Architectures of Circulation:

Urban Infrastructures of Global Commodity Production

Seminar Summer Term 2019

Habitat Unit

The production and distribution of all sorts of goods is increasingly organized within global networks. Complex infrastructural arrangements connect dispersed logistics areas and production locations within cities and urban hinterlands worldwide, enabling the circulation of commodities and the exploitation of spatial difference from the urban to the planetary scale. These infrastructure systems have massive impacts on urbanization processes and the urban form by creating splintered landscapes of connectivity, altering or reinforcing patterns of socio-spatial inequality.

In this seminar, we explored the spatiality and architecture of physical infrastructures enabling commodity flows, their operating modes, local and translocal urban impacts. Research debates on infrastructures of connectivity and urbanization were introduced through a series of readings in architecture (LeCavalier 2016, Lyster 2016) and urban studies (Graham 2001, Kanai and Schindler 2019), political economy (Harvey 2001, Brenner 2016), human geography (Kleibert and Horner 2018, Cowen 2017) and anthropology (Carse 2017, Tsing 2016), covering different geographical contexts in the Global South and North. By discussing this literature rooted in different strands of critical theory and case study research, it was our aim to build a sensitivity regarding the socio-economic relations and power structures embodied in the built infrastructures of commodity production and circulation.

This report presents six case studies on specific infrastructure buildings or spaces in the context of commodity circuits, and their (trans-) local interplay with urban development. They are the result of participants' group research and mapping projects in response to the seminar's central research questions.
- How do specific buildings or built forms function as physical infrastructures enabling the production and circulation of specific commodities?
- In which ways do these architectures and commodity circuits interact with urbanization processes?

Case studies were designed departing from commodity types. The report features research on six products:
Christmas Decorations | Oil | Flowers | Meat | Cement | Coal

Panels follow a matrix of five scales of investigation:
Product | Production Network | Infrastructure Network | Architecture | Urban

The seminar was conducted with close links to the research project "Transnational Production Spaces", an exploration of the interplay between globalized industrial production and urban space (Hagemann 2015, Hagemann and Beyer 2019, forthcoming) and current research on infrastructures of connectivity at Habitat Unit (Beyer et al forthcoming).

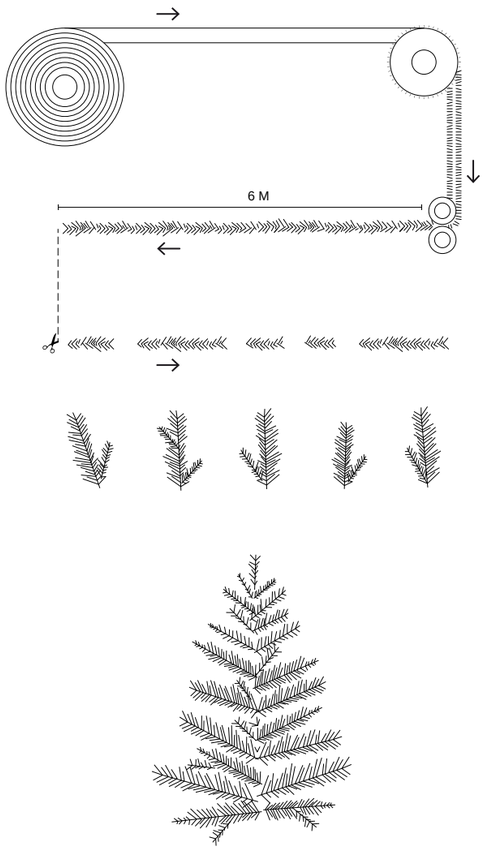
CHRISTMAS DECORATION

MERRY CHRISTMAS (MADE IN CHINA)

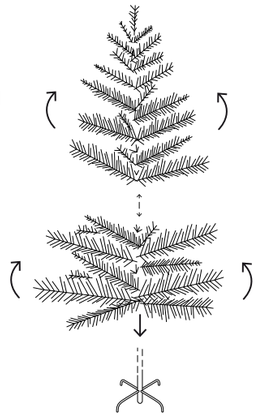
EVELINA FALIAGKA
JOHANNA HAMEL
KATERINA MARECKOVA
KAROLA SCHAEFERMEIER
PAULA VARGAS

Katerina Mareckova
Paula Vargas
Karola Schaefermeier
Johanna Hamel
Evelina Faliagka

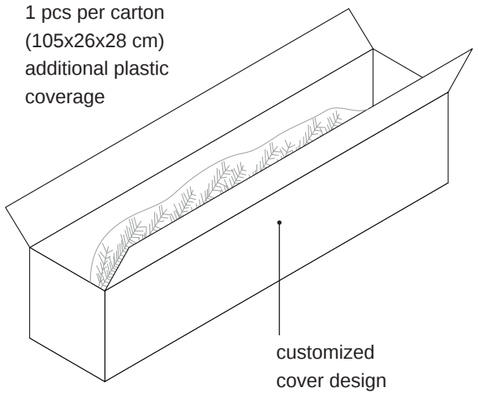
Merry Christmas (made in China)



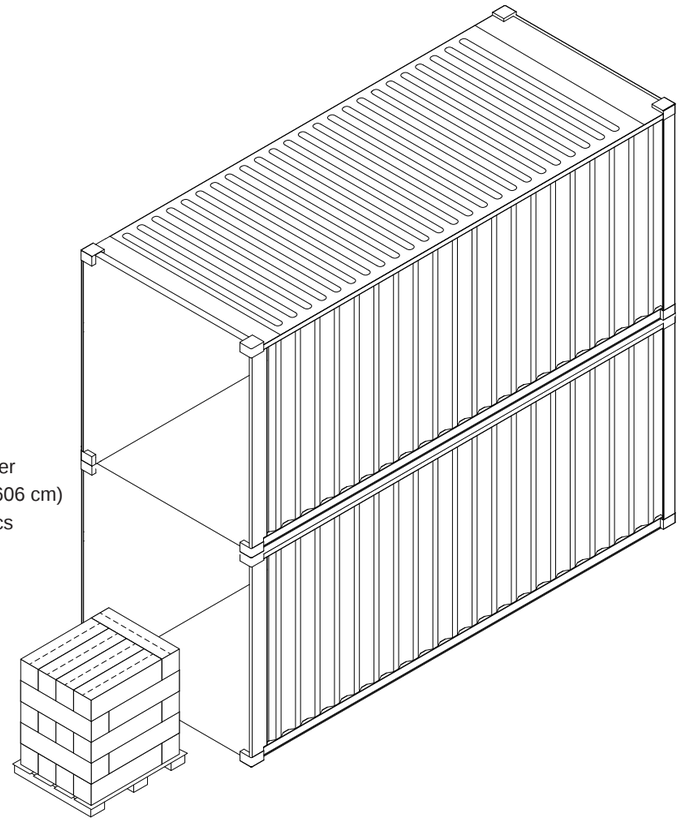
standard artificial
christmas tree
with removable stand
height 120 cm

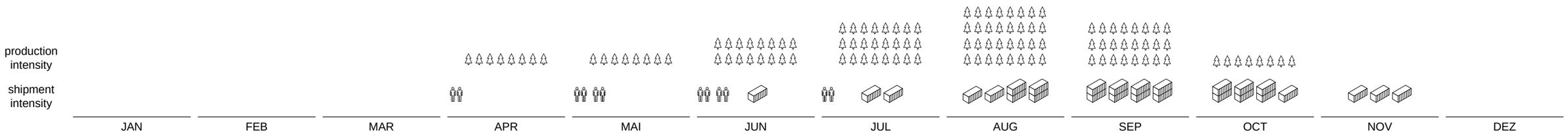


1 pcs per carton
(105x26x28 cm)
additional plastic
coverage



250 pcs
per container
(243x259x606 cm)
moq 500 pcs





Artificial Christmas trees at Dong Xuan Centre

material: pine-green PVC stripe
needles shredded, tied
assembled to branches
trunk devided in 2-3 parts
wrapped, packed, loaded in containers
seasonally changing production and
shipment intensity

According to Xinhua state-run news agency, 60% of Christmas decorations are being produced in Yiwu, the Chinese epicentre of small-commodities, which accounts for more than 750 Christmas decoration companies (Maughan, 2014).

The manufacturing process starts with a pine-green pvc stripe. These flat stripes are mechanically shredded into thousands of needles and frayed along a wire core. Up to 6 meter long lines of “branches” are first cut by hand to keep their ruffled form and then tied together and assembled into a final tree.

In order to reduce the product’s package size, the tree’s trunk is divided into 2-3 pieces, depending on the height of the tree, while the stand of the tree is flat-foldable.

Then, all parts are wrapped with a plastic cover and laid into a carton box. As an additional service, the manufacturing companies offer a customized cover design.
At the end, the final product is transported in standard sized shipping containers.

Followed by annual visits of the purchasers, most of the orders are being placed in the late summer, so the products can be shipped during September-October when the Christmas selling period starts.

PRODUCT

Katerina Mareckova
Paula Vargas
Karola Schaefermeier
Johanna Hamel
Evelina Faliagka

Merry Christmas (made in China)

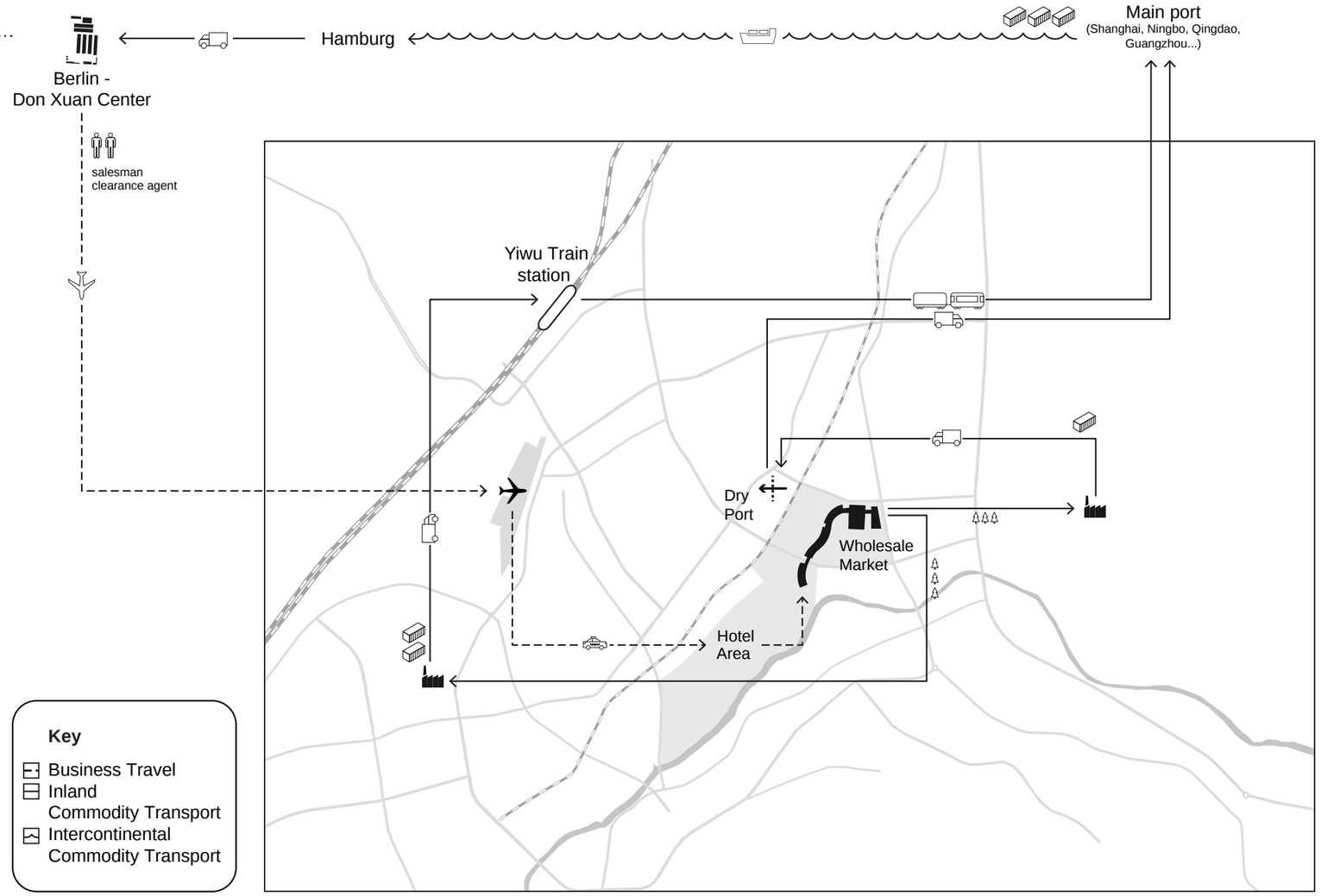
Dong Xuan Center in Berlin

Vietnamese flower-salesman

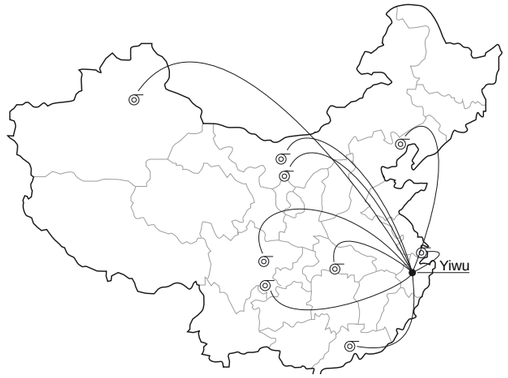
“The business with artificial flowers is not going well. Ordering a whole container is too expensive for me. So I’m cooperating with another Vietnamese market in Czech Republic and deliver only the amount I need from there.“

Palestinian salesman

“The commodities I sell are coming via ship to Hamburg. My clearance agent collects the containers carrying my order and sends them with trucks directly into my warehouse here in Dong Xuan Center. “



PVC Production in China



PRODUCTION NETWORK

Yiwu - Hamburg - Berlin

Trade fair ‘Yiwu wholesale’
7km long, 5 districts, 70.000 booths
order: placed by custom-agents
production: 600 small factories
transported via ship, air, train
ship: China, Yiwu - Germany, Hamburg
truck: Germany, Hamburg - Berlin

Yiwu, the largest wholesale market in the world stretching over 7 km, attracts more than 500,000 foreign producers and custom-agents every year to do their business there. The market is divided into five districts and the sales area organised according to themes. 70,000 booths each one not bigger than 7m2 are displaying products in the endless halls. The Christmas decoration department is located in the 1st district on the 3rd floor.

Buyers coming to Yiwu may choose from the wide range of offerings during their annual visit and place an order (Ibanez Tirado 2018). This order is then forwarded to one of the 750 specialized small industries located nearby the city that receive the raw PVC material from companies all around China (Businesswire, 2016). These factories produce, pack and also load the Christmas trees into the shipping containers. Trucks transport the ready-to-ship containers either to Yiwu’s dry port or main railway station. From there the containers continue to the most important ports (Shanghai, Ningbo, Qingdao, etc.) in the immediate vicinity of Yiwu. Besides the distribution via air and rail, shipping is the most favoured way of transportation. After the 3-week transfer from China to Germany, the ship arrives in Hamburg where the containers are collected and reloaded onto a truck to be driven to the Dong Xuan Centre in Berlin.

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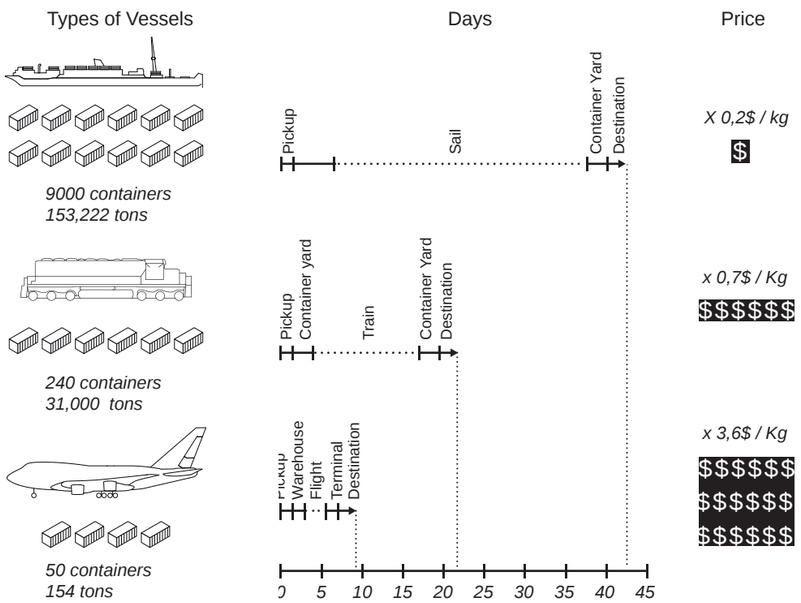
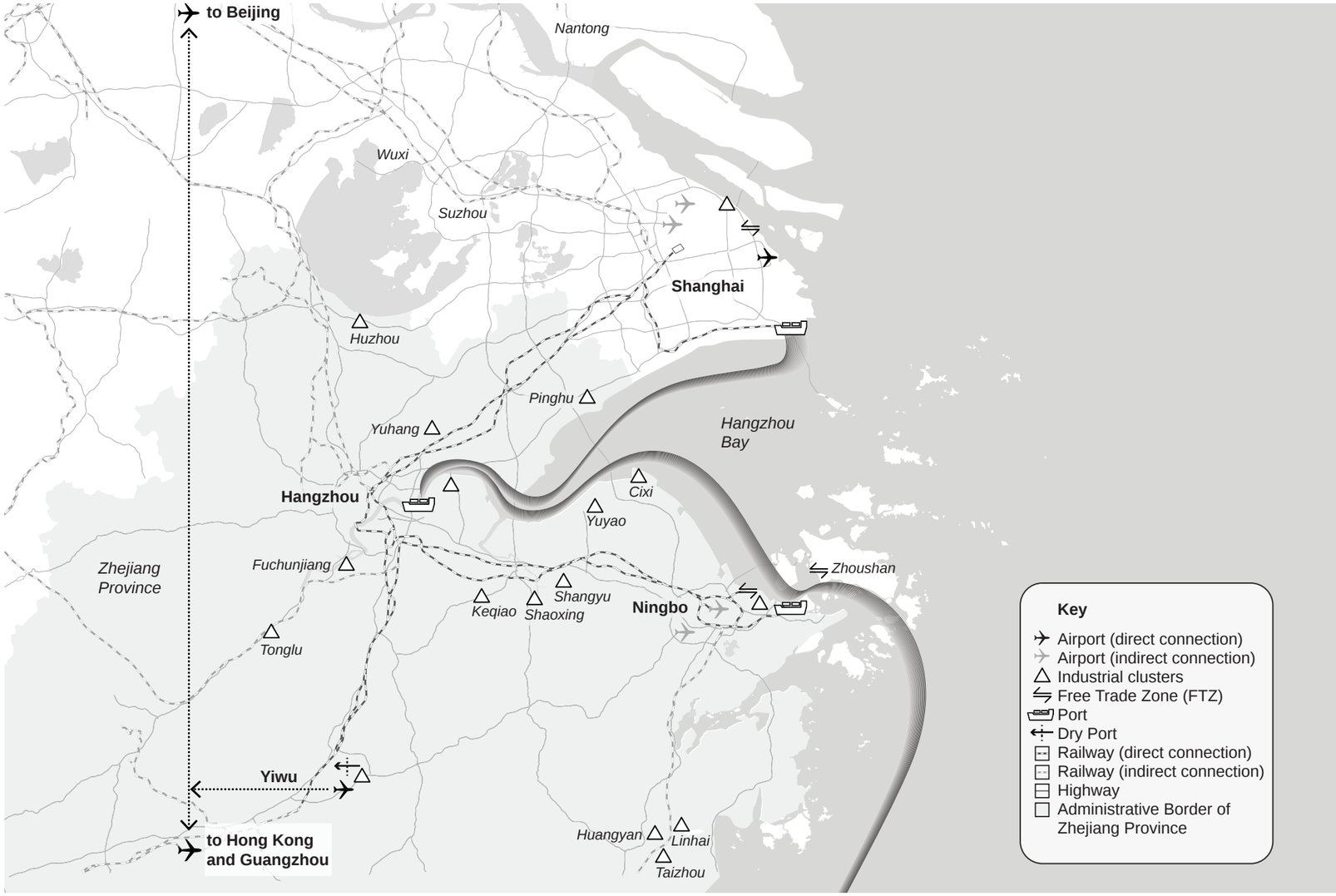
Merry Christmas (made in China)





INFRASTRUCTURE NETWORK

An Infrastructural Node

Most common ways of transporting goods in China: Rail Freight + Trucks: Yiwu—Ningbo—Shanghai—Beijing—Hong Kong—Guangzhou
BRI Proposed Rail Freight Connection: Duisburg (Germany)—Moscow (Russia)—Beijing (China)—Yiwu (China)
Most preferred way of transporting goods: Ships—"Sea Route"
Duration of shipment: 28–31 days

In order to understand the significance of Yiwu's wholesale market, it is essential to look at its extensive infrastructural network. When Yiwu was approved to be a national experimental city for international trade reform, its local government provided various infrastructures to the Yiwu Market. The city is close to a highway connecting it with the ports of Ningbo and Shanghai. Moreover, its train station connects the market with Shanghai, Hangzhou, and 18 other major stations nationwide, and its airport runs direct flights to Beijing, Shanghai, Hong Kong and Guangzhou. One crucial element in Yiwu's infrastructural network is the multi-functional Dry Port, built in 2012, ten years after the wholesale market was established. Since most of the exports depend on shipping routes, our Christmas trees travel with trucks from Yiwu to major ports (Ningbo and Guangzhou) and are shipped to Hamburg, a journey that lasts at least 28 days. Nevertheless, in context of China's Belt and Road Initiative, a new potential way was created recently, a direct freight rail connection from Yiwu to Duisburg. This new option has been the fastest way of transporting goods, cutting down the delivery time to only 14 days. However, due to its high costs Dong Xuan's salesmen do not prefer this connection yet. (Searates LLC n.d.; Henneke 2014; Information Office of Zhejiang 2019)

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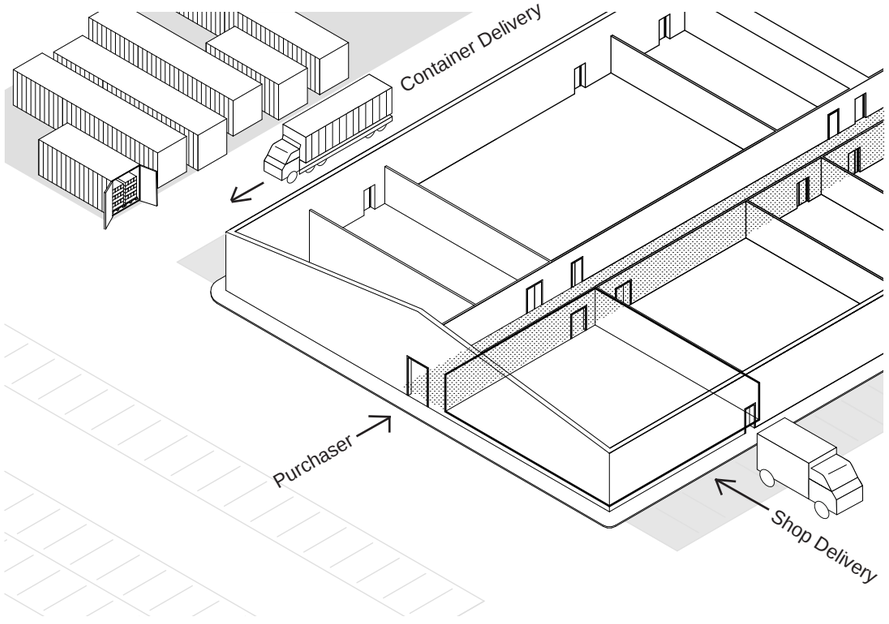

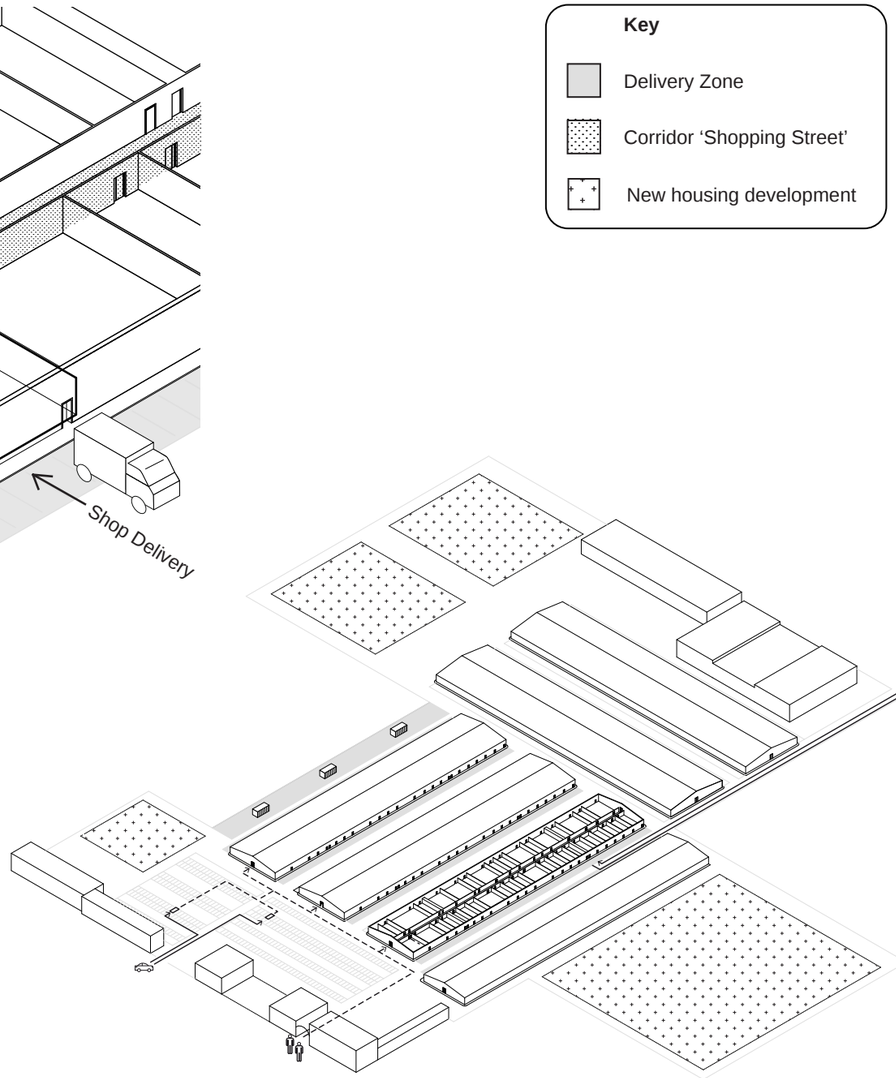

ARCHITECTURE

Dong Xuan Center

trade center for asian products
plot of 170.000m²
8 industry halls
similar groundfloor:
corridor with shops arranged in a line
purchased from the backside
entered (as purchaser) from the frontside

The Dong Xuan Centre is a gigantic trade centre for Asian products in Lichtenberg district in Berlin. 2000 workers from Vietnam, India, Pakistan, Turkey, Poland and China are working there selling clothes, entertainment electronics and Asian food. Moreover, one could also find there Vietnamese restaurants, nail studios, hairdressers, insurance offices, lawyers, driving schools etc. (Strauß, 2019)
The market is open for business partners from all over Europe as well as private purchasers. The plot has a size of 170.000m². The architectural design is pragmatic and reduced to the "essentials": an industry hall with a corridor in the middle and similar shops of one, two or three modules are arranged in a line. This corridor is 200m long and has a width of 2m. The different entities display their products in front of their shops, by marking a white line on the floor 40cm away from the wall. This floor plan is identical in each one of the eight halls of Dong Xuan. Walking through this corridor as a private purchaser or business partner, one can enter the different shops directly. While purchasers enter through the main corridor, the shops are supplied from the opposite side. On the backside of every shop there is a direct entrance to the outside. Small vans and transporters are delivering goods into the shop. Since most of the shops do not entail a warehouse space, everything is unpacked immediately after delivery and displayed within the shop. Nevertheless some shops have a little storage in the back.

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Paula Vargas
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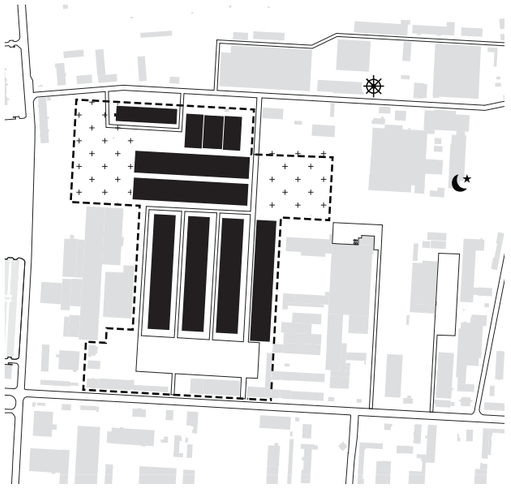
Merry Christmas (made in China)

Key

Registered Residents with Vietnamese background in Berlin

- >2500
- >1500
- >800
- >300
- >100



Key

- Plan for residential development within DXC
- DXC Market Hall
- Mosque
- Buddhist Pagoda
- Urban Pattern

Key

- Dong Xuan Center
- Industry areas
- Residential areas
- Railways
- Stations
- Tram stops
- Highway

URBAN

The DXC as an ‘Asia town’

Major concentration of vietnamese population in Lichtenberg, Berlin around DXC
Residential and urban areas in Lichtenberg
New development of residential use promoted by DX GmbH
Comparison of residential areas
Religious facilities related to the establishment of the DXC as a cultural center.
Development of services in addition to the wholesale market character of the area.

The Dong Xuan Center (DXC) is a global trade center located in the eastern side of Berlin, in the district of Lichtenberg. It is a place for ethnic diversity where migrants from Vietnam, China, India, Pakistan, Turkey and other countries are to be found among the wholesalers and the retailers. These former pathways of migration and longstanding transnational ties can be related to current trade and economical corridors. It was founded in 2005 as a wholesale market and run mainly by people with a vietnamese background, migrants that had arrived during the GDR as contract workers, and that had engaged in small business and trade after the reunification. However, the site is no longer only a shopping and trading facility but it also offers a number of services. As one can see in the map on the left, DX GmbH (the company that operates the center) has already planned a new expansion for residential uses and hotels. The main aim behind this expansion is to generate a new “Asia Town” in Lichtenberg that will serve as a space of encounter and social life for the vietnamese community. The DXC has shaped the whole district not only through its economic function but throught its social significance. It provides a space in which cultural and religious habits are practiced and shown to the public. The map also shows the mosque and the pagoda, where people can seek for advice. (Hüwelmeier 2013, Kitzmann and Schmiz 2017)

OIL

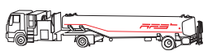
THE HINTERLANDS OF BUDGET AIR TRAVEL

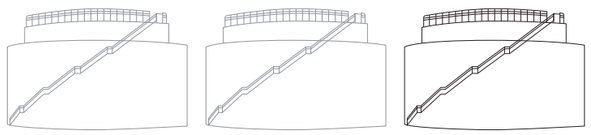
TUNCA BERIL BASARAN
CHRISTINA KRAMPOKOUKI
ROSA PINTOS HANHAUSEN
SIMON WARNE

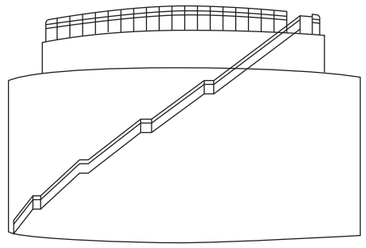
Habitat Unit

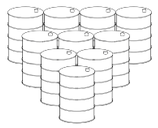
Christina Krampokouki
Tunca Beril Basaran
Rosa Pintos Hanhausen
Simon Warne

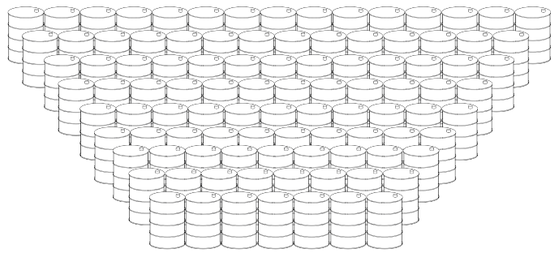
		Schönefeld			Schwedt
CONSUMPTION VS. PRODUCTION	270 flights/day	3,145 barrels/day*	3h flight →	68 barrels	840 barrels/day → 4.3% of their daily overall production
SUPPLY CHAIN	5 ←	4 ←	3 ←	2 ←	1 ←
CONTAINER	Airbus 319/320	Airport Tank Truck	Airport Tank Farm	Tank Wagon	Refinery Storage
CAPACITY	≈ 25,000 L	≈ 34,000 L	≈ 19,010,000 L / each	≈ 80,000 L / each	≈ 300,000,000 L / each
	157 barrels	214 barrels	119,560 barrels	503 barrels	1,886,792 barrels











Fuelling Budget Air Travel

Jet A1
from Schwedt to Schönefeld
tanker train
tank farm
storage considerations
water phase
tanker truck
Airbus 319/320

Of the ca. 1 million passengers flying in and out of Berlin-Schönefeld airport every month (FBB “Traffic Statistics” 2019), how many are aware of the network of actors and infrastructure behind the scenes enabling this action? Perhaps not many wonder how many tonnes of fuel are needed for a standard flight or don’t know that jet fuel is not the same as kerosene.

The difference between kerosene and jet fuel lies in the additives used to improve the fuel properties for flight operation, especially at high altitudes, and to prevent damage to the turbines. After the distillation process in the refinery is over, it is vested into a storage tank to then be transferred into tanker trains, tanker trucks, tanker ships or pipelines.

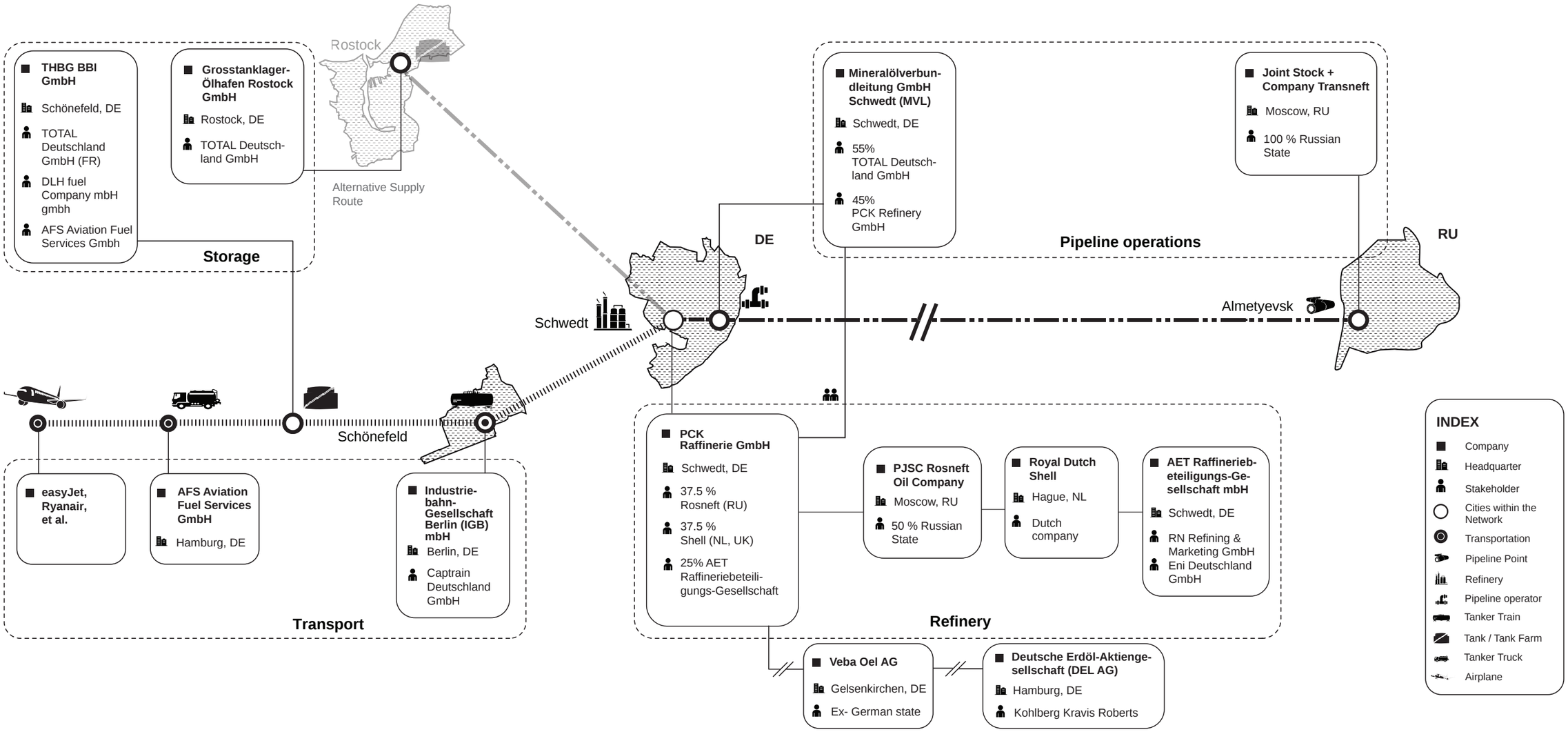
Once at the airport, the fuel is stored in tanks, which have water drains at their lowest point. When it comes to storage, the ‘water phase’ is the main concern. First, any surface active ingredients in the fuel will migrate to the water, thus disarming the filter separator. This would allow a slug of water into the aircraft. Second, it will foster the appearance of bugs and bacteria, which could then be pumped into the aircraft and damage the engines. However, if the proper conditions are met, fuel can be stored indefinitely (Visser 2011).

Tanker trucks pick up the fuel directly in the tank farm and then head back to the boarding gates, where the plane will be waiting for them and, probably, the passengers, too.

*Based on our estimates.

PRODUCT

Christina Krampokouki
Tunca Beril Basaran
Rosa Pintos Hanhausen
Simon Warne



PRODUCTION NETWORK

The Stakeholders of Jet A1

production chain processes
sector allocation
transnational operations
areas of operation / handling of pipeline
tank farms and refineries
historical ownership
key players and shareholders

The production network of Jet A1 fuel for use in Berlin-Schönefeld airport involves a complex cooperation of numerous national and international actors. Large-scale infrastructure and industrial complexes such as pipelines, refineries and ports are invariably owned and operated by holding companies representing at least one of the world's largest oil companies, while smaller scale sections of the production chain, such as distribution by road or rail, are usually taken care of by smaller domestic or local firms.

Schwedt's PCK refinery was established as a state company in 1958 by the GDR. In 1991, fifteen years later, it was privatised and sold to Veba Oel AG, DEA Mineralöl AG and AET-Raffineriebeteilungsgesellschafts mbH (PCK "History").

In more recent times, the Dutch oil company Shell and the Russian-state company Rosneft were joint major shareholders of PCK with 37.5% each, until 2014, when Rosneft bought TOTAL's 16.6% ownership, thus positioning themselves as the most dominant PCK shareholder (Rosneft 2015). This Russian company not only holds shares in this refinery, but also in four others in Germany (Kloosterman, Mamadouh and Terhorst 2018).

Rosneft is an example of a leading global firm playing a key role in shaping and coordinating global production, attempting to strengthen its position in one of Europe's most efficient refining centres and to use the opportunity to serve final customers in its most important market.

Christina Krampokouki
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Rosa Pintos Hanhausen
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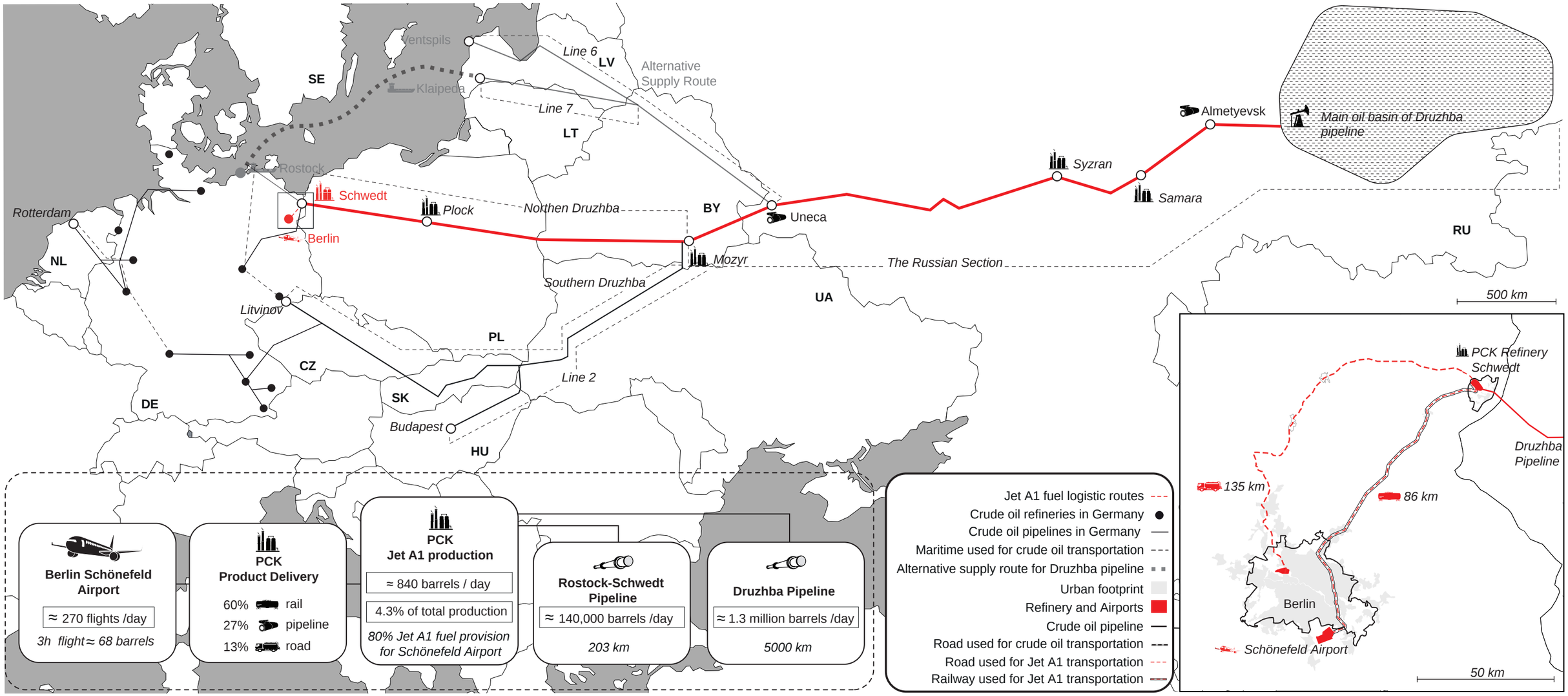

INFRASTRUCTURE NETWORK

From Russia to Schönefeld: the Friendship Route

the *Druzhba* (friendship) pipeline
length and production capacity
lead times
alternative route
refinery products
from refinery to airport

Since 1964, the Druzhba Pipeline, also known as the Friendship Pipeline, has been operating as one of the largest in the world in terms of length and production capacity.

More than 5,500 km long including all its branches, Druzhba supplies 25% of Germany's crude oil via its Northern branch (PCK "Our PCK"). Crude oil's journey from the drilling point in Russia's Ural region to Schwedt in Germany takes approximately three weeks.

Once there, the PCK Refinery produces Jet A1 fuel for Tegel and Schönefeld airports in Berlin. The refinery can additionally be supplied with crude oil via pipeline or rail from Rostock.

Jet A1 is a relatively minor product of Schwedt's PCK refinery, which supplies 90% of Berlin's gasoline and diesel, supplied via the 78 km long Seefeld product pipeline (PCK "Divisions").

All aircraft departing from Berlin-Tegel Airport have Jet A1 from Schwedt in their tanks; PCK supplies Berlin-Schönefeld Airport with 80% of its fuel (PCK "Divisions").

Tegel airport is supplied every day by 30 road tankers of 34,000 litres each and Schönefeld is supplied by railroad. Annually, a total of six million products are sent by rail; every night, 17 trains with 20 wagons each depart from Schwedt ("Produkte und Vertriebswege der PCK Raffinerie in Schwedt").

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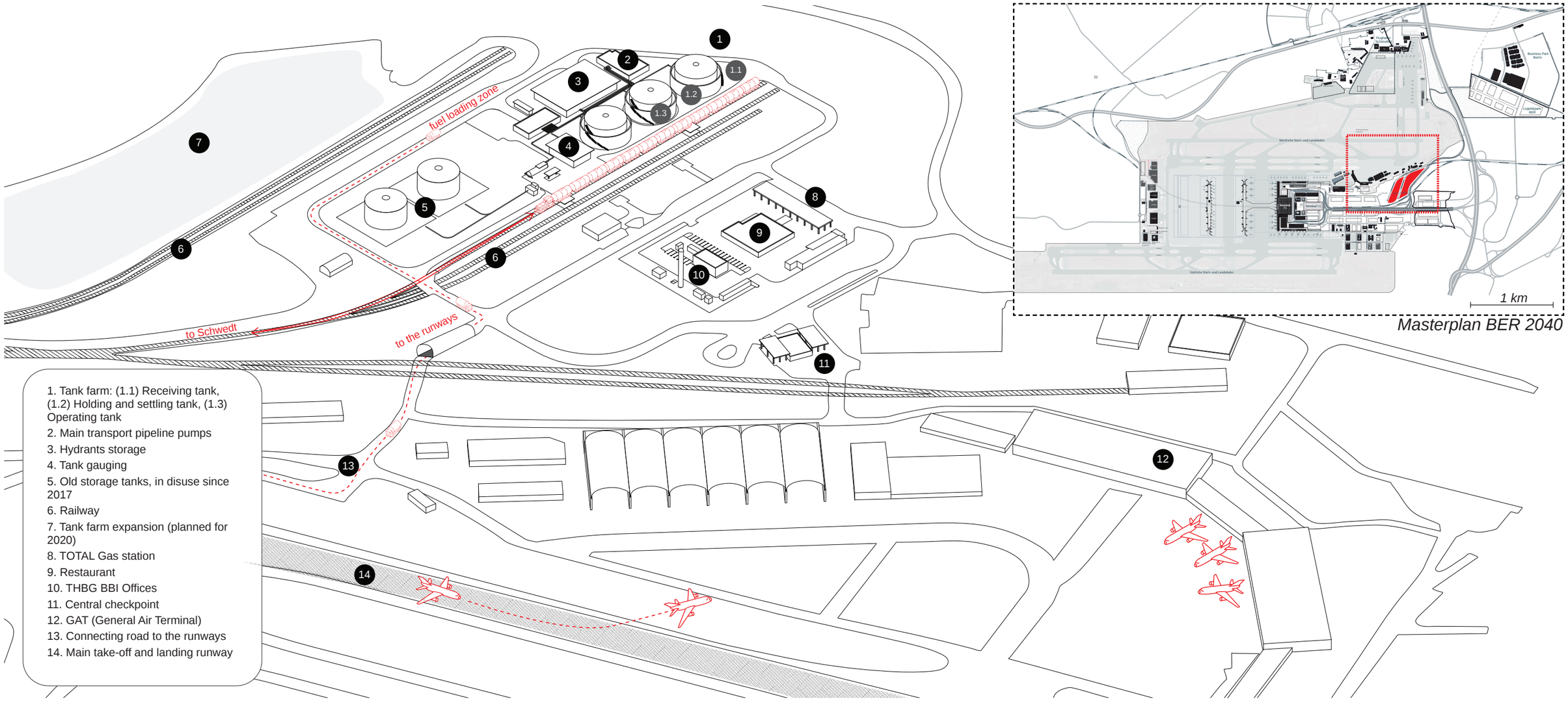

ARCHITECTURE

The Tank Farm: Fuel Logistics at Berlin's Expanding Airport

tank farm
receiving tank
settling tank
operating tank
tank trucks
expansion tank farm
surrounding roads
runways

The tank farm at Schönefeld airport comprises three areas separated by roads. In the central one, we can observe a typical tank layout composed of three tanks, each one of them serving a very specific purpose: "[o]ne tank is used as a receiving tank and accepts new fuel loads; a second tank acts as a holding and settling tank to allow time for contaminants to settle; and the third tank is called the operating tank from which fuel is drawn for daily use" (Quilty et al. 2015).

To its left, there is an empty piece of land where the expansion of the tank farm that will serve the new airport is going to be. There is an extra set of train tracks already built in-between the two plots.

To its right, there is a TOTAL gas station, a fast food restaurant and a small complex of several buildings containing the offices of THBG BBI group, who operate the farm. On the bottom right we find the central check-point entrance to the compound.

Surrounding this complex we find a road that connects it to the runways. This is the path that the tank trucks take to refuel before heading back to the gates, where they will serve the planes before takeoff.

Christina Krampokouki
Tunca Beril Basaran
Rosa Pintos Hanhausen
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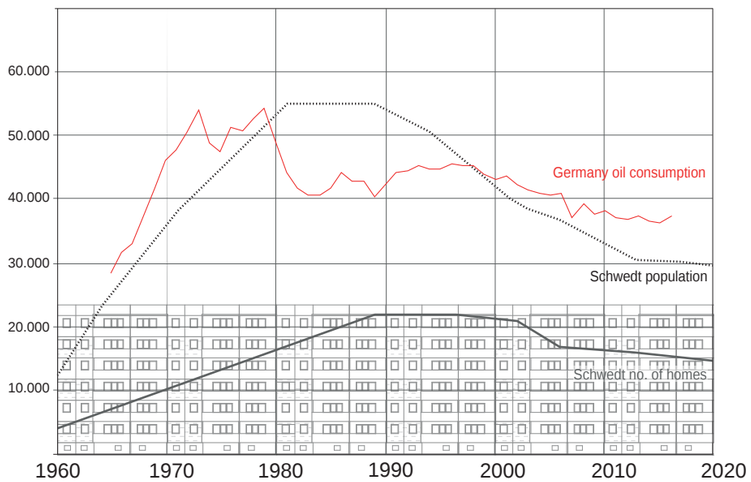
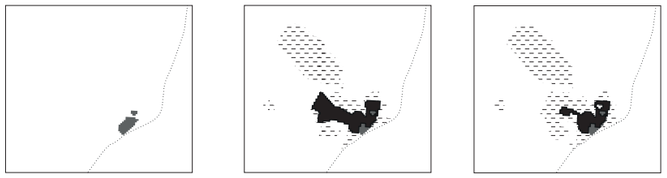


Timeline: Schwedt's Boom-and-Bust



1960: Schwedt is a small village (grey), damaged from WWII

1990: Schwedt's peak with 54,000 people and 90% in Plattenbau socialist housing (black).

2020: A city in managed decline with extensive demolitions of Plattenbau socialist housing

1960 | 1990 | 2020

City

From 1965: Construction of socialist planned city quarters Am Waldrand Talsand Kastanienallee

1980s: "Plattenbau" form 90% of all constructions in city of Schwedt

1997: First extensive demolitions

2002: Urban Redevelopment Programme East

2014 onward: City centre redevelopment

Refinery

1960: PCK Refinery inaugurated

1963: Druzhba oil pipeline in operation

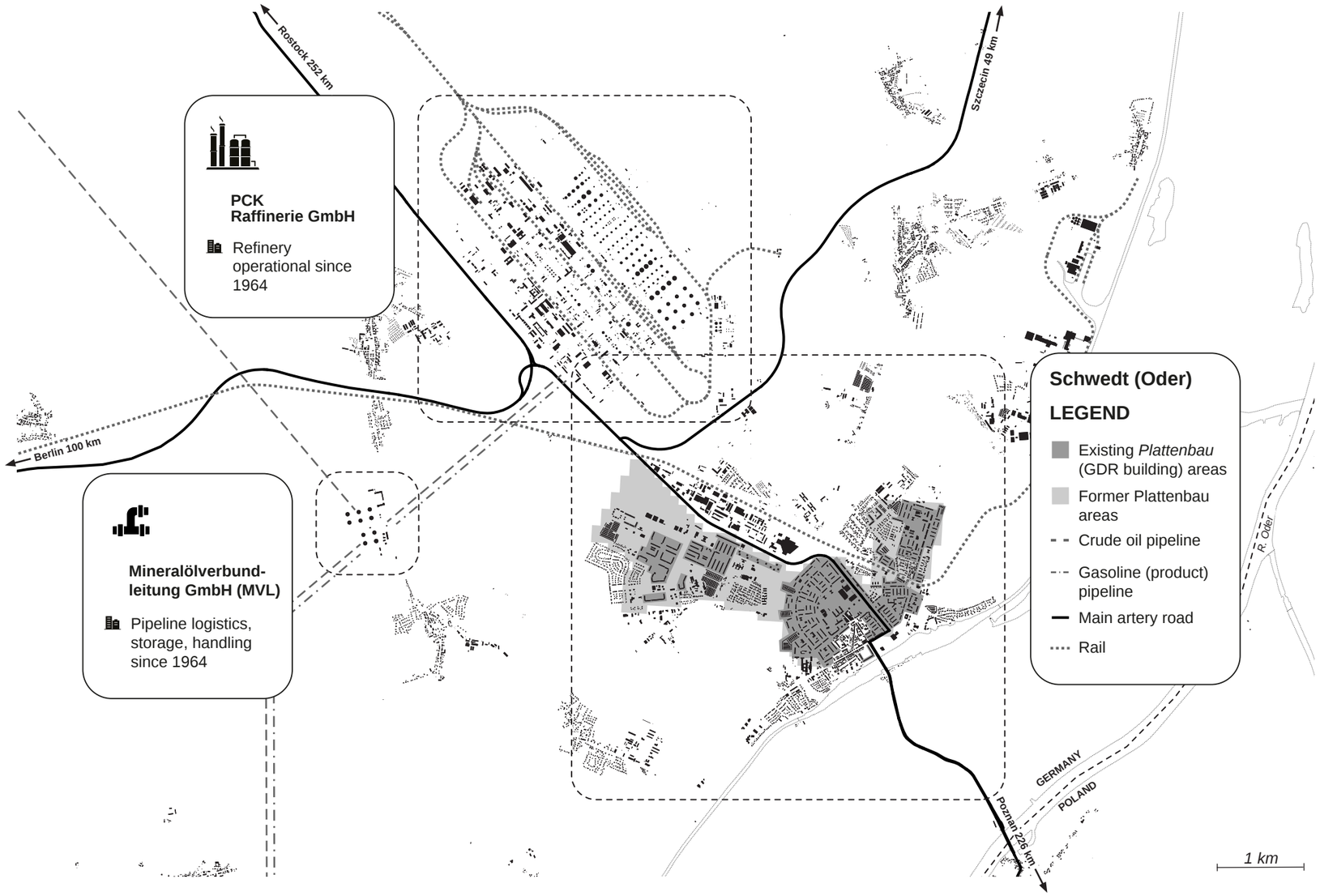
1964: PCK Refinery fully operational

1980s: PCK refinery employs 8,000 workers

1978: "Schwedt Initiative" Massive restructuring of PCK refinery operations - 2,000 people employed for renovation

1990: German Reunification: PCK dissolved and privatised

Today: PCK has 1,200 of its own employees, and 2,000 employees of service providers on the refiniery site



Schwedt (Oder), Brandenburg: Shrinking Socialist City

"Socialist City"
pragmatic masterplan
shrinking city
spatial reorganisation
gradual decline of Germany's oil industry

Schwedt is a small industrial city in north-eastern Brandenburg, Germany. In 1958, with the commissioning of the PCK refinery, Schwedt was to transform into a centre of the GDR oil industry and, accordingly, the tiny war-devastated city was chosen by GDR leaders to become one of four new "Socialist Cities" (Kleiner 2015).

The building boom that corresponded with the city's growth was based on a pragmatic masterplan of prefabricated concrete GDR Plattenbau buildings.

Since German reunification, Schwedt, like many towns and cities in the former GDR, has been steadily shrinking, requiring the removal of derelict housing blocks. As a result, 11,000 homes have been demolished since 1990 to create space for lower density housing, mixed-use developments, forests and open spaces (Rehmann 2014).

The reasons for Schwedt's shrinkage are likely to correspond with other former-GDR shrinking cities, yet it's also possible that Schwedt's monotonous environment of pragmatic industrial urbanism is also to blame, with its lack of amenities and urban functions (Kleiner 2015).

Schwedt's decline also corresponds with a gradual decline in Germany's oil consumption, which could be attributed to environmental regulations and improvements in fuel efficiency — despite huge and sustained growth in the number of flights since 1990, Germany's consumption of jet fuel has remained roughly stable since 2006 (Pfeiffer and Wigger 2018).

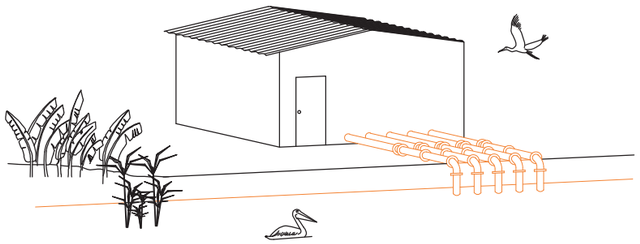
FLOWERS

THE JOURNEY OF A FRESH ROSE

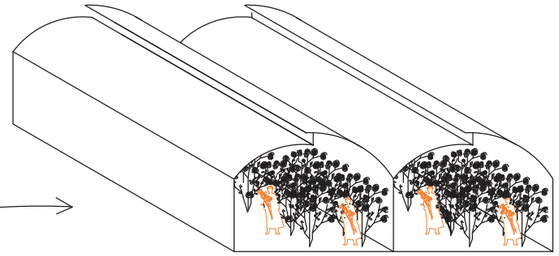
KRISTINA BAIERL
AMANDA KÜSTER
MATHILDE PAGNEUX
CLARA SALAUN

Habitat Unit

Amanda Küster
Clara Salaun
Kristina Baierl
Mathilde Pagneux



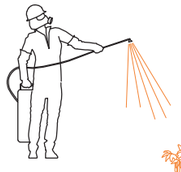
Pumping stations:
Most of the water used for plants irrigation comes from the lake Naivasha.



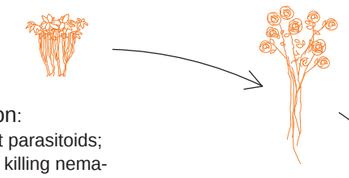
Greenhouses:
- 44 hectares of culture
- 7-13L of water per flower
- 22-26°C

Cycle of Water:
More growers are harvesting rainwater, using drip irrigation.

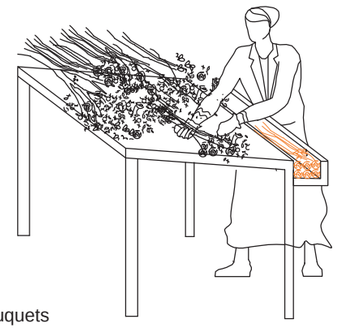
FILTER



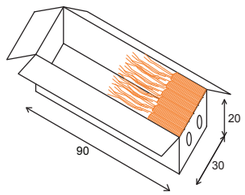
Pesticides/Fertigation:
IPM products are insect parasitoids; insect predators; insect killing nematodes; insect-killing fungi; soil health products; and sticky traps.

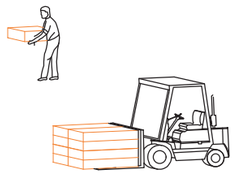


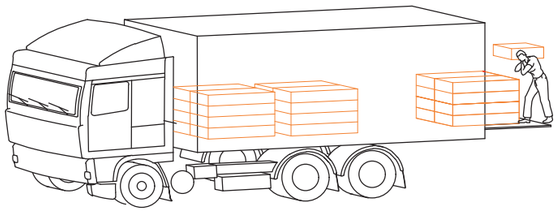
Harvest/Selection:
- 15 varieties of flowers sorted by size and colors (reds, whites, yellows, oranges, pinks, cerises and bi-colours).



Packing:
- 10 flowers in each bouquets packed in standard sized boxes
- 20-24 bouquets per box
- cooled at 5°C







Delivery:
- The flowers are then placed in a cold room of 3°Cbefore being delivered by plane, a maximum of 48 hours later, to Europe.
- The rose costs around 8 cents when it leaves the farm.
- Nini Farm sells about 260,000 flowers every day.

PRODUCT

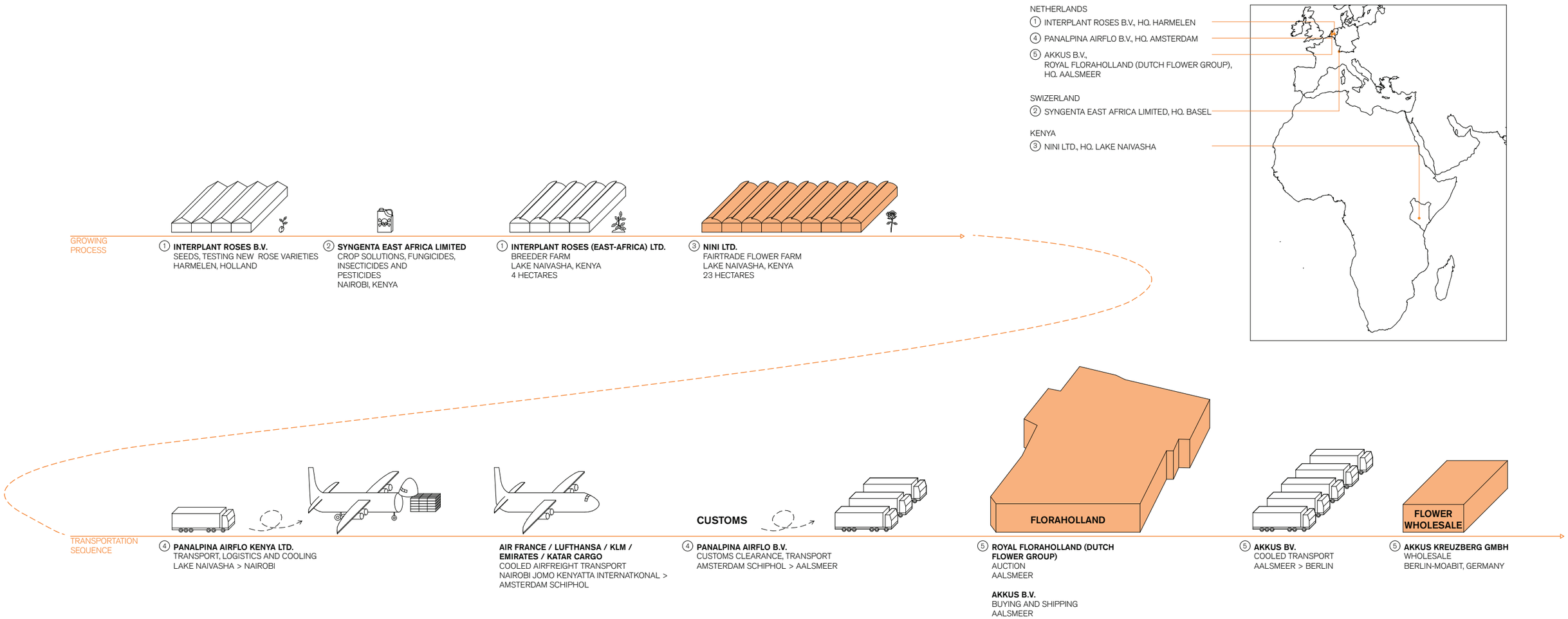
Rose Production

Flower production
volume: +260,000 flowers a day
plant and technology import, local water
transport: cool trucks
temperature : 22-26 °C in greenhouses
typical mode of sale : package
durability : 48H
infrastructural requirements:
greenhouses, pipes, trucks, machines to remove thorns from the stems

It is in Kenya, on the shores of Lake Naivasha in the Rift Valley, where most roses adorning the vases of European customers are cultivated today. At Nini Farm, a.e., 550 workers work six days a week, picking 15 varieties of roses, grown soilless or under hydroponics under huge greenhouses. Roses are packed at source on the farm, sorted by size and color, after removal of leaves and thorns by machine. Arranged in standard bouquets, the flowers are stored in a cold room before being delivered by plane, a maximum of 48 hours later, to Europe.

As roses are very water-intensive, pumping stations have multiplied on the lake. Even if pumping is strictly regulated, records indicate a decline of the lake level with the increase of intensive horticulture (Maitre 2016). Growers experiment with modern growth technologies, and deploy biological pest control measures, partly upon pressure from European buyers and retailers. The farms replace 25% of crops each year to keep up to date with the latest varieties and to maintain economic and physical viability of plants. Nini exports an average of 110 million stems per year of varying lengths depending upon demand. Special events like Valentine's Day have a huge impact on the production. 80% of the roses are sent directly to major supermarkets such as Tesco UK, Kaufland Germany and Carrefour France, as well as stores in Russia and Japan. The remaining stems are transported to the Netherlands for flower auctions (Nini Ltd, 2019). The intensive flower production, widely encouraged by the government, has strong impacts on the growing environment and its population.

Amanda Küster
Clara Salaun
Kristina Baierl
Mathilde Pagneux



PRODUCTION NETWORK

Actors' Network

actors in close co-operation
breeding volume: 100.000 crossings a year
growing volume: 110 million stems per year
growing requirements: greenhouses, pesticides, insecticides, fungicides, hydroponics with a closed fertigation system
transport requirements: trucks (3°C) and planes (2-8°C)

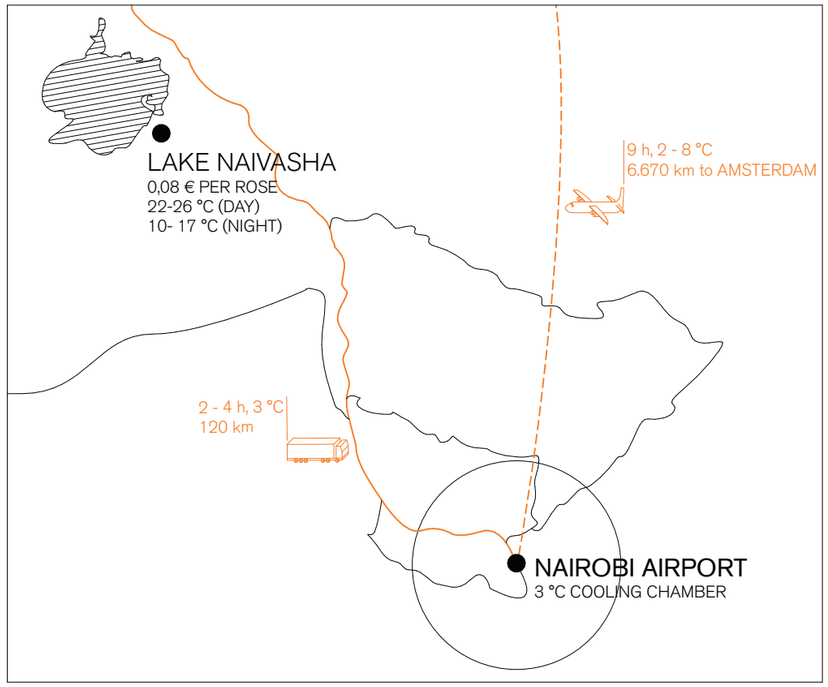
The flower business is a perishable one. Thus, the cooling chain and a quick transfer between actors is crucial. Actors operate on two main scales: growing and transport. All companies operate either in Europe or Kenya.

Two years before growers could harvest their different varieties of roses, actors in the Netherlands had researched the perfect way to cultivate the perfect new rose. For example, Interplant Roses B.V. provide new varieties and send them out to Kenya to be tested in a different climate on affiliated breeder farms (Interplant Roses B.V., 2014-2018). Once they found a perfect rose and cultivated it, farms like fairtrade Nini Ltd. can buy the plants to grow them in greenhouses. Nini Farm has 550 employees who look after the roses until they are cut (Nini Ltd., 2019). Pesticides are provided by Syngenta East Africa (Schreier, 2017).

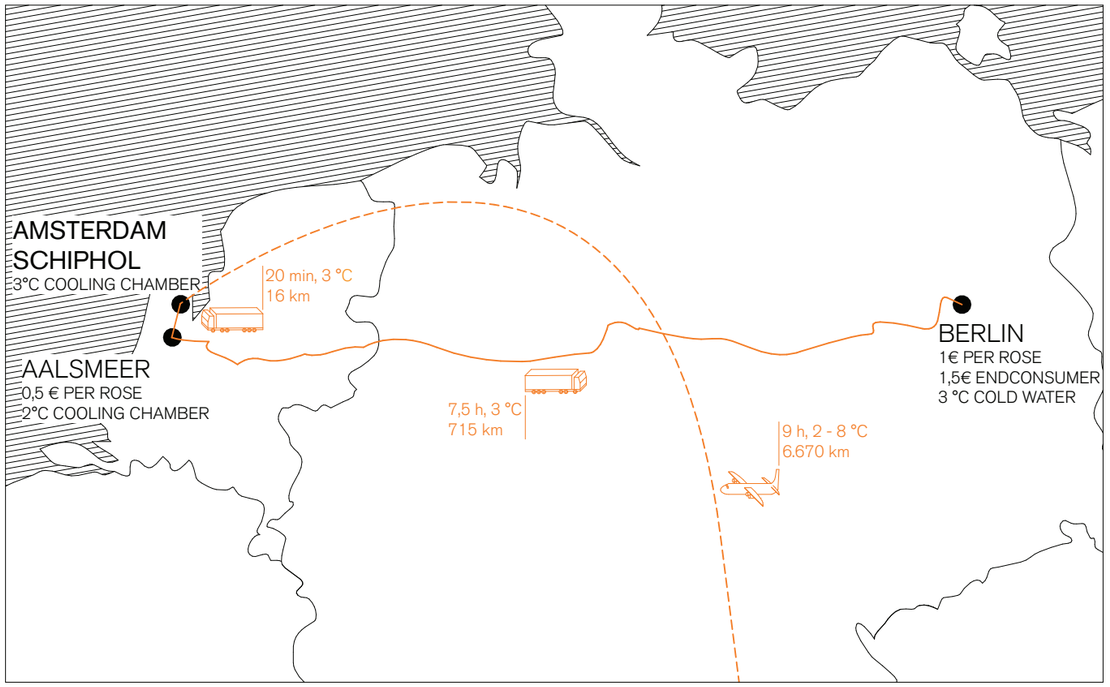
Because time and cooling are the most important factors, big companies with the resources and networks to perform a perfect transfer for perishable goods are commissioned to transfer the roses: a.e., Panalpina, one of the world's biggest logistics providers for perishables with different hubs around the world. They pack, transport and load the product in the cargo airplane, provide the necessary papers, take responsibility for customs at Schiphol airport and deliver the freight to the auctioneers at Royal FloraHolland (Hortiwise, 2018).

Amanda Küster
Clara Salaun
Kristina Baierl
Mathilde Pagneux

KENYA



EUROPE

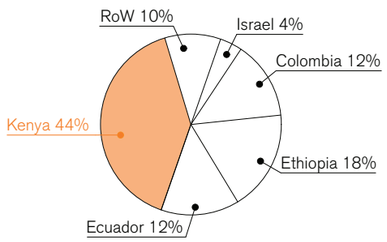


= fully loaded Cargo from Kenya to Amsterdam, 2-3 days

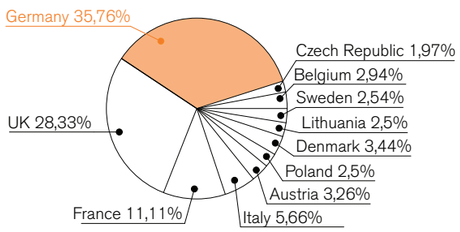
= empty Cargo from Amsterdam to Kenya, 1-2 days

= fully loaded ship from Mombasa to Amsterdam, 25 days

IMPORT NUMBERS TO THE EU



EXPORT NUMBERS FROM AALSMEER TO THE EU



INFRASTRUCTURE NETWORK

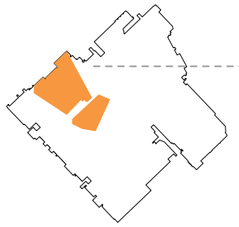
The Kenyan roses have a long way to go to their final destination in Europe. From the farm in the highlands of Lake Naivasha they are transported to Jomo Kenyatta International Airport in Nairobi by a truck cooled down to 3°C, managed by Panalpina Airflo Ltd.

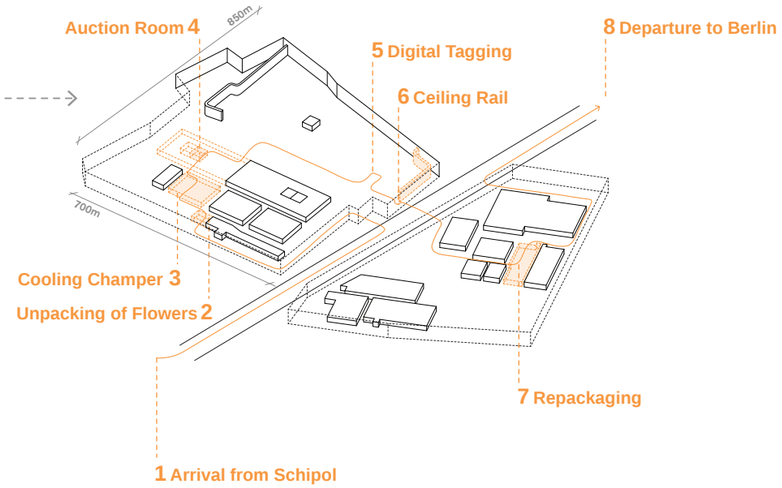
The load is then shipped by airfreight to Amsterdam Schiphol Airport. From there, Panalpina Airflo B.V. is in charge of the perishable goods and delivers them to the FloraHolland Center in Aalsmeer (DVV Media Group, 2016).

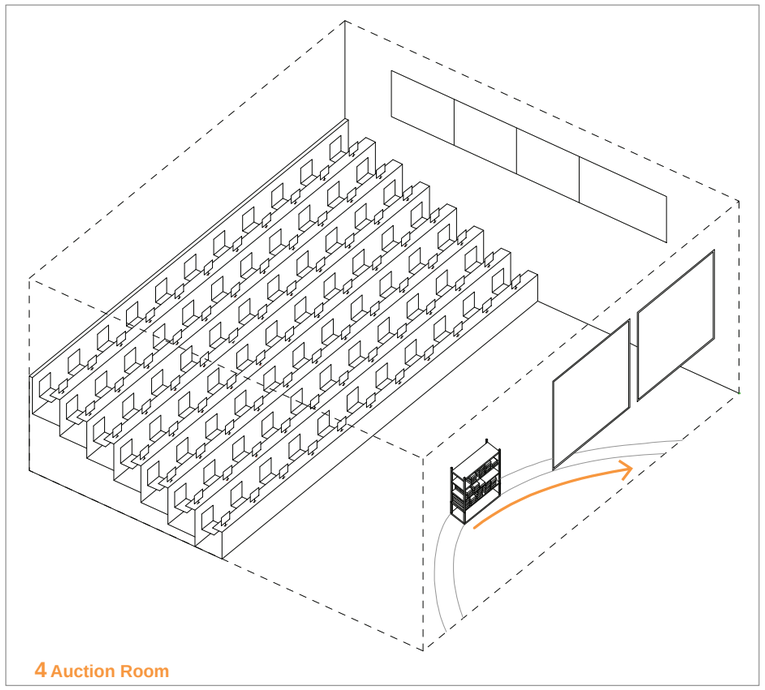
After being auctioned off, the roses are transported to the Berlin Wholesale Market by Akkus B.V., where customers can then finally purchase the Kenyan roses (Akkus, 2019).

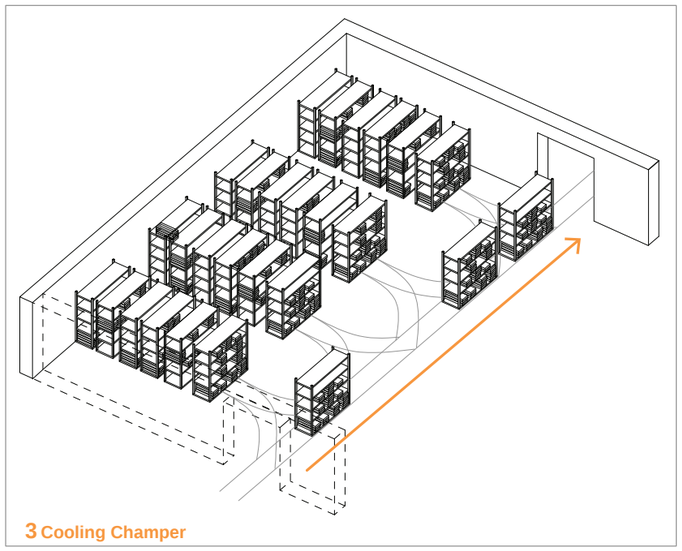
This transport chain seems to be the most efficient way to ship flowers to Europe in terms of time and money - even if it is not the most environmentally friendly one. To make the shipping process somewhat less harmful to the environment and to reduce the $C0_2$ emission, the roses could be transported by ship starting at the Mombasa Kilindini Harbour to the port of Amsterdam, which would take 25 days to complete the journey. From the sellers' point of view, though, the down side to this method is the inflexibility. There can be no quick reaction to spontaneously changing sales quotes. Therefore, transportation by plane still appears to be the most convenient and common one (DVV Media Group, 2016).

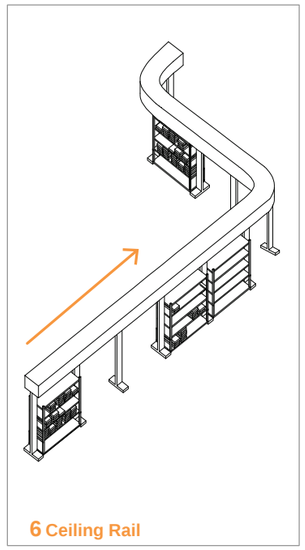
Amanda
Clara
Kristina
Mathilde






4 Auction Room


3 Cooling Champer


6 Ceiling Rail

1 23.00 Arrival from Schipol
The bulk of flowers are first transported by airplane to Schipol Airport and then by truck for the last strech to FloraHolland in Aalsmeer.

2 00.00 Unpacking of Flowers
The truck docks at one of the 523 loading platforms. Flowers are taken out of their packaging and put into containers. The containers are then put into auction trolleys.

3 01.00 - 05.30 Cooling Chamber
The auction trolley is then sent to a cool chamber where it stays until auction time. Regular quality checks on all flowers are done during this time.

4 06.00 - 10.00 Auction Room
The auction begins at 6.00 and usually takes about 4 hours. Trolleys slowly roll in and out of the auction room via an extensive internal rail system.

5 06.00 - 12.00 Digital Tagging
As the trolleys roll out of the auction room they get digitally tagged with the transaction information resulting from the auction. If several buyers bought from one trolley, the flowers get redistributed onto new trolleys owned by the buyers. Otherwise, the complete trolleys are transfered to their new owners.

6 Ceiling Rail
Trolleys bought by large wholesale merchants with their own premises on the south side of Legmeerdijk get their trolleys automatically transported to their building via the Aalsmeer Shuttle - a ceiling rail system specifically made for this.

7 12.00 - 14.00 Repackaging
On the premises of the wholesale merchant, the bought flowers are repackaged for transportation and loaded into trailers headed to their end destination.
Most trucks are loaded with flowers bound inland to locations within and beyond the borders of the Netherlands. Other trucks loaded with flowers for overseas head towards Schiphol Airport in time to catch the routes to their end destinations.

FloraHolland, Aalsmeer

Loading docks: 523
Transactions per day: 43.860
Trolleys: 135.000
Clocks: 13
Area: 1.103.000 m2

FloraHolland in Aalsmeer, the Netherlands, is the world's largest international trade platform for flowers and plants. It is a cooperative venture belonging to growers of flowers and plants who bring their supply together to form a single international trade platform.

FloraHolland's membership consists of thousands of growers representing approximately 60 countries. They sell flowers from countries such as Kenya, Ethiopia, Colombia, Ecuador along with the Netherlands.

Most traders have a handling area in or near the auction buildings, where they are able to prepare their purchased products for transport.

Between growers and clients, flowers have to be transferred quickly after purchase to ensure minimum time waste. The large complex of FloraHolland poses problems with regard to internal travel distances. The solution: go airborne. The customers residing south of the N231 highway receive their products via the Aalsmeer Shuttle. This shuttle is a 15 km-long overhead runway system that operates at a speed of around 11km/hour. It is able to transport 2600 trolleys per hour and reaches the southern area via a covered bridge. This streamlined method of transport ensures the fast and timely delivery of products. Thus, on average clients receive their product 90min after purchase. (Royal FloraHolland, 2019)

ARCHITECTURE

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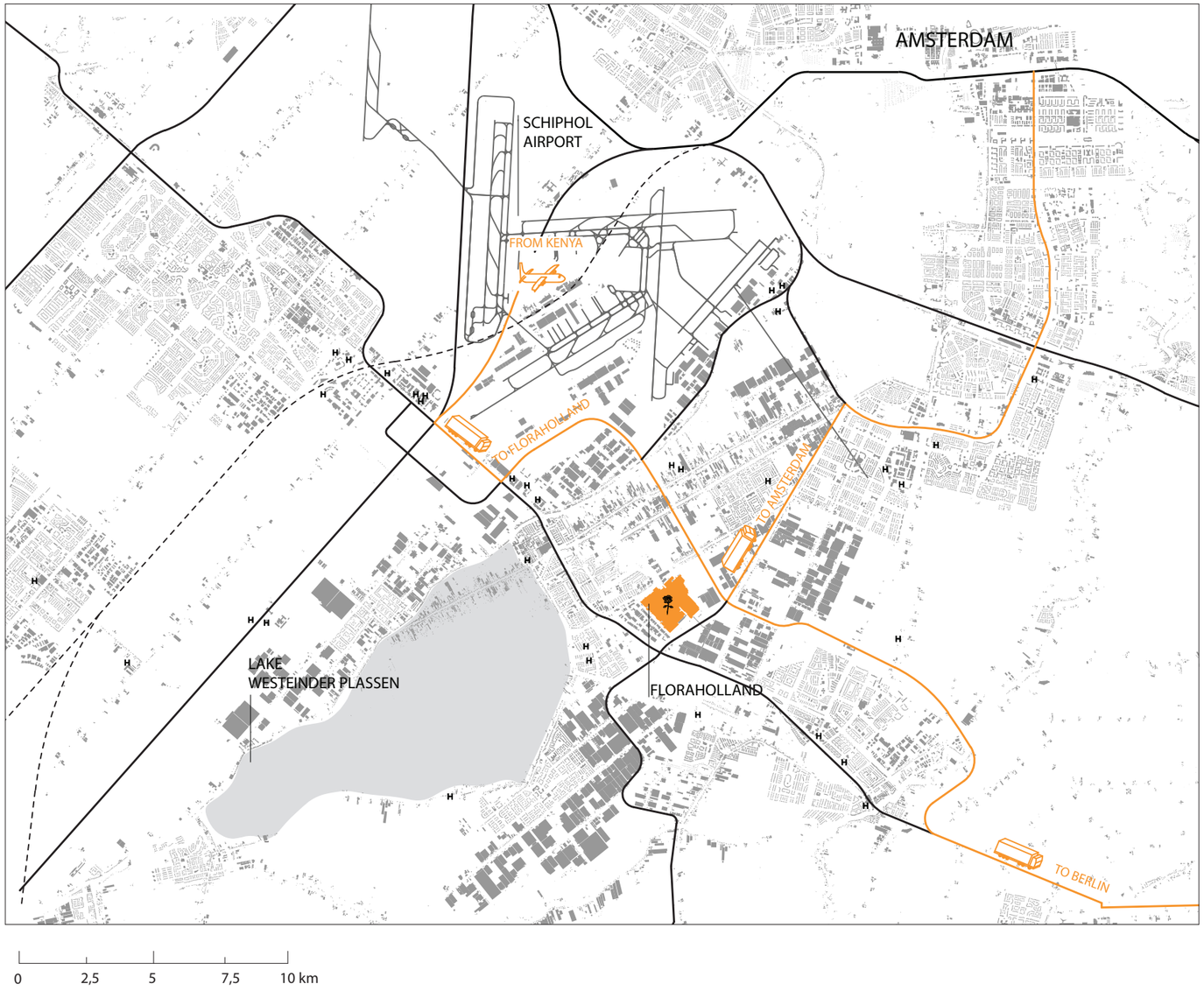


Aalsmeer in urban context

Aalsmeer: 32.29 km² (11.9 km² aquatic areas)
31,700 inhabitants
Near Schiphol airport and Amsterdam

Aalsmeer is a sparsely populated town on the outskirts of Amsterdam. This is the location of FloraHolland, the world's largest international trade platform for flowers and plants. In this urban context the roses from Nini farm in Kenya are passed onwards before being distributed across Europe.

Aalsmeer is a good place to do this: Schiphol International Airport is only a few kilometres to the north. From there, flowers are trucked to the Aalsmeer industrial area, where FloraHolland is located. They leave only few hours later by truck, either directly to Amsterdam or to the rest of Europe, including Berlin. Aalsmeer is well connected to many European motorways. It is also a transitional city for truck drivers.

But it is also worth noting that these infrastructures and facilities, which are conducive to the flower trade, also foster another activity in Aalsmeer: tourism (Gemeente Aalsmeer n.d.). The town is located near an international airport and the capital city. This allows international tourists and residents of Amsterdam to visit the town within an hour's bus ride of the capital. The lake allows water sports and outdoor activities. There are many hotels to be found in the town. But above all, FloraHolland has become an essential tourist activity (RoyalFloraholland n.d.). Daily visits are possible, and a route is planned to show what seems to be the main activity of this small town.

URBAN

MEAT

YOU’RE BACON ME CRAZY! WESTFLEISCH AND THE COMPLEXITY OF PIG MEAT PRODUCTION

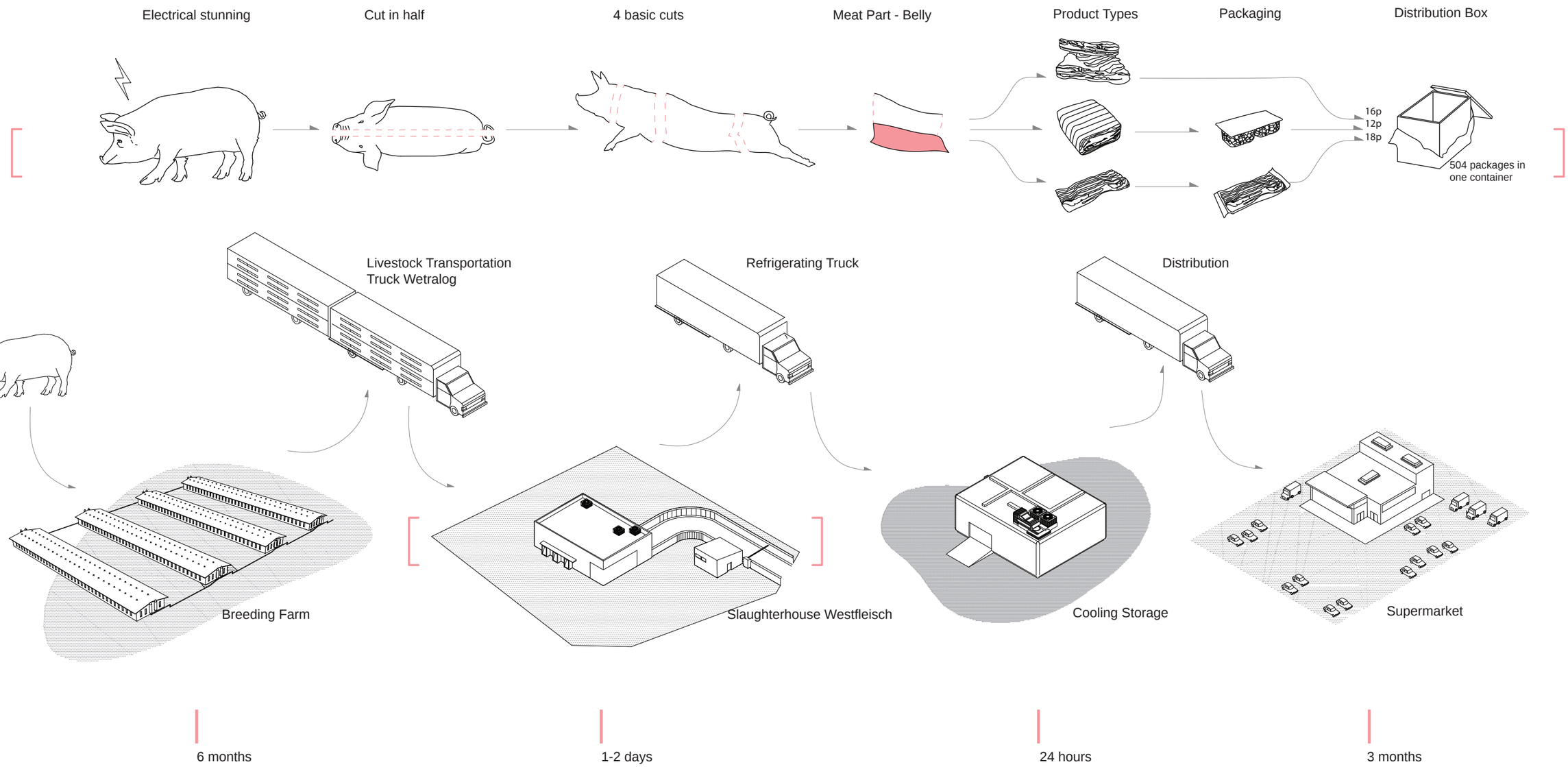
PABLO DE BRITTO TAVARES
SACHA JONCKERS
PENELOPI FILOTHEI KARALIS
YANNICK MARQUES SCHROEDER
ANTONELLO PREZIOSO

Habitat Unit

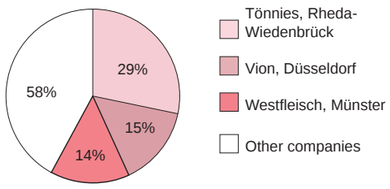
Architectures of Circulation
Seminar SoSe 2019

Pablo De Britto
Penelopi Filothei Karalis
Sacha Jonkers
Yannick Marques Schroeder
Antonello Prezioso

You're bacon me crazy! Westfleisch and the complexity of pig and meat production



Market shares of German pig companies 2017



Bacon

animal selection
body part-product selection
product type
packaging, containers
temperature, humidity requirements
typical mode of sale
durability
disposability
infrastructure requirements

The product bacon comes from the belly of the pork – a layered meat and fat tissue. The pig is raised in breeding farms until it is six months old and reaches the weight of 100-120 kg. Then it is transported by trucks to a slaughterhouse, usually situated in the same region. There the pig, after being slaughtered, is cut first in half and subsequently in smaller parts. After this the meat is processed. The belly of the pig can be cut in strips, cubes, or simply in smaller pieces.

According to the kind of cut, bacon is packaged in different ways. For distribution in supermarkets, we found the package of bacon strips is made out of plastic and contains a product weight of 100g. Bacon in cubes is packaged in double plastic containers of 125g each, thus 250g per package. These units packaged for end consumers are then packed in larger boxes. The boxes are wrapped with cellophane in larger bundles to be transported.

Meat products are transported to a controlled temperature storage by refrigerating trucks that can maintain a temperature between -20° and +2° C. From there, they are distributed to supermarkets where they are displayed in fridges to make them available to the customers. According to EU regulations, no more than three months ought to pass from the time of packaging until consumption. After the product has been consumed, the plastic package can be recycled in the specific waste container.

PRODUCT

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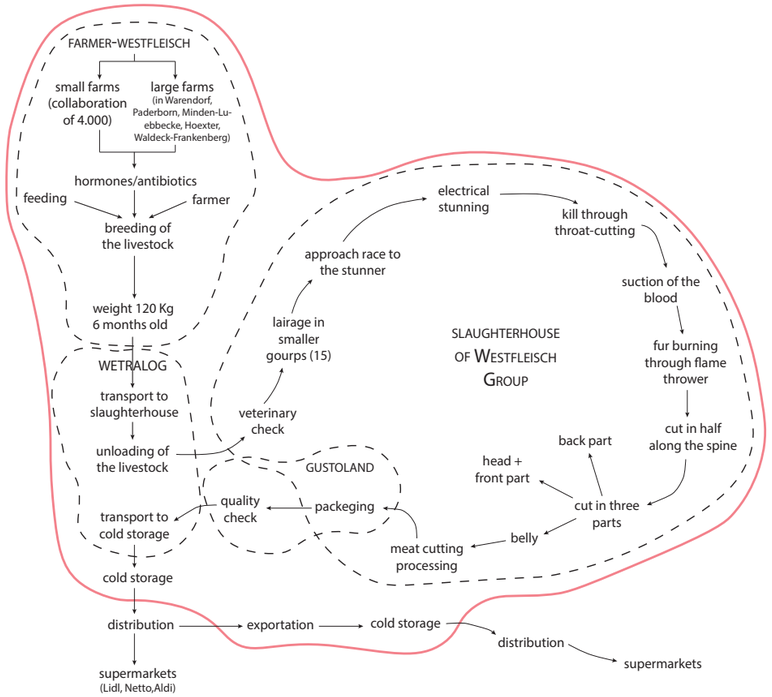
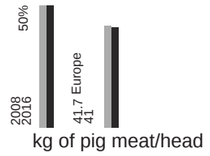
Sacha Jonkers
Yannick Marques Schroeder
Antonello Prezioso

You're bacon me crazy! Westfleisch and the complexity of pig and meat production



Related Companies of Westfleisch

Gustoland	slaughtering process and packaging
Westcrown	sow meat cuts and specialities, Westfleisch + Danish Crown
Westfleisch Finanz	construction and financing of buildings + technical equipment
Wetralog	transport logistics
Coldstore Hamm	cold storage warehouse
WestPet	refining of by-products for manufacturing of pet food
Dog's Nature	manufacture of natural and mostly dried dog snacks
WF Byproducts	products from the remains of slaughted animals
Wenova	personnel service provider and recruitment agency
WestfalenLand	convenience food
Ice House	frozen convenience food
Bruns	processing of pig heads



Largest Importers
Importation Centers

Number of Pigs per 100 He

- >600
- 300-600
- 150-300
- 50-150
- 0-50

Livestock Imports

Piglets	Slaughter Pigs
10-15% from:	8-12% from:
Netherlands	Netherlands
Denmark	Belgium

Food Imports

total food importation is 15-20%

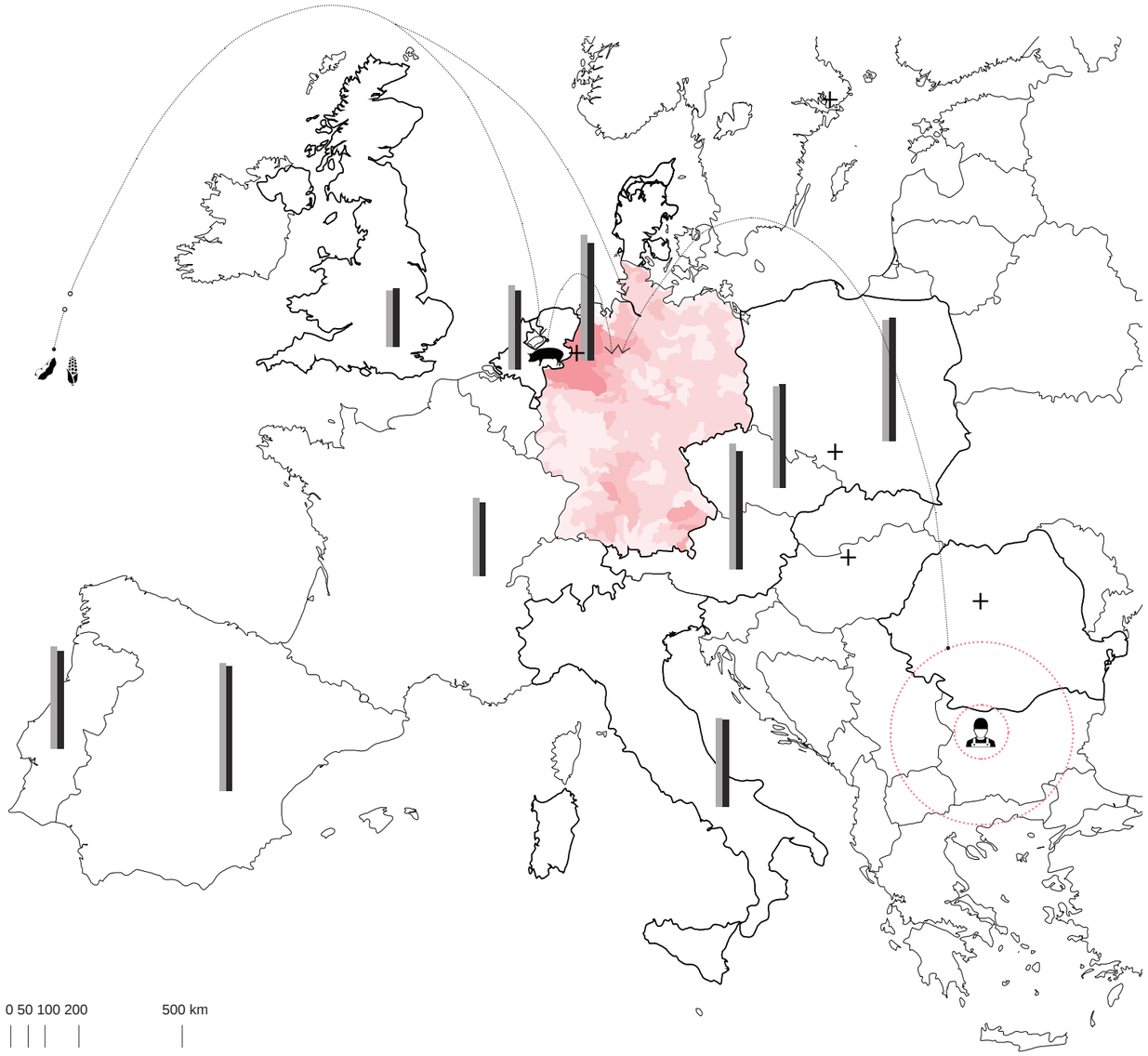
Soy Beans	Corn
88% from:	2.7% from:
USA	USA
Brazil	Brazil
Paraguay	France

Workers

90.000 from East EU represent 80% of staff in Germany's slaughterhouses

Extra-EU Exportation

Canada	Malaysia	Thailand
China	Mexico	Vietnam
India	Russia	Congo
Kazakhstan	Singapore	Angola
Kyrgyzstan	South Korea	Côte d'Ivoire
Japan		



PRODUCTION NETWORK

Meat processing and production

Westfleisch group
Westfalen livestock, slaughterhouse
cooperation with local farms
livestock process
importation/exportation
workers flow
pig density
cold chain
hygiene and welfare

Our focus are the slaughterhouses of Westfleisch, the third biggest meat producer in Germany after Tönnies and Vion. Nearly 55% of pigs production in Germany takes place in Lower Saxony and North-Rhine Westphalia, where 73% of the area is occupied by agriculture and breeding activities (1.5 million hectares). The main production processes usually take place in the same region: namely, agricultural production by local farmers, breeding farming on independent and collaborative farms, as well as slaughtering, processing and packaging in so-called meat centers.
In the production process, many workers from East European countries are involved. Their work contracts and salaries are managed by the daughter company Wenova.
Soy beans as well as corn are imported to complete the pig diet. Another Westfleisch subsidiary, Wetralog, is responsible for the logistics process, guaranteeing the required transportation services.

Westfleisch is also exporting its products worldwide. Outside EU, the company sells mainly products of parts of the animal body which are less frequently consumed within Europe (such as ears, noses, heads, etc.). One of the main destinationd is Asia.
All processes in all different stages should follow the European Union and national regulations for environment, alimentation, hygiene and welfare, transparency and taxation.

Architectures of Circulation
Seminar SoSe 2019

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You're bacon me crazy! Westfleisch and the complexity of pig and meat production

Border Control Soy Beans | Rotterdam/Hamburg
- Identification of consignment
- Documentary check
- Identity check
- Plant health check

Livestock | Höxter
- 5.000 m²
- › 1.000 pigs

Livestock Hub | Paderborn
- 14.000 m²
- Capacity 17.000 pigs

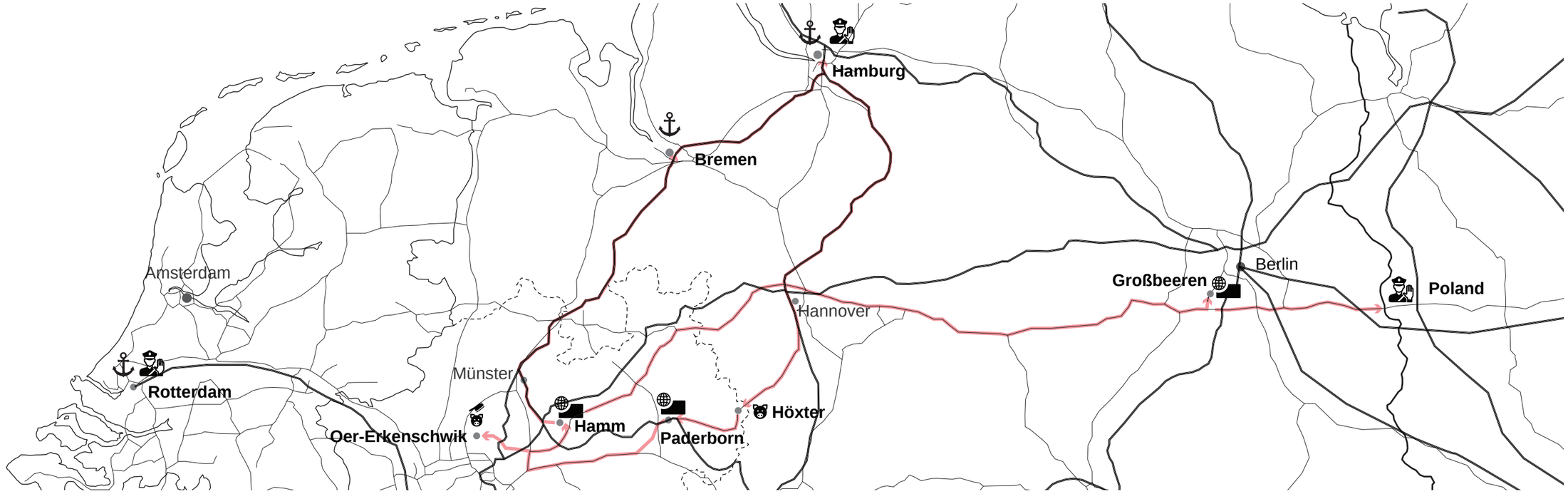
Slaughterhouse Westfleisch | Oer-Erckenschwick
- 115.000 m²
- meat processing and packaging
- direct sales of meat
- › 120.000 tons p.a. of meat and meat products

Coldstore Warehouse | Hamm
- 24h service + direct delivery to China
- 13.000 m²
- 17.000 slots for single pallets
- Freezing capacity: 650 T/24 h

LIDL Logistikzentrum | Grossbeeren
- 2 floors
- 42.000 m²
- 70 branches in Brandeburg
- always 25 degrees minus temperature

Border Control Meat | Poland
- Country or region of origin of the product
- Hygenic check for public health
- Testing for residues of veterinary drugs, pesticides, heavy metals and contamination

Highway
Railway
Harbour
Border Control
Livestock
Slaughterhouse
Logistics Centre
Truck
Train



Wetralog Food-Logistik | Münster
- Transportation 80% by truck + 20% by train
- Transportation temperature between -20° and + 2° C
- Refrigerated vehicles: 101moving units + 287 trailers
- Cattle vehicles: 21 moving units + 22 trailers

R 3 h / 3 h → H 1.30 h / 1.30 h → breeding period → 1 h → 3-7 days → 1.30 h → 1-2 days → 1 h → 24 h → G 4.30 h → B 2 h / H 3 h → 6 h

1. **Rotterdam/Hamburg** Border Control
2. **Höxter** Westfleisch Livestock
3. **Paderborn** Livestock Hub
4. **Oer-Erkenschwick** Slaughterhouse
5. **Hamm** Coldstorage
6. **Großbeeren** LIDL Logistikzentrum
6. **Bremen/Hamburg** Exportation
7. **Poland** Border Control

INFRASTRUCTURE NETWORK

Transportation and Logistics

product logistics
companies involved
mode of transport
typical routes
lead times
most significant hubs, nodes, points of access or passage
selective connectivity: bordering, filters, valves, friction

The map shows the geography of a potential production network of Westfleisch. In Germany, on average 10% of the animal feeds consist of soy beans and corn imported from South America, while 90% is produced in areas surrounding the farms. According to EU law, all plant products have to pass a rigid quality check at the border. After the border check the animal feeds can be sold to farms in Germany. Once the pig reaches a specific age and weight (120 Kg), it is moved from the farm to a livestock hub where it can stay for a minimum of three days and a maximum of seven days. From there, pigs are transported to the slaughterhouse where the meat is also processed and packaged.
Once the bacon or other meat products reach the cold warehouse, a complex and structured logistics system organises further distribution of these products. One part is sent to supermarket logistics centers and therefore to end customers in the country. Another part is sent to the north of Germany to be exported to other countries. In the case of Westfleisch, China is one of the main destinations.
All transportation logistics are managed by Wetralog, which is taking care both of the transport of livestock and the transport of fresh or frozen products. Wetralog disposes a fleet of trucks and freight wagons for rail transport. But 80% of Wetralog's German-wide transportation of animals and meat products is carried out by truck and thus using highways.

Pablo De Britto
Penelopi Filothei Karalis
Sacha Jonkers
Yannick Marques Schroeder
Antonello Prezioso

You're bacon me crazy! Westfleisch and the complexity of pig and meat production

Outside

A. Washing area for livestock transportation trucks
B. Chimney
C. Washing area for product transportation trucks
D. Exit gate for livestock transportation trucks
E¹. Uploading area for big meat cuts
E². Uploading area for animal food
E³. Uploading area for waste
F. Parking area for trucks + electrical plugs to reach the cooling temperature
G. Fresh water collector
H. Water depuration treatment
I. Trucks parking area

Inside

1. Cooling system on the roof
2¹. Processing of the big meat cuts
2². Processing of pig heads
2³. Processing of animal food
3. Packaging area
4¹. Uploading area for big meat cuts
4². Uploading area for pig heads
4³. Uploading are for animal food
5. Waste processing area

Tunnels

Undergroud tunnels
Overground tunnels

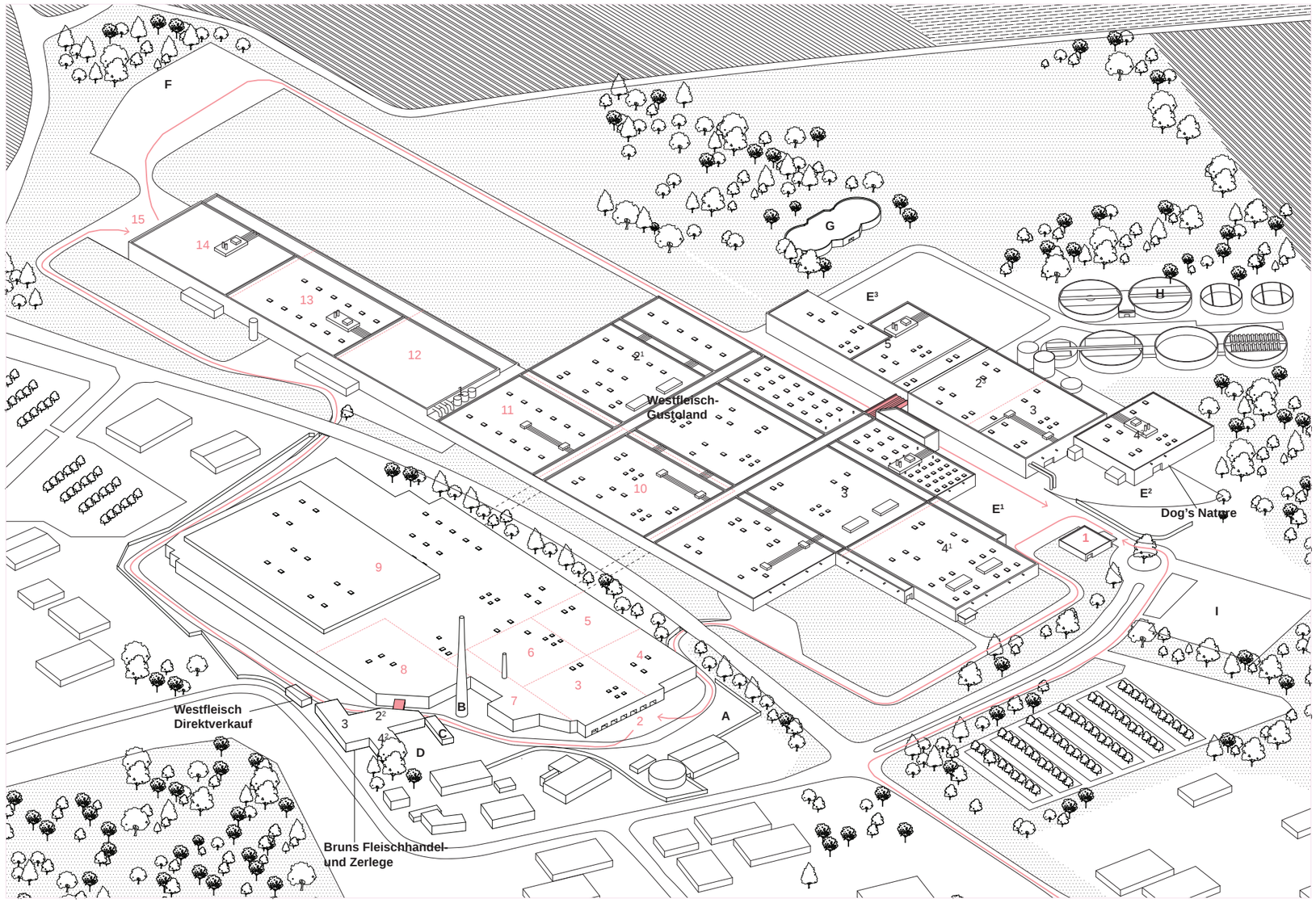
Bacon production

1. Gate of main entrance / exit:
   - livestock tranportation entrance
   - product tranportation exit
2. Unloading of livestock
3. Unloading area and pig registration
4. Livestock waiting area
5. Stunning area
6. Kill through throat cutting
7. Smoking area / flame thrower
8. Head removal
9. Slaughtering area
10. Processing of the meat
11. Processing of the small meat cuts
12. Packaging area
13. Cooling storage
14. Uploading area and dry storage
15. Uploading area for small meat cuts and other products

Surfaces

Dog's Nature 8.500 m²
Westfleisch Direktverkauf 115 m²
Bruns 1.350 m²
Westfleisch / Gustoland 112.000 m²
Land owned by the company 265.000 m²

0 5 10 20 50 m



ARCHITECTURE

Slaughterhouse Oer-Erkenschwick

architectural program
technical equipments
operations in the building
exterior and interior circulation/ immediate
spatial interrelations
adaptations
trucks flow (outside)
production flow (inside)
waste

The slaughterhouse is in charge of slaughtering the highest possible amount of pigs efficiently and in accordance with the regulations settled by the European Union. A floor area of 112.700 m² is required for slaughtering nearly 55.000 pigs per week in an effectively organized production chain. Several complex processes involve multiple steps and new technology equipment. The flows happen outside and inside taking advantage of the entire surface. On the outside area the architecture is more oriented towards transportation methods, while the interior parts focus on the product processing. The slaughterhouse buildings are connected by several bridges and tunnels between them. For example, the Westfleisch building is connected to the Gustoland building by two tunnels underneath the highway, minimizing the transportation time from one building to the other, in order to maintain the cold chain and link the different production stages. Westfleisch also operates a direct selling point at the center.

Most of the operations require a significant amount of water (14 liters/head) as well as electrical power supply. The processes generate a high amount of waste output to be collected and disposed of every day. The infrastructure for waste management is substantial and deals with manure, wastewater, discarded animals, blood emissions, viscerae, bones, fat and solid waste.

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You're bacon me crazy! Westfleisch and the complexity of pig and meat production

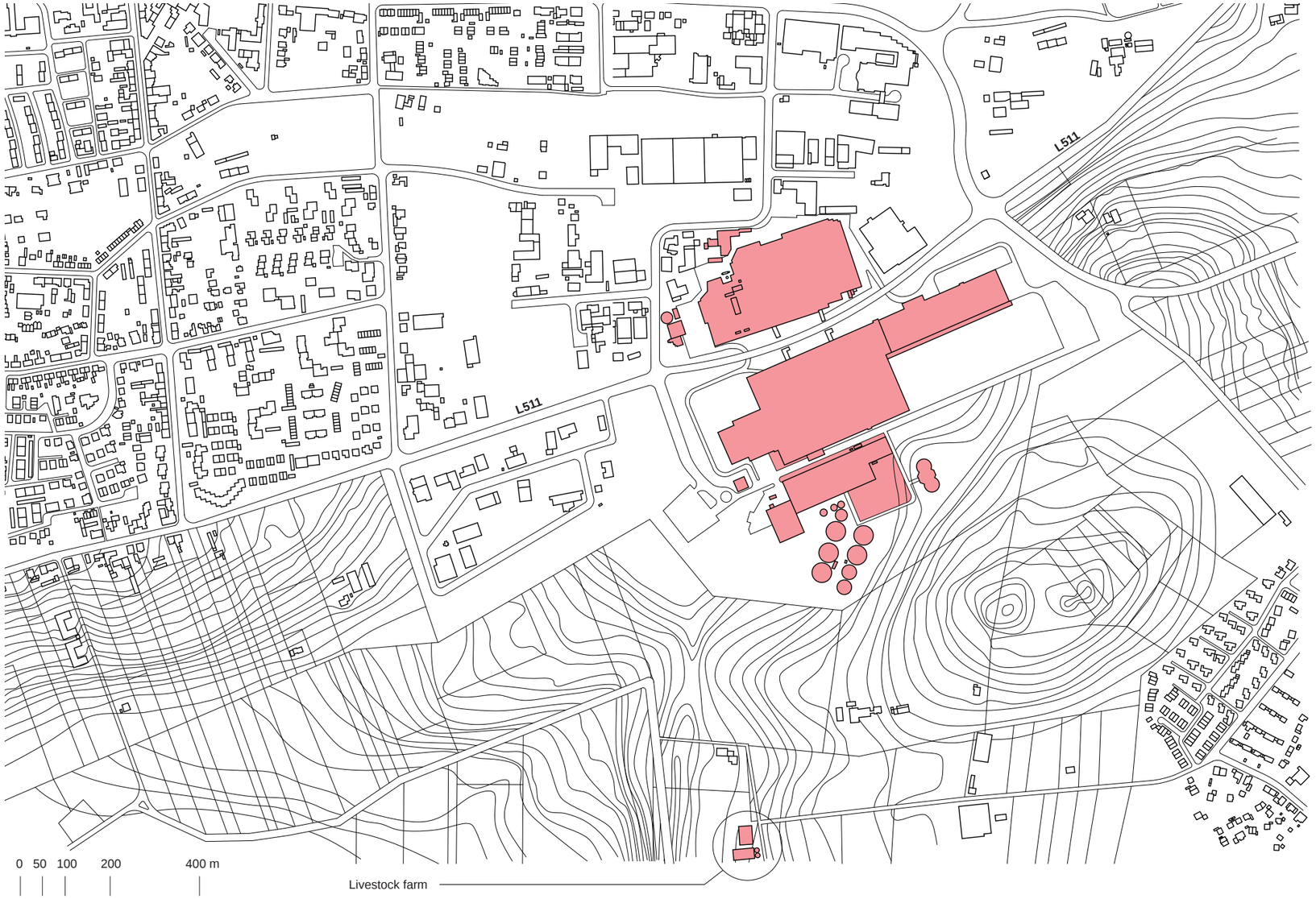
Number of daily delivery operations

	2014		2018		2020/22 (est.)	
	Day	Night	Day	Night	Day	Night
Livestock transport	39	2	63	3	117	6
Packed products transport	130	11	209	18	391	33
Other products transport	214	10	343	16	643	30
Total	406		652		1220	

Increase of truck flow → + 160% → + 187%

→ + 300%

Increase of: pollution, noise, bad smell



Comparing numbers of pigs slaughtered and inhabitants

	2018	2020/22
	55.000 per week	100.000 per week
	31.000	

Oer-Erkenschwick

immediate surroundings (neighborhood)
agriculture/industry
connection with the roads
trucks flows
scale differences
collaterals/externalities (pollution, noise, congestion..)
production increase
protest

Oer-Erkenschwick is a town in North Rhine-Westphalia, Germany. It is situated in the northern periphery of the Ruhrgebiet, circa 5 km from Recklinghausen. The municipal area comprises 38.8 km², including built-up areas and agricultural land. More than 50% of the area is occupied by agriculture. This, in combination with the high presence of industries, generates a quite specific urban landscape of production. The urban settlements are normally surrounded by industrial activity, which works as filter between the town and the countryside, where many productive processes start.

The Westfleisch center has been developed on a large plot crossed by the overland route L511, ensuring easy access and efficient functionality in terms of transport logistics.

There is a pronounced difference of scale between the factories and the residential and other urban structures, which expresses the impact of industrial meat production on this landscape.

The difference of scale also creates conflicts between the industry and the inhabitants of the surrounding villages because of bad smells, noise pollution, traffic jams and pollution. The disagreements increased when Westfleisch communicated the decision to expand its Oer-Erkenschwick facility in order to double the weekly production output to 100.000 slaughtered pigs. This decision was approved despite of the petitions and the protests of a large number of people.

URBAN

CEMENT

DAR ES SALAAM AND THE YELLOW GIRAFFE
THE EFFECTS OF CEMENT IN DAR ES SALAAM'S URBANISATION PROCESS

MARIEKE LE NEÜN
NINA PFEIL
ESTHER SCHWEDLER
CAMILLE VALETTE

Habitat Unit

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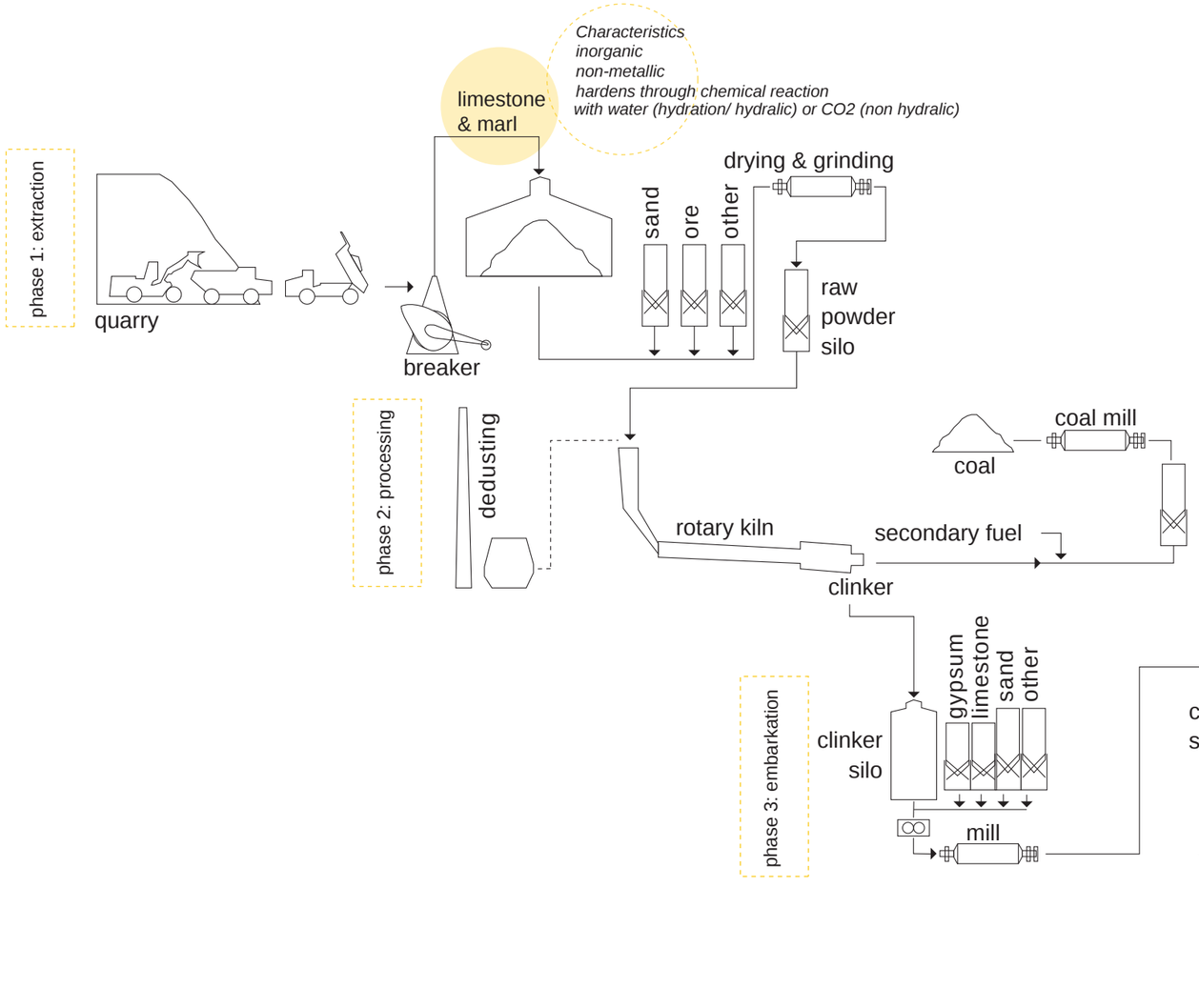

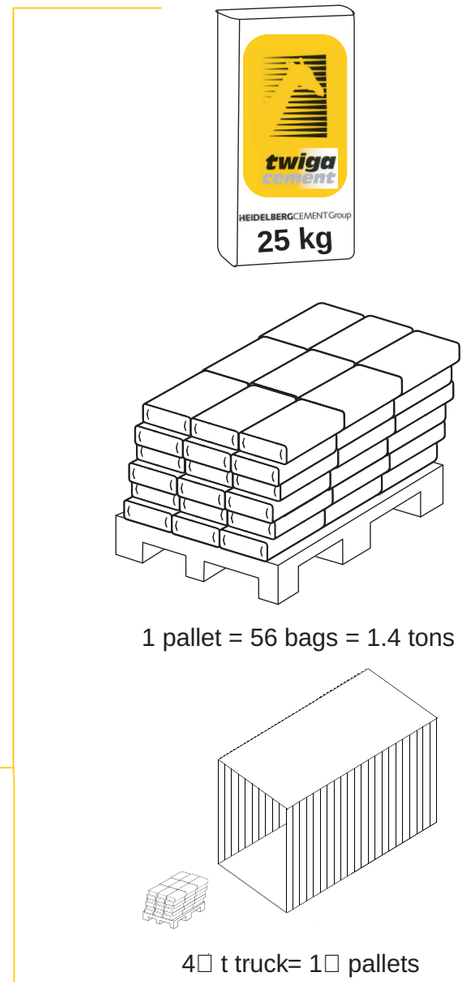

PRODUCT

Cement

most used man-made material in the world (4.1 mil tons/ 2017)
second most consumed product in the world
third largest emitter of carbon dioxide (7% of greenhouse emissions world wide)
most future growth in consumption expected in sub-saharan region
usually less than 200 km distribution radius

Cement is a crucial building material with a long history. Its use has increased especially from the 19th century onwards, after Portland Cement, the most common form of cement and the basic ingredient of concrete, was patented (Rodgers 2018). The largest growth in future cement consumption is expected in the sub-saharan region (ibid.). The inorganic and non-metallic product is mainly used as binder, for example for concrete (WHD n.d.).

Cement production includes phases of extraction, processing and embarkation (ibid.). Crucial elements of a cement plant are the kiln and mills (ibid.).

The most common form of distribution for cement is powder, packaged in 25 kg bags. 56 bags are stored on one pallet, equalling a weight of 1,4 tons. A standard 40 ton truck with a permitted payload of 25 tons can thus transport 18 pallets carrying 1008 bags.

Producers claim the radius of distribution is usually less than 200km (HeidelbergCement AG 2018: 20). In many cases, cement thus appears to be a local product. But the production and use of cement are very resource intensive. In consequence of its huge environmental impacts, the sustainability of the product is highly questionable. This also hints to the limits of the ongoing and worldwide investment in the built environment driving the expansion of cement consumption and production (Harvey 2016).

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Camille Valette

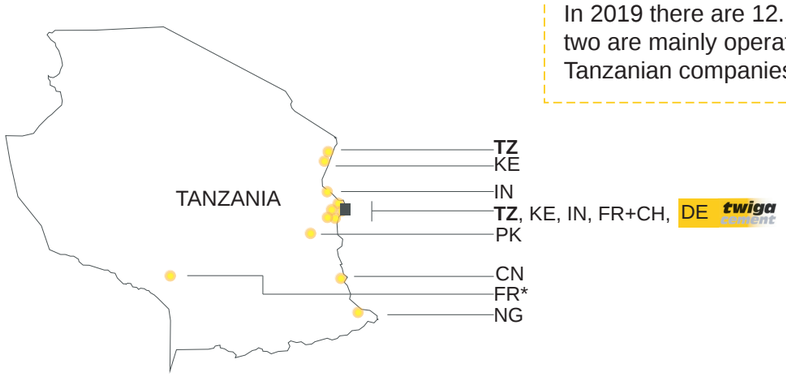
countries with manufacturing sites

countries with manufacturing sites in sub-saharan Africa

production sites of HeidelbergCement group

the world's second largest cement producer

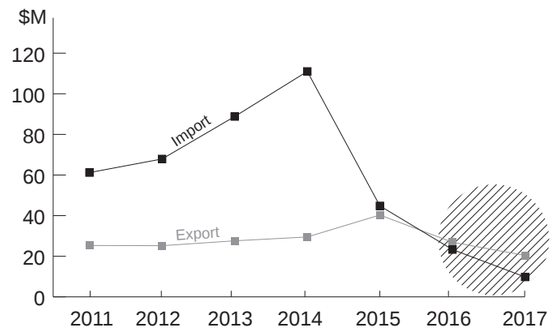
Until 2011 there were three cement plants in Tanzania. In 2019 there are 12. Only two are mainly operated by Tanzanian companies.



origins of cement company holders in Tanzania

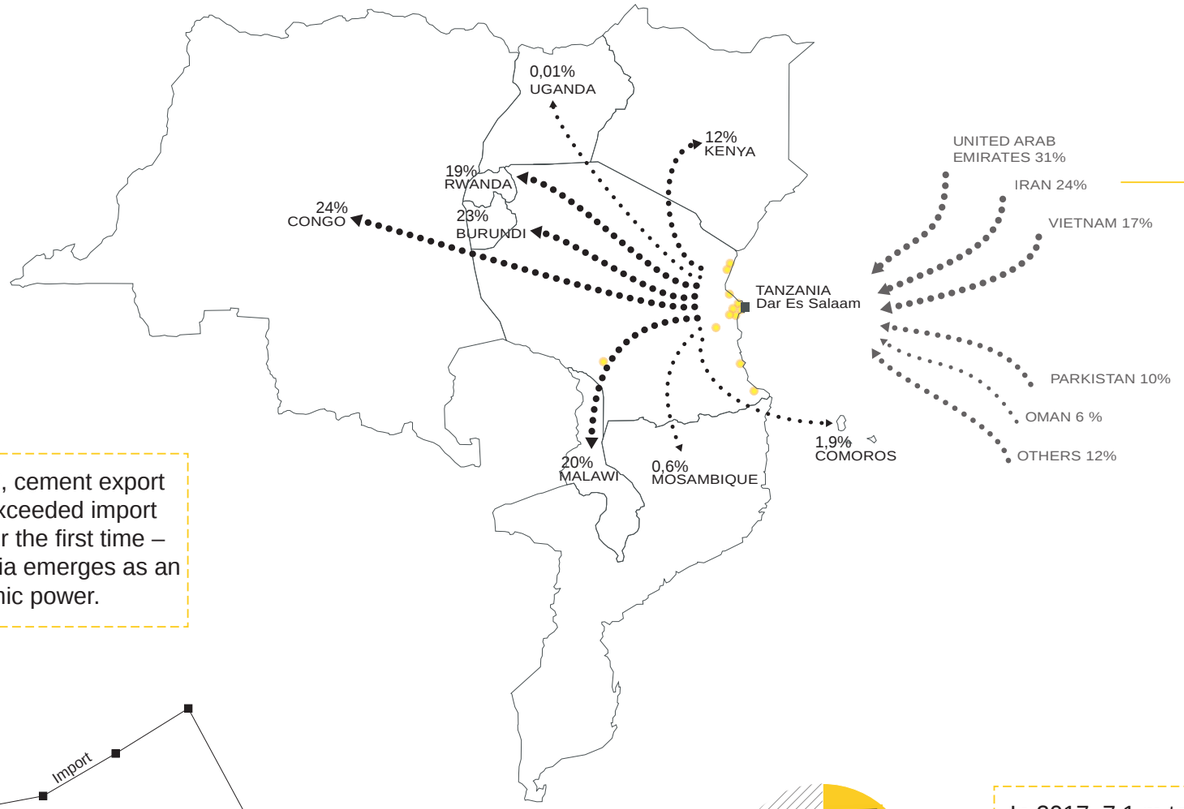
an industry of international alliances

In 2016, cement export rates exceeded import rates for the first time – Tanzania emerges as an economic power.



cement trading development in Tanzania

growth of the cement industry reflects urbanisation



In 2017, 7,1 m tons of cement produced in Tanzania. Twiga represents 36% of the market share.

PRODUCTION NETWORK

A subsidiary of the global player HeidelbergCement

cement plants in strategic locations close to market, concentrated around Dar
rapidly growing cement industry
dominant international actors
decreasing cement import demand,
cement export to neighbouring countries
TPCC as a market leader in Tanzania

Tanzania Portland Cement Company, producer of the Twiga cement brand with the yellow giraffe, is located in the Tanzanian metropole Dar es Salaam. It is a subsidiary of HeidelbergCement group, the largest cement producer in Germany and the second largest in the world. Also other international stakeholders have invested in Tanzania's cement market, as demand is expected to rise in the region (Rodgers 2018). The industry represents an international mix of companies based in China, France but also India, Pakistan and African countries. Only two out of 12 plants are operated by Tanzanian-based companies (CemNet 2019).

From the early 2000s until today, Tanzania's cement industry has grown rapidly. The number of plants rose from three in 2011 to 12 in 2019 (GTAI 2017). Since 2016, Tanzania has been exporting more cement than it is importing. Tanzania also became an important supplier to its neighbors Burundi, Congo, Rwanda and Malawi. (OEC 2017).

Cement production in Tanzania appears to be strongly interrelated with international alliances. In critical reflection of the firm and production networks, the question arises as to who really benefits from the booming cement industry dominated by foreign actors. Does the growth in this production sector implicate a short-term absorption of resources or really a long-term investment in the country?

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Esther Schwedler
Camille Valette

46 - 1826

1827 - 4776

4777 - 12833

12834 - 26737

54781

population density per km2

dar es salaam as a growing city

Twiga Cement factory

cement plant

TPCC flows

railway

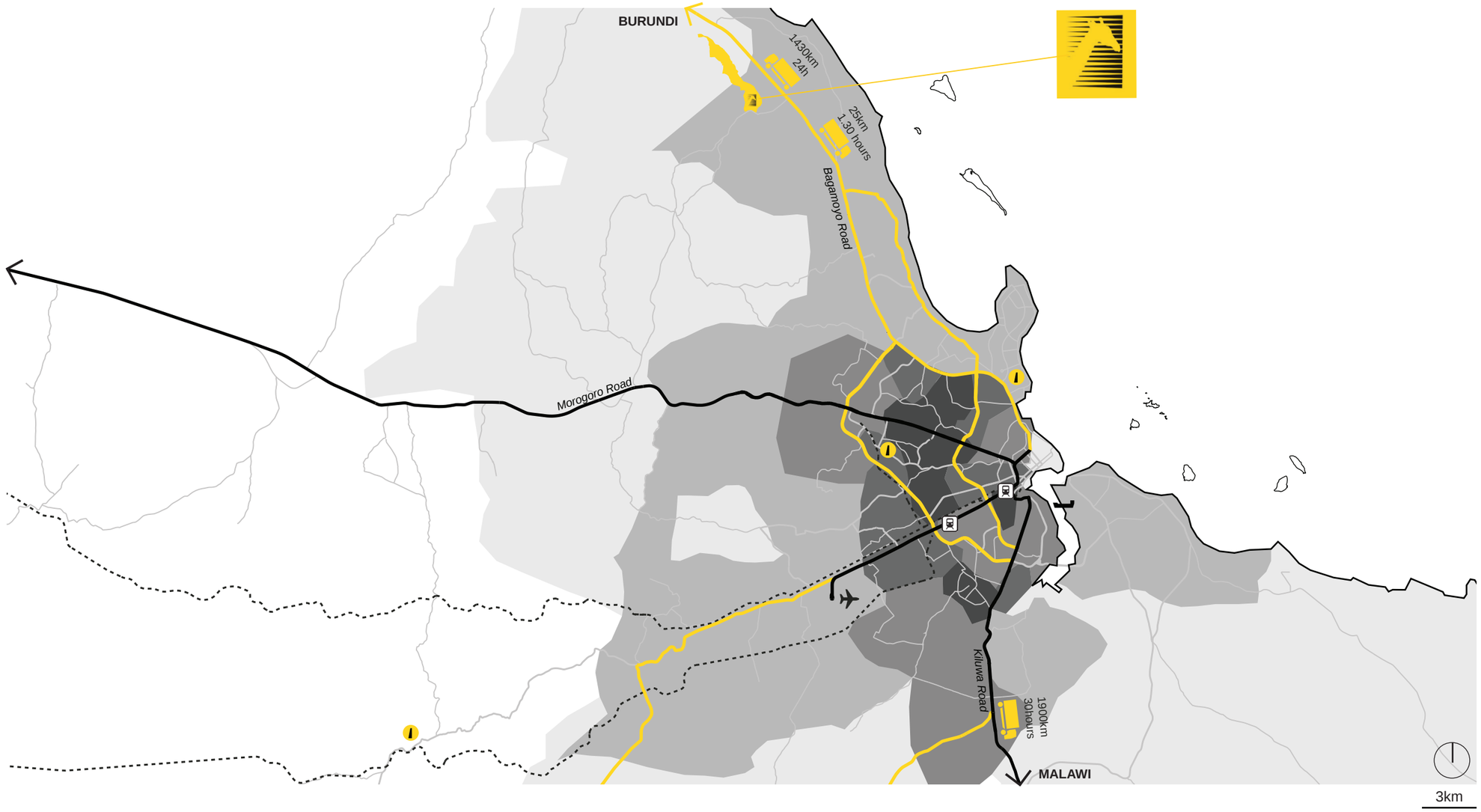
highway

main roads

airport

train station

container port



INFRASTRUCTURE NETWORK

Logistics and transport in Dar

product logistics
temporality of flows
growing population density
insufficient infrastructure
transportation difficulties
congested roads
poverty and inequalities in Dar es Salaam
25km distance = 1.30 hours drive to the city centre from TPCC

TPCC sells cement mainly in Tanzania and neighbouring countries. The distribution relies on trucks. Local handling, transport and logistics costs are high for the company due to a poorly developed transport sector and infrastructure (TPCC 2007). In fact, the TPCC plant is situated in the north of of the city at Wazo Hill, 25km from the city centre, and it takes an hour and a half for a Twiga truck to travel this relatively short distance.

Dar es Salaam, Tanzania's major city, is confronted with many difficulties regarding urban transportation. The low income levels of a majority of city inhabitants, the low quality of urban passenger transport and poor accessibility limit the inhabitants' mobility and thus may add to perpetuate poverty. The road network is marked by contrasts. While the few radial main roads are fairly well maintained, the condition of secondary roads has deterioriated increasingly. This has been causing severe problems concerning the interconnection between residential areas and the access to the city centre. (Diaz Olvera, Plat, Pochet 2002). The growing city experiences massive development of new infrastructure in the centre, financed by international investments and loans. However, seen in critical reflection, this may increase the fragmentation of its structure and reinforce social and spatial inequalities within Dar es Salaam.

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Wazo Hill, an area rich in limestone
quarry and plant site parallel to the highway
separating different types of residential areas

Twiga cement production cycle
complete production on site (approximative locations)

Wazo Hill Quarry and Plant

22.8 hectars quarry and plant area
limestone-rich area
1973 TPCC is nationalised
1998 TPCC is bought by the german Heidelberg group
290 employees nowadays
the biggest cement group of Tanzania and impacting sub saharan market

About 25km to the North from the centre of Dar es Salaam, at Wazo Hill, a limestone-rich area extends for about 2.5km parallel to the Bagamoyo highway. TPCC and three other quarries are located here. East of the plant and quarry there is a formally planned neighbourhood with schools and a hospital, west of the plants infomal settlements have developed.

TPCC has a production capacity of 1.4 million mt of cement per year, a considerable share of the national total cement production of 3 million mt. TPCC is held by HeidelbergCement Group, but the local factory management has full responsibility for production and market development (Twiga report 2017) It is headed by chairmen from Turkey, Spain and UK as well as Tanzania, The plant employs 290 workers, mainly Tanzanians.

As the demand for cement is growing in East Africa, TPCC invests in sources of raw material and reliable energy supply. For instance, a gas plant is planned to be built on the site. Since 2018, Twiga Cement has been organising sustainability events in cooperation with schools. Meanwhile, in March 2018, ultimatums to control dust pollution in order to protect surrounding neighbourhoods and to regulate factory water pollution have highlighted the ecological problems linked to the plant.

ARCHITECTURE

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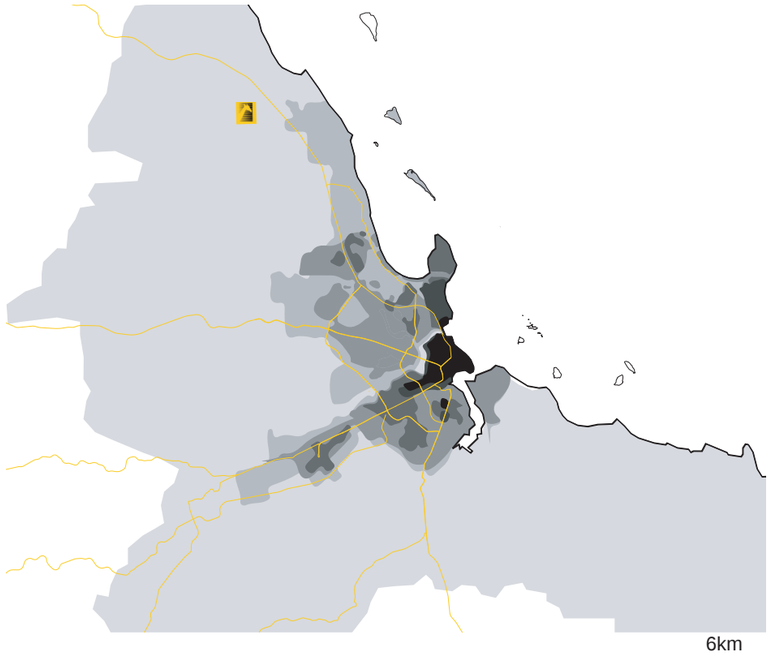
Nina Pfeil
Esther Schwedler
Camille Valette

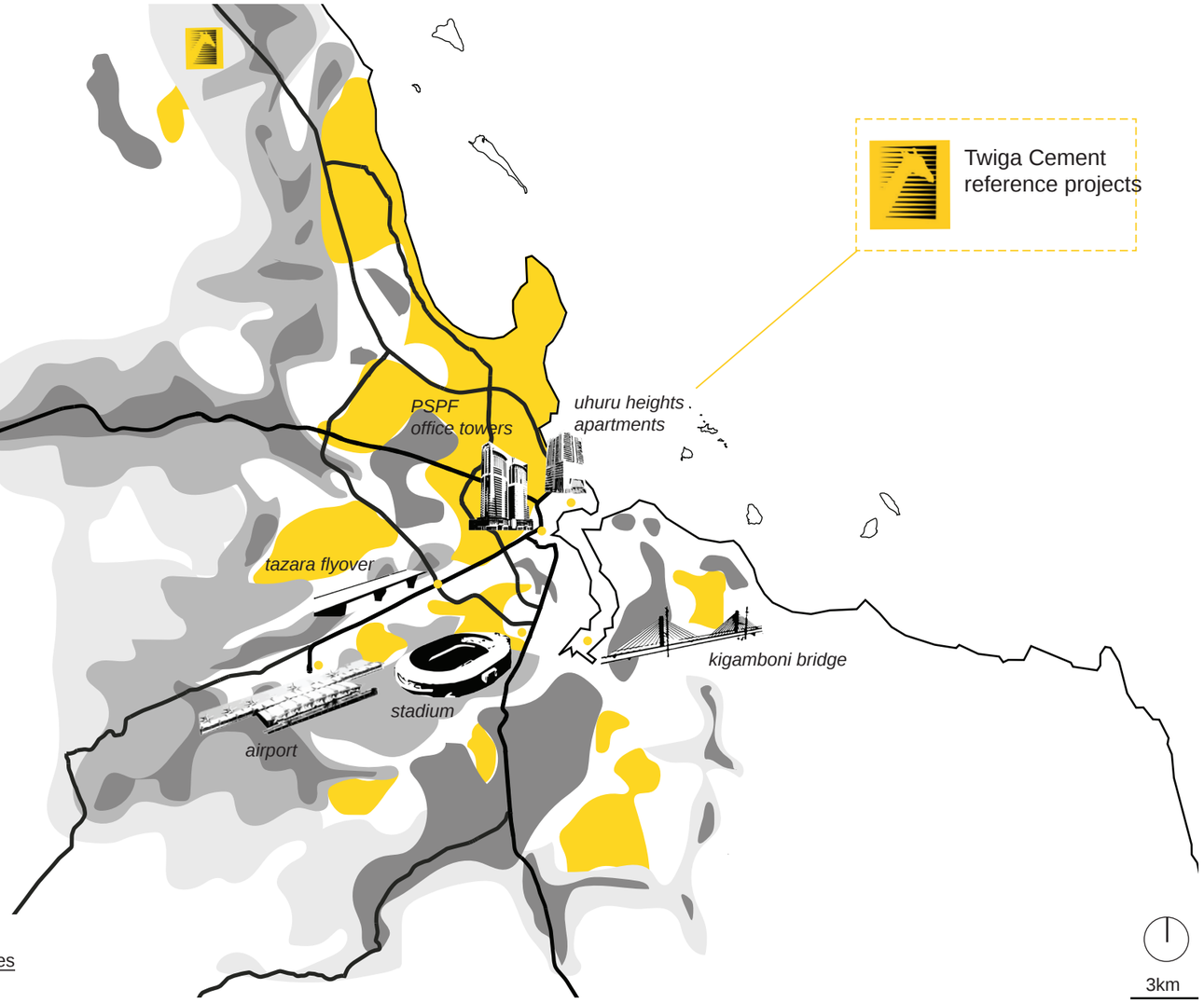


2014
1992
1978
1963
1947
1945

urban development

Dar es Salaam's rapid growth

informal residential 2002
informal residential 2012
informal residential 2022
planned residential 2022
other urban 2022



informality

informal and planned residential zones

Urban Development in Dar es Salaam

5,47 million inhabitants in 2019
10 million inhabitants projected in 2030
fastest growing city in East Africa
dominated by informal developments
inefficient transport network
flagship projects built with Twiga cement

Dar es Salaam counted 5.47 million inhabitants in 2019. Assumed to be the fastest growing city in Africa (The World Bank Group 2019), it is expected to be a mega city with 10 million inhabitants in 2030 (Huang 2017). Dar experienced phases of growth under the German colonial regime and after Tanzania's independence in 1961. Mainly, urban development followed the old colonial street patterns, however new infill development required new roads and ultimately resulted in uncontrolled growth.

Nowadays the urban area is characterized by a densely built up city centre and rapidly expanding suburban areas (ibid.).
Focusing the city's rapid growth, the resulting sprawl, increasing informal settlements and an inefficient transport network, the World Bank developed the Dar es Salaam Metropolitan Development Project in 2015 (The World Bank Group 2019).
New developments are constructed using Twiga Cement. Flagship projects like the Julius Nyerere International Airport or the New National Stadium, the PSPF Office or 'Twin Towers', Uhuru Heights Apartments and the Tazara Flyover are proudly displayed as references of the yellow giraffe brand by the company (TPCC n.d.).
Who benefits from the ongoing growth and urbanisation? Are the presented developments evidence for a trajectory leading towards a decent life for everyone? Is informality and low-income-housing built within a new development strategy as well?

URBAN

COAL

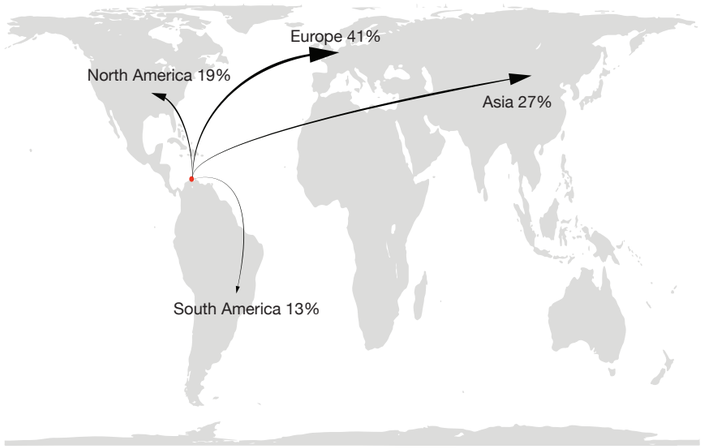
EL CERREJON. IMPACTS OF EXTRACTIVISM ON URBAN STRUCTURES IN COLOMBIA

VALENTINA NADWORNICEK
LEONI WEYRAUCH

Habitat Unit

Nadwornicek, Valentina
Weyrauch, Leoni

Colombia's Export of Coal Briquettes

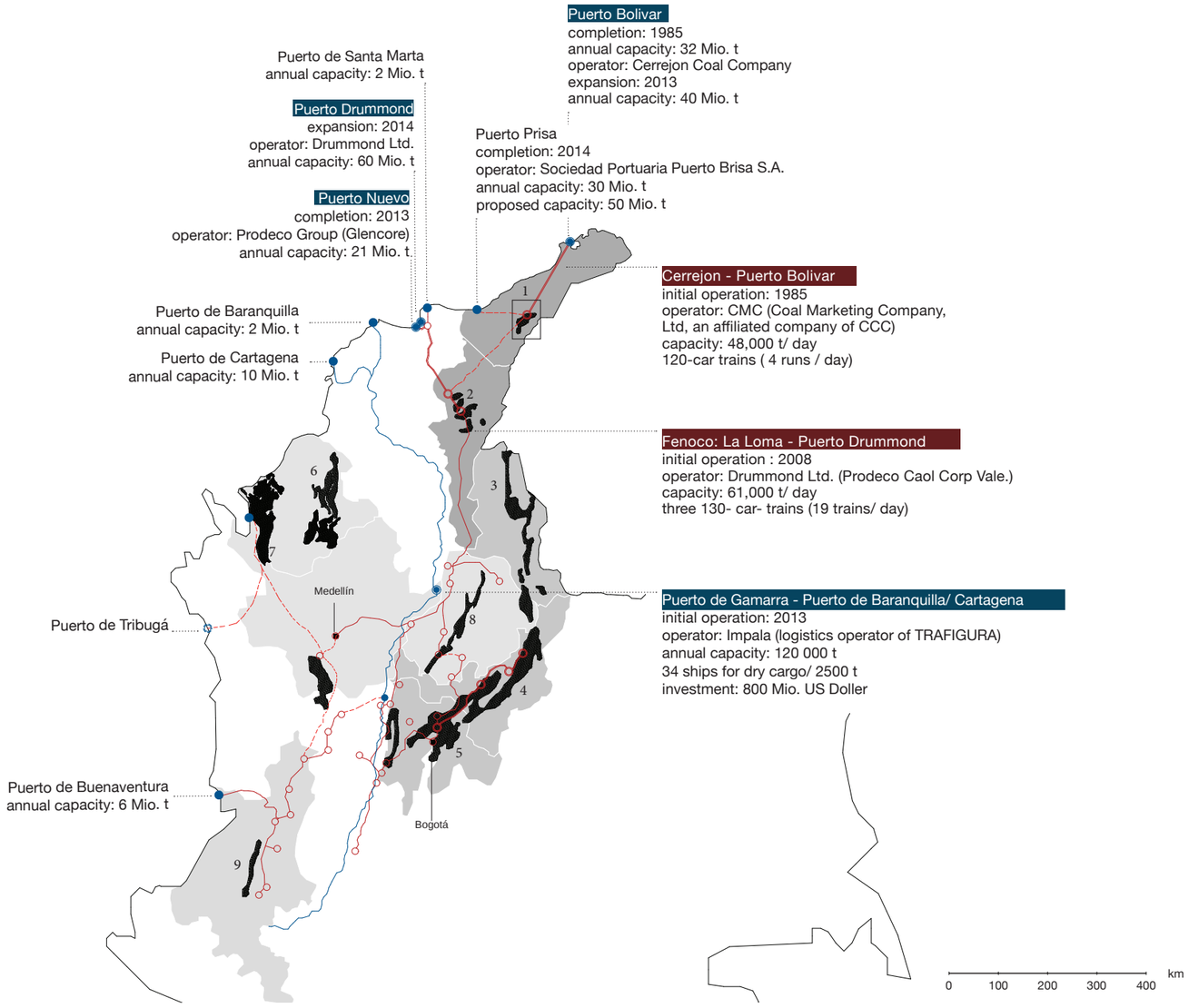


- port
- private port
- planned port
- water route
- railway
- private railway
- planned railway
- potential coal deposit

Coal Production of Departments

3M t - 36,5M t	1 La Guajira 2 Cesar
150 000 - 3M t	3 Norte de Santander 4 Boyaca 5 Cundinamarca
- 150 000 t	6 Cordoba 7 Antioquia 8 Santander 9 Cauca

INFRASTRUCTURE NETWORK



Relation of coal deposits and railway network

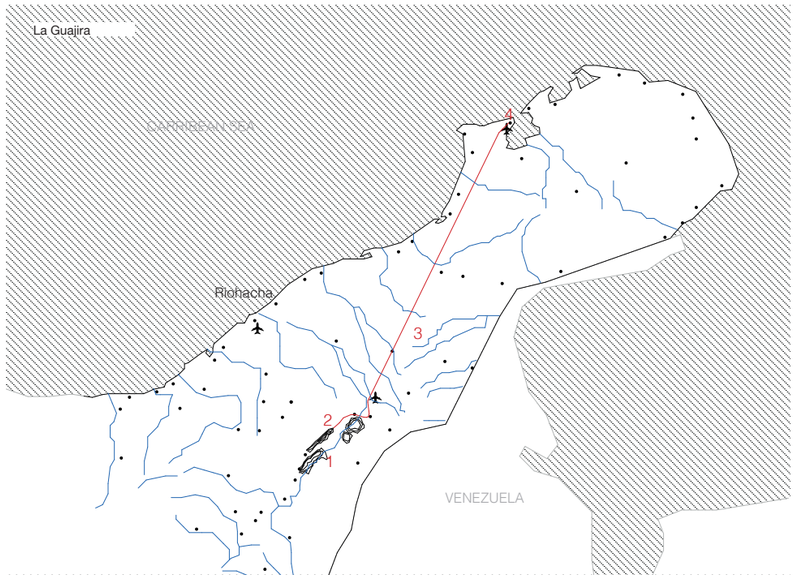
The mainly export based economy of Colombia has always been strongly dependent on the development of the railway network, which initially made it possible to bring agricultural commodities and today serves to transport mining commodities to the ports of Colombia.

The railway network, constructed over 170 years starting in 1850, was instrumental for the development of the main corridors that facilitate the export of commodities to global markets. Once constructed, the company-owned railway lines operate with high efficiency and conveniently low transportation costs. The map shows the railway lines in perfect overlap with the mining areas of the country. They serve as direct connections to the ports, from where the coal is shipped to the purchasing countries.

In 2016, Colombia's yearly coal production reached 59,9 Mio t, making the country the world's tenth largest producer of hard coal and the fourth largest exporter of coal. 91% of the extracted coal is exported. The major share (41%) (Simoes, 2017) is shipped to European markets due to shorter distances and lower freight costs compared to the rapidly growing Asian markets.

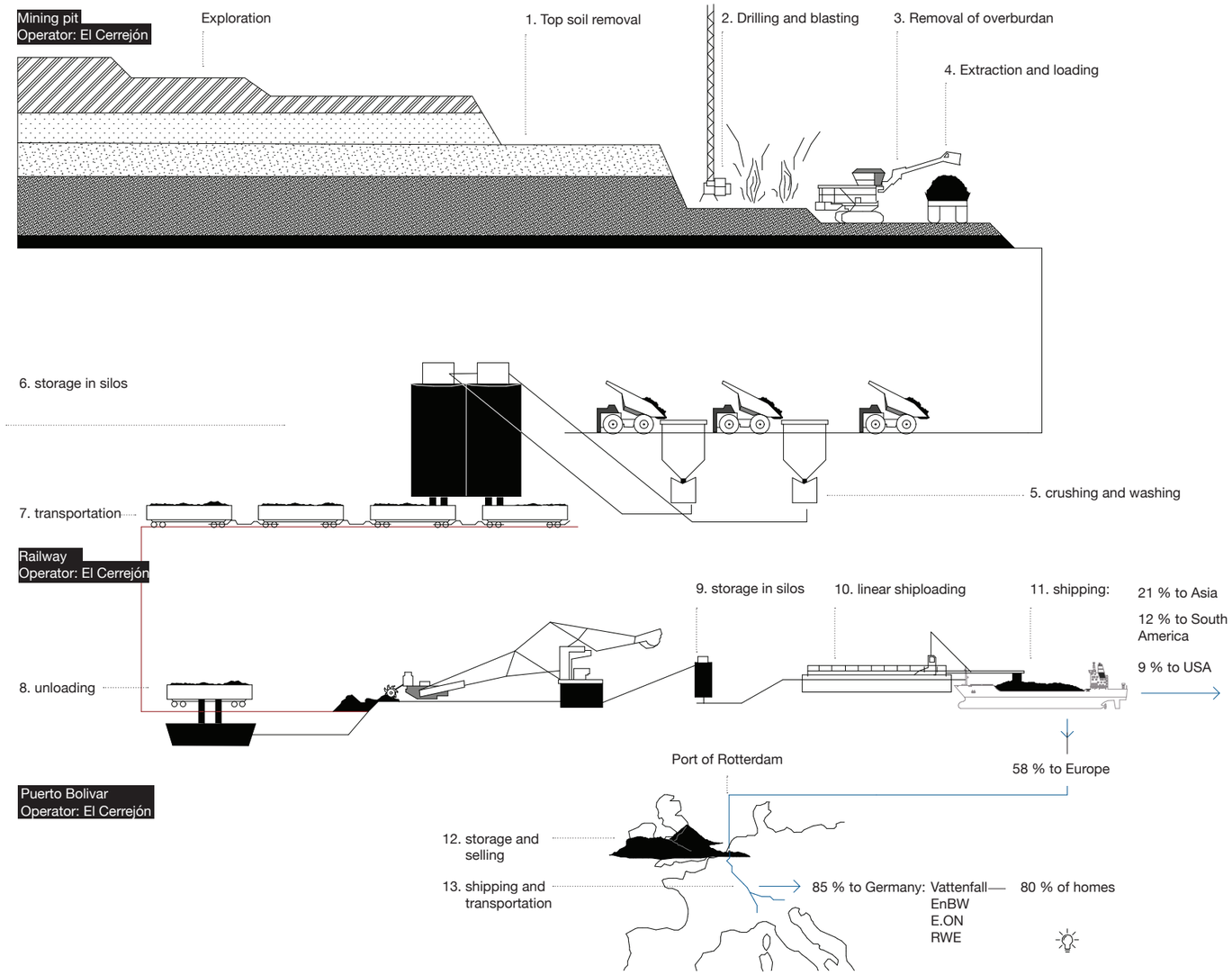
Major carboniferous zones are located in the departments of La Guajira and Cesar with advantages for export. Other departments in the heart of the country show commercially viable mines as well, but due to the longer transportation distances the margin of profit is reduced.
Thus, not only the size of a coal deposit is decisive for its exploitation, but also its location and the quality of its connection to ports.

Nadwornicek, Valentina
Weyrauch, Leoni



Places of Production

1 El Cerrejón: mining
2 Albania: coal
3 Ferrocarril: inland transport
4 Puerto Bolivar: shipping logistics



PRODUCTION NETWORK

The production chain of El Cerrejón

The overall system is very efficient, fast and results in low costs for el Cerrejón. In comparison with other countries, the Colombian mines save the most money with their low inland transport and shipping costs, followed by South Africa, Indonesia and Russia.

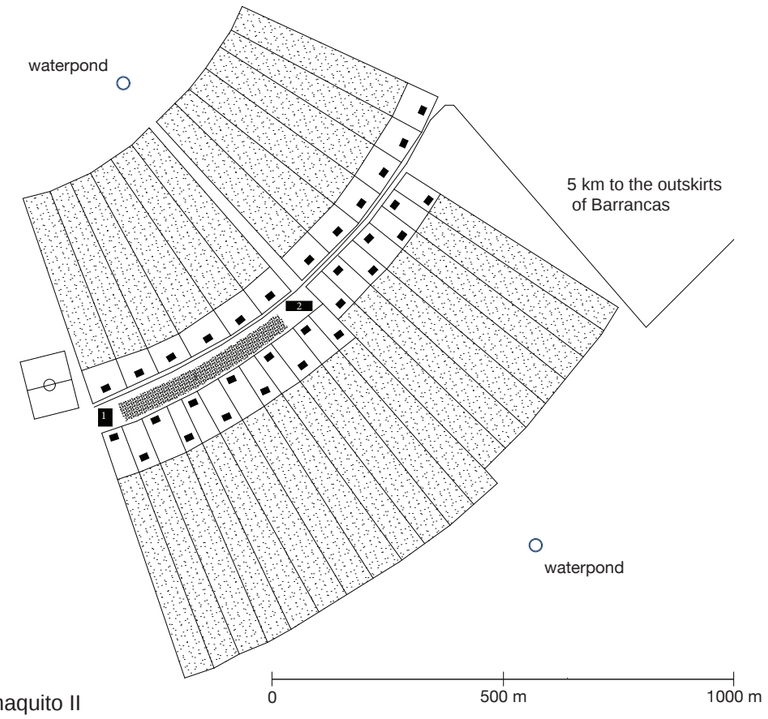
In 1985, coal transport started with two trains per day. Nowadays, around 48,000 tons are transported daily, trains run forth and back to the port 8 times a day.
Coal, a natural material found beneath layers of soil, is extracted through drilling and blasting with dynamite or drill compressors. These processes cause the volatilization of great amounts of coal dust. El Cerrejón uses 27-35 million litres of water daily for the irrigation of roads, according to a policy brief by Dupre-Harbord (2017: p.3).

Water use is one of the main fields of conflict in the area, where by contrast, according to the United Nations Development Programme, the average person has access to 0.7 liters of untreated water a day.
The splintered material is loaded onto hauling trucks by hydraulic shovels, which transport the coal to the processing station in the northern section of the mine. There it is ground, washed and stored in two 12,500 t silos which load directly onto 109 freight wagons, each in less than a minute.

Another 6 million litres of water are used for these processes. For every ton of high quality coal, on estimate 17 tonnes of waste material is produced, amounting to 816,000 tonnes of waste daily, containing high amounts of heavy metals and toxic elements.Waste ist stockpiled and continues to contaminate nearby rivers.
From the point of loading, the coal is transported to the port in open freight wagons. Upon arrival the coal is stored in open piles until it is loaded on the ships.

Nadwornicek, Valentina
Weyrauch, Leoni

Site plan of the resettlement of Tamaquito II



Tamaquito II

- built up structure
- horticulture
- subsistence agriculture

1. communal assembly
2. primary school

The mine

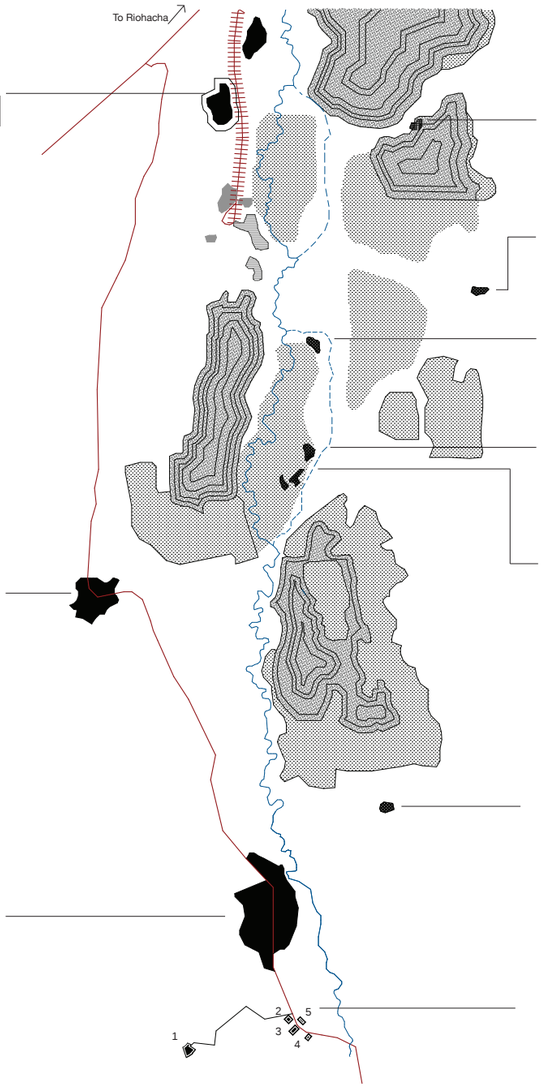
- mine today
- expansion approved
- expansion planned
- facilities
- coal storage

Urban structure

- gated community
- settlement
- former settlement
- in resettlement process
- resettlement

Infrastructure

- sealed road
- train track (Cerrejón)
- river (Rio Ranchero)
- relocation planned



I. The gated community

MUSHAISA
completion: 1983
Construction: Morrison-Knudsen
Capacity: 2,200 residents

II. The municipalities

HATONUEVO
foundation: 1840
municipality: 1994
popolation: 2005: 16 000
2017: 25 000

BARRANCAS
foundation: 1664
population: 1985: 24 000
2005: 26 000
2017: 37 000

III. The indigenous/ Afro-Colombian settlements

Tobaco
Afro-Colombian
forced displacement: 2001
350 families

Tamaquito
Wayuú
start of displacement: 2013
31 families

Roche
Afro-Colombian
start of displacement: 2011
25 families

Patilla
Afro-Colombian
start of displacement: 2012
73 families

Chancleta
Afro-Colombian
start of displacement: 2012
57 families

Las Casitas
Afro-Colombian
start of displacement: 2014
31 families

IV. The new settlements provided by *El Cerrejón*

1. Tamaquito II / 2. Patilla / 3. Chancleta / 4. Roche / 5. Las Casitas

0 — 5 km

URBAN CHANGES

Expansion of El Cerrejón and its impact on urban processes

The constant expansion of the El Cerrejón mining pit since 1976 and its transportation network show a strong impact on urban structures and displacement processes. The emergence of international gated communities, working class towns and the resettlement of indigenous and African-Colombian villages can be seen as a result.

The lifestyle based on self-sustainable agriculture of different ethnic groups, mainly Wayúu, ended with the discovery of natural resources and the opening of the El Cerrejón mine in 1973. As a consequence numerous displacements of indigenous and African-Colombian villages in the region of La Guajira took place. According to Indepaz, an NGO working with displaced communities in the area, 17 of these communities have “disappeared” over the last 20 years. People had to move because of the construction of the railway, the port and the constant expansion of extraction activities. In the case of ongoing resettlement processes, as in the village Tamaquito, El Cerrejón states their aim is to perform “responsible, comprehensive resettlements”, but the reality shows the contrary. The living environment changed from being traditionally set in a rural zone to a semi-urban environment. While former settlements were close to the river, now a road is connecting the new settlement to the city Barrancas.

Within this semi-urban environment El Cerrejón replaced the organic village structure by a rigid plan, consisting of one lane being seamed by standardized houses, one next to another. (Hora, 2014) Apart from the disrespect of the settlement structure and architecture, the people, which used to have 5000 ha of agricultural land, received only 300 ha which do not allow self-sustainable agriculture anymore. Paying for electricity, food and water supply, they were put in economic dependency of El Cerrejón.

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