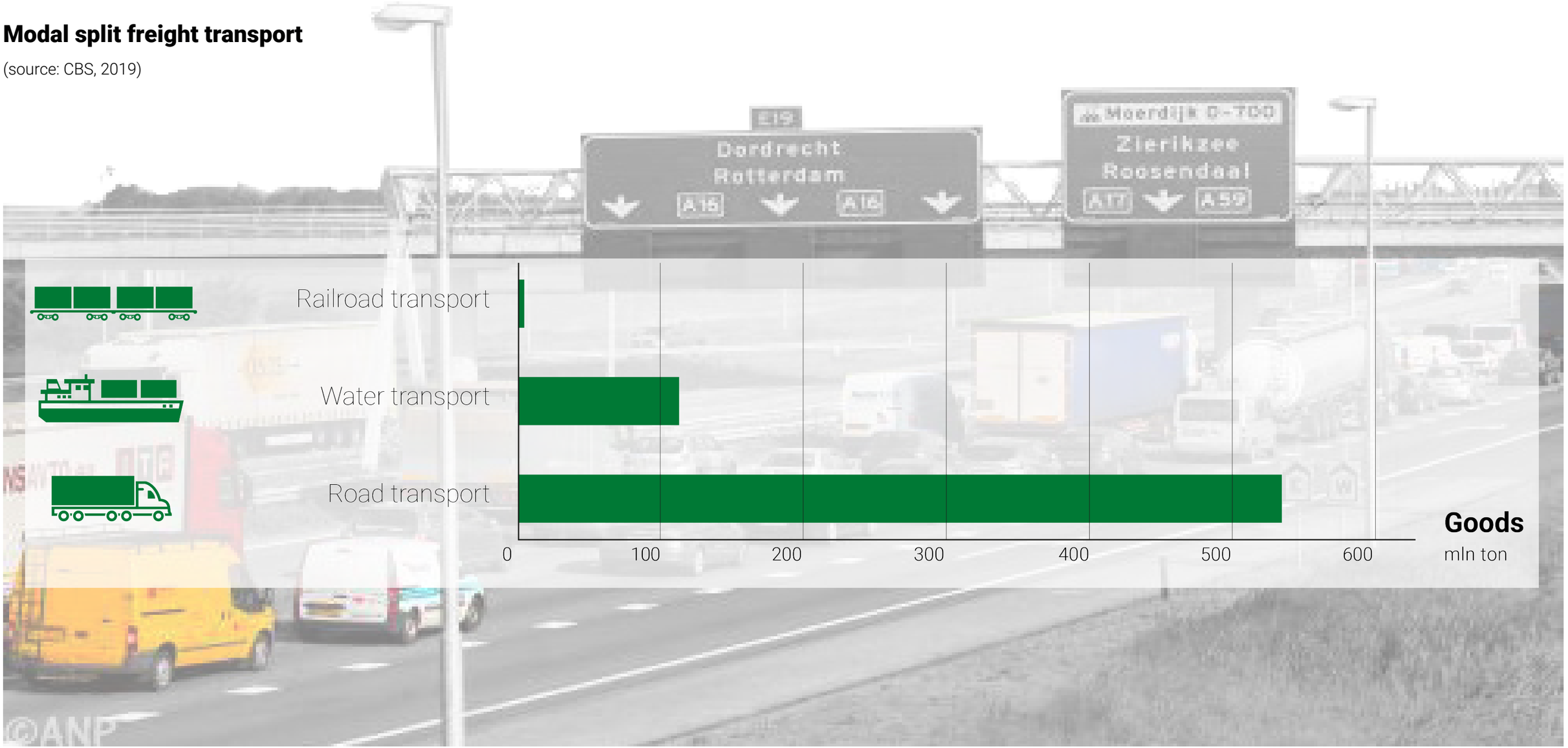
(source: CBS, 2019a)



In 2025, **93%** of the Dutch population will live in urban areas (Van Duin, 2005)

Modal split freight transport

(source: CBS, 2019)

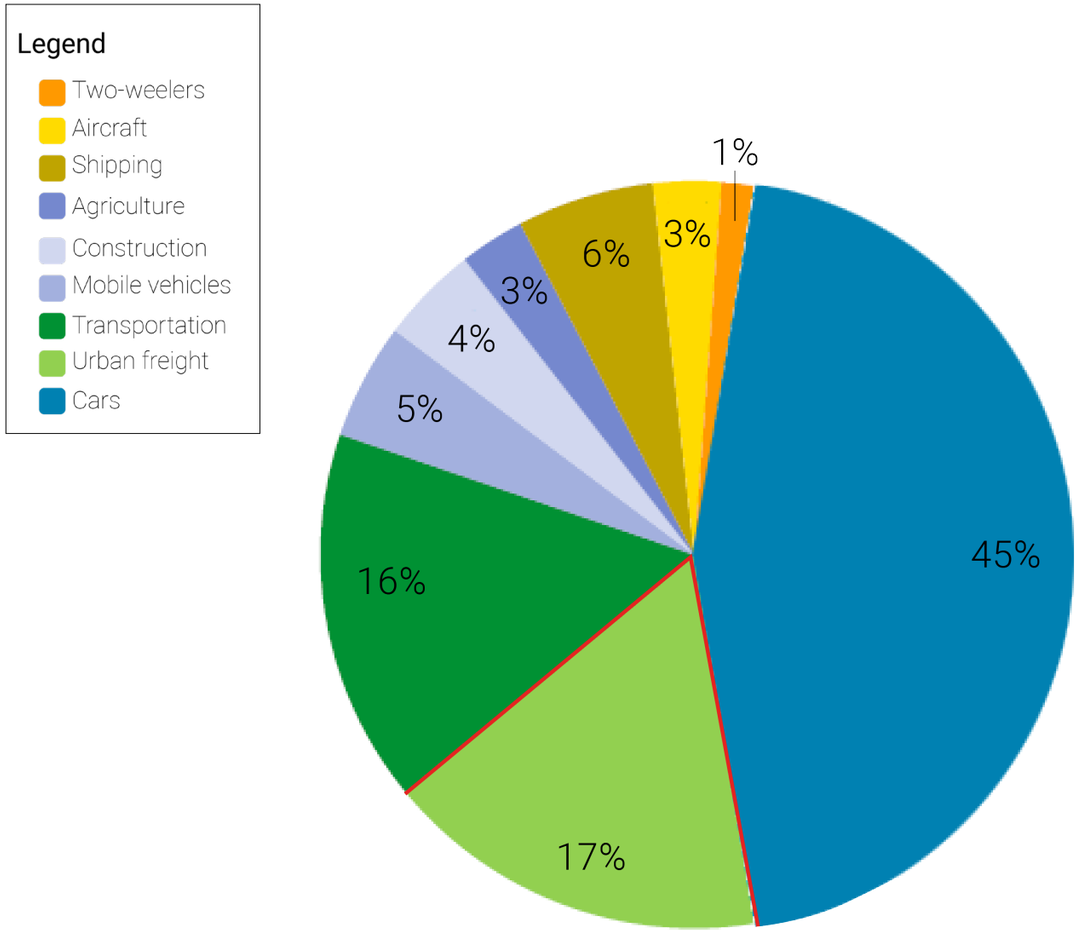


Road transport is the **most popular mode** in the Netherlands

Roads are filling up with more trucks through the growth of freight

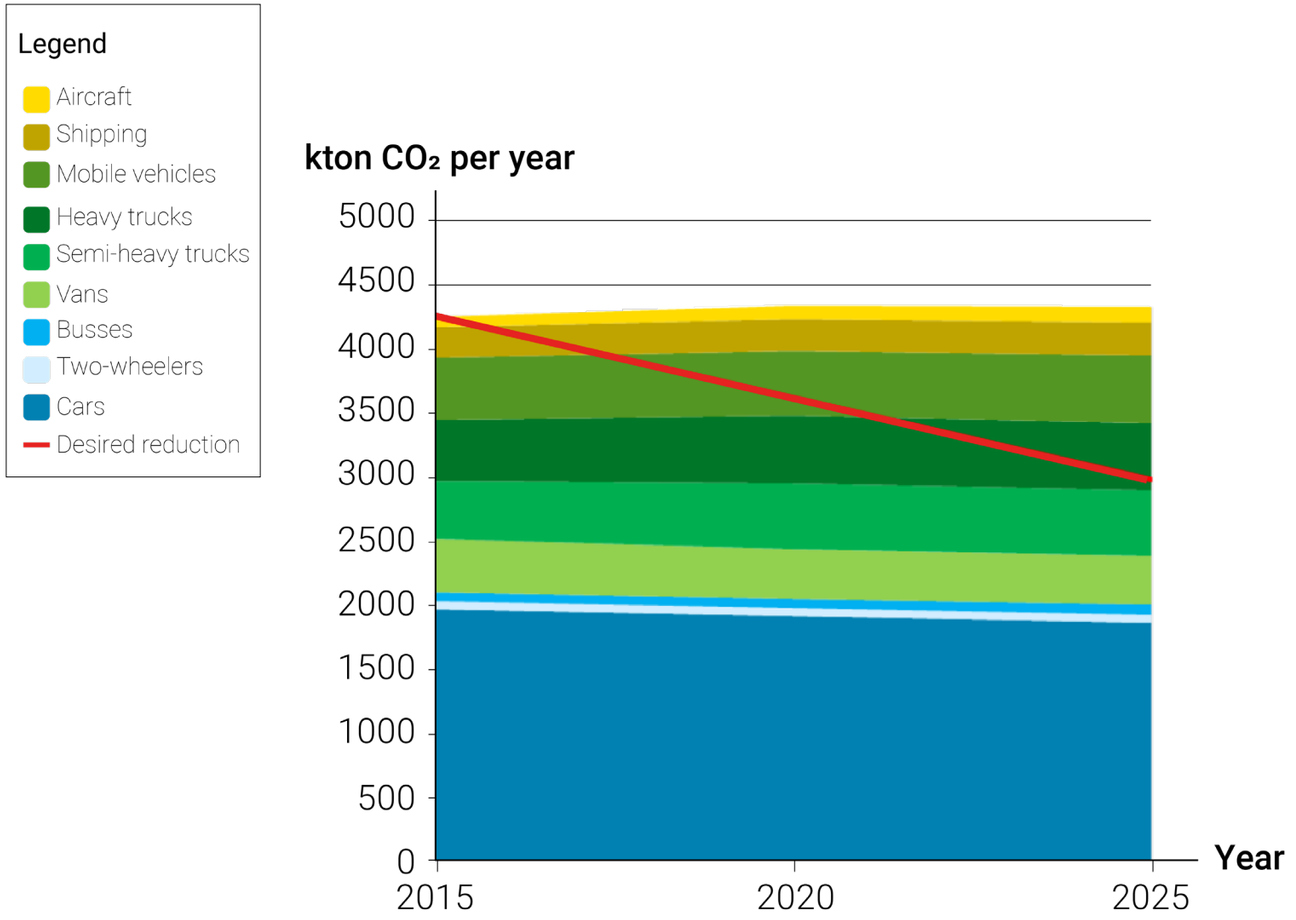
Share CO_2 emission per motive

(source: MRDH, 2018)



CO_2 ambitions MRDH with reduction path

(source: MRDH, 2018)

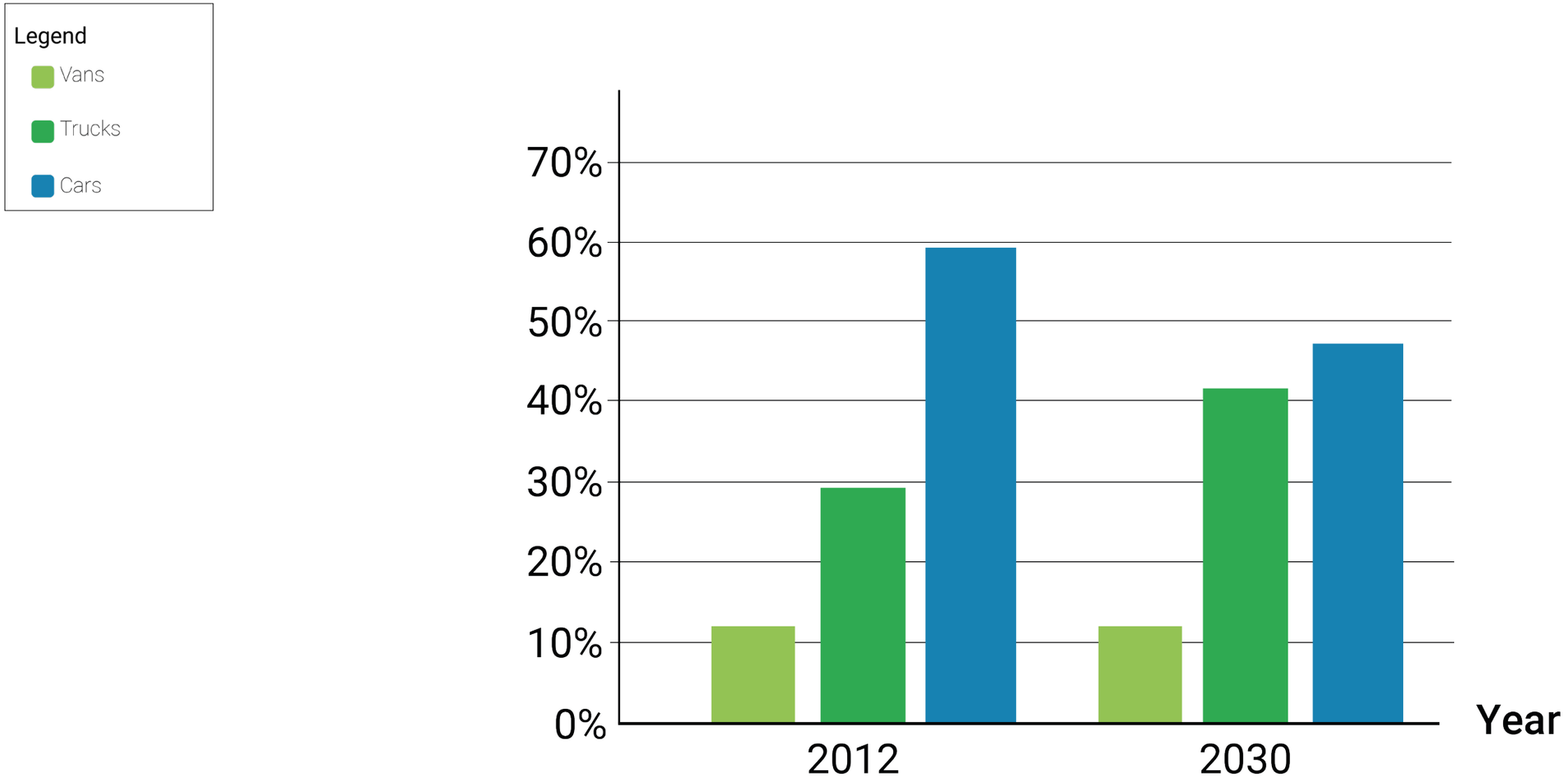


Urban freight has a share of **17%** in the CO2 emission

Personal mobility is at the moment still the most polluting

Increasing stake of GHG emissions due trucks

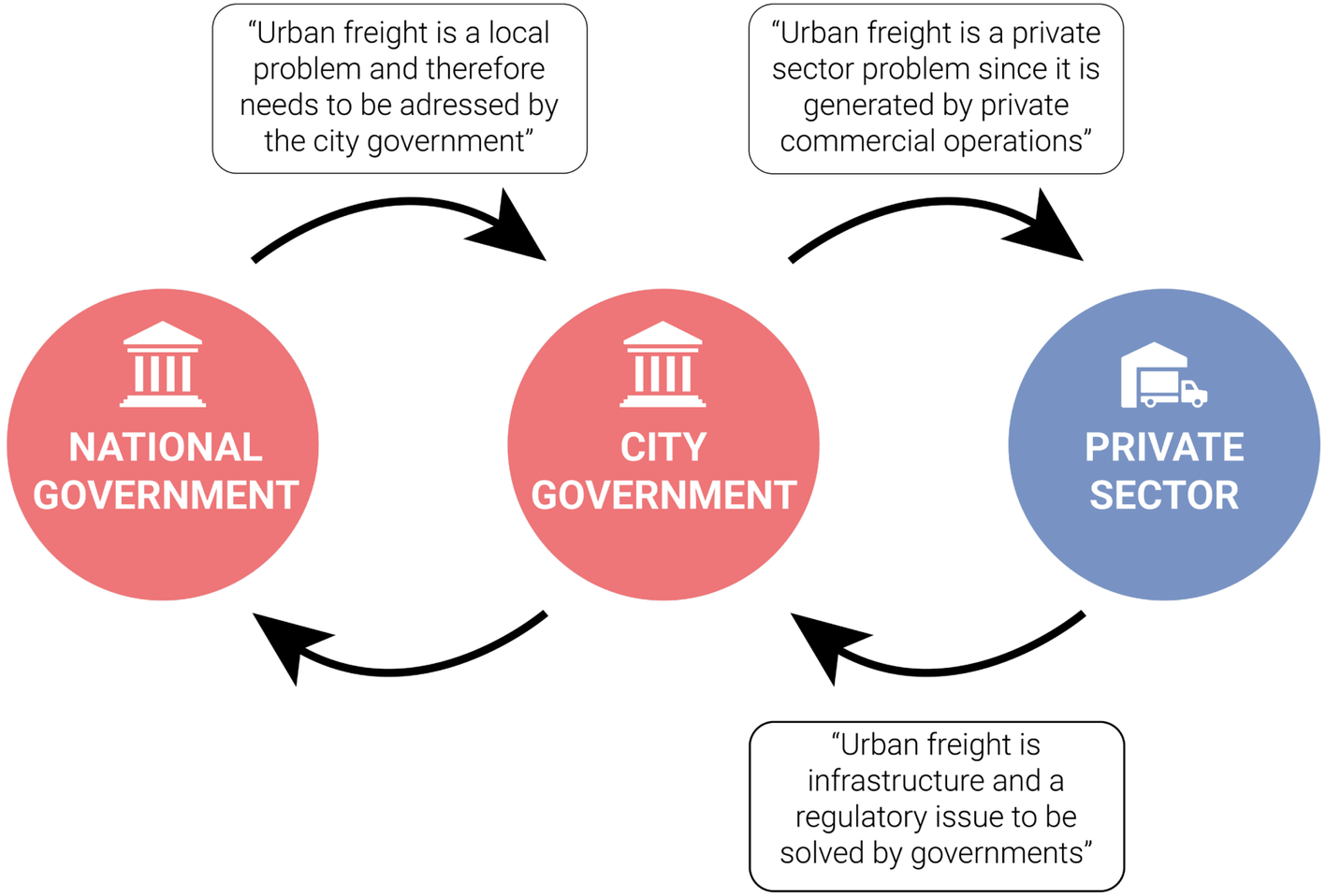
(source: Transport Online, 2015)



Greenhouse gas emissions is growing at **a faster rate** than passenger vehicle emissions

Dynamics between different stakeholders

(source: Smart Freight Centre, 2017)

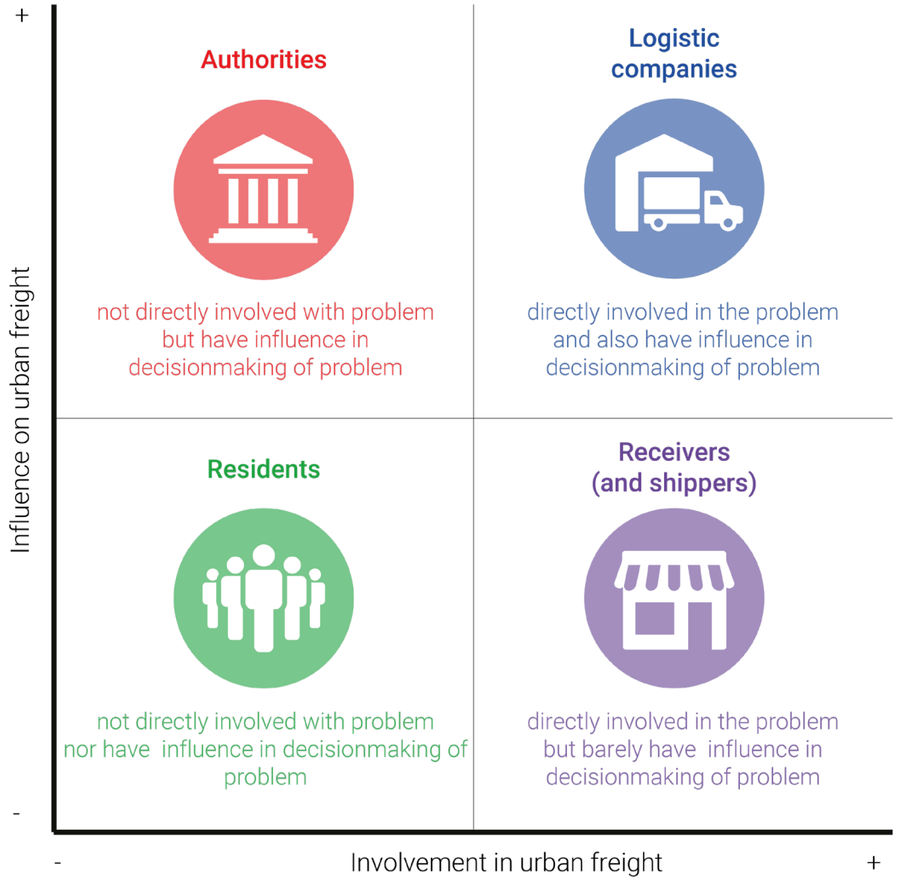


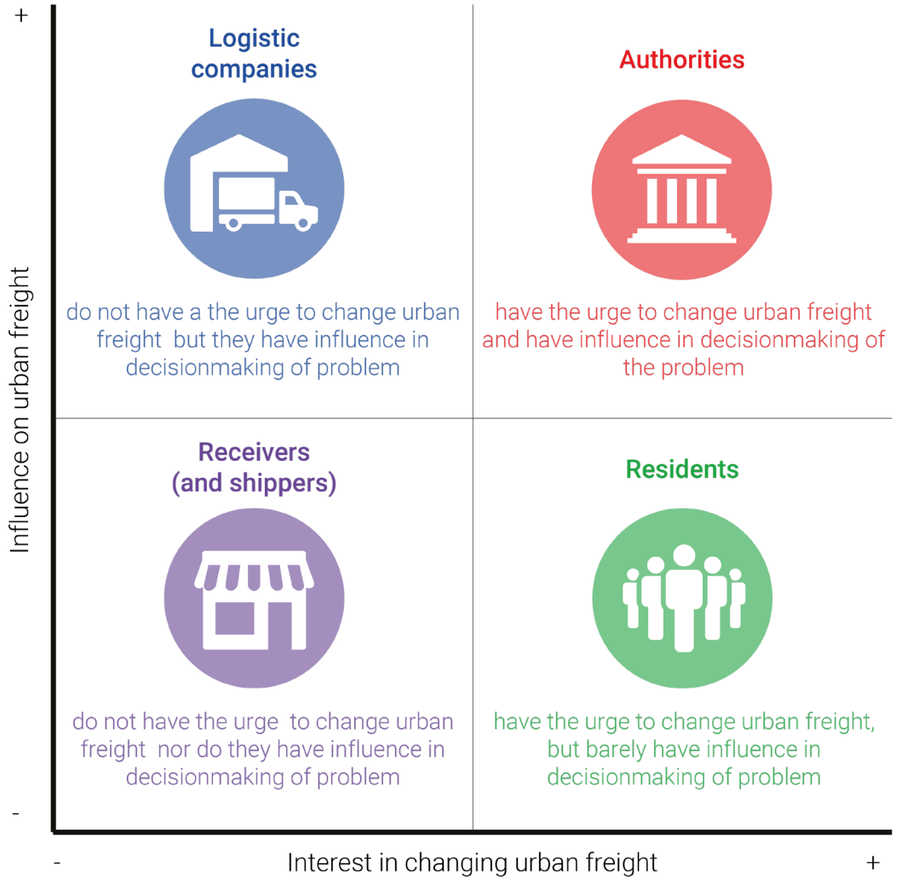
Who is **responsible** for the problems?

Stakeholders are willing to change but they have different expectations on taking initatives

Influence, involvement and interest diagram

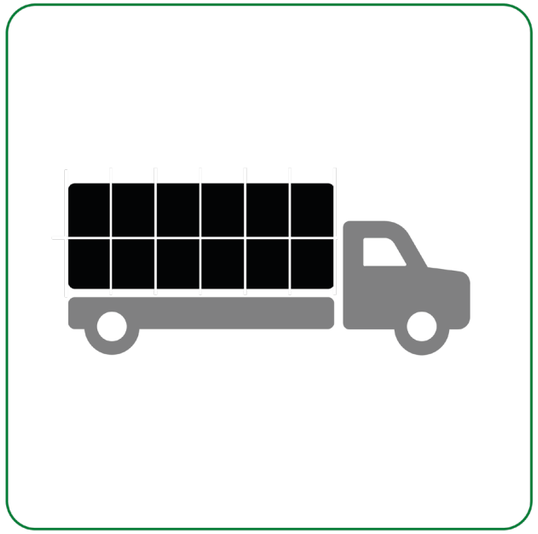
(source: adapted from Van Den Bossche et al., 2017)





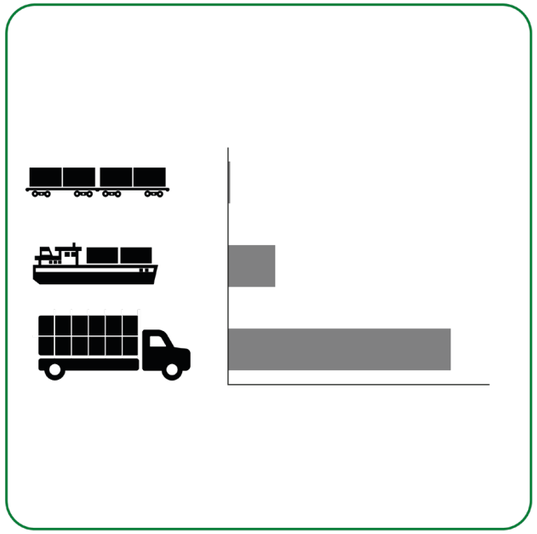
There is a **discrepancy** in involvement and interest among stakeholder groups

Authorities have the power to trigger changes in urban freight with policy and incentivation



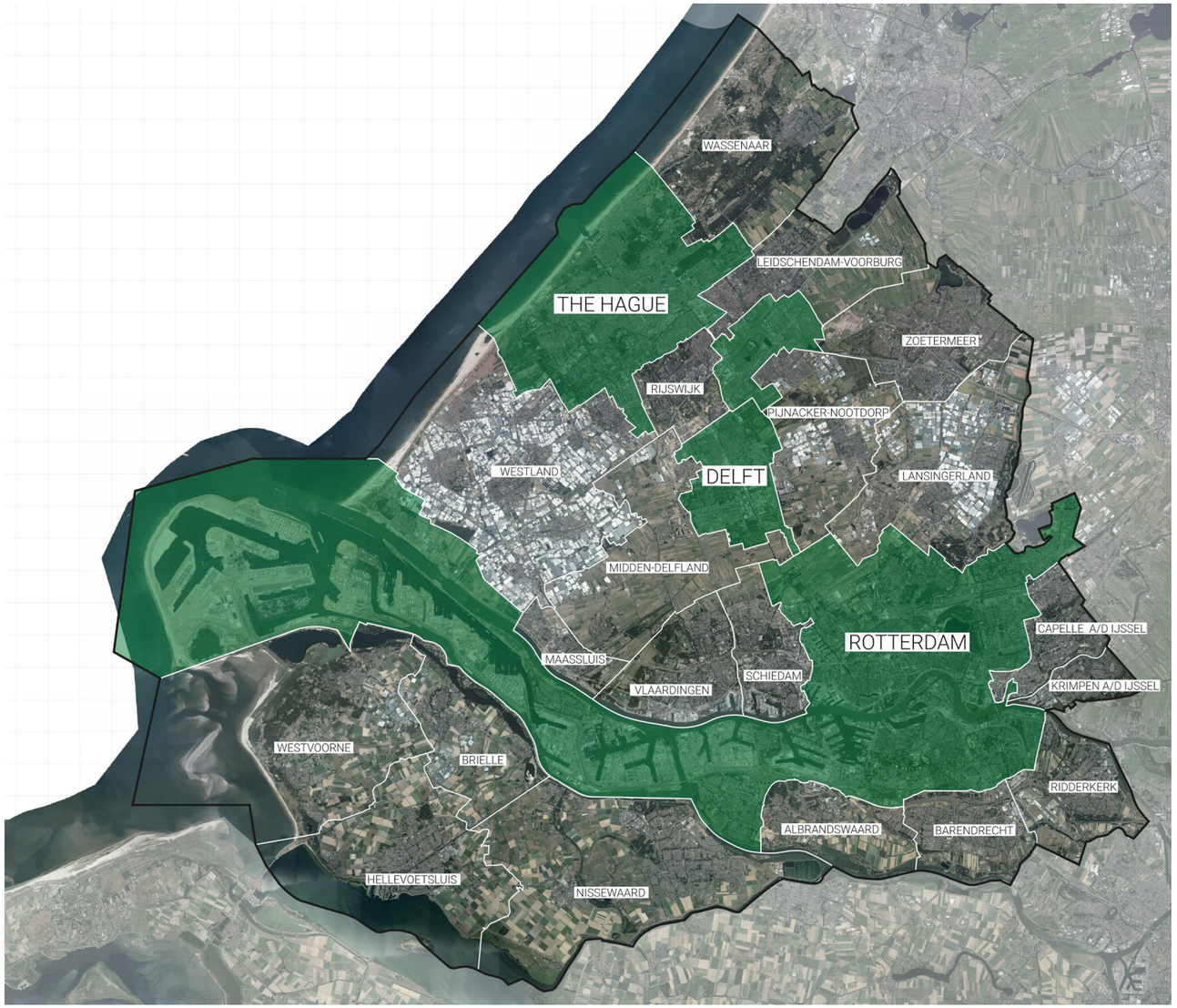
automobile vehicles make intensive use of depletable resources of energy

economic and technological trends exacerbate impacts and are responsbile for more transport flows and distances



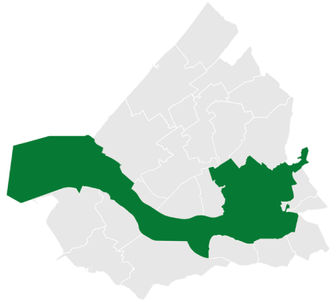
unsustainable growing amount of road transport without multimodal consideration

urban freight policies are insufficient to tackle increasing negative externalities due to lack of knowledge and awareness



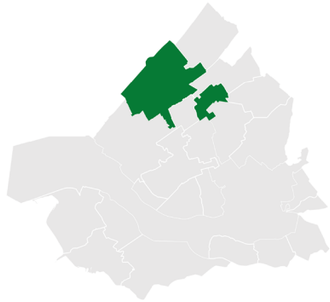
ROTTERDAM

206,44 km² area of the city
644.618 habitants in the city
3,060 /km² density in the city
1013 kton CO_2 emission in the city
32 % of the region



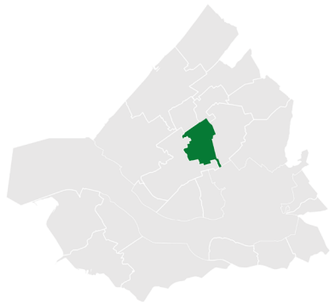
THE HAGUE

82,45 km² area of the city
537.833 habitants in the city
6,523 /km² density in the city
415 kton CO_2 emission in the city
13% of the region



DELFT

22,65 km² area of the city
103.163 habitants in the city
4,555 /km² density in the city
138 kton CO_2 emission in the city
5 % of the region

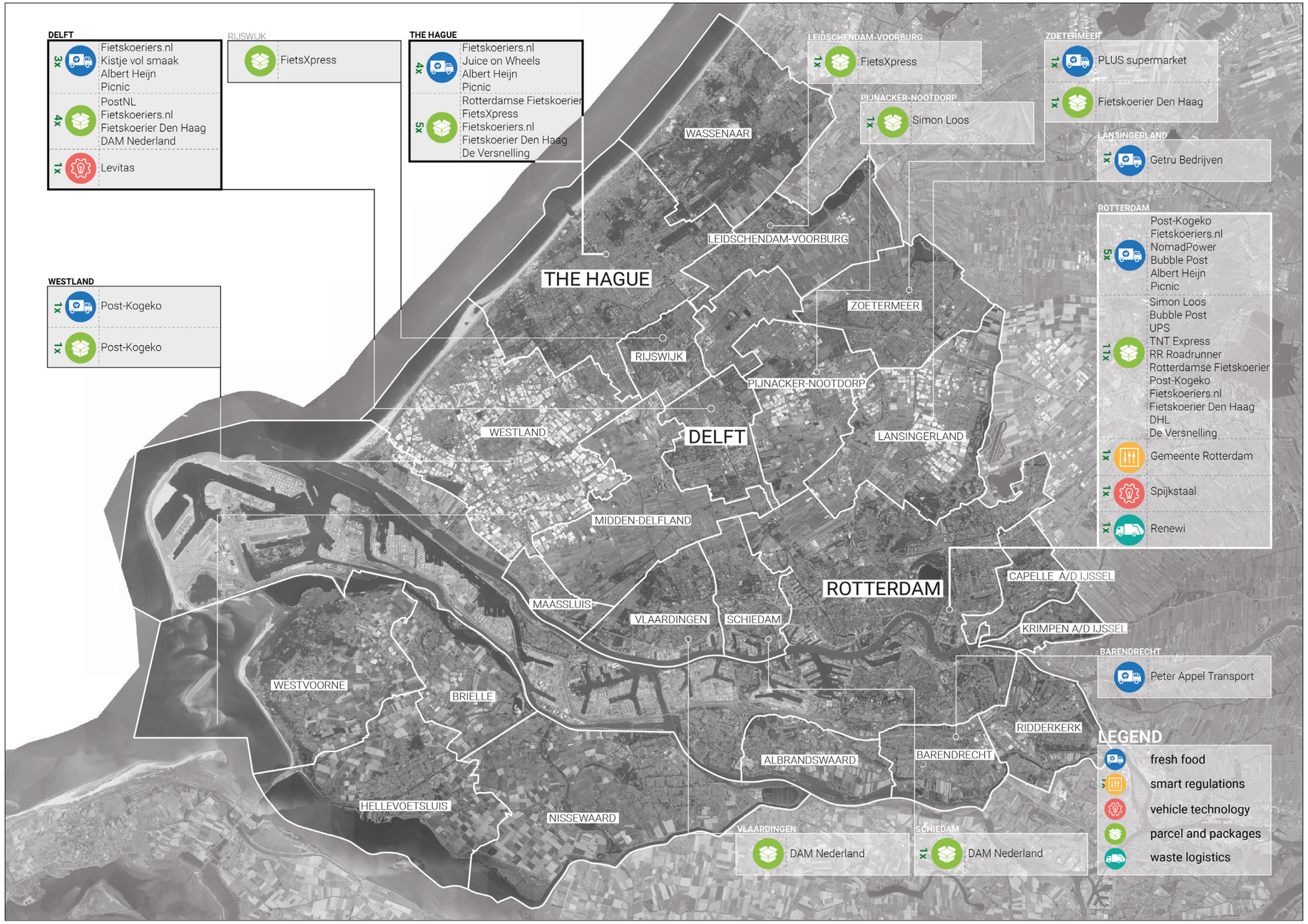


testing area:

Rotterdam-The Hague Metropolitan Area Metropoolregio Rotterdam-Den Haag (MRDH)

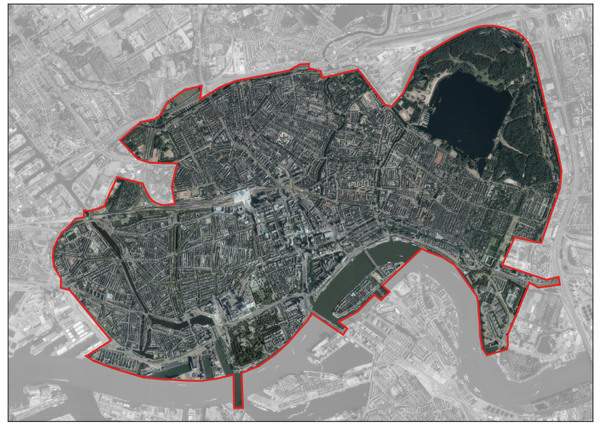
Zero Emission Stadslogistiek

- waste logistics
- smart regulations
- fresh food
- vehicle technology
- parcel and packages
- catering industry
- facility flows
- hanging transport
- renovation and demolishment

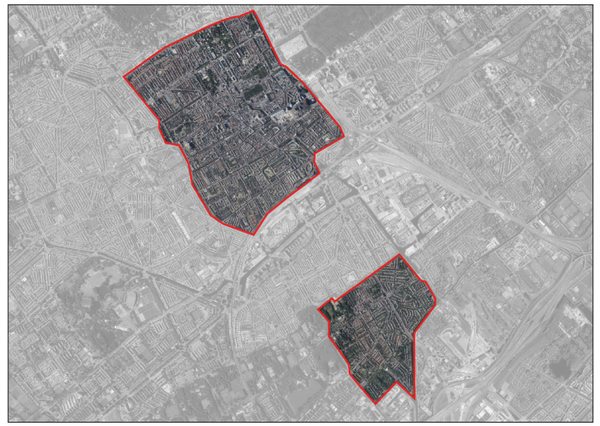


Municipality	Low emission zone	Vehicle restrictions	Time windows
Gemeente Rotterdam	- Low emission zone in the city centre and Maasvlakte Restriction based on engine	Engine: min EURO IV (city centre) min EURO VI (Maasvlakte) Complete truck ban 's-Gravendijkwal	Mo - Su 05.00 - 10.30 Additonal exemption zero emission vehicles: Mo - Th 18:00 - 20:00
Den Haag	- Low emission zone in the city centre Restrictions based on engine and age	Engine: min EURO IV Age: max 13 years	Mo - Fr 5.00 - 11.30 Sa - Su 6.00 - 11.30 Around Central Station instead: Mo-Fr 5.00 - 7.00, 10.00-11.30
Gemeente Delft	- Logistic zone in city centre - Low emission zone in south east of the city centre Restrictions based on size	Weight: max 3.5 ton Length: max 10 m Width: max 2.20 m	with exemption Mo - Fr 7.00 - 12.00 Sa 7.00 - 11.00 Official Holidays 10.00 -12.00

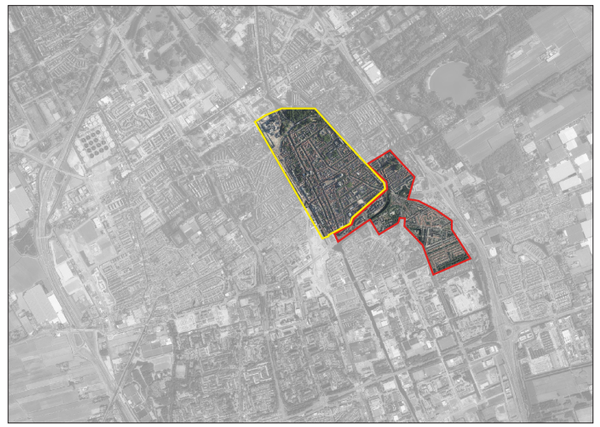
ROTTERDAM



THE HAGUE + RIJSWIJK



DELFT



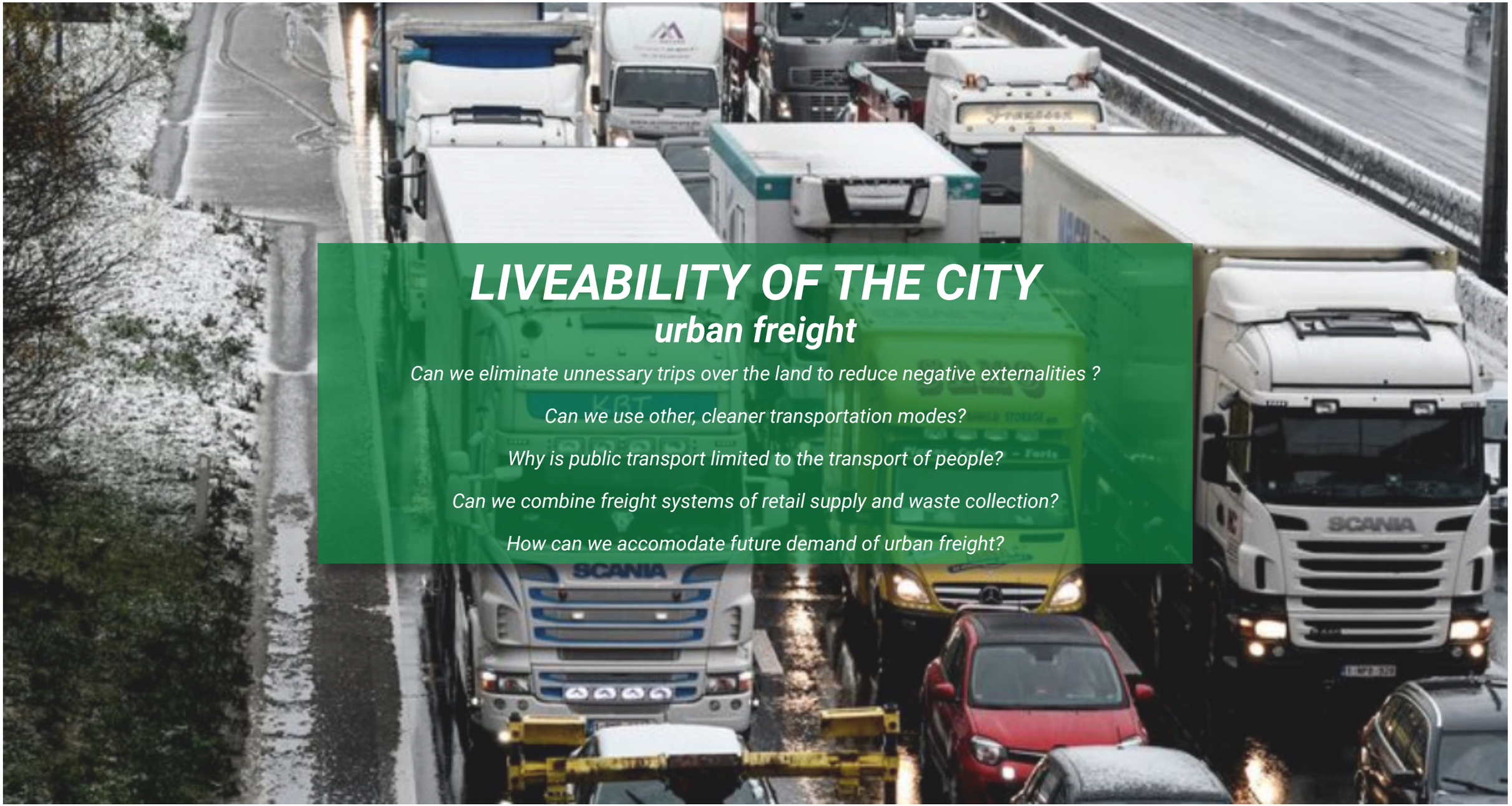
ANP via AD, 2019

LIVEABILITY OF THE CITY

urban freight

well-working freight system?

HLN, 2017



LIVEABILITY OF THE CITY

urban freight

Can we eliminate unnessary trips over the land to reduce negative externalities ?

Can we use other, cleaner transportation modes?

Why is public transport limited to the transport of people?

Can we combine freight systems of retail supply and waste collection?

How can we accomodate future demand of urban freight?

HLN, 2017

research aim:

- develop a **strategic framework** for **local authorities**
- accomodate the **increasing logistic demand of retailers**
- reduce the **negative externalities**

- respond to **national** and **international climate agreements**

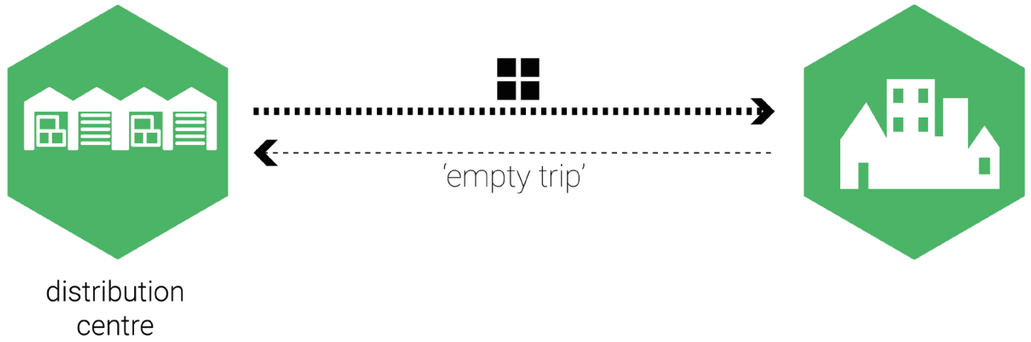
research aim:

- develop a **strategic framework** for **local authorities**
- accomodate the **increasing logistic demand of retailers**
- reduce the **negative externalities**

- respond to **national** and **international climate agreements**

research question

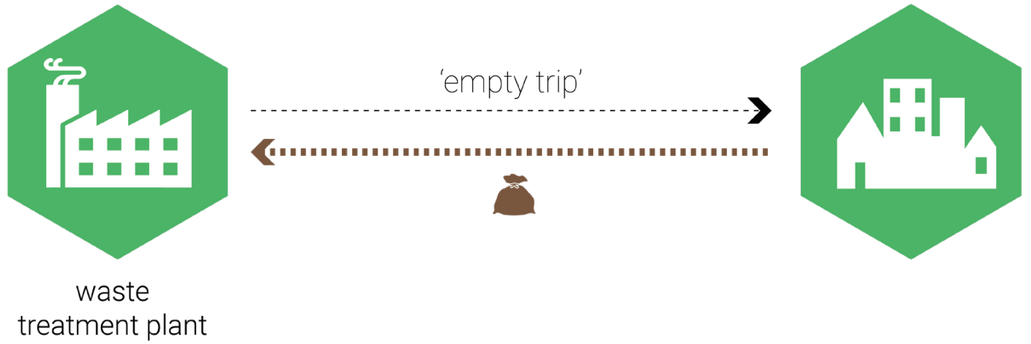
How can a **strategic framework of urban freight transportation** in the **MRDH** accommodate the **increasing logistic demand** of **retailers** in a **sustainable and liveable way**?



SUPPLY OF GOODS

'full' trip to city

'empty' trip back to distribution centre



WASTE COLLECTION

'empty' trip to city

'full' trip to waste treatment facility


urban freight
national/regional distribution centre
national/regional distribution centre
national/regional distribution centre
national/regional distribution centre
national/regional distribution centre
retailer / shopping mall
retailer / shopping mall
retailer / shopping mall
retailer / shopping mall
retailer / shopping mall

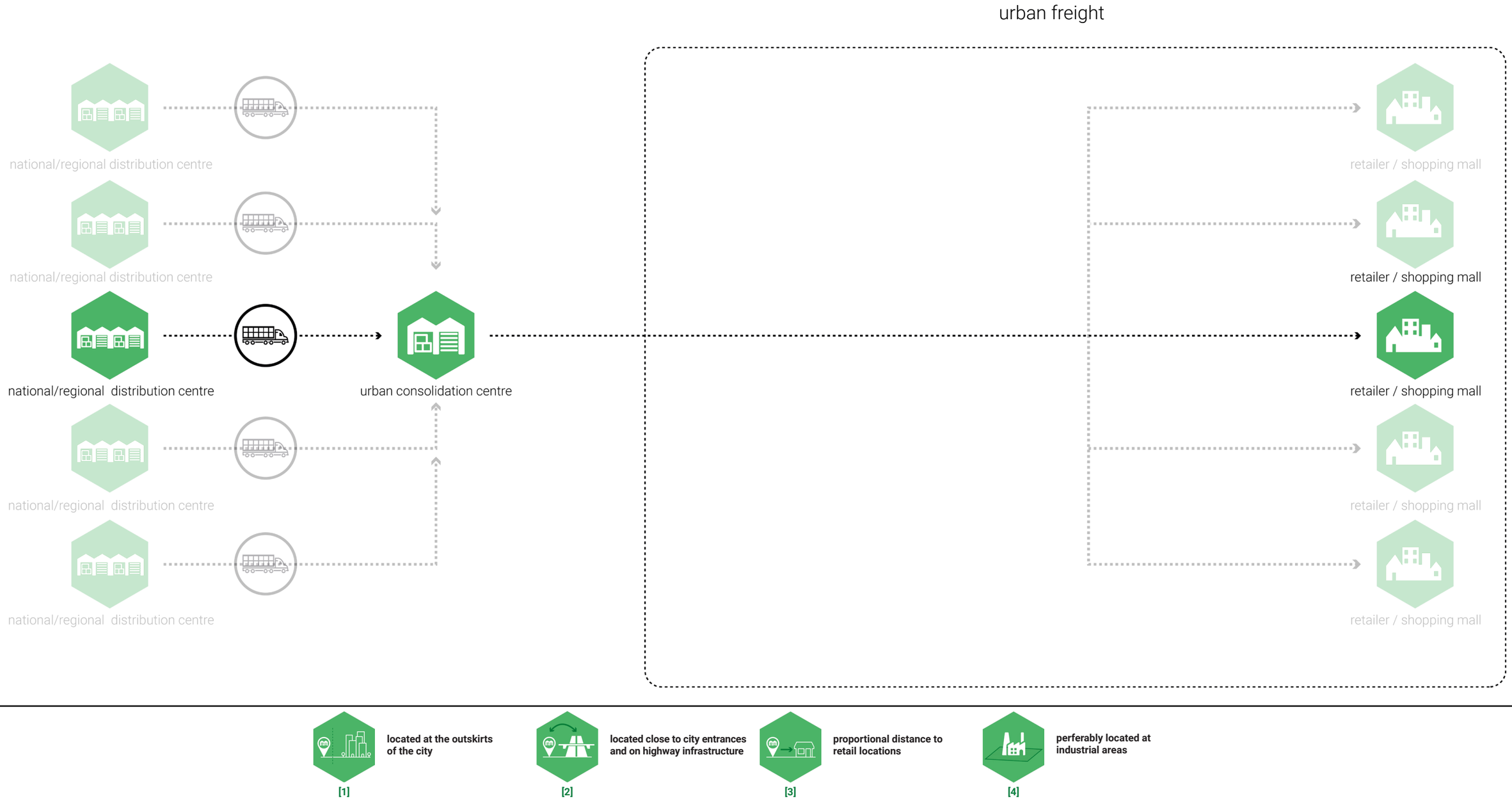
Conceptualisation

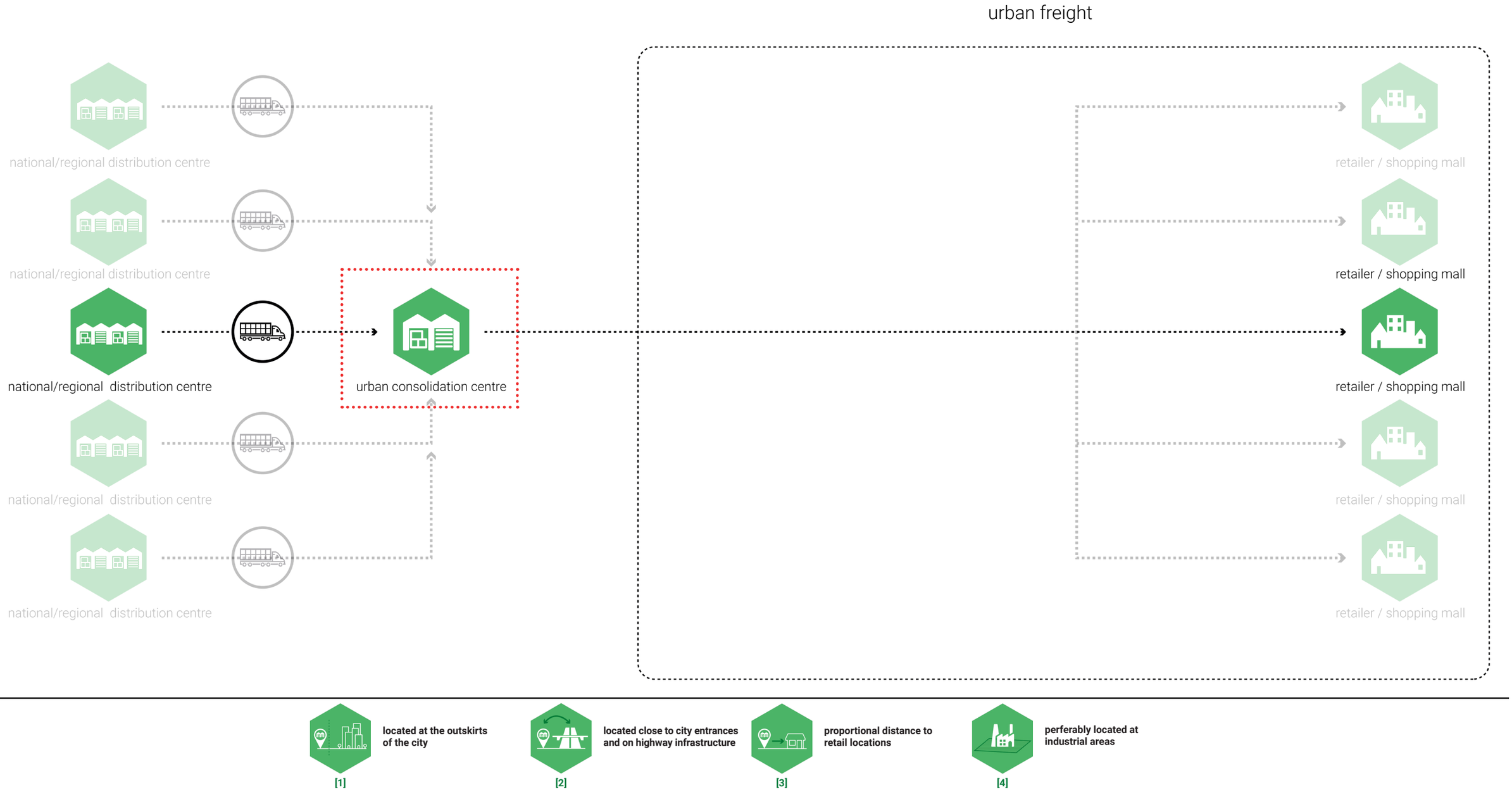
urban consolidation

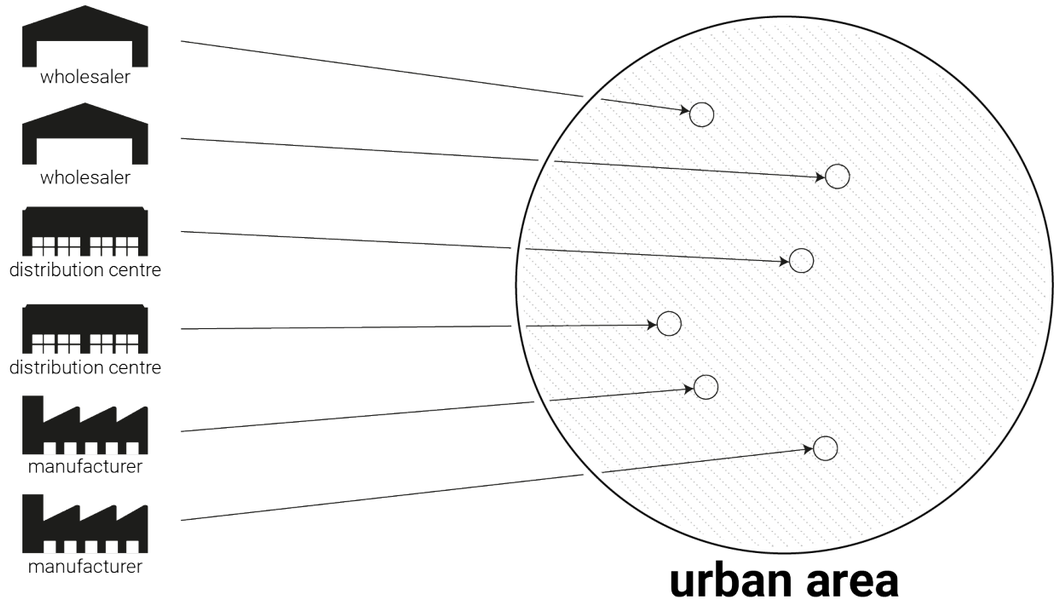
+

urban multimodality

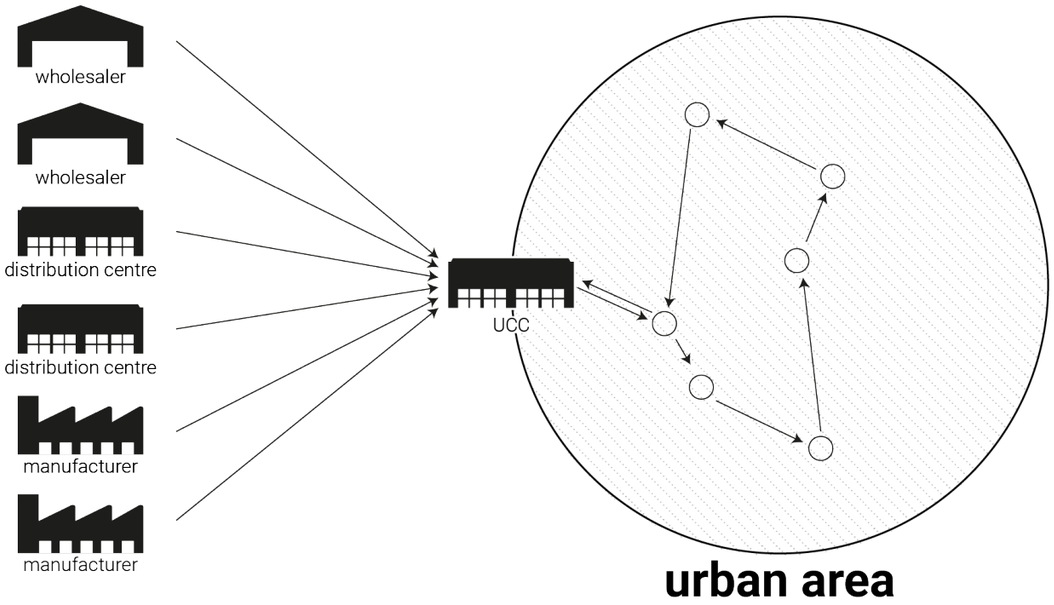
top: *Amsterdam Logistic City Hub, 2019* ***bottom:*** *Cityhub Utrecht, n.d.*


urban freight
national/regional distribution centre
national/regional distribution centre
national/regional distribution centre
urban consolidation centre
national/regional distribution centre
national/regional distribution centre
retailer / shopping mall
retailer / shopping mall
retailer / shopping mall
retailer / shopping mall
retailer / shopping mall
[1] located at the outskirts of the city
[2] located close to city entrances and on highway infrastructure
[3] proportional distance to retail locations
[4] perferably located at industrial areas


urban freight
national/regional distribution centre
national/regional distribution centre
national/regional distribution centre
urban consolidation centre
national/regional distribution centre
national/regional distribution centre
retailer / shopping mall
retailer / shopping mall
retailer / shopping mall
retailer / shopping mall
retailer / shopping mall
[1]
located at the outskirts of the city
[2]
located close to city entrances and on highway infrastructure
[3]
proportional distance to retail locations
[4]
perferably located at industrial areas



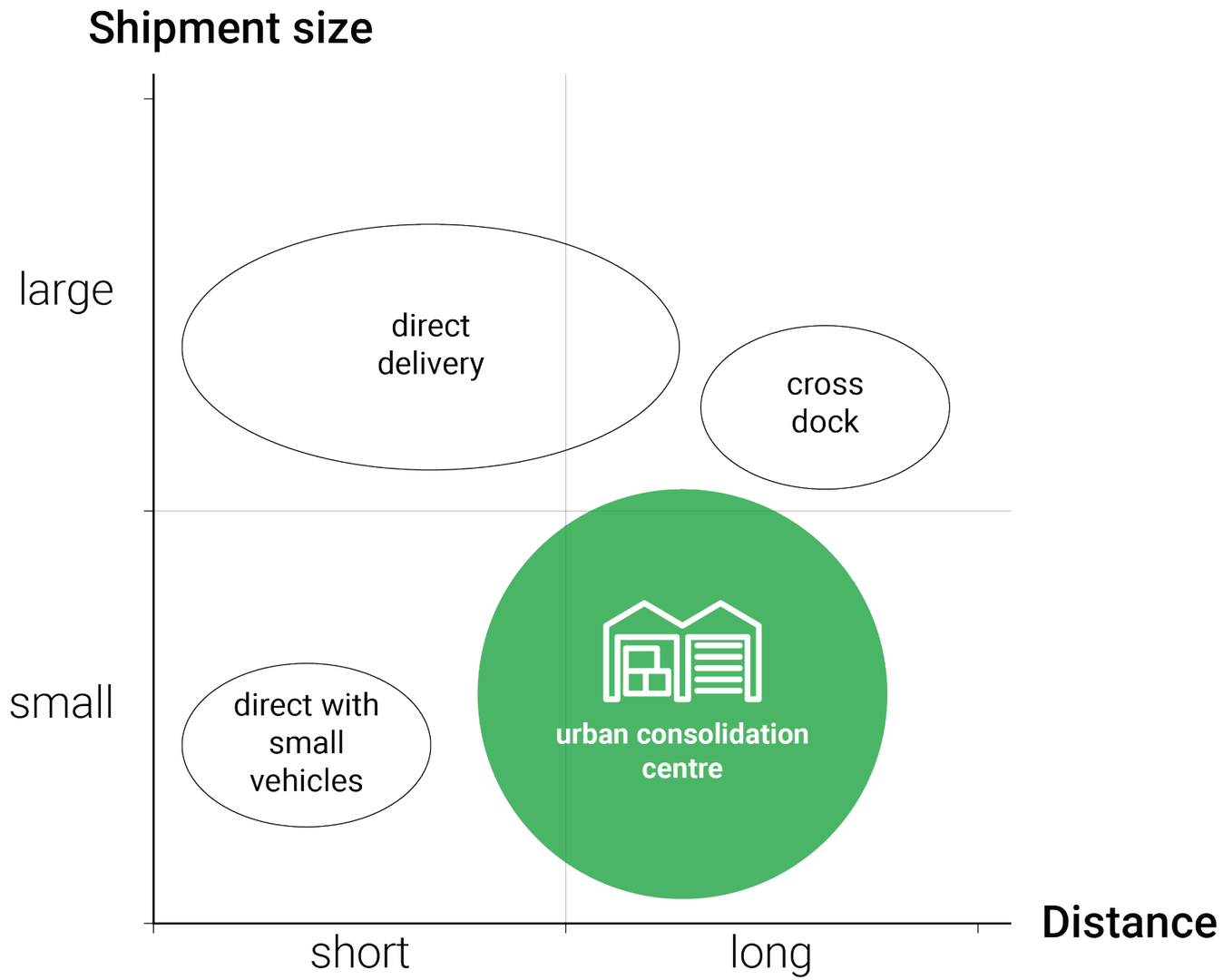
without consolidation centre



with consolidation centre

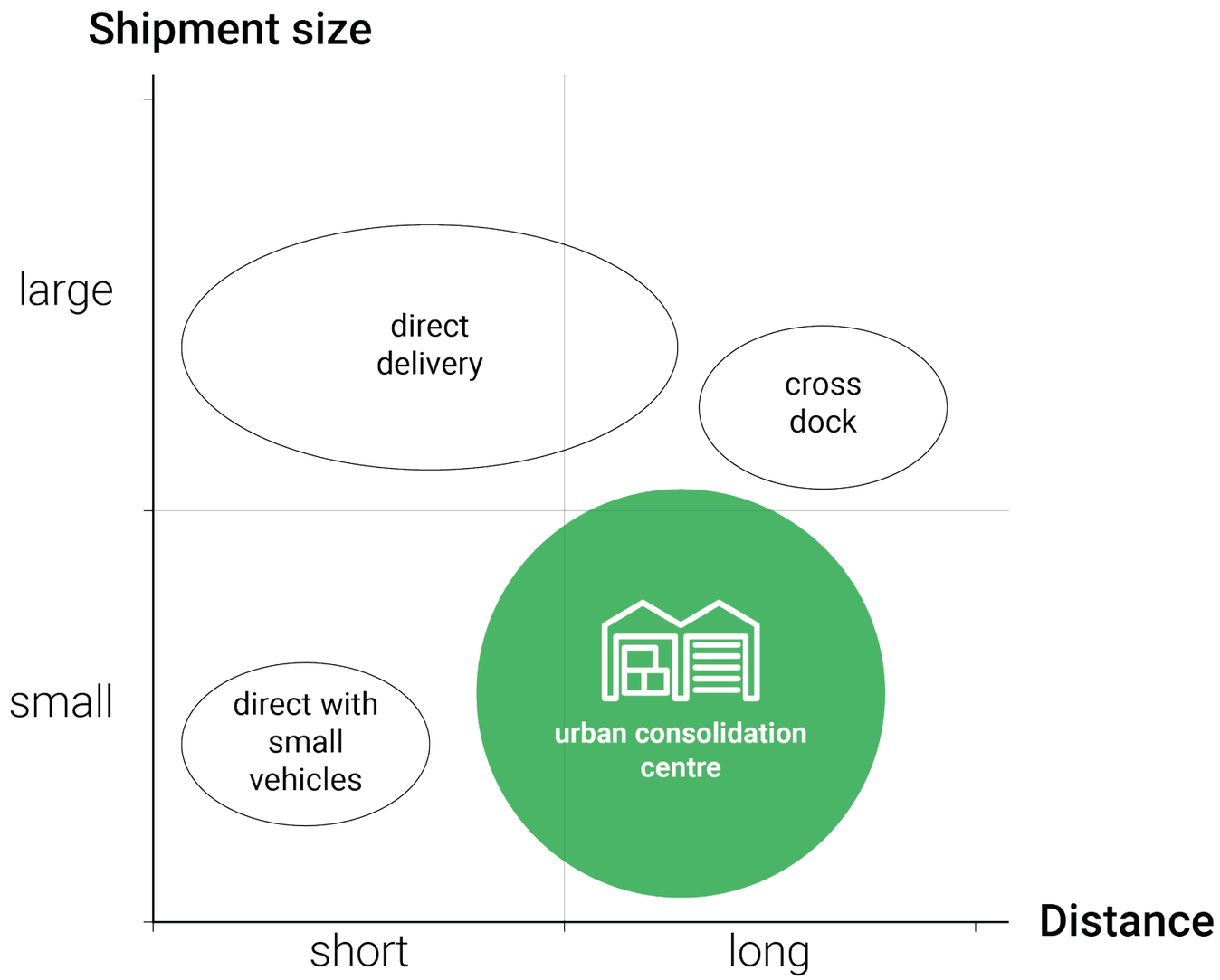
Distribution ways for urban freight (types of goods and waste)

(source: Kin et al., 2018)



Distribution ways for urban freight (types of goods and waste)

(source: Kin et al., 2018)



APPLICABLE GOODS:

1. consumer goods

-> fashion, miscellaneous,

small supermarkets and food specialists, drugsstore,

cosmetics etc.

2. durable goods

-> (small) electronics, tools,

(small) construction materials,

boutique etc.

3. retail waste

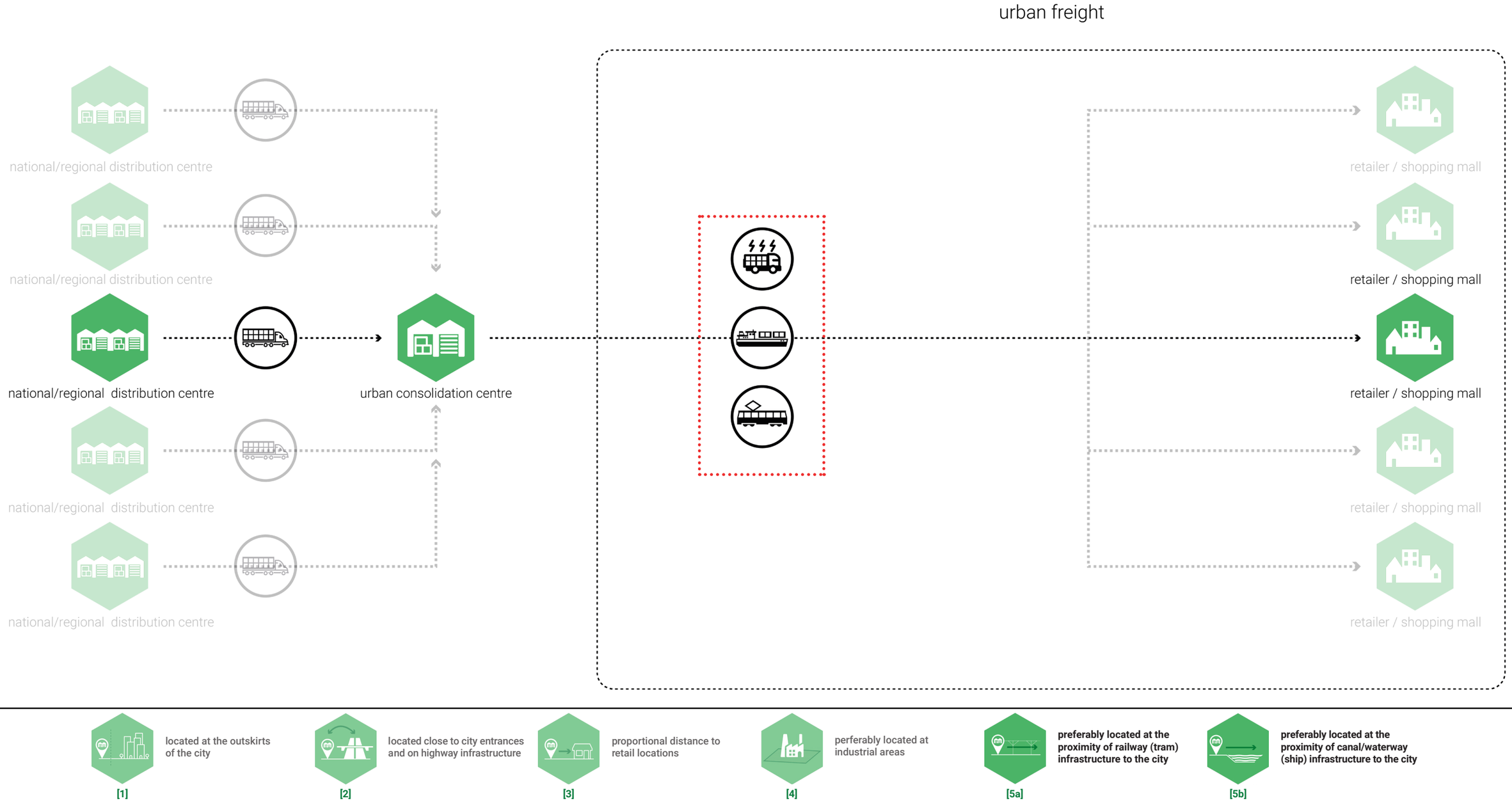
-> (small) residual waste

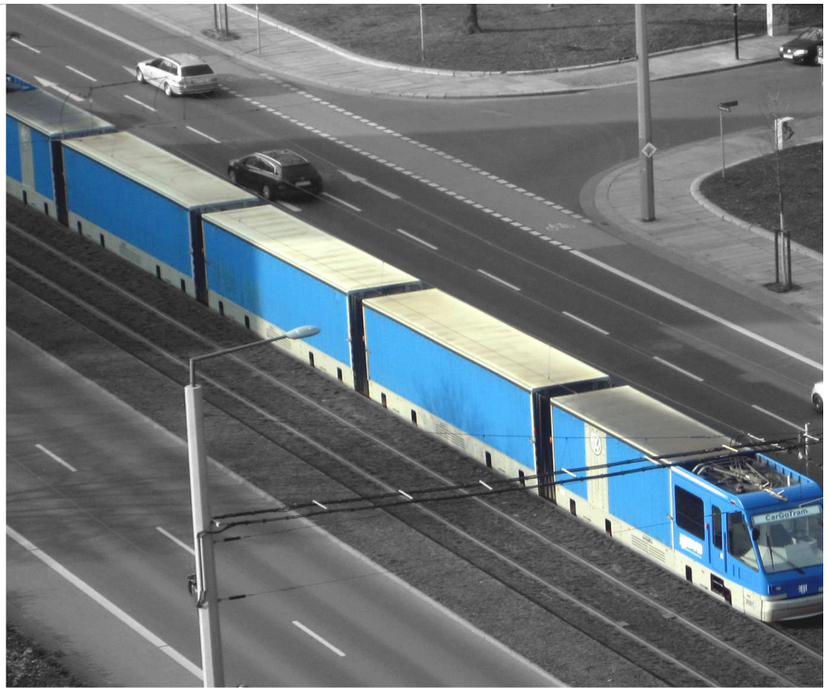
urban consolidation

+

urban multimodality

top: *NL Architects, 2009* ***bottom:*** *Bestfact, 2015*


urban freight
national/regional distribution centre
national/regional distribution centre
national/regional distribution centre
urban consolidation centre
national/regional distribution centre
national/regional distribution centre
retailer / shopping mall
retailer / shopping mall
retailer / shopping mall
retailer / shopping mall
retailer / shopping mall
[1] located at the outskirts of the city
[2] located close to city entrances and on highway infrastructure
[3] proportional distance to retail locations
[4] perferably located at industrial areas
[5a] preferably located at the proximity of railway (tram) infrastructure to the city
[5b] preferably located at the proximity of canal/waterway (ship) infrastructure to the city



Length: 20 m
Width: 4.25 m
Load capacity: 85 m3, 75 t

top: *SENSEable City Lab via MIT news, 2016; sustainabletransport, n.d.; Frze, 2014* ***bottom:*** *Bestfact, 2015; Dowideit, 2017*

urban consolidation centres (UCC)

entry point of system

transhipment centres (TC)

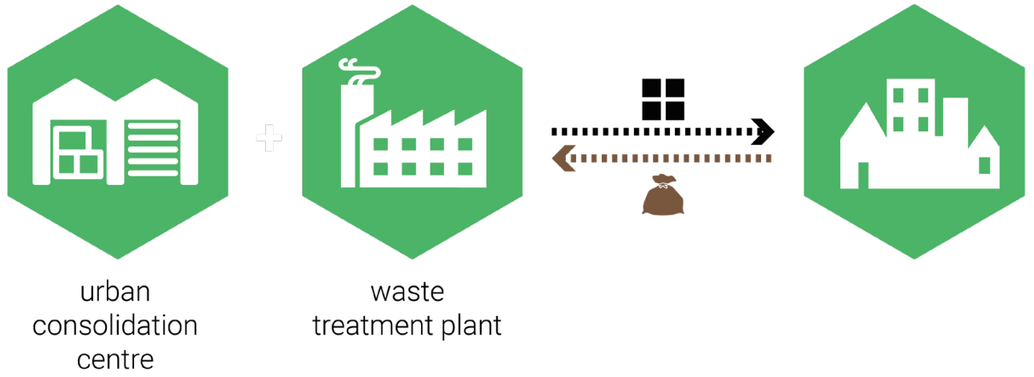
intermediate point of system

drop-off points (DoP)

exit point of system

urban consolidation centres (UCC)

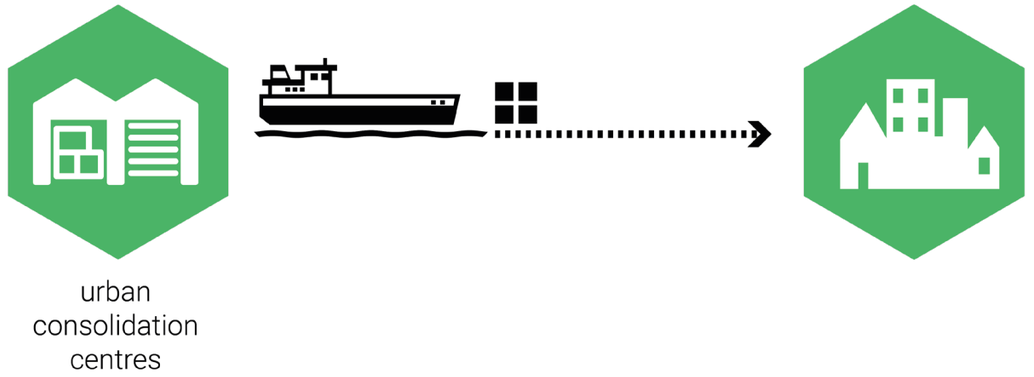
entry point of system



PRINCIPLE #1

urban consolidation centre situated near

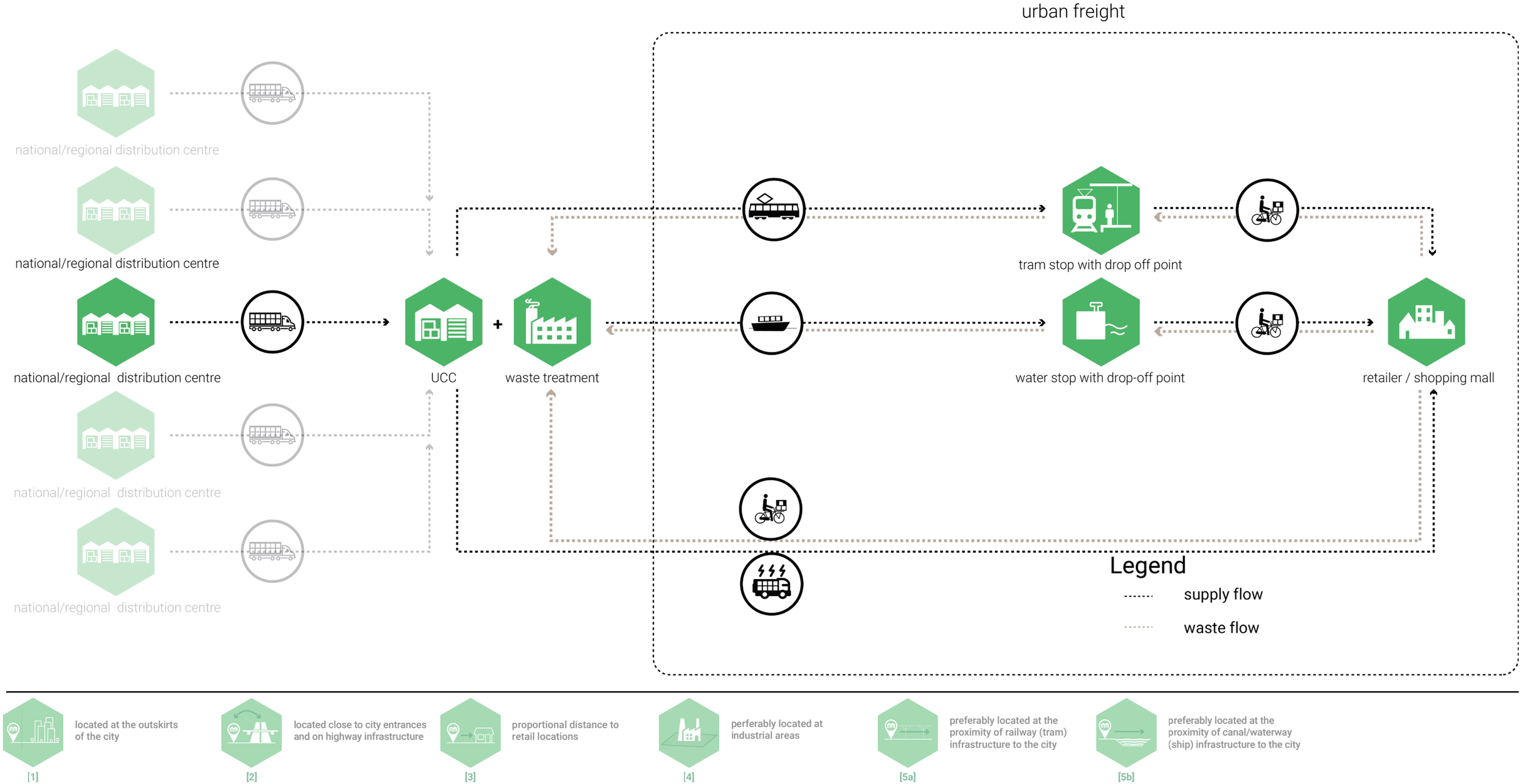
waste treatment facility



PRINCIPLE #2

urban consolidation centre situated along

waterway corridor



[1] located at the outskirts of the city

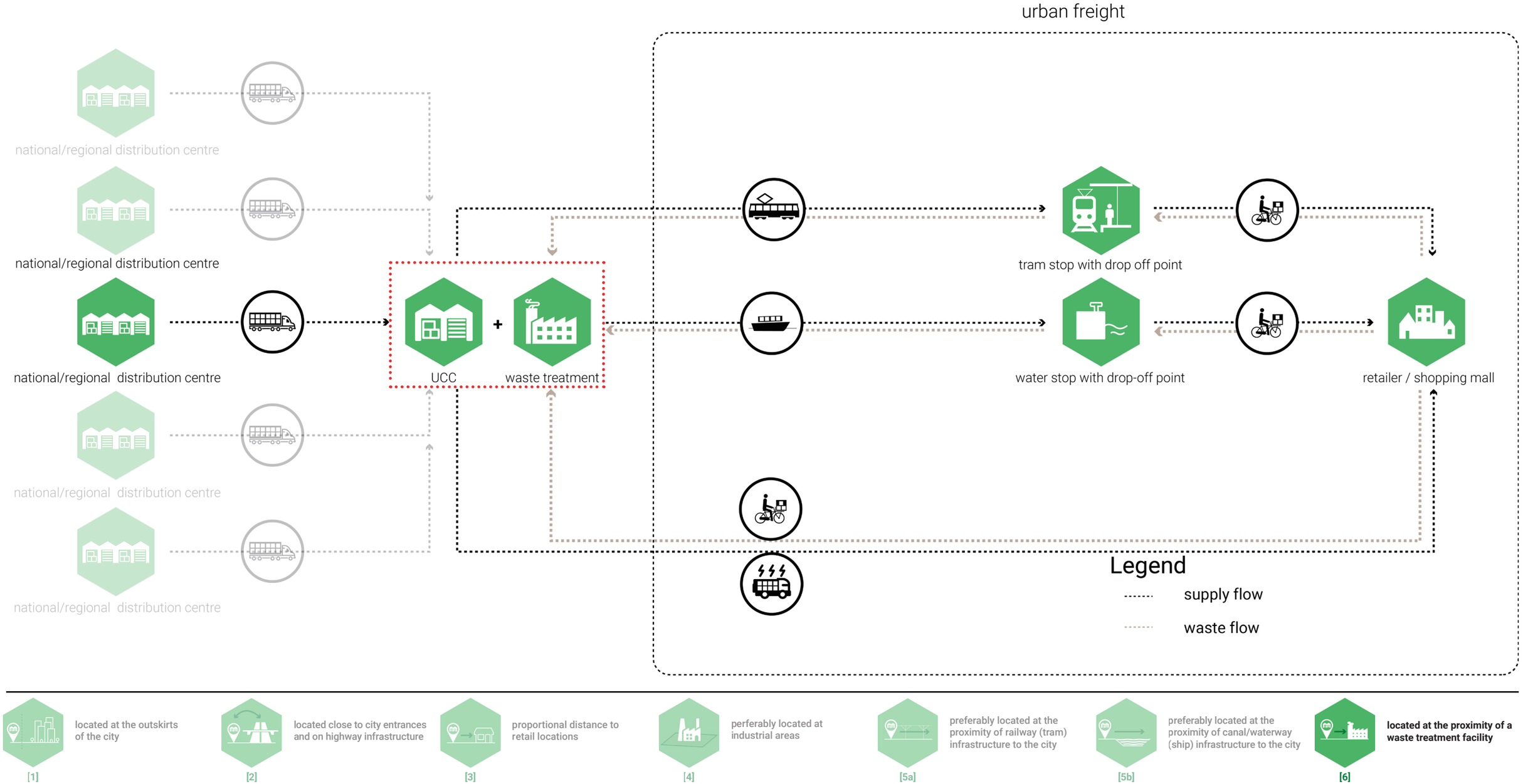
[2] located close to city entrances and on highway infrastructure

[3] proportional distance to retail locations

[4] perferably located at industrial areas

[5a] preferably located at the proximity of railway (tram) infrastructure to the city

[5b] preferably located at the proximity of canal/waterway (ship) infrastructure to the city



[1] located at the outskirts of the city

[2] located close to city entrances and on highway infrastructure

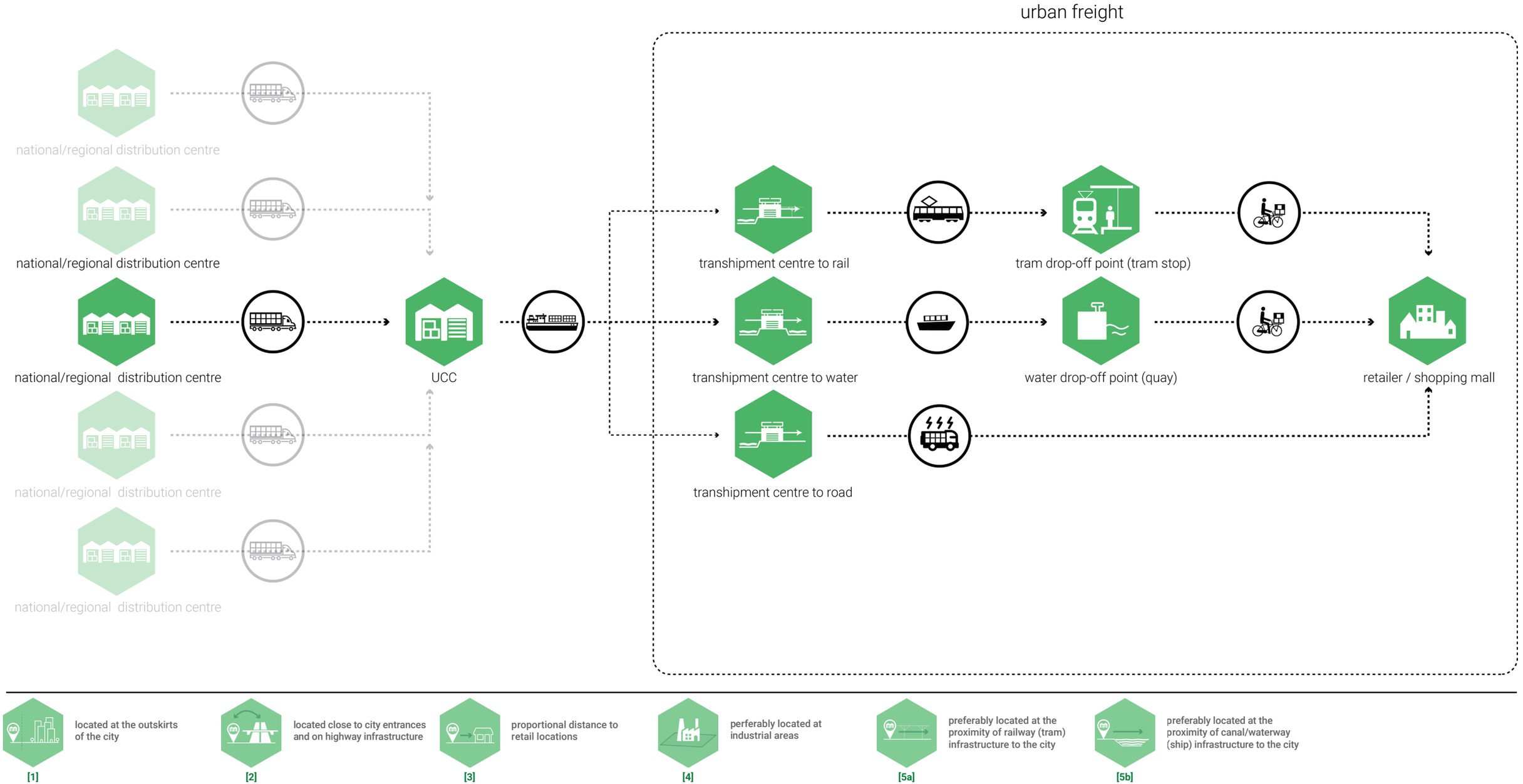
[3] proportional distance to retail locations

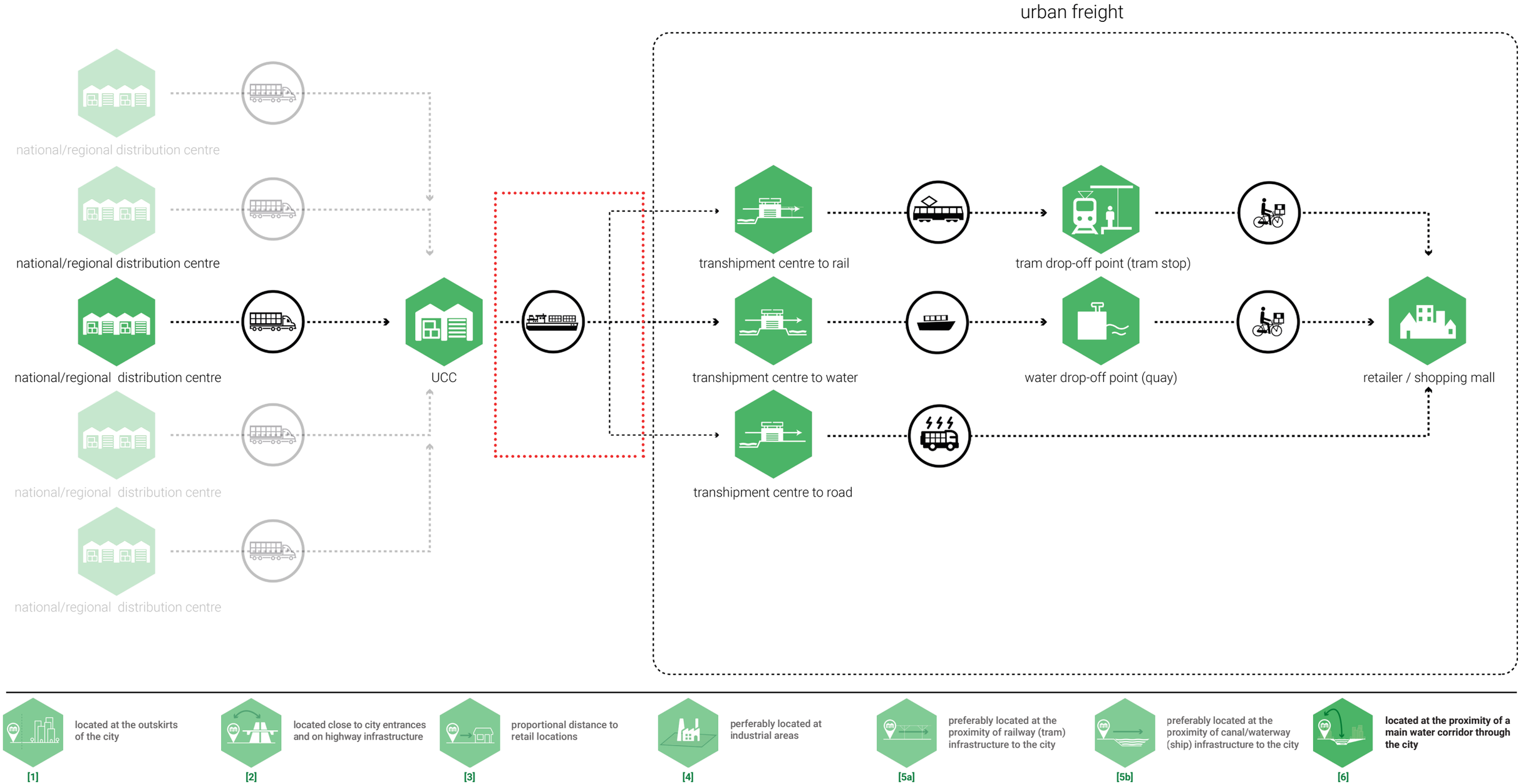
[4] perferably located at industrial areas

[5a] preferably located at the proximity of railway (tram) infrastructure to the city

[5b] preferably located at the proximity of canal/waterway (ship) infrastructure to the city

[6] **located at the proximity of a waste treatment facility**

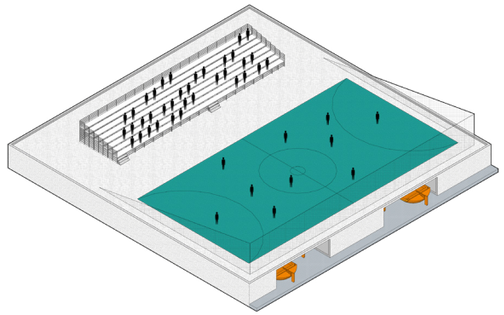

urban freight
national/regional distribution centre
national/regional distribution centre
national/regional distribution centre
UCC
national/regional distribution centre
national/regional distribution centre
transhipment centre to rail
tram drop-off point (tram stop)
transhipment centre to water
water drop-off point (quay)
retailer / shopping mall
transhipment centre to road
[1]
located at the outskirts of the city
[2]
located close to city entrances and on highway infrastructure
[3]
proportional distance to retail locations
[4]
perferably located at industrial areas
[5a]
preferably located at the proximity of railway (tram) infrastructure to the city
[5b]
preferably located at the proximity of canal/waterway (ship) infrastructure to the city


urban freight
national/regional distribution centre
national/regional distribution centre
national/regional distribution centre
UCC
national/regional distribution centre
national/regional distribution centre
transhipment centre to rail
tram drop-off point (tram stop)
transhipment centre to water
water drop-off point (quay)
retailer / shopping mall
transhipment centre to road
[1] located at the outskirts of the city
[2] located close to city entrances and on highway infrastructure
[3] proportional distance to retail locations
[4] perferably located at industrial areas
[5a] preferably located at the proximity of railway (tram) infrastructure to the city
[5b] preferably located at the proximity of canal/waterway (ship) infrastructure to the city
[6] located at the proximity of a main water corridor through the city

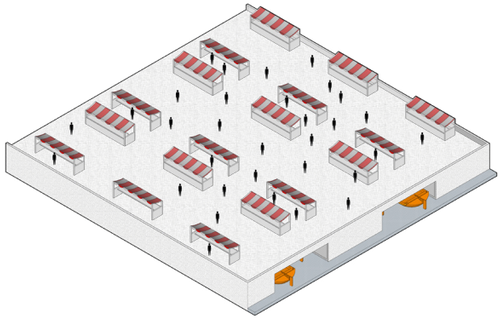
transhipment centres (TC)

intermediate point of system

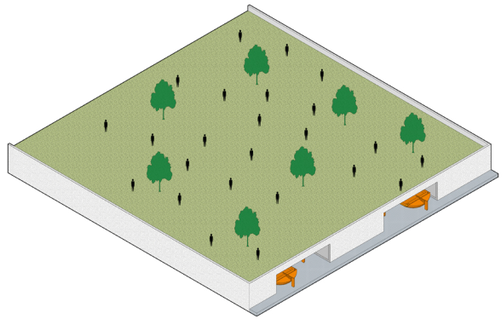
temporary FUNCTION



1. play ground / sport events / skate park



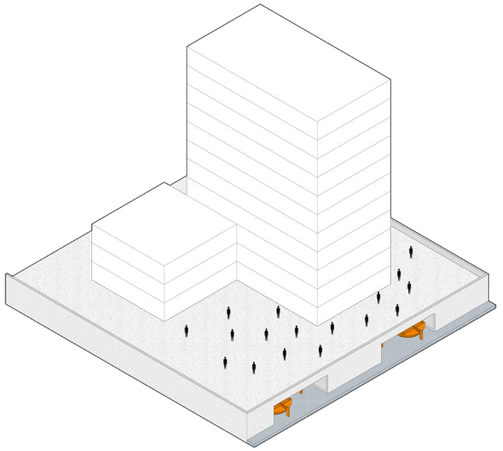
2. market / fair / bazaar



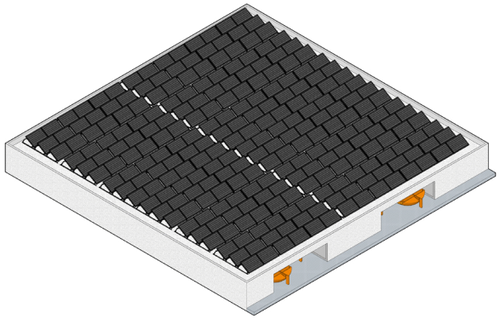
3. small park / green public space

4. small public space / picknick / terrace

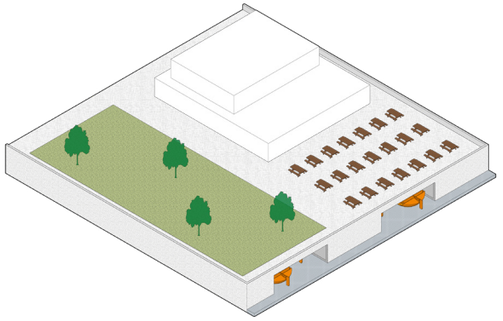
permanent FUNCTION



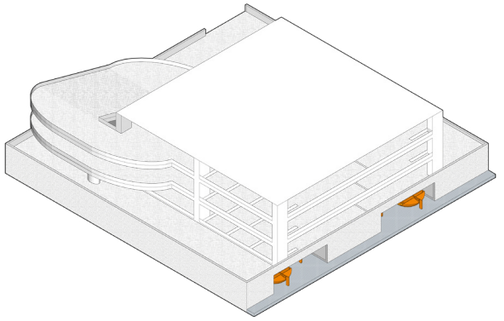
5. (large) esidential / office / retail building



6. electricity: solar panel / windmill



7. public pavillion / cafe / restaurant / single tenant



8. parking place / car storage

[1a] located at the proximity (<6km, road) of a constructed UCC

[1b] located at the proximity (<6km, road) of a constructed UCC

[2] located at the chosen water corridor through the city [with principle #2]

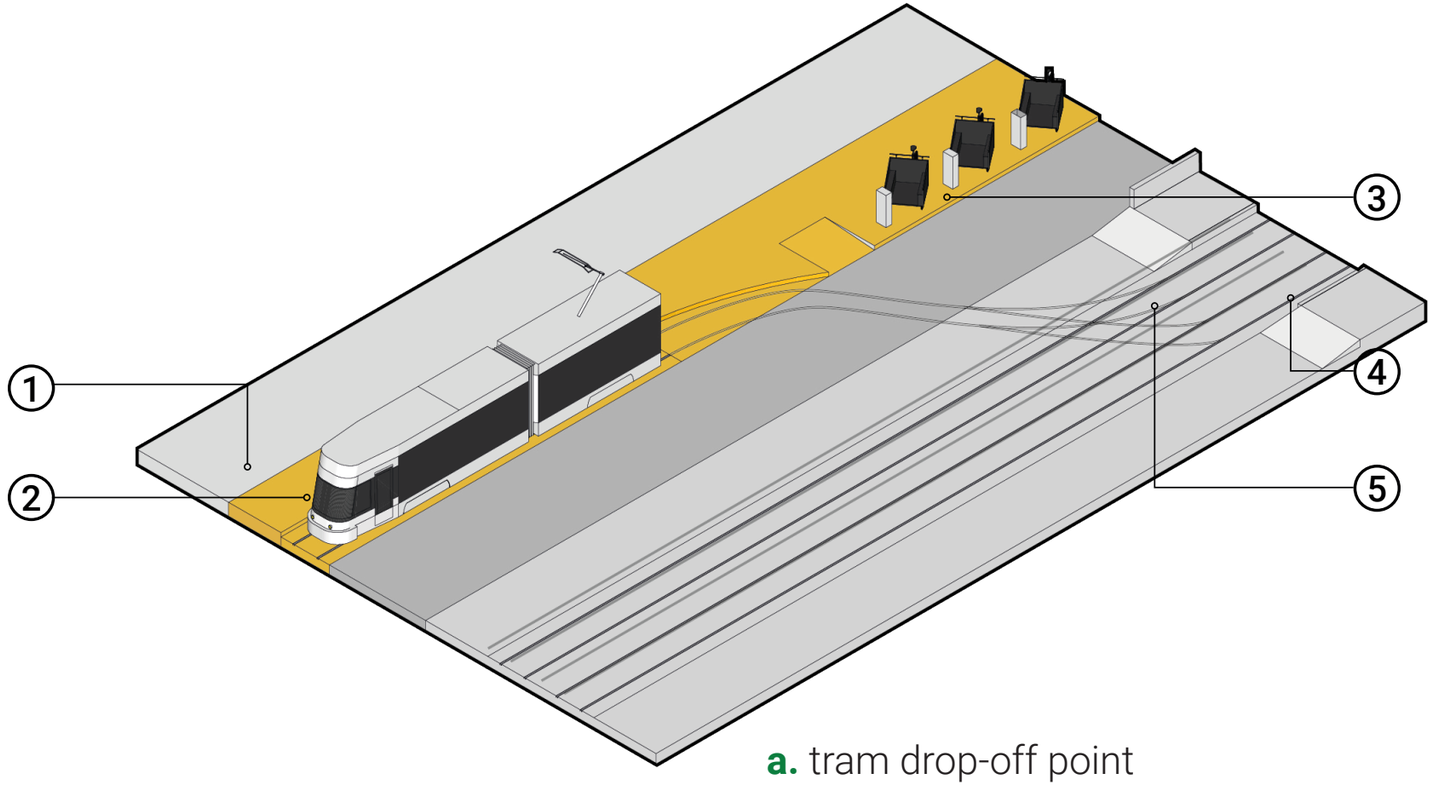
[3a] located at the proximity of an tram end stop of a fine-grained tram network

[3b] located at the proximity of a fine-grained canal/water (ship) infrastructure

[4] located at the proximity (<6 km) of drop-off points / retail areas

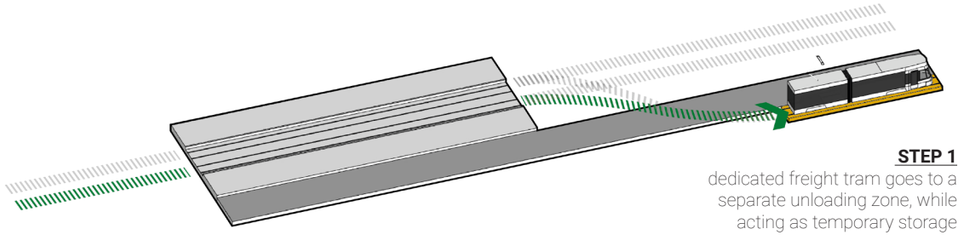
drop-off points (DoP)

exit point of system

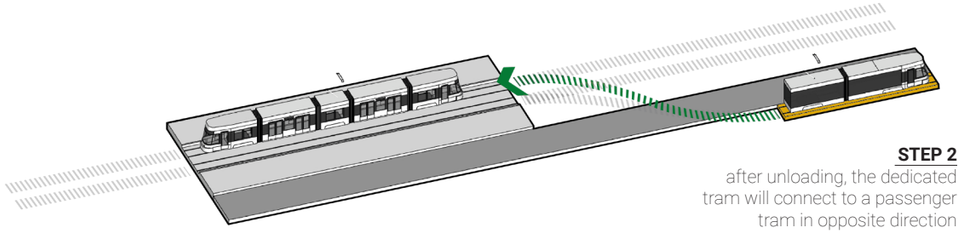


a. tram drop-off point

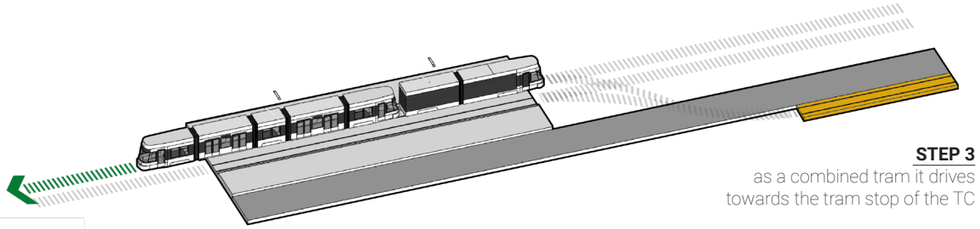
1. loading/unloading zone
2. extra side track for freight
3. cargo bike charging point
4. passenger tram stop
5. switch for the opposite direction



STEP 1
dedicated freight tram goes to a separate unloading zone, while acting as temporary storage



STEP 2
after unloading, the dedicated tram will connect to a passenger tram in opposite direction



STEP 3
as a combined tram it drives towards the tram stop of the TC

located at the proximity (<6 km) of a constructed UCC

[1a]

located at the proximity (<6 km) of a constructed TC

[1b]

located at the proximity (<0.5 km) of a final retailer

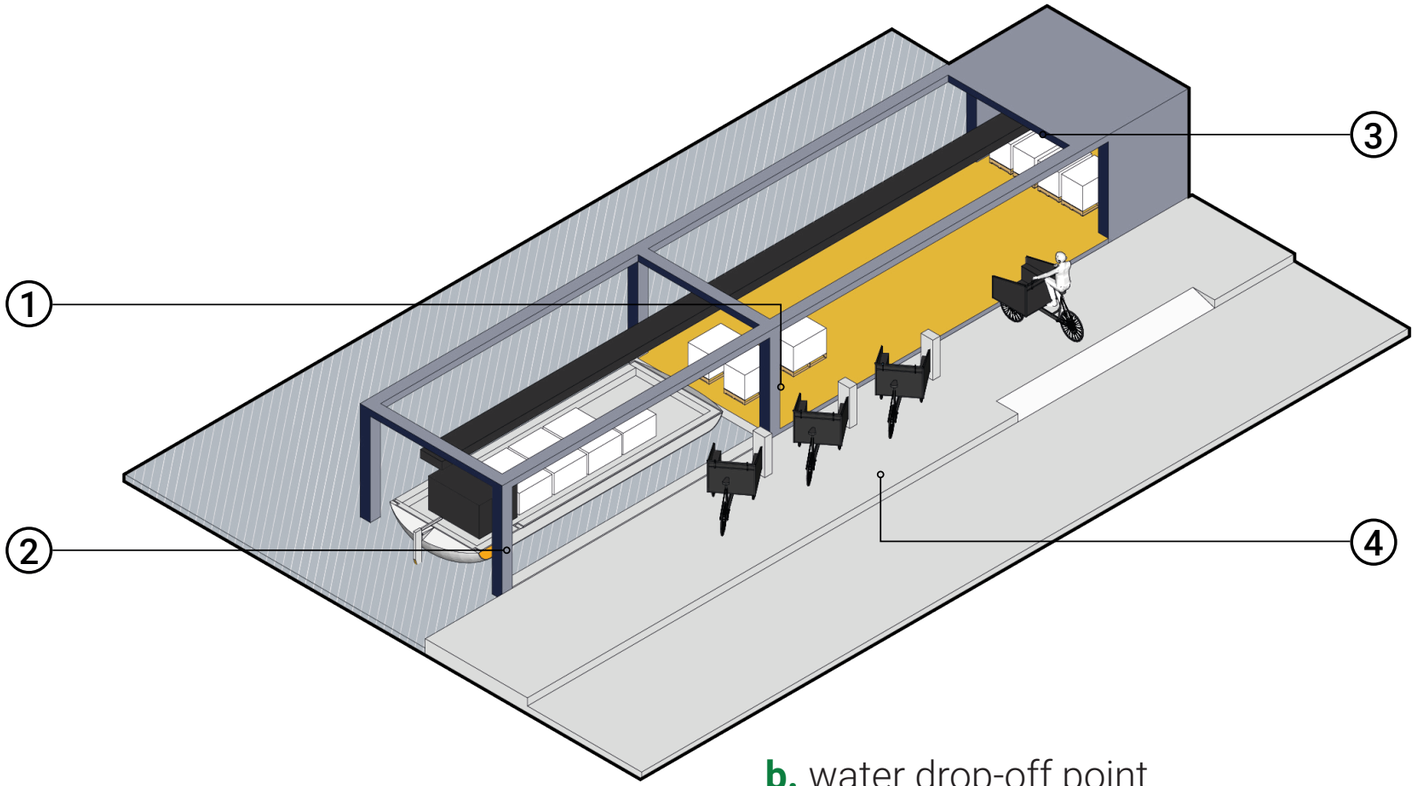
[2]

located at the proximity of a fine-grained rail (tram) infrastructure

[3]

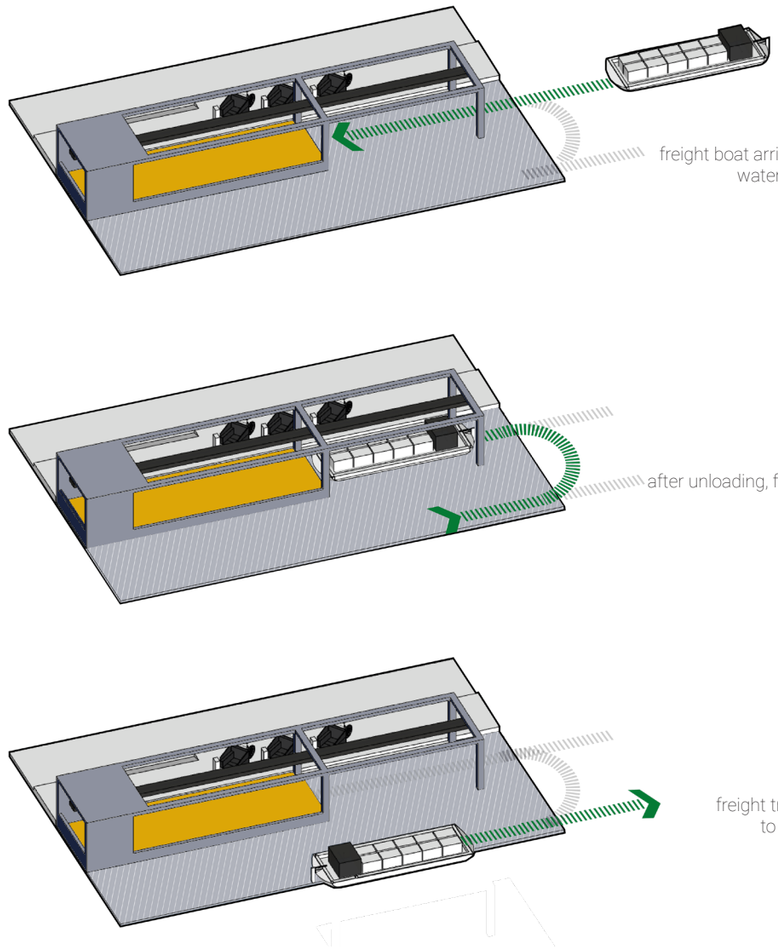
located where there is enough space available

[4]



b. water drop-off point

1. floating boat platform
2. moring space + (un)loading) crane for freight boat
3. temporary storage
4. cargo bike charging point



STEP 1
freight boat arrives behind the water drop-off point

STEP 2
after unloading, freight boat will make a U-turn

STEP 3
freight tram goes back to the TC or UCC

[1a] located at the proximity (<6 km) of a constructed UCC

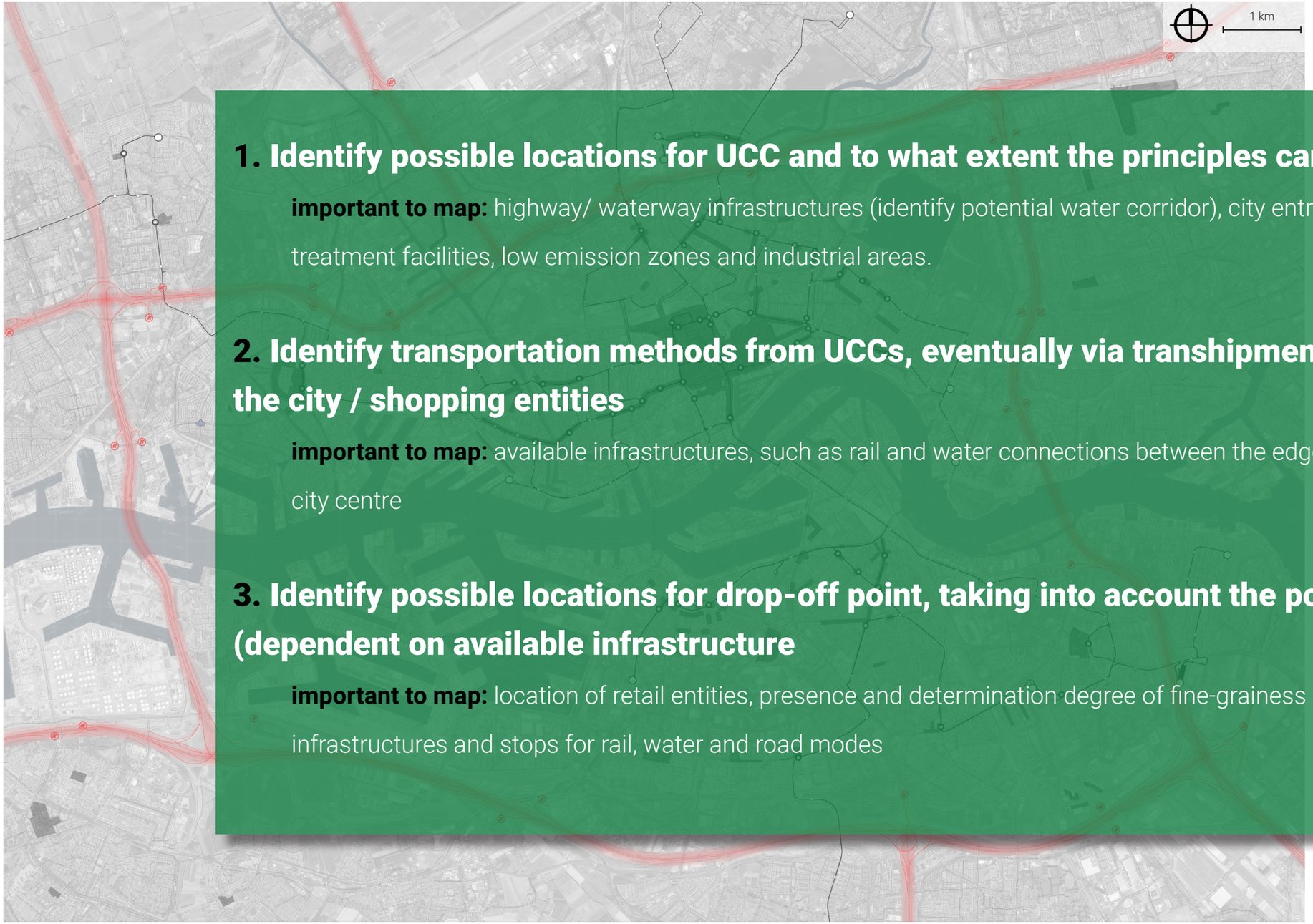
[1b] located at the proximity (<6 km) of a constructed TC

[2] located at the proximity (<0.5 km) of a final retailer

[3] located at the proximity of a fine-grained canal/water (ship) infrastructure

[4] located where there is enough space available

STRATEGY DEVELOPMENT



1. Identify possible locations for UCC and to what extent the principles can be applied

important to map: highway/ waterway infrastructures (identify potential water corridor), city entrances, waste treatment facilities, low emission zones and industrial areas.

2. Identify transportation methods from UCCs, eventually via transhipment centres to the city / shopping entities

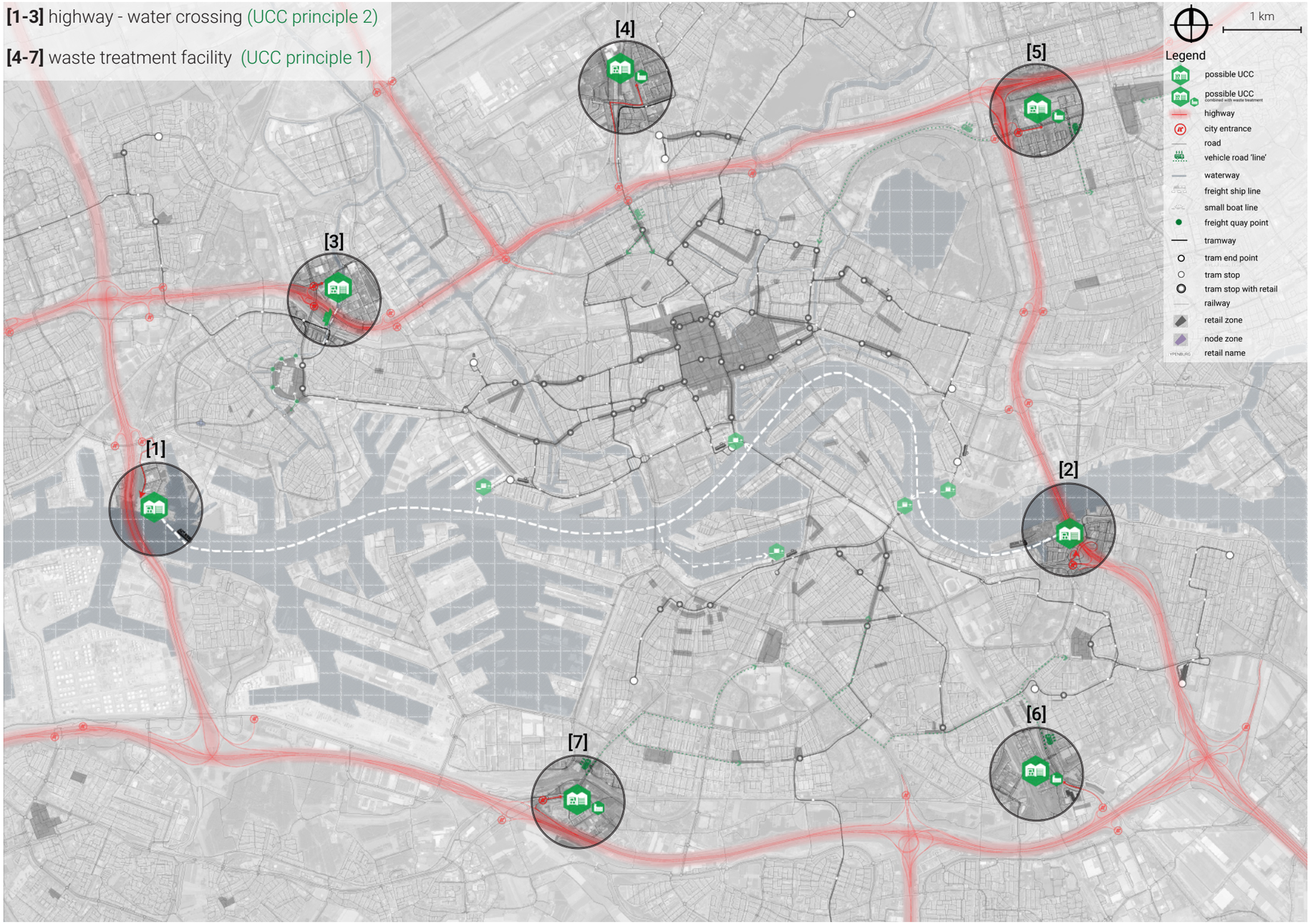
important to map: available infrastructures, such as rail and water connections between the edge of the city and city centre

3. Identify possible locations for drop-off point, taking into account the post transport (dependent on available infrastructure

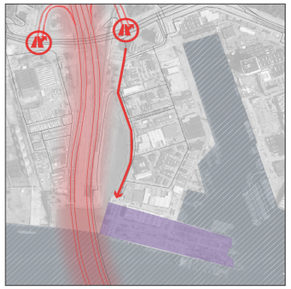
important to map: location of retail entities, presence and determination degree of fine-grainess of local infrastructures and stops for rail, water and road modes

[1-3] highway - water crossing (UCC principle 2)

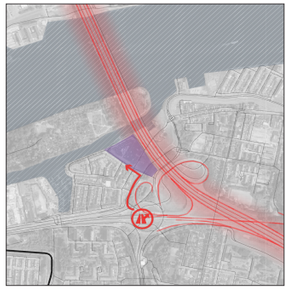
[4-7] waste treatment facility (UCC principle 1)



WATER CORRIDOR PRINCIPLE (2)



[1] Vijfsluizen (west)

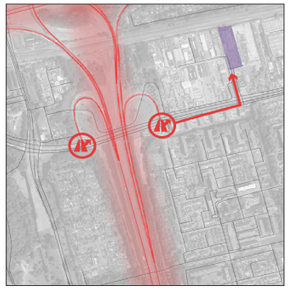


[2] Van Brienenoord (east)

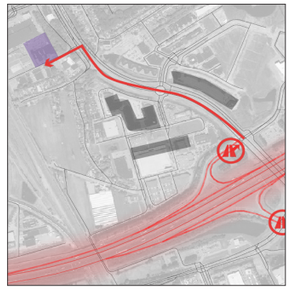
[3] 's Gravenlandsepolder (north)

WASTE TREATMENT PRINCIPLE (1)

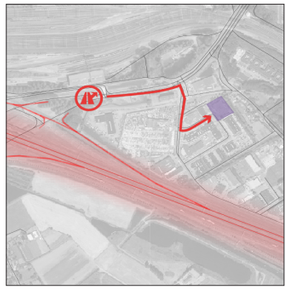
[4] MP Hillegersberg- Schiebroek



[5] MP Prins Alexander

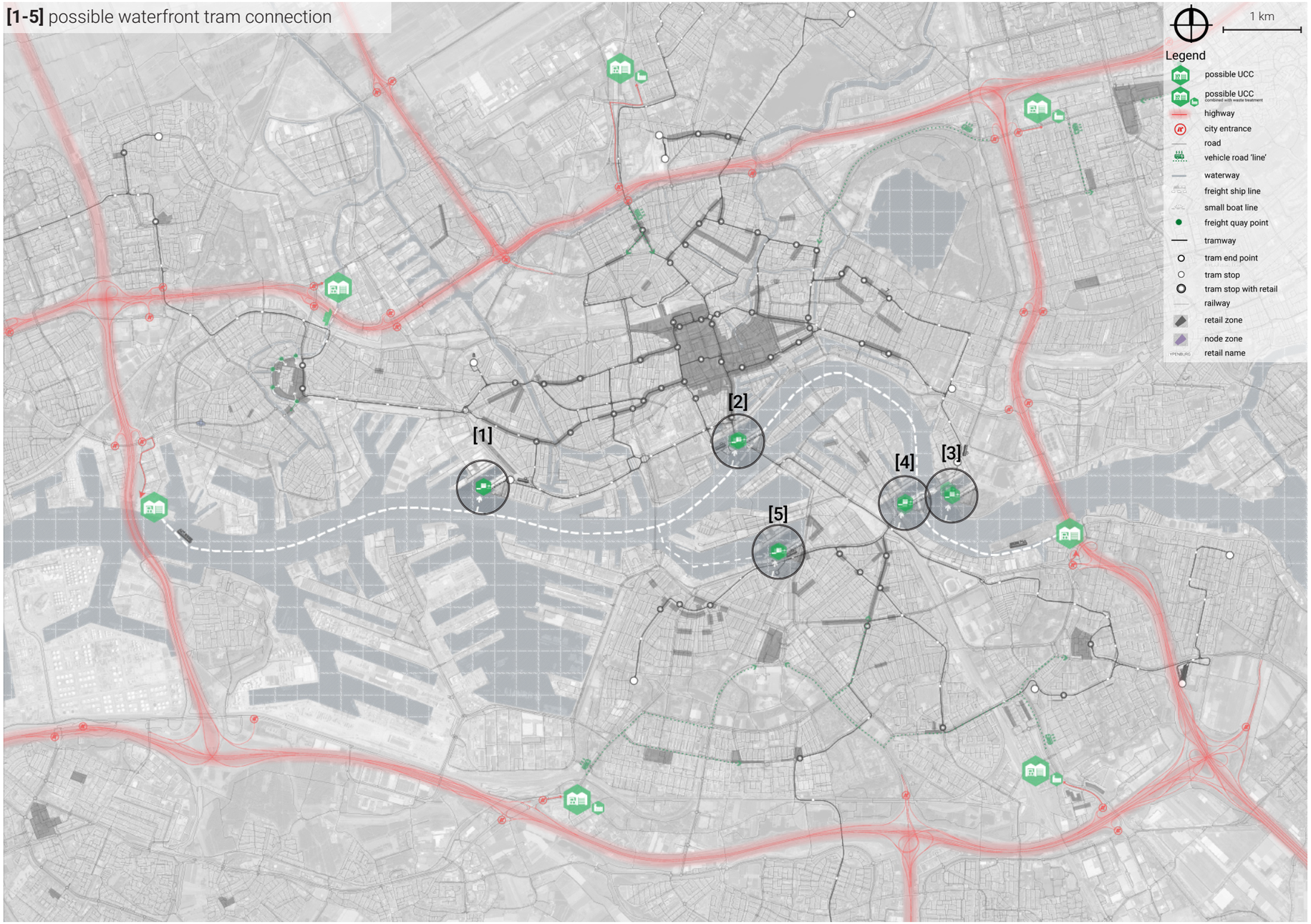


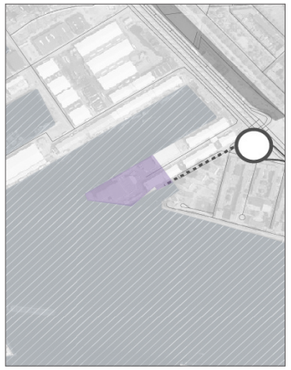
[6] MP IJsselmonde



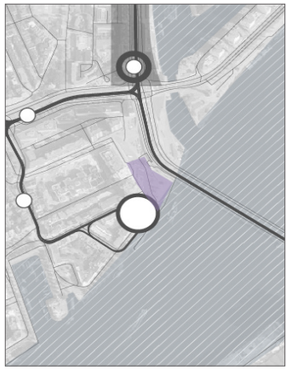
[7] MP Charlois

[1-5] possible waterfront tram connection

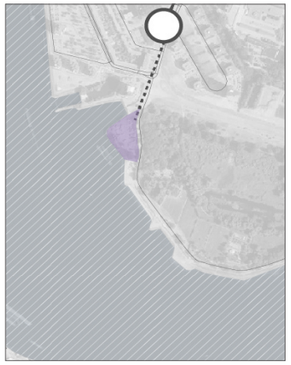




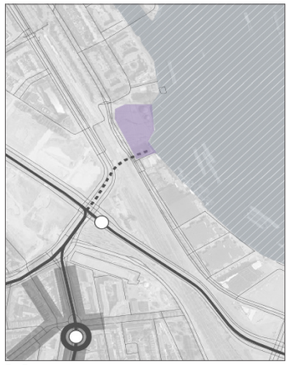
[1] Merwevierhaven (R'dam N)



[2] Willemsplein (R'dam N)

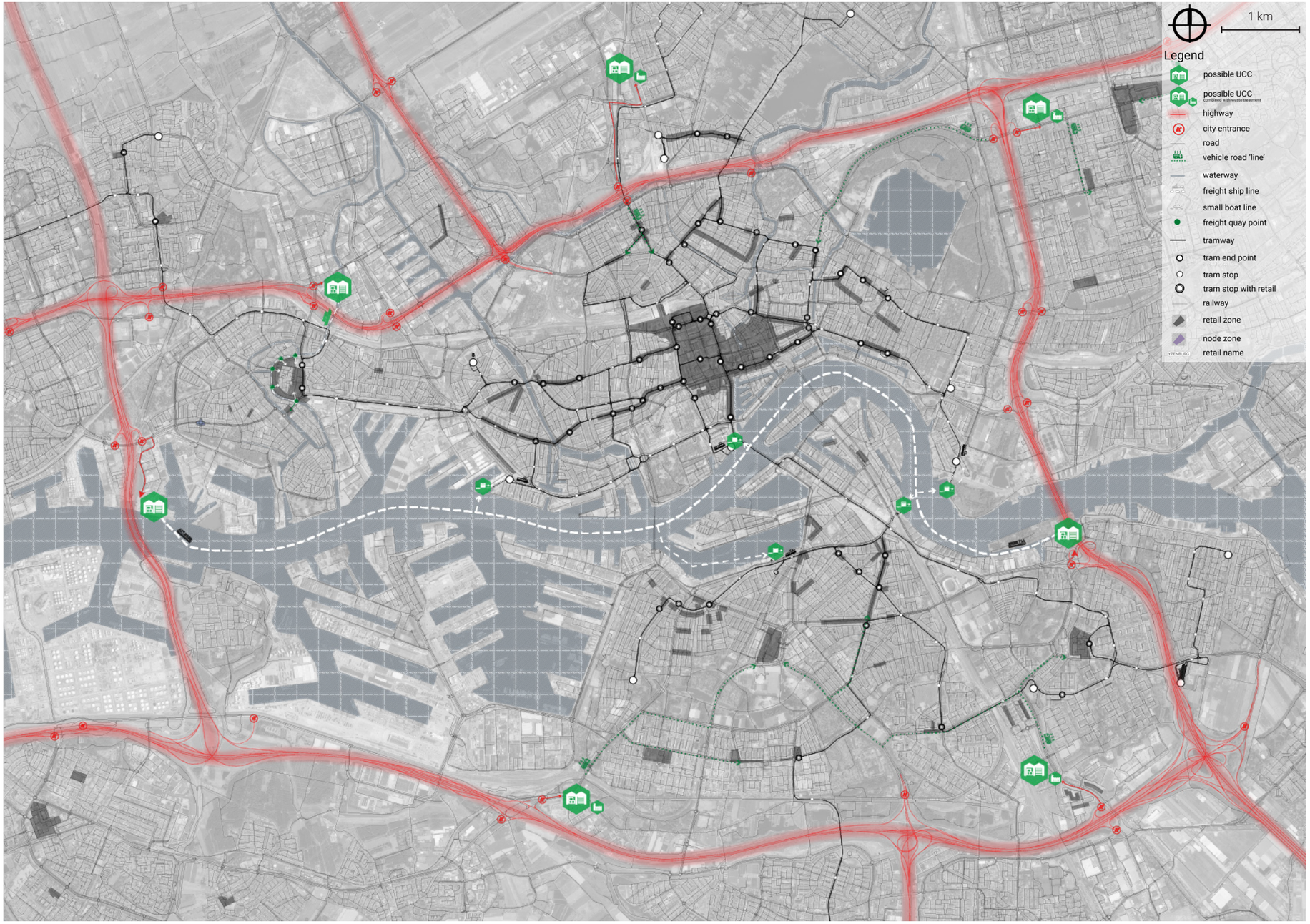


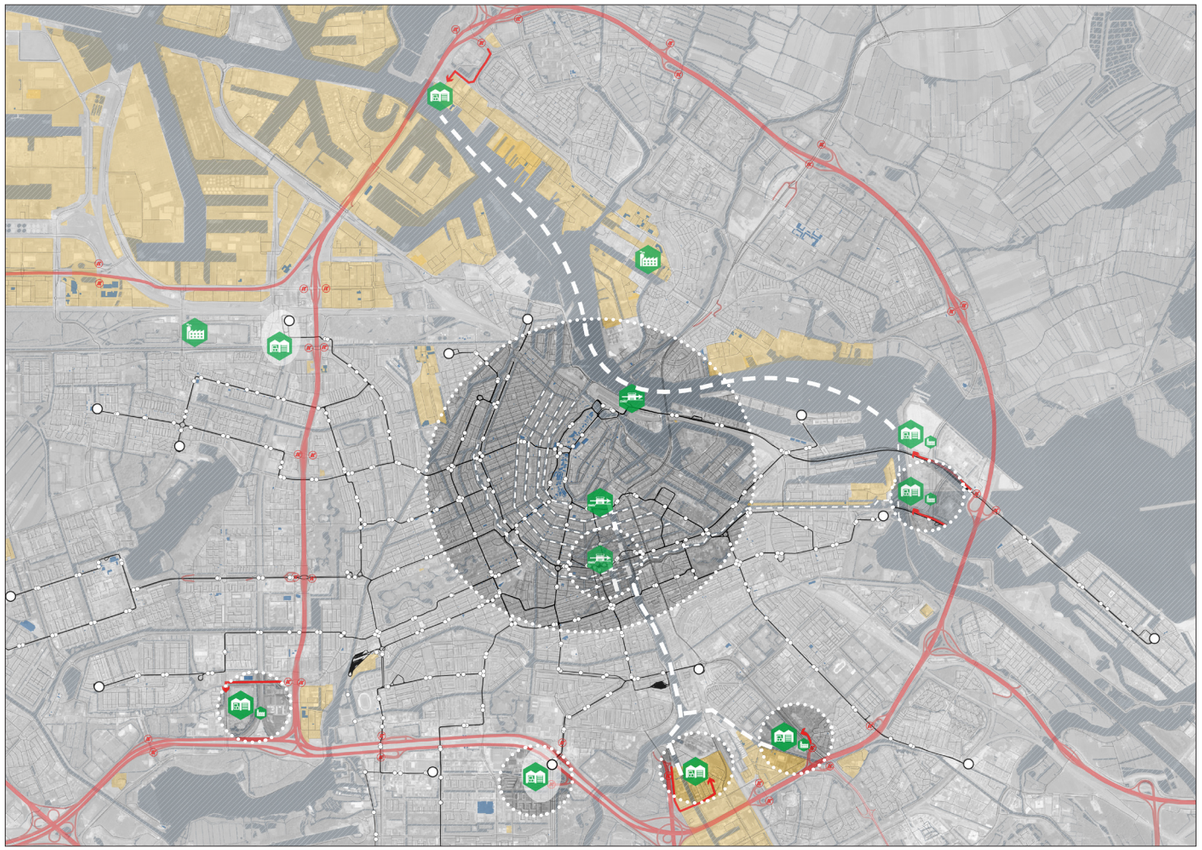
[3] De Esch (R'dam N)



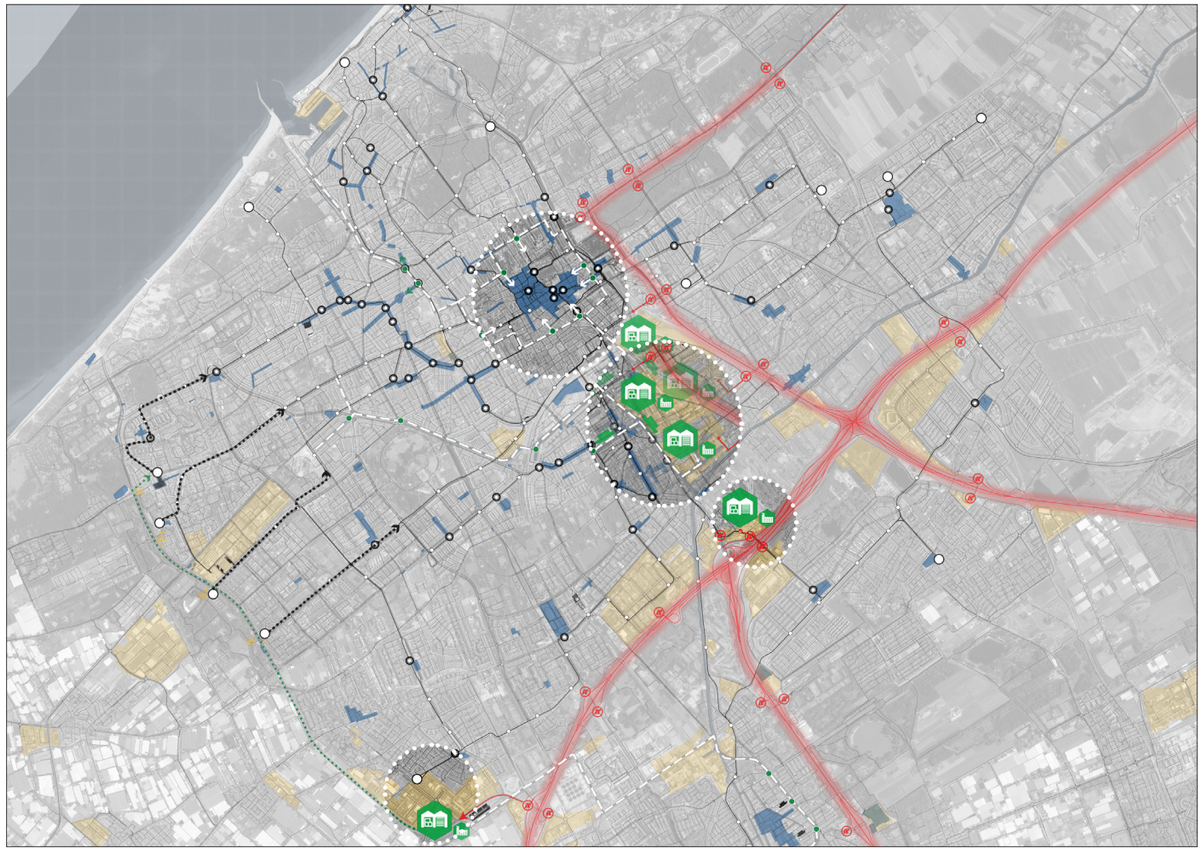
[4] Feijenoord (R'dam S)

[5] Brielselaan (R'dam S)


1 km
Legend
possible UCC
possible UCC
combined with waste treatment
highway
city entrance
road
vehicle road 'line'
waterway
freight ship line
small boat line
freight quay point
tramway
tram end point
tram stop
tram stop with retail
railway
retail zone
node zone
retail name



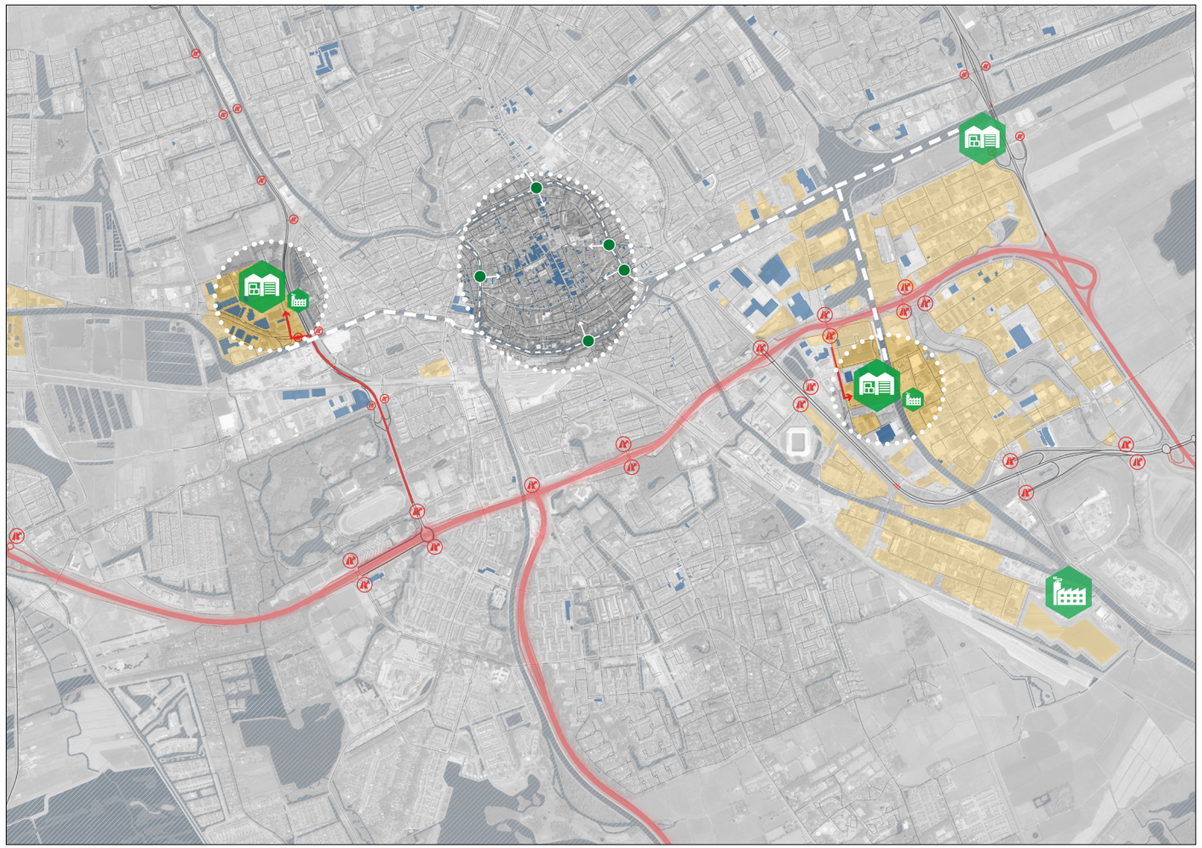
Amsterdam



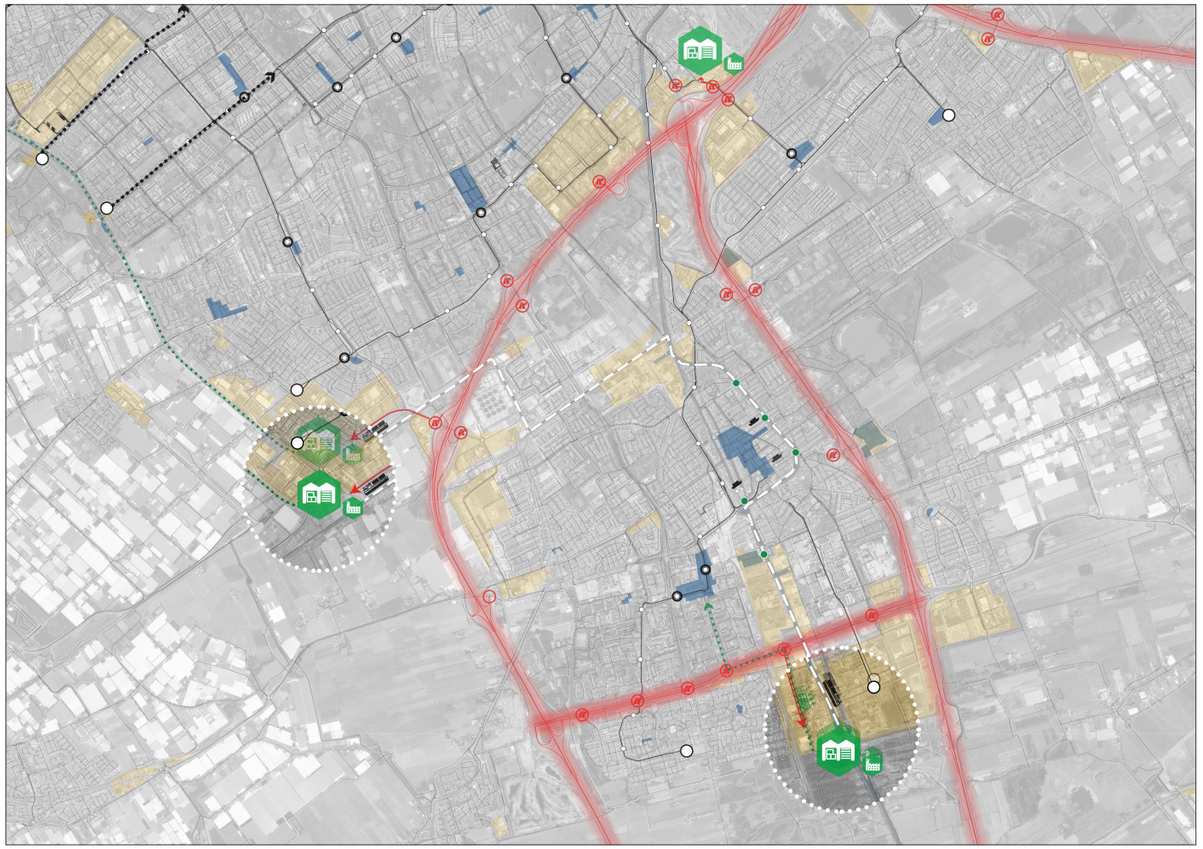
The Hague

complete (historical, river) cities: having both water and tram infrastructures

Amsterdam, Rotterdam, The Hague, Utrecht



Groningen

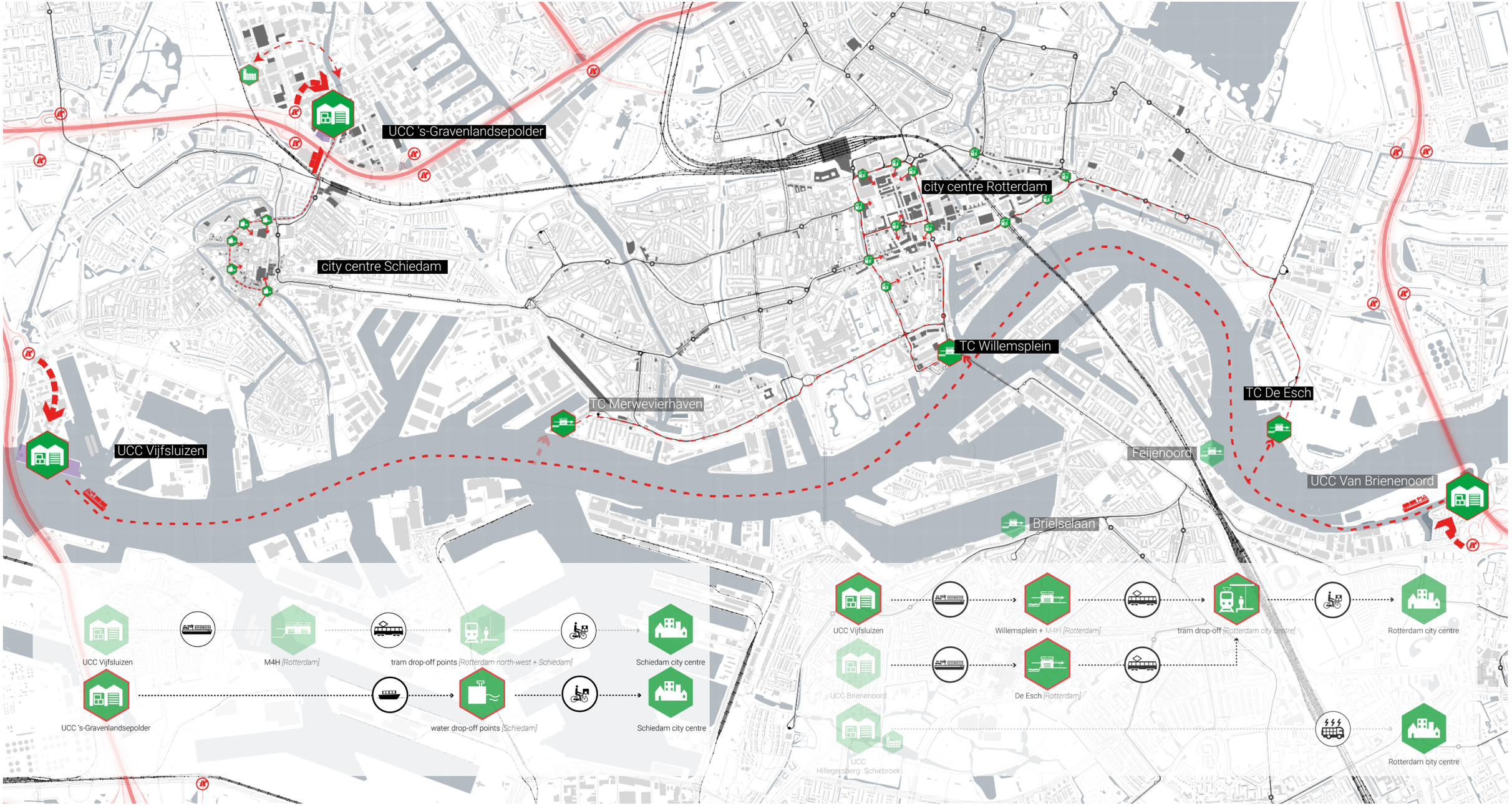


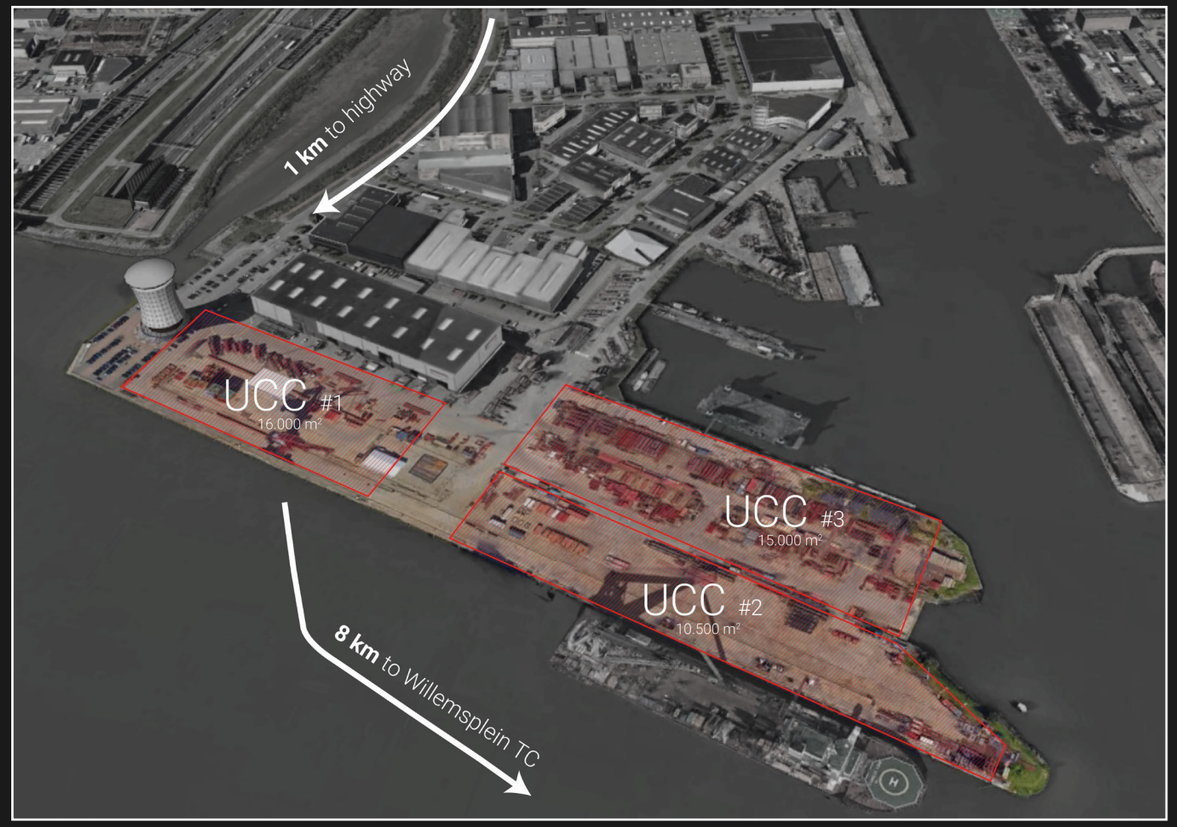
Delft

histroical (river) cities: having a canal network / river in the city, connected to industrial area by water corridor(s)

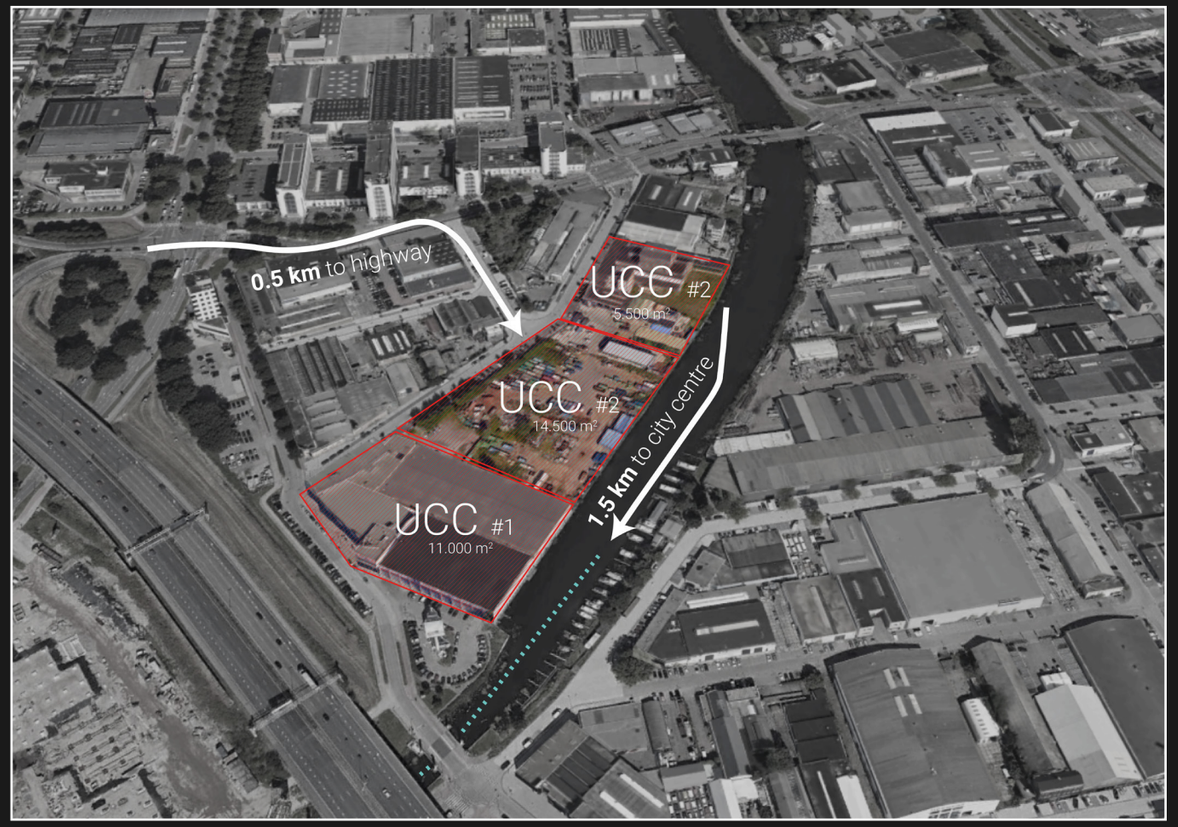
canal network: e.g. Alkmaar, Amersfoort, Groningen, Leiden, Leeuwarden, Delft, Schiedam, Zwolle;
river: e.g. Arnhem, Maastricht, Nijmegen, (Delft)

Strategy elaboration and design


UCC 's-Gravenlandsepolder
city centre Schiedam
city centre Rotterdam
TC Willemsplein
TC Merwevierhaven
TC De Esch
UCC Vijfsluizen
Feijenoord
UCC Van Brienenoord
Brielselaan
UCC Vijfsluizen
M4H [Rotterdam]
tram drop-off points [Rotterdam north-west + Schiedam]
Schiedam city centre
UCC 's-Gravenlandsepolder
water drop-off points [Schiedam]
Schiedam city centre
UCC Vijfsluizen
Willemsplein + M4H [Rotterdam]
tram drop-off [Rotterdam city centre]
Rotterdam city centre
UCC Brienenoord
De Esch [Rotterdam]
UCC Hillegersberg- Schiebroek
Rotterdam city centre

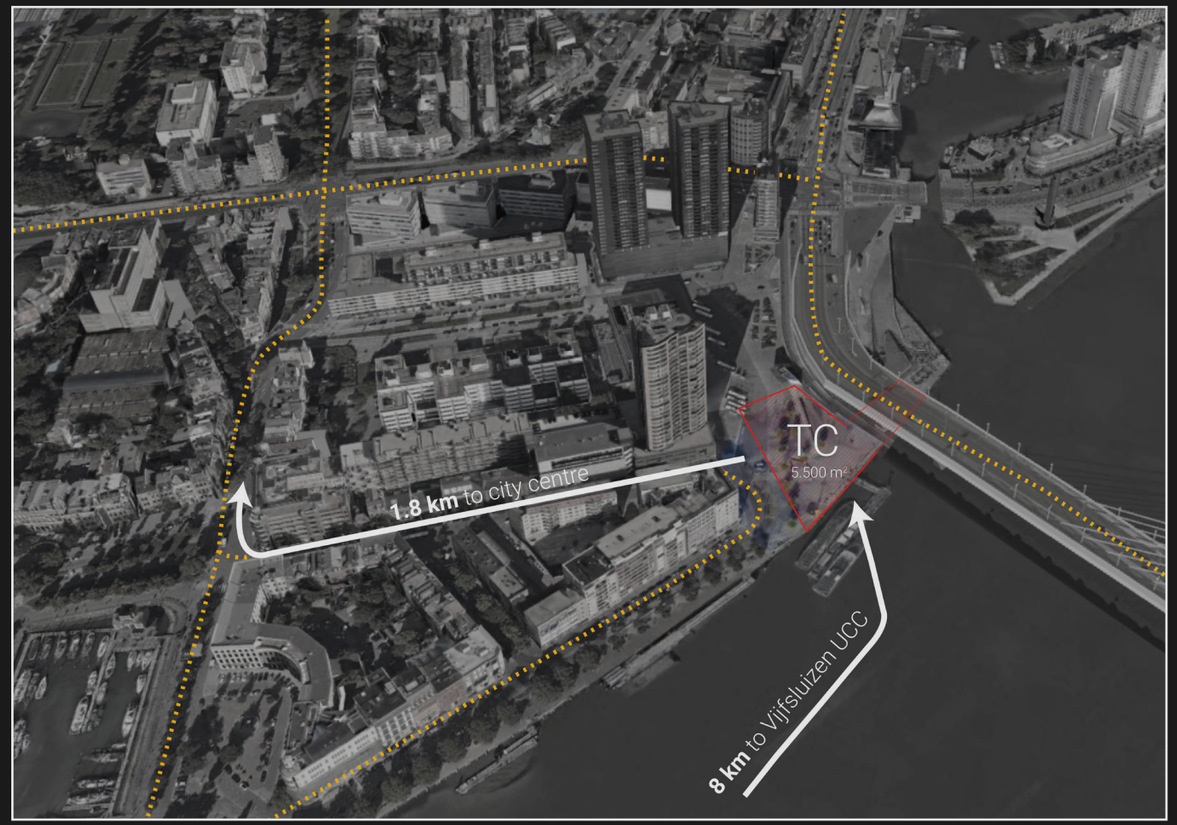


UCC Vijfsluizen

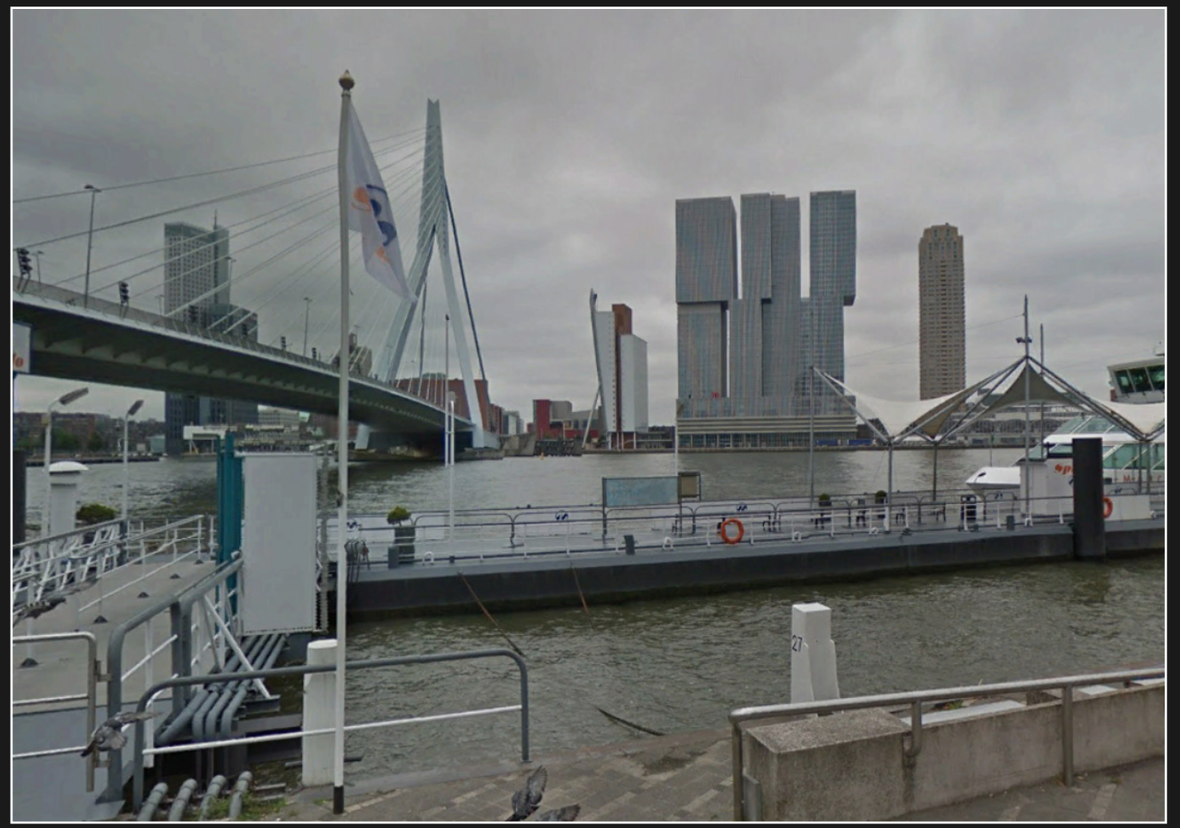


UCC ‘s-Gravenlande

Google Earth, 2020

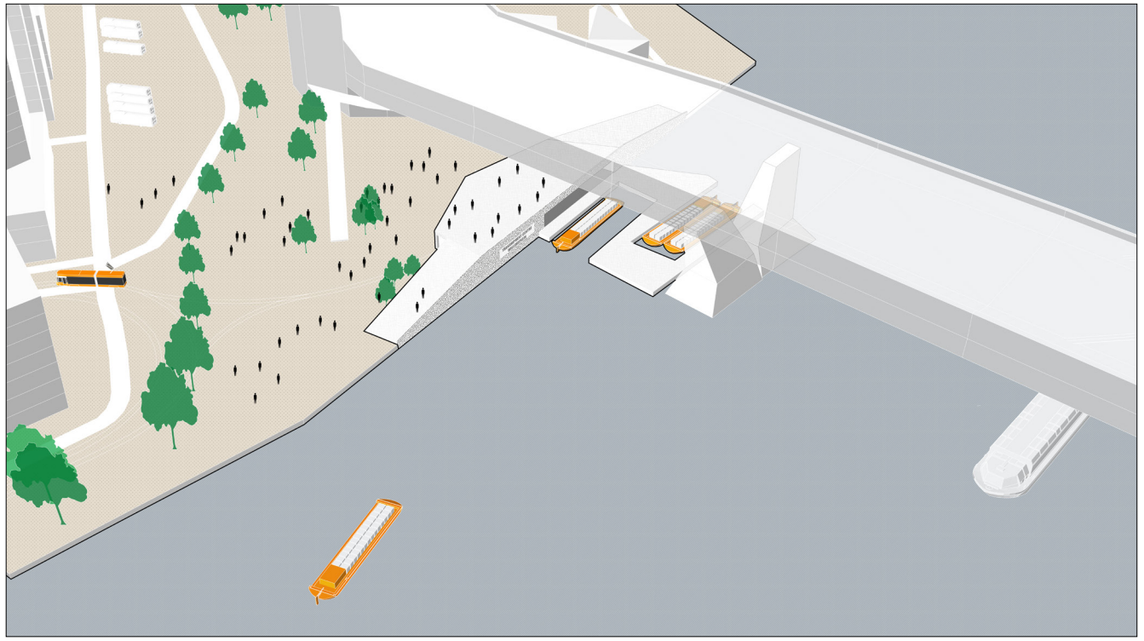


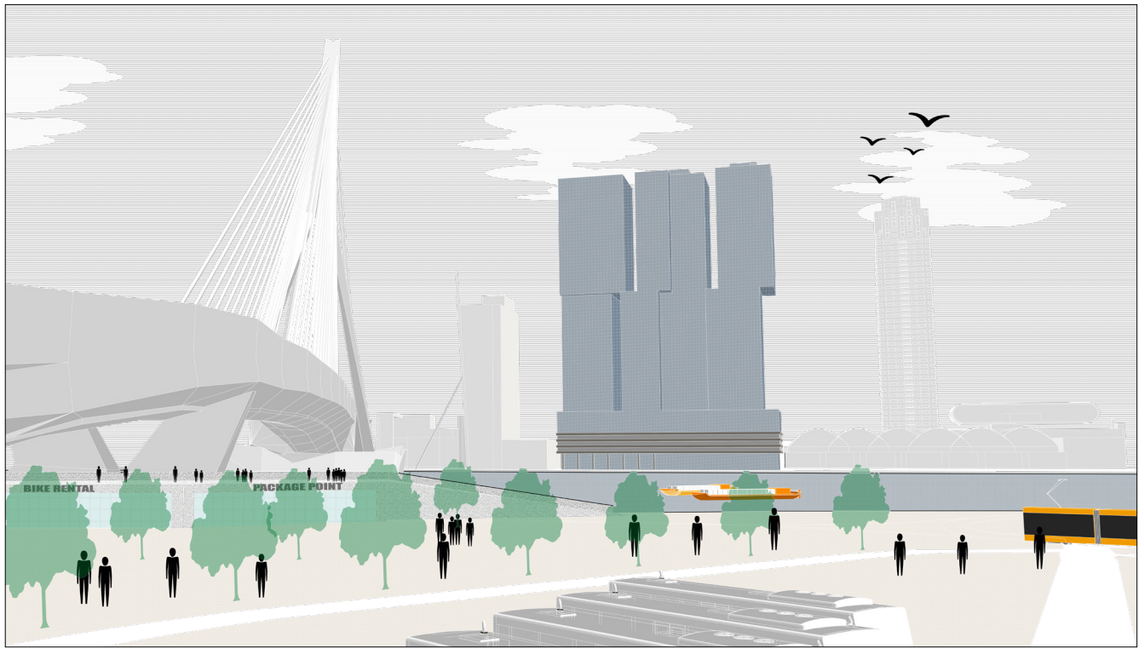
TC Willemsplein



TC Willemsplein current view

Google Earth, 2020





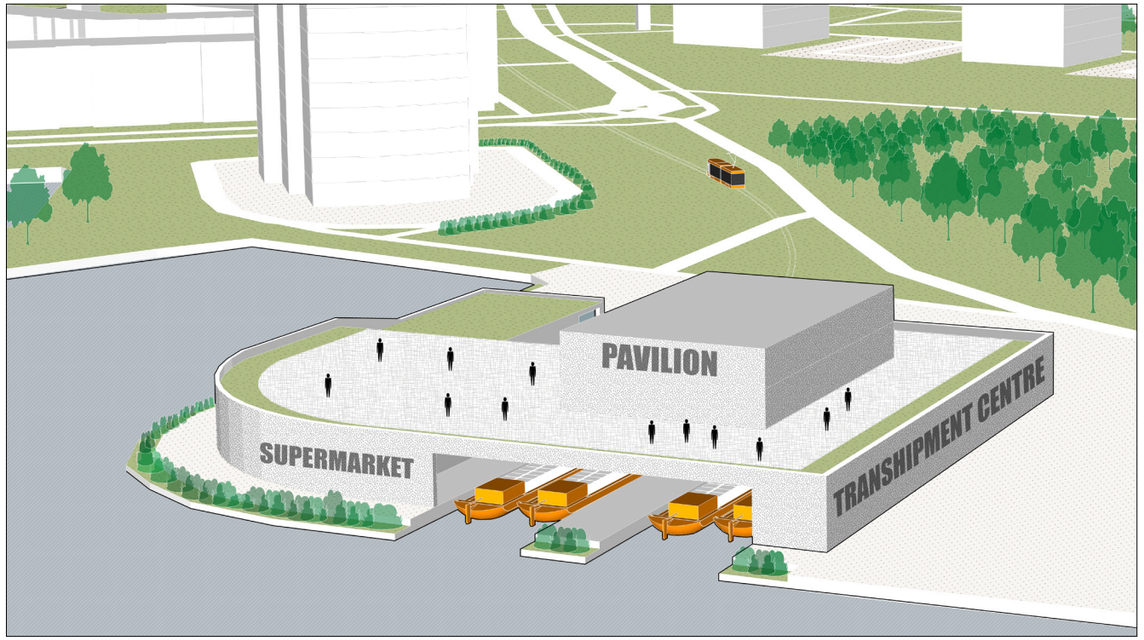
25 m

TC De Esch

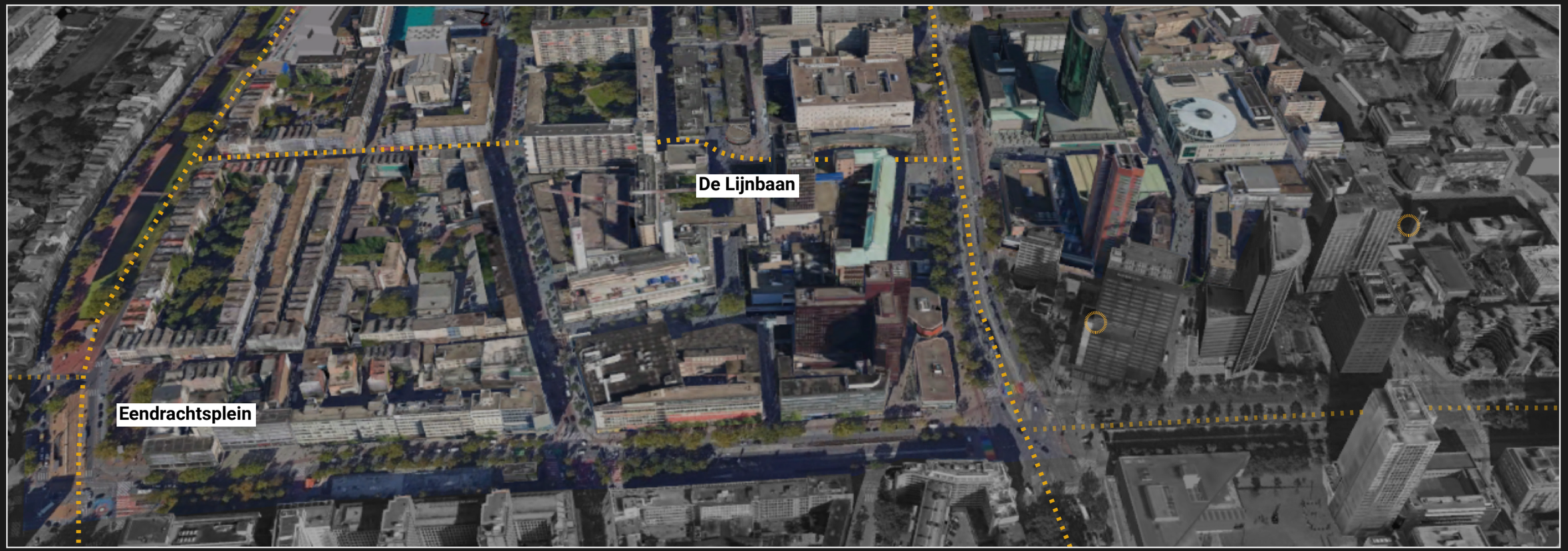
TC Willemsplein current view

Google Earth, 2020


30 m


PAVILION
SUPERMARKET
TRANSHIPMENT CENTRE


PAVILION
TRANSHIPMENT CENTRE
SUPERMARKET



city centre Rotterdam

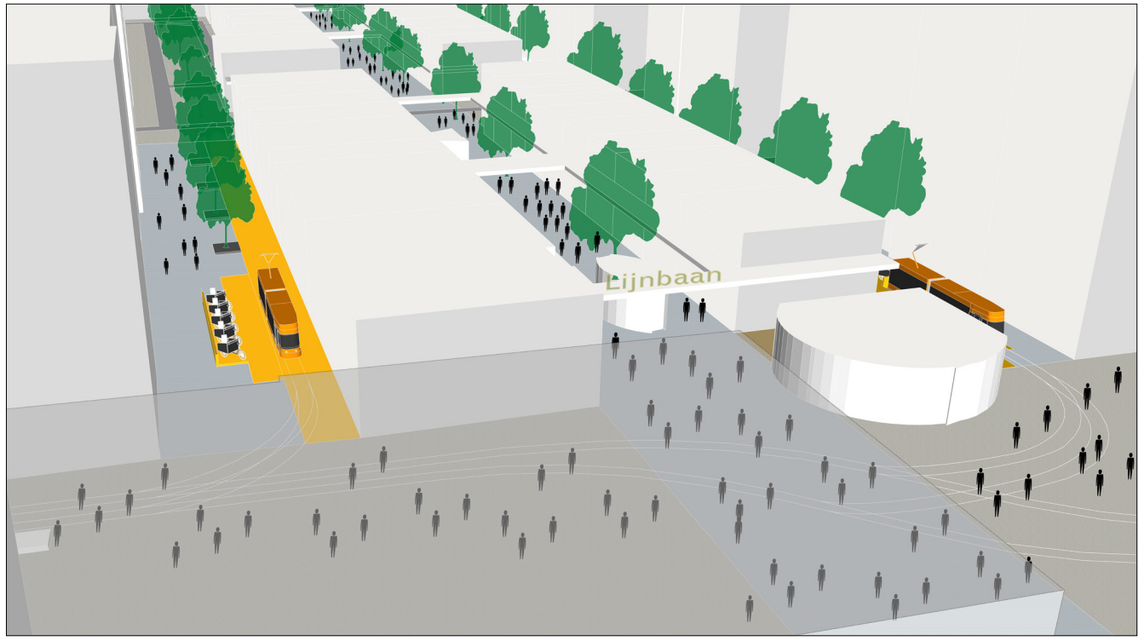
Google Earth, 2020

DoP Lijnbaan

DoP Eendrachtsplein

Google Earth, 2020

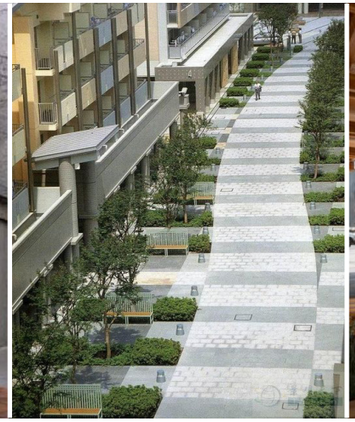

Van Ghentstraat
Lijnbaan
Hennekijnstraat
Van Oldebarneveltplaats
7,5m


Lijnbaan

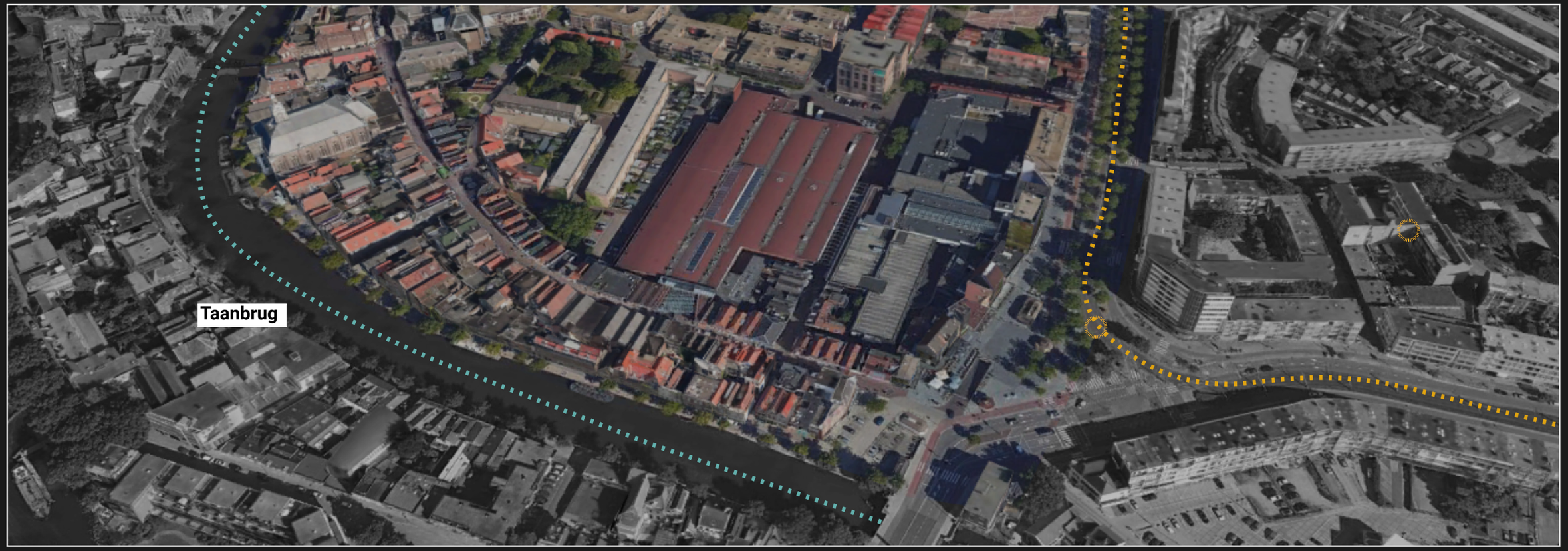

Lijnbaan

current impression

new impression




Westersingel
Mauritsweg
Oude Binnenweg
Eendrachtsplein
10m



city centre Schiedam

Google Earth, 2020

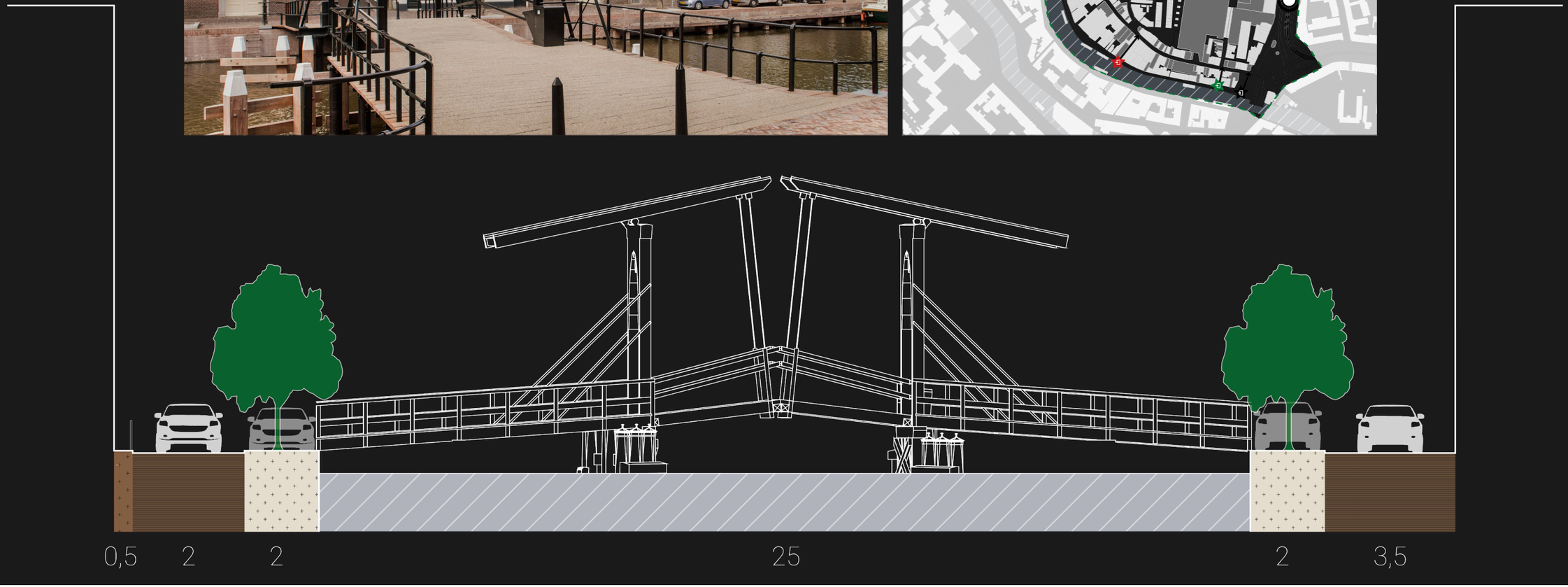


photo: *Sluijter, 2017*


Lange Haven
Taansteeg
Lange Haven
10m

Conclusions and Lessons Learnt

research question: **How can a strategic framework of urban freight transportation in the MRDH accommodate the increasing logistic demand of retailers in a sustainable and liveable way?**

conclusions

Changing the spatial organisation of urban freight could reduce the amount of freight movements in the MRDH and thus negative externalities

- Every shipment that can find synergy with waste reduces the amount of freight movements
- Every shipment that can take place over water or rail reduces the amount of freight movements

Proposed interventions contribute to the liveability by removing the amount of trucks in ‘vulnerable’ areas

Using three different urban regions in the MRDH show the wide variety of possible strategies that can be appied by local authorities

There is a huge potential for urban multimodality in Dutch cities, especially on the water, when integrated into urban freight strategies in urban regions

Mokum & Maritiem Shanks, 2016

There is a huge potential for urban multimodality in Dutch cities, especially on the water, when integrated into urban freight strategies in urban regions

A well-considered allocation of urban consolidation centres and other proposed nodes can create several synergies and strengthen this potential

Mokum & Maritiem Shanks, 2016

There is a huge potential for urban multimodality in Dutch cities, especially on the water, when integrated into urban freight strategies in urban regions

A well-considered allocation of urban consolidation centres and other proposed nodes can create several synergies and strengthen this potential

Relatively small interventions are required when mainly existing (infra)structures are (re-)used. Additional functions on nodes could contribute to spatial and social quality

Mokum & Maritiem Shanks, 2016

There is a huge potential for urban multimodality in Dutch cities, especially on the water, when integrated into urban freight strategies in urban regions

A well-considered allocation of urban consolidation centres and other proposed nodes can create several synergies and strengthen this potential

Relatively small interventions are required when mainly existing (infra)structures are (re-)used. Additional functions on nodes could contribute to spatial and social quality

Besides policies, a spatial strategic framework for urban freight can be environmental, social en economical beneficial and improve liveability

Mokum & Maritiem Shanks, 2016

THANK YOU!

Mokum & Maritiem Shanks, 2016