The Logistics of Milk and Timber

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The Berlage Center for
Advanced Studies in
Architecture and Urban Design

Abstract

The Berlage's 2023 Project Global titled "The Logistics of Milk and Timber" is part of a three year investigation on global supply chains in the Core Network Corridors established by the European Union. This year, the research project aims to describe and document the logistics environment of the North Sea-Baltic Corridor through the lens of milk and timber, from the small scale of the object to the scale of the corridor. The exercise explores the spaces, trajectories, materials and actors that take part in the supply chain to create a comparative and synthetic study of both industries. Focusing on Estonia, the research will consider the involvement of local, national, and extranational factors in the timber and milk supply chains. The investigation aims to project potential future developments and their architectural implications to define relevant spatial and design questions.
The project is based on an understanding of the spatial, natural, or technologically modified properties of milk and timber- their cultivation, extraction, processing, distribution, and consumption. The logistic environments and instruments involved in these processes are studied for their individual characteristics and co-dependent organizations mediating between economic and ecological sustainability, and between the Estonian and trans-European contexts through the North Sea Baltic Corridor. Representative diagrams, drawings, and maps showcase the interdependent spatial relations between living organisms, human consumption needs, constructed objects, product values, logistic spaces, and infrastructure that together constitute supply chain networks. This dossier documents the collective research on both industries including specific products. The more in-depth case studies are structured within a framework that allows for comparability between their key elements.
The first part of the semester concluded with fieldwork in Estonia, which was documented in the form of a documentary and expert conversations. Excerpts from the fieldwork are included in the collective documentation and allow for the formation of fourteen design questions relevant to the spatial implications of the logistics of timber and milk.

Table of Contents

Introduction

North Sea-Baltic Corridor

The North Sea-Baltic Corridor (NSBC) is one of the EU's nine transportation corridors. The overall objective is to develop a competitive and interoperable trans-European transport network. The corridor spans through Belgium, the Netherlands, northern Germany, Poland, through the Baltic States to Finland and Sweden. The main instrument to implement the NSB Corridor objectives are transport infrastructure projects, including roads, railways, and inland waterways.
The corridor aims to establish a competitive and interconnected trans-European transport network of goods and people to capitalize on the economic potential of the area. The most significant project within the corridor is Rail Baltica, which is meant to transform the Soviet gauge railway infrastructure of Estonia, Latvia, and Lithuania and connect it to the rest of the states using the standard European gauge. Freight transport opportunities will expand the markets for the goods produced in the Baltics and provide more diverse opportunities for employment.
Estonia is a post-soviet and EU member country, the northernmost of the Baltic states. Its historical national economic reliance on forestry and agriculture and its geographical position between Scandinavia, Russia and the rest of mainland EU make it an integral point in the trans-european supply chains of milk and timber products. Although it is a small country, it has a long coastline and numerous cargo ports, which are the northernmost ones that are kept ice-free year-round.
Since the Russian invasion of Ukraine, Estonia has faced economic challenges. It lost a significant trade partner and faces a stand still in foreign investments due to the tense political climate in the area. Although this has also created opportunities to expand in the European market, with higher focus on establishing inter-european trade networks.

Estonian milk

Estonian dairy farms are considered to be among the most productive in EU, as they initiate the circulation of high-volume and high-quality milk products into the country's internal market and, almost to the same extent, into markets of countries along the NSBC. The development of the dairy industry has, in part, been contributed to by the country's natural characteristics and climate conditions which allows dairy goods to be produced at a relatively low cost. In addition it is equally important that selective cattle breeding over the course of the twentieth century has rendered the Estonian Holstein breed very productive.

The Estonian dairy industry can be traced back to the early nineteenth century. The proliferation of livestock manors during this time paved the way for increased milk production, which, in turn, led to the establishment of homestead dairies. To improve the quality and efficiency of these dairies, foreign experts were brought in to provide guidance on livestock and dairy management. At the end of the nineteenth, there were already 200 active manor dairies utilizing steam or horsepower, mainly producing butter and Swiss cheese. Early in the 20th century, there was a surge in the popularity of home and private dairies, and the widespread use of manual separators and butter machines became a common practice. Co-operative dairies were also established, with the First Congress of the Estonian Farmers' Unions in 1899 laying the groundwork for dairy co-operation. Successful co-operative dairies established a framework for more efficient dairy production, livestock farming and agriculture. The number of dairies in Estonia increased rapidly after World War I, and by 1934, the Estonian dairy industry relied almost entirely on joint activities. The development of technology and the increase in milk production led to the establishment of a well-organized milk collection network. Farmers would take their milk in 40-liter cans to the dairy on a horse wagon. Co-operative dairies that survived the Second World War were gradually absolved by the collectivization of agriculture and nationalization of dairies under Soviet rule. Over the course of the

following three decades, fresh milk dairy plants sprouted up in various Estonian cities, including Tallinn, Tartu, Paide, Pärnu, and Jõhvi. As a result, many of the smaller local dairies and creameries gradually shut down, reducing the number of dairy plants from 212 in 1950 to 41 in 1980. Although there were fewer dairy farms, milk production increased in the second half of the twentieth century, reaching an all-time high in 1987 with 1,290,000 tons of milk produced. By the end of the Soviet era, all milk produced in Estonia was being processed by nine dairy companies and two combined meat and dairy companies. The restoration of Estonian independence in 1991 from the Soviet Union lead to the privatization of agriculture and processing industries. This resulted in a decline in milk production and consumption in the first decade. However, after joining the European Union, Estonia's milk production began to recover. New farms and industries were established, equipment and technology were updated, and new dairy products were introduced. The country's dairy industry has seen the emergence of small producers who specialize in unique dairy products and traditional national products.

The Estonian dairy industry has a long history, dating back to the early 19th century when livestock manors paved the way for increased milk production and the establishment of homestead dairies. The industry saw the use of foreign experts to improve the quality and efficiency of dairies, with the proliferation of co-operative dairies that established a framework for more efficient dairy production, livestock farming, and agriculture. The industry grew rapidly after World War I and relied almost entirely on co-operative farms by 1934. During the Soviet era, the dairy industry experienced significant changes as a result of collectivization and nationalization of dairies. This led to the closure of numerous smaller local dairies and creameries. Milk production increased despite fewer dairy farms, reaching an all-time high in 1987. After Estonia regained independence in 1991, the industry declined but began to recover after joining the European Union, with the emergence of small producers who specialize in unique dairy products and traditional national products. The organic market of dairy products since the early twenty first century has helped local farmers survive by providing subsidies and higher price points for their goods.
While most large dairy farms in Estonia today send their milk abroad for processing, smaller organic farms often process the milk themselves due to the high cost of organic feed. By managing the entire supply chain on their farm, organic farmers have the freedom to use different techniques for cow management, pasture treatment (including the use of manure and organic biomass), and milk product processing. This holistic approach allows smaller farms to select the products they want to make, with the organic label allowing them to reach a higher price point. Additionally, EU organic regulations and certifications provide these farmers with certain subsidies that regular dairy farms cannot access
In 2021, Estonian dairy farmers sold over 800 thousand tons of milk, accounting for almost a fourth of agricultural production. The price of raw milk has recently skyrocketed, reaching an all time high of around 500 euros per ton in December of last year.

Estonian timber

More than 50% of the country's land are forested areas, with about 30% of that land being under national forestry protection. The country's economy is heavily reliant on the timber industry, with 30% of its output profits coming in the form of bioeconomy and timber. Since Estonia's integration in EU, an increasingly more strict legal framework of forest management regulates harvesting and reforestation in state and privately owned forests.
In year 1991 the Estonian state decided to launch the land restitution process, aiming to give back the land to private hands and restore the properties as they were in 1918. Illegal logging, which was common during the 1990s has significantly decreased due to imposed EU forest management and timber trade regulations, such as the European Union Timber Regulation. During the same time frame, EU funding and greenfield investments have played an important role in the development of the Estonian timber

sector, allowing its industries to become high-tech and productive, responsive to the market's needs with regard to the quality of products and security of supply.

Currently 41% of the forested area is owned by the Estonian State, 33% is owned by individual private owners and 15% is owned by other legal entities and/or institutions. 8% of forested lands are yet to be privatized, as final determinations are awaiting legal rulings. The country's foreign trade balance of timber products was +1 780 000 000 euros in 2021 and +11 333 000 000 euros in 2022.

In response to challenges due to the Russian - Ukraine war, in the summer of 2022 Estonia announced a relaxation of logging restrictions on state-owned land. As a result, the area of land logged will increase by almost a quarter to 2,400 hectares, according to Siim Kuresoo, of the conservation non-profit the Estonian Fund for Nature.

Methodology

Firstly milk and timber were studied as natural resources in the context of Estonia. The research on the primary natural resources, the cow and the tree, and on the environments and methods in which milk and timber are extracted as raw materials, was transposed into a collection of drawings. Since the extracted materials were investigated as commodities, they were necessarily included within applicable ranges of similar or comparable objects. The ranges that are relevant to the logistics of Estonian milk and timber products were documented to form a basis of the spatial, technological, and cultural parameters that define the managing processes of these resources.

The research scope was later extended to include environments, infrastructure and socio-economic constructs that largely define local Estonian positionings in the cross-scalar logistic network of Europe and of the NSBC. This was achieved through the documentation of relevant findings in a set of scaled maps. More specifically:

Trans-European scale maps of the NSBC showcase spatial elements that obstruct or promote the internal financial cohesion between EU country members and the global position of an EU single market.

Geopolitical scale maps showcase space-specific information about cross-national developmental relations that have emerged through the high degree of shared historic and geographic conditions in the Baltic states. (land use, socioeconomic conditions, and the TEN-T project of Rail Baltica.)

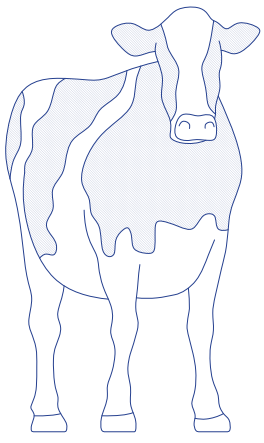
National scale maps showcase transportation infrastructure and productive environments that are relevant to all Estonian counties and territories. (the logistic infrastructure and the milk and timber industries to which the country's economy largely relies on)

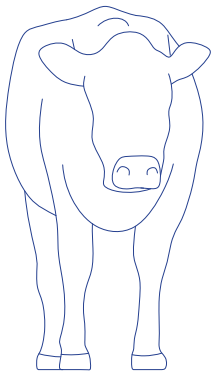
Metropolitan scale maps showcase logistic infrastructure and conditions that are articulated in the urban agglomeration of Tallinn and in smaller adjacent spatial organizations in its periphery and that characterize the role of the urban/industrial center in domestic and international trade relations. (urban-rural distribution map, public transportation network, industrial and logistics centers).
The instruments and environments that are embedded specifically in supply chains of milk and timber were documented through a set of case studies on specific Estonian products.The comparative drawings showcase dimensional and technological relations between the chosen products and the environments in which they are produced and distributed. In doing so the work refers to the broader trans-european context to which they relate.
The collective set touches upon the balance between rhythms and extents of cultivation, harvesting, production and distribution. More specifically for the timber industry, the extent and ways in which imported raw materials are used due to high production demands in the case study of the fire repellent door supply chain is explored. The mutually formative relation between the product and the space-specific regulations and conditions of the markets in which it is available is touched upon in the case study of the prefabricated wooden house supply

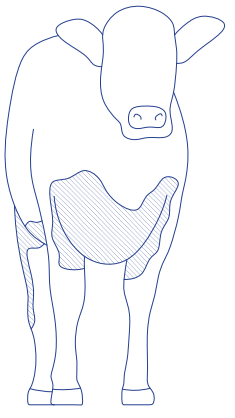
chain. The tapping on the economic potential of by-products in the case study of wood pellets supply chain is achieved through the case study of the wood pellets supply chain. Similarly for the milk industry, the regulated dependency between milk collection, cattle farming and feed crop cultivation is explored through the organic cheese supply chain. The production standards and long-distance transportation capabilities are showcased in the demineralized whey powder supply chain, while the the local-specific character of a product in relation to its mass-market circulation is most evident in the case study of the kohuke supply chain. The profit and customer satisfaction balance is achieved through the case study of the kefir supply chain.

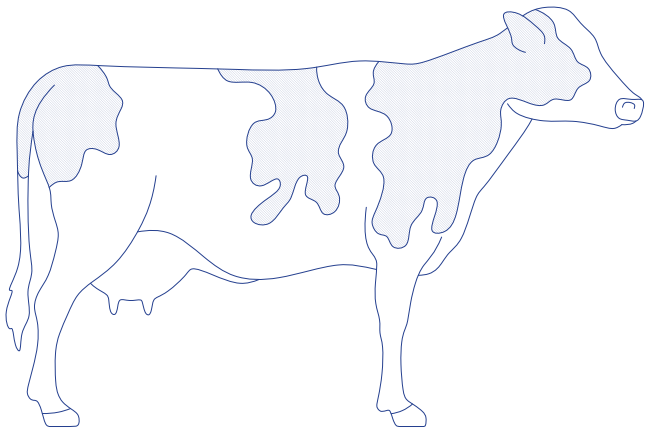
For each case study the key logistic infrastructures and vehicles that characterize their role in the milk and timber logistic network of Estonia and the NSBC will be presented.

Natural Resources

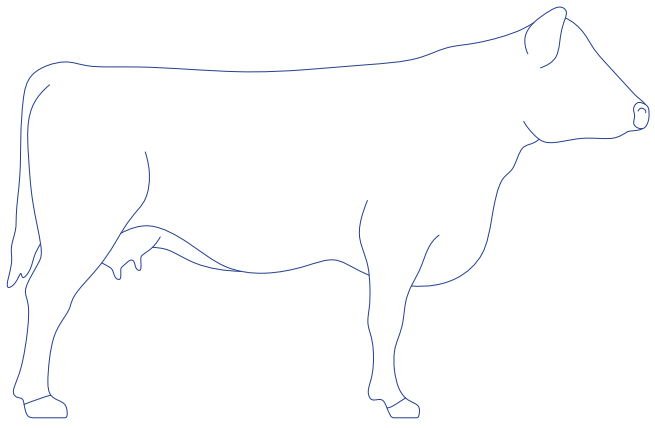




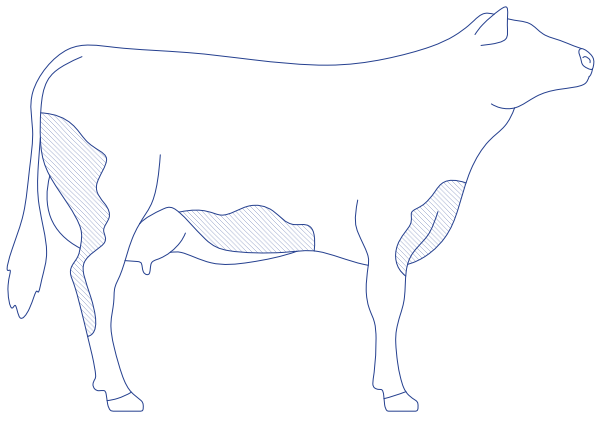




holstein cattle
9420 kg milk/year



estonia red cattle
8152 kg milk/year

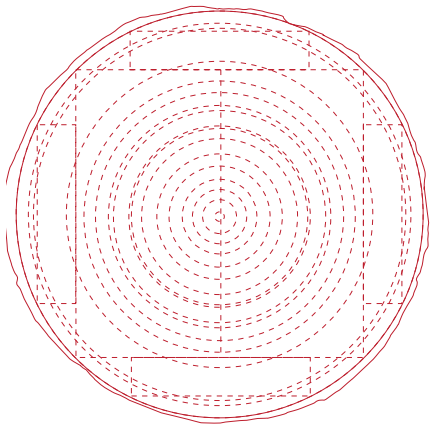


estonia native cattle
7822 kg milk/year

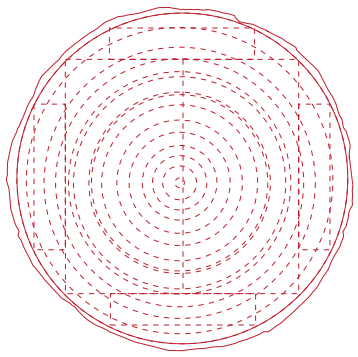
0 100 cm

The cow

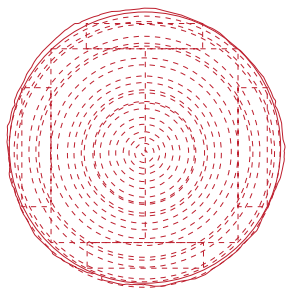
In Estonia, there are three primary breeds of cattle: Holstein, Native Estonian, and Red Estonian. The Holstein breed is preferred for dairy production due to its higher milk yields. To increase the quality and productivity of their livestock, dairy farmers use careful breeding practices with artificial insemination of high-quality bull sperm, which can be quite expensive. Additionally, calves are separated at a young age and closely monitored to ensure healthy growth. Before a cow gives birth, it is referred to as a heifer. Dairy cows will give birth around once a year for five to six years, after which they are replaced with younger cows.



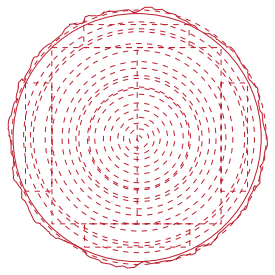
Spruce
40 cm



Birch
32,52 cm

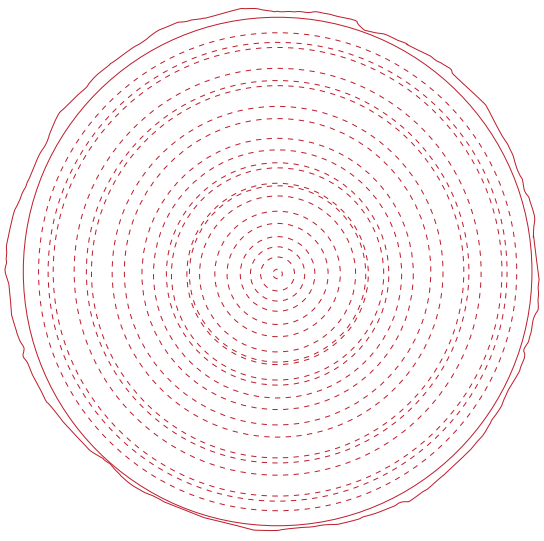


Pine
26,67 cm



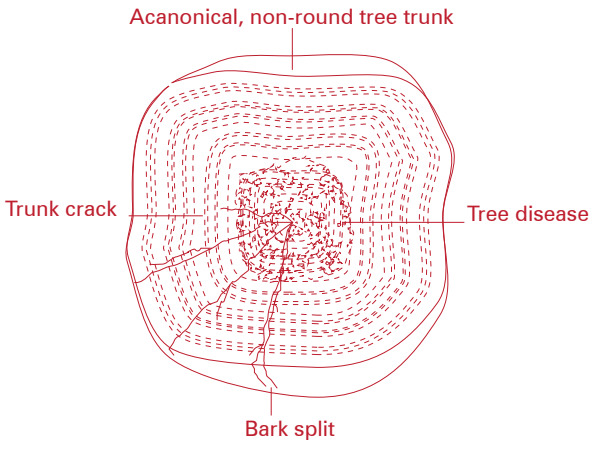
Oak
24,39 cm

Sawn wood / veneer

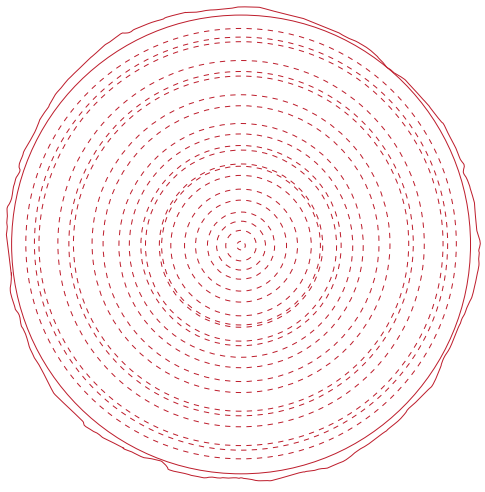


Aspen
50 cm

Pulpwood / veneer



Pulpwood / fuelwood

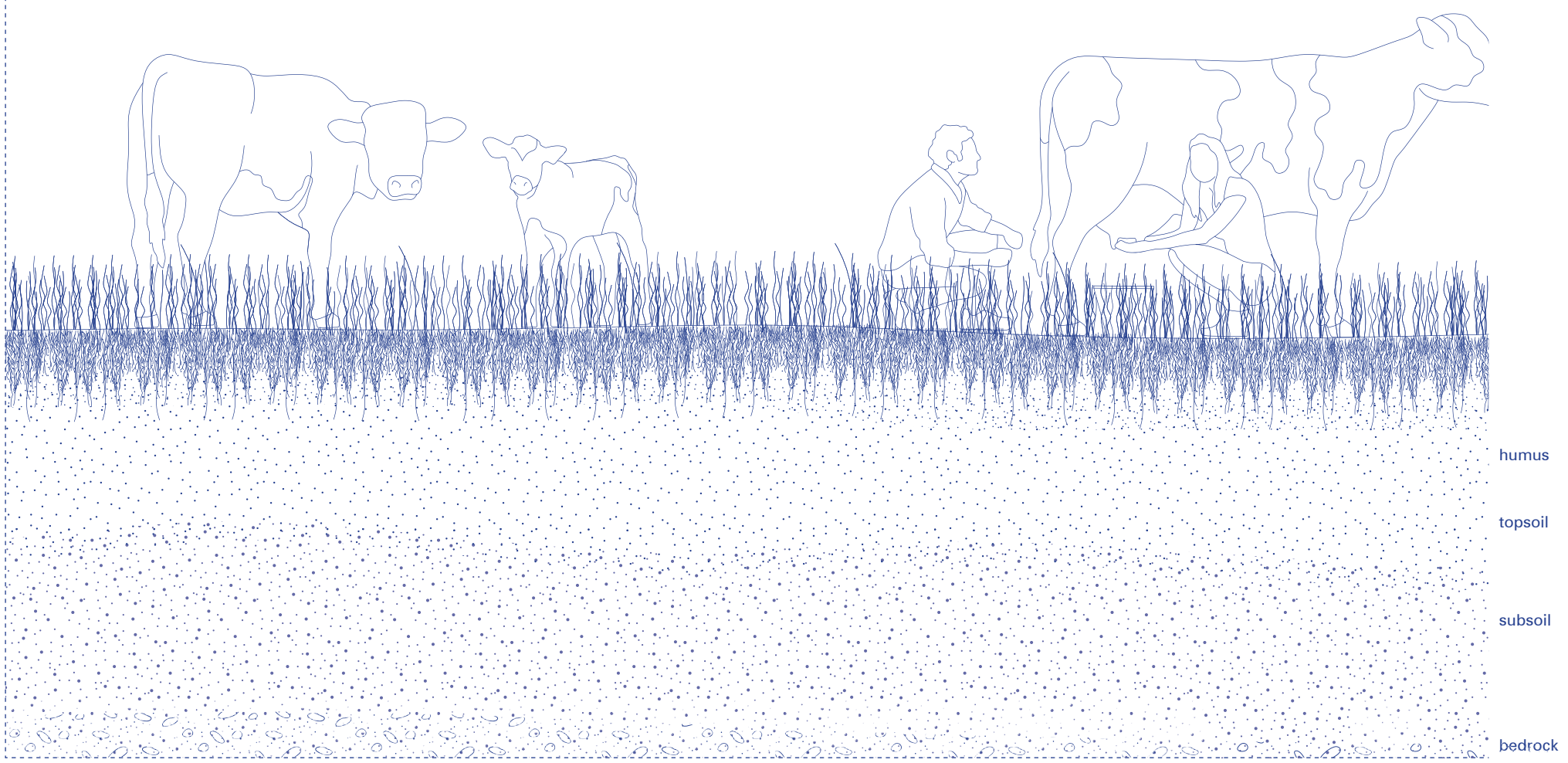


Alder
45,11 cm

Fuelwood / veneer

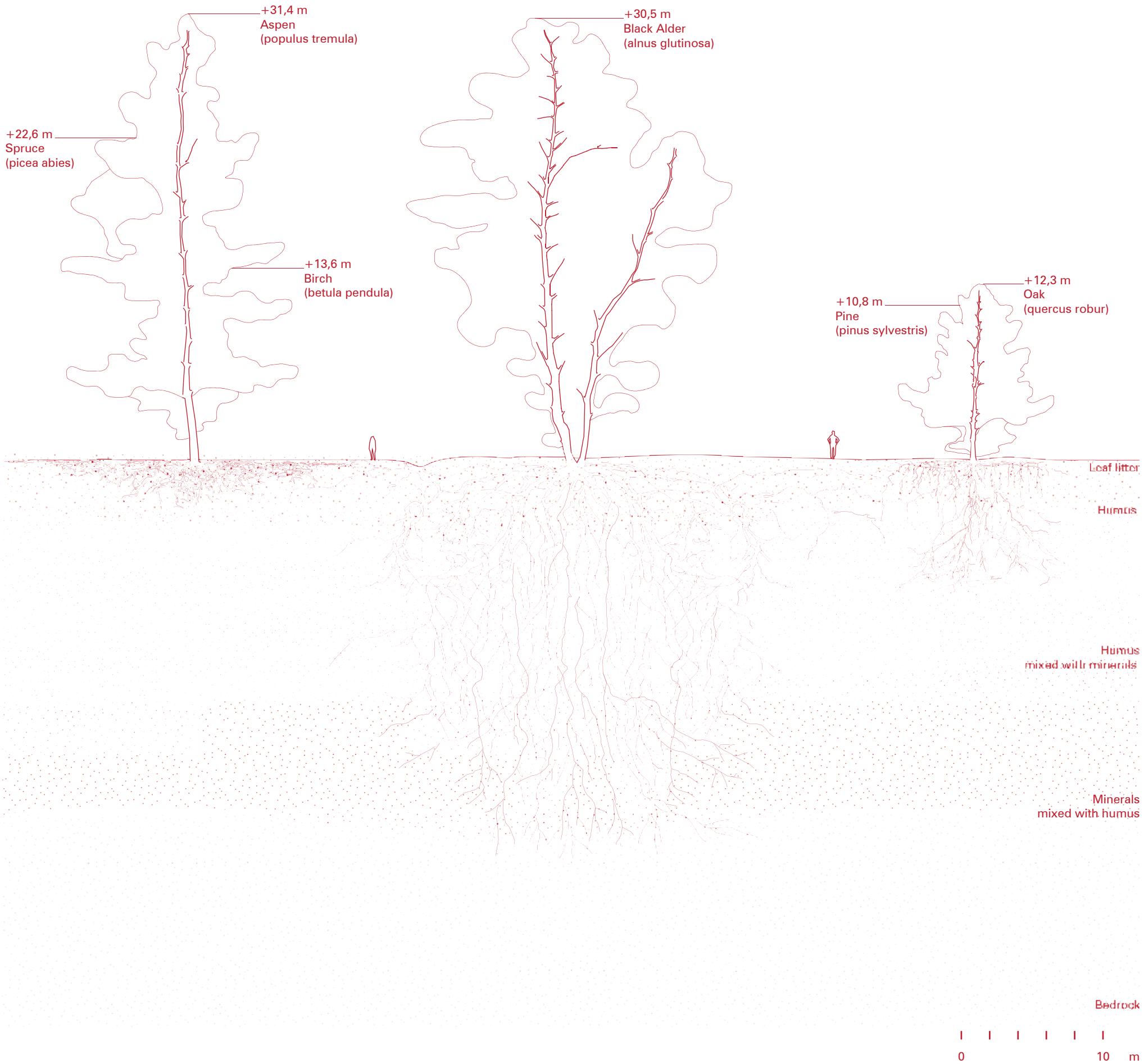
The tree

Estonia’s most common tree species are pine, birch, spruce, aspen, and black and gray alder.
Aside from the natural characteristics of each species, the presence of marks on a tree’s trunk, caused by diseases, accidentally inflicted damages and the removal of its limbs affects its quality as a raw material.
High-quality pine, birch and spruce logs are harvested to be sawn into structural components. Low quality logs of these species, along with aspen logs are mostly used as pulpwood. Parallely, low quality logs, regardless of species, along with most alder logs are traded as fuelwood.
The growth and commercial value of each tree is usually calculated by firstly measuring the diameter of its stem at 1,3 meters above ground, a height referred to as “breast height diameter”. The standardized growth rate for each tree species expresses its average BHD to age ratio, and is used for reference or comparison calculations.



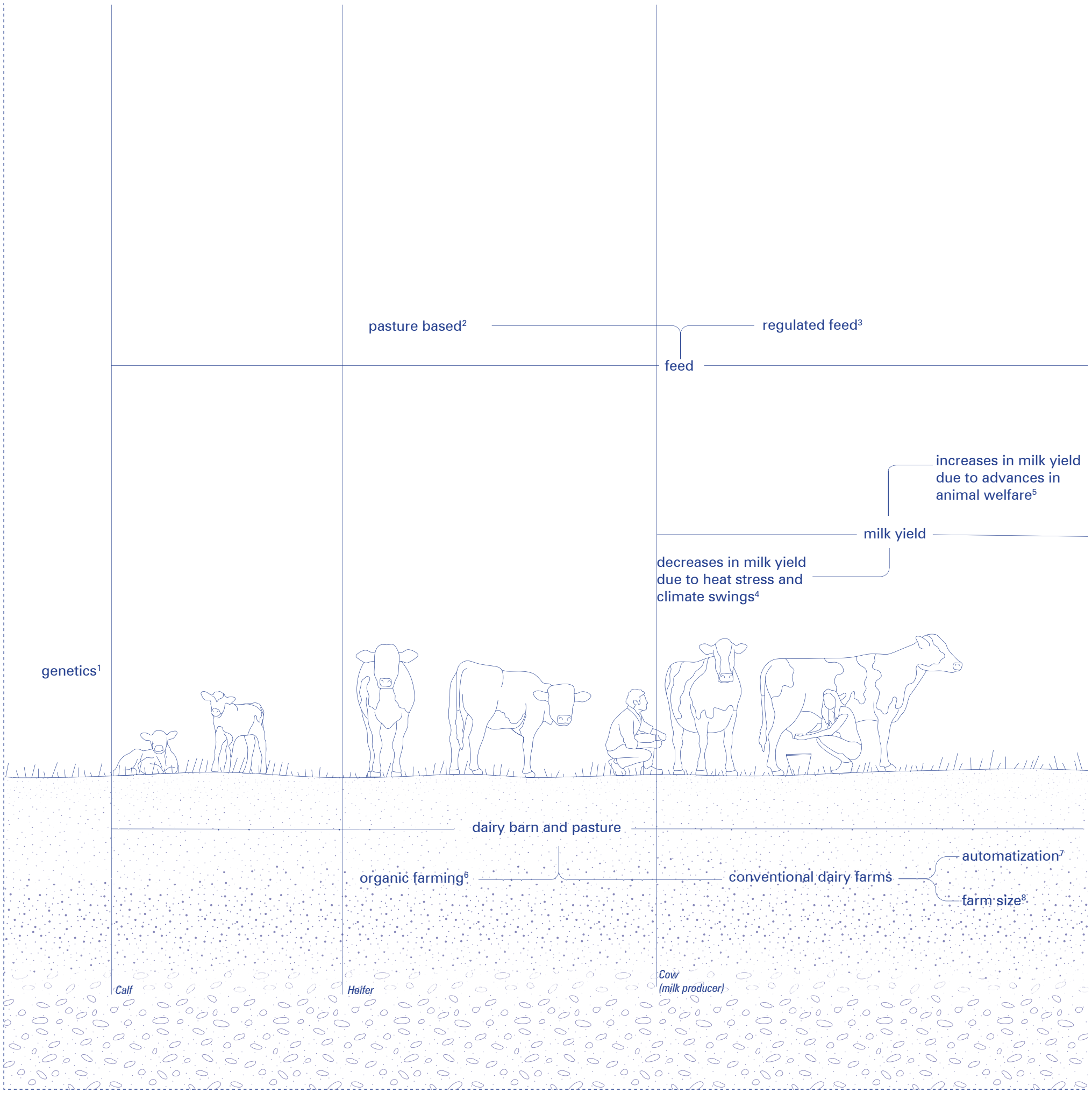
Field soil

During the spring and summer months, cows may be left outside for pasture feedings. Although this process is not typical of larger dairy farms, organic dairy certification implies that cattle should have access to open air whenever possible. The pasture is nurtured with all organic materials, prohibiting artificial fertilizers or supplements. Dairy farmers must manage their pastures carefully to ensure that they provide enough food for their animals while also maintaining soil fertility and minimizing the impact of grazing on the environment. An effective natural solution for organic dairy farmers is manure to provide nutrients for pasture growth.



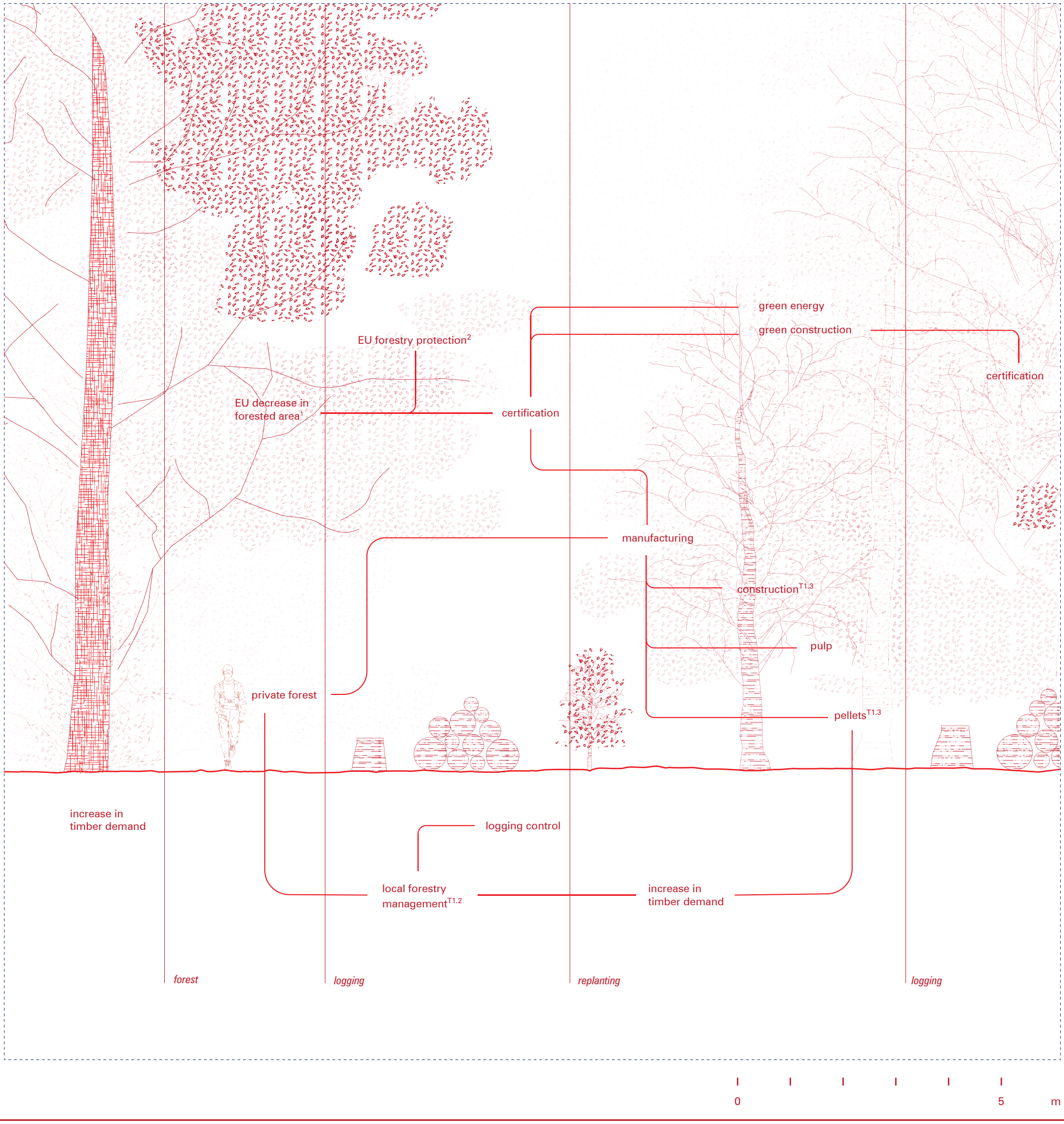
Forest soil

A tree begins its life cycle usually as a seed that is planted or organically placed in appropriate soil. In the case of species that develop through a rhizomatic root system, a clone plant may sprout from the existing root structure of its parent tree. The seedlings of Estonia's most popular tree species thrive on different soil qualities of moisture content, mineral composition, and acidic level. In general, high activity clay soils and partially drained wetland soils that are found mainly in the southwest of the country, are considered fertile. The average growth rate of these species also varies, but their harvesting takes place in similar time frames. Starting from the age of five, the tree stands undergo a thinning process every five to ten years, during which only the most profit-promising specimens are preserved and are given access to more soil nutrients and sunlight. At forty years old the remaining trees are considered mature enough to harvest. Oaks that are valued for their high quality timber in Estonia, reach harvest maturity between sixty and eighty years old.



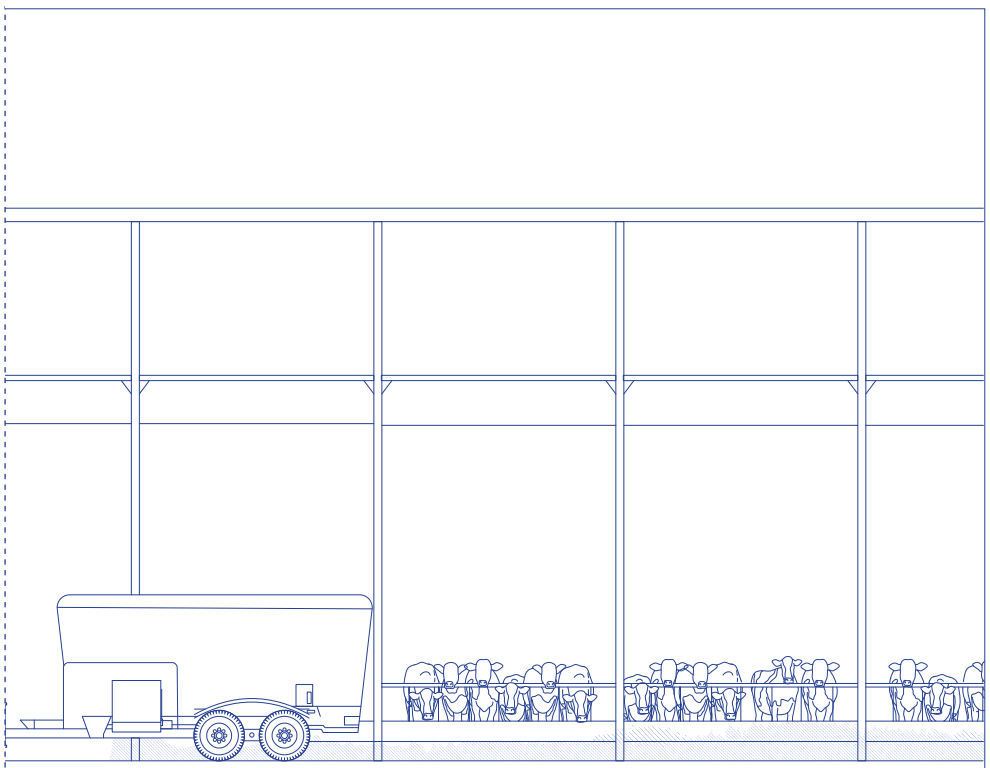
Farm forecast

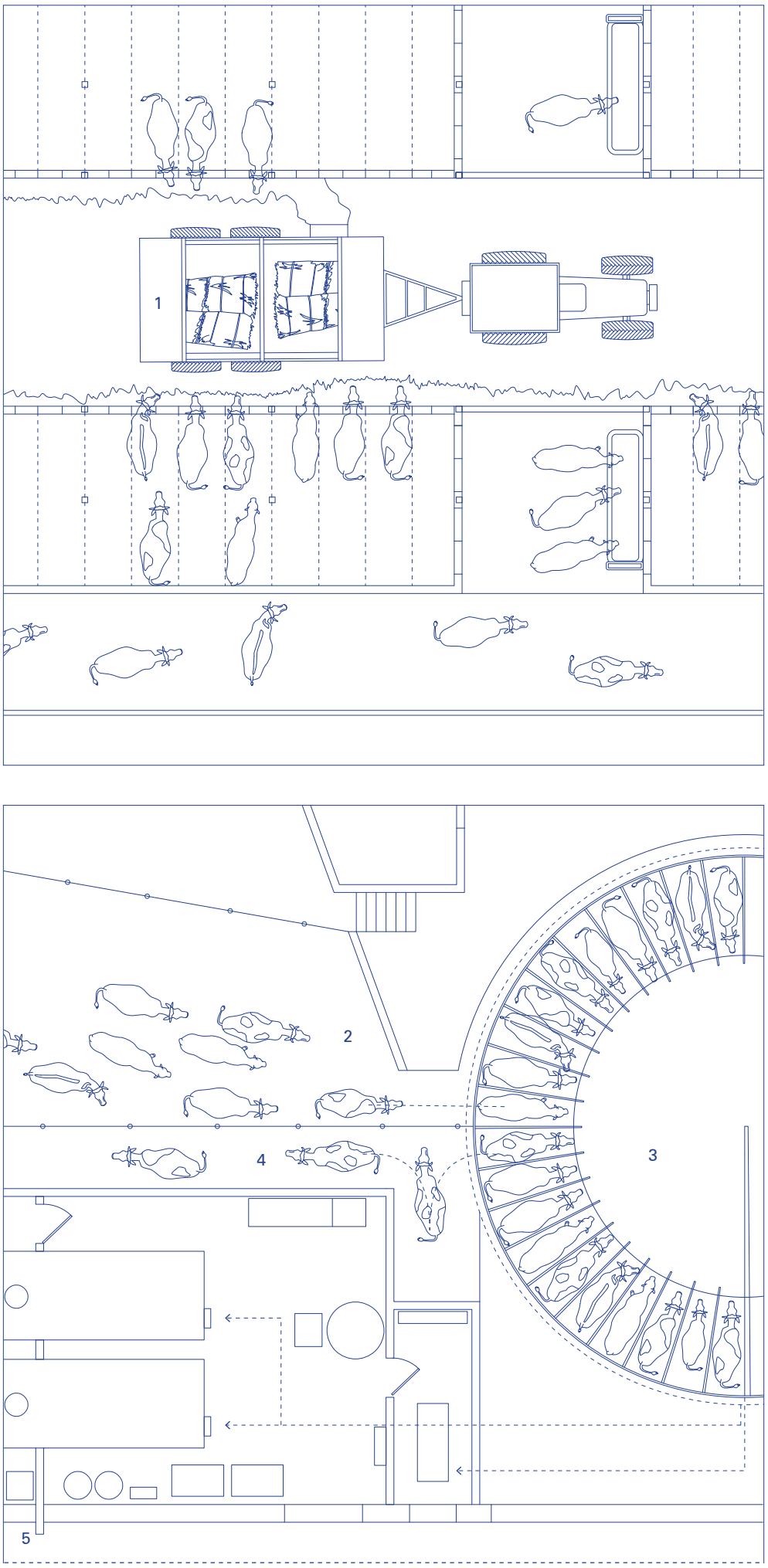
The Estonian dairy farmers are facing a concerning trend of rising milk prices. While the inflation may initially appear profitable, it's anticipated that the high prices will eventually decline, leading to a period of lower prices but still high demand. To help farmers, European organic certifications have become more flexible with the long-term goal to fully transition the agricultural industry to organic standards. This means that smaller farmers may lose the exclusivity of their products and have to compete with larger producers, or they'll need to explore alternative methods to maintain profitability.

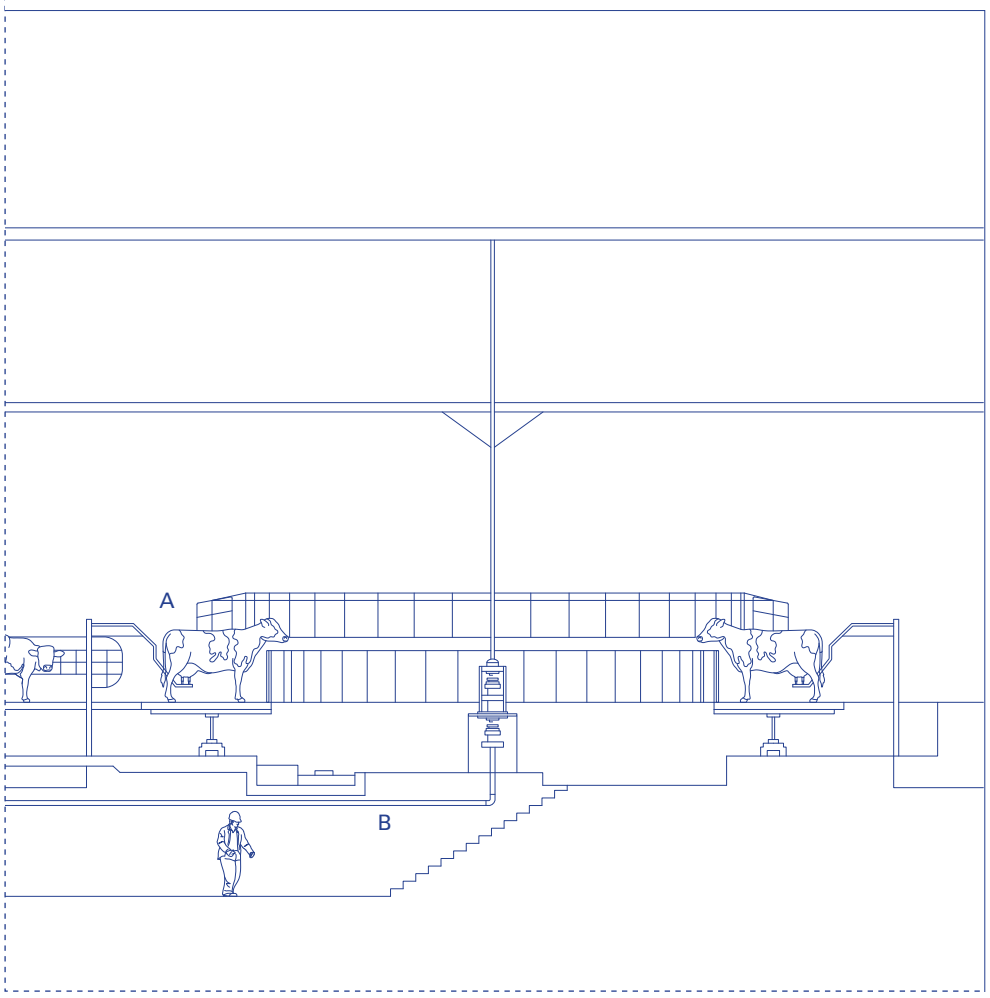


Forest forecast

The Estonian timber industry is experiencing a surge in demand due to the profitability of wood products. However, there are concerns that the increasing investments in biofuel, prefabricated houses, and other processed materials may lead to over-harvesting of Estonian forests. While industry members argue that clear-cutting practices are necessary for profitability and sustainability, environmentalists are worried about the manipulation of Estonian forestland, and projections suggest that the country's forested areas may begin to shrink after decades of growth. Recent sanctions imposed by Russia have disrupted the logistical networks for transporting, producing, and exporting timber products. Nevertheless, the industry is expected to continue growing and generating profits, partly due to heavy European investments in eco-friendly materials. As a result, companies are increasingly motivated to proactively address environmental issues through measures such as specified certification consultancies, long-term replanting strategies, carbon sequestration, and carbon credits.



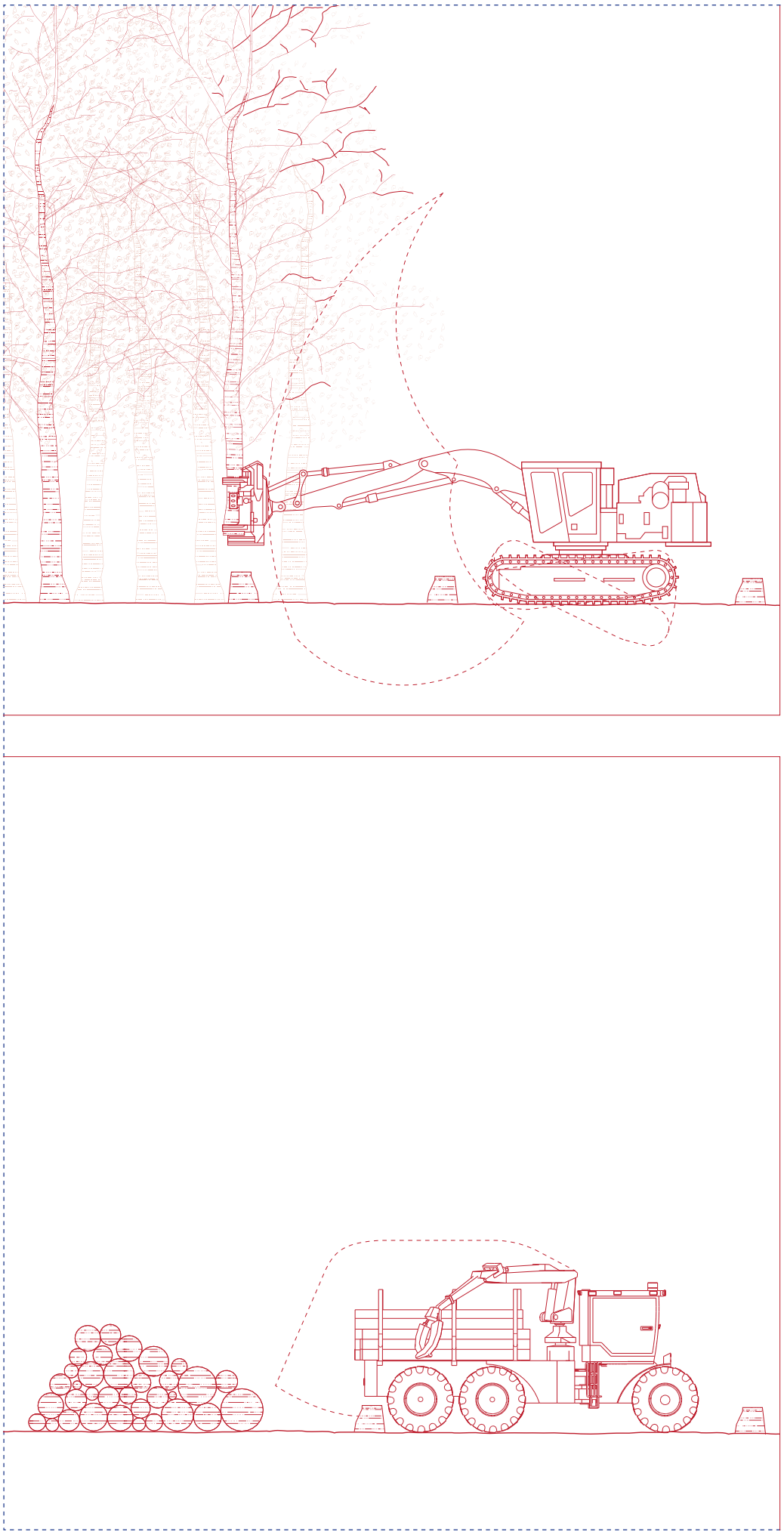


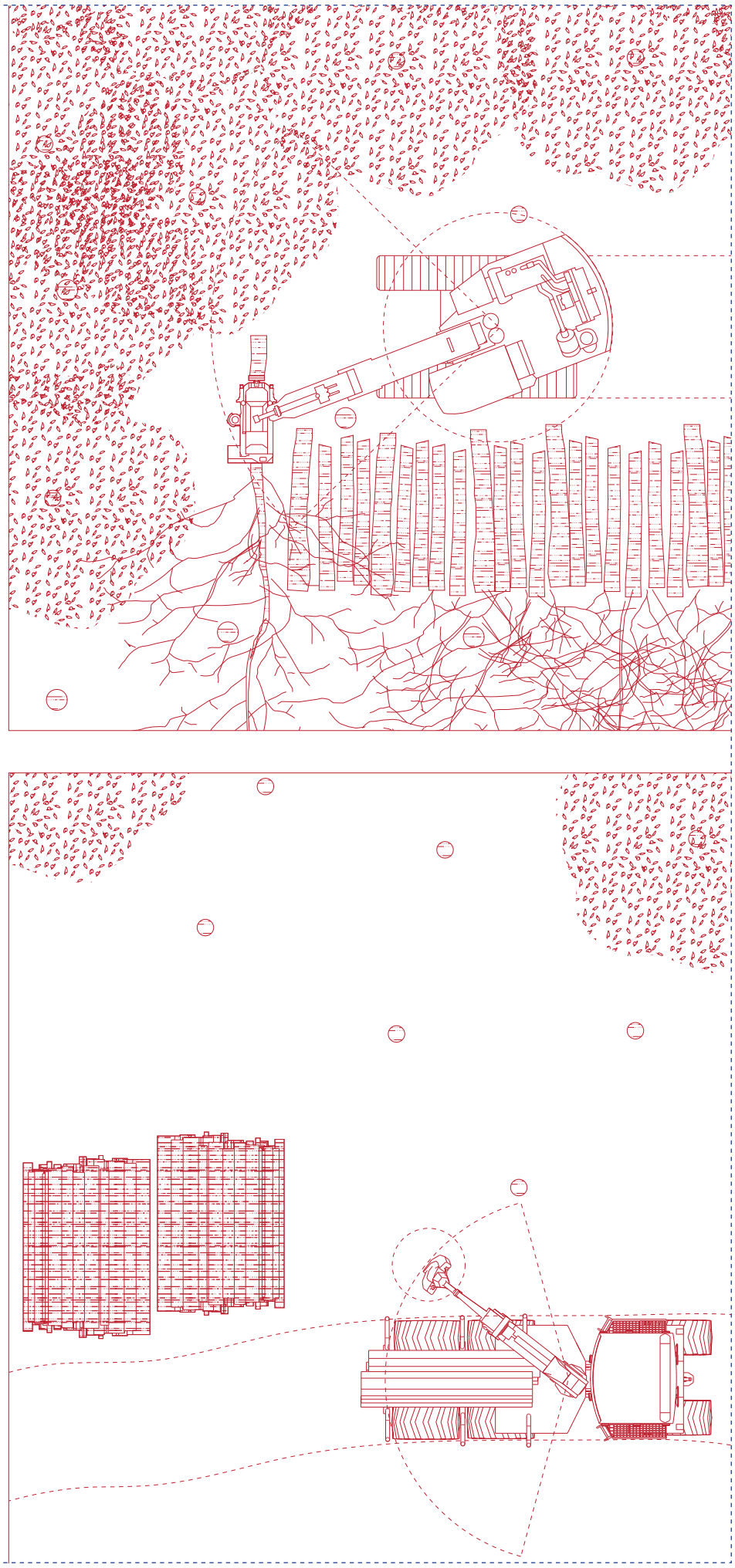


0 5 m

Milking

On larger farms, cows can eat, drink, and be milked according to their own preferences through the use of various automated technologies, including computer-formulated feeding systems, robotic milking machines, and sophisticated sensors that monitor the cows' health and wellness.
On the feeding side, the cows are provided with computer-formulated diets that are tailored to their individual needs and preferences. The robots dispense the feed automatically, ensuring that the cows receive the right amount at the right time while minimizing waste. On the milking side, the cows can walk up to a robotic milking machine whenever they feel the need to be milked. These machines are equipped with advanced sensors that can track the cow's body weight, milk yield, temperature, and other important metrics, helping to ensure that the cow remains healthy and productive. The milking cups are attached to the cow's teats from underneath. The robot then milks the cow until she is finished, before detaching the milking cups and allowing the cow to leave the machine. Each machine can milk up to seven cows per hour. The goal of robotic technologies is to maximize the milking process while maintaining a healthy herd.





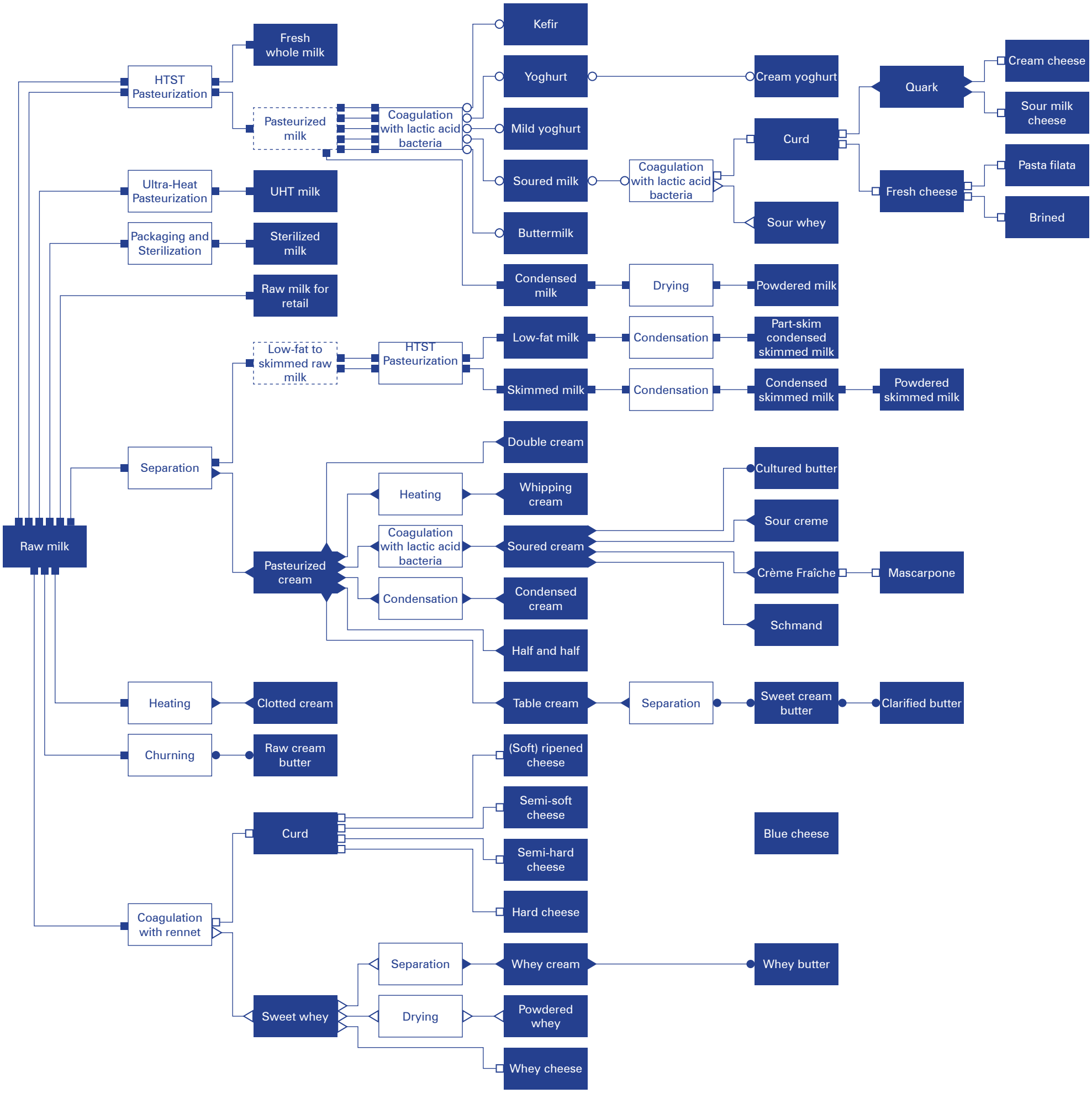
0 5 m

Logging

A feller buncher cuts down trees at their base, and/or places the cut tree on a stack suitable for a skidder, forwarder, or yarder for transport to further processing. To ensure the sustainability of harvested forests, the EU has established legal frameworks similar to those for animal welfare regulations, emphasizing the need for reforestation and replanting.
Clear-cutting is the timber harvesting method that is preferred by most foresters due to its profitability. Since almost all of the stands' trees are cut, the new seedlings that are planted in their place have more evenly distributed and unobstructed access to sunlight and soil nutrients. However, aside from the possibility to improve a forest's overall health by preventing the spread of diseases, the method disrupts the forest ecosystem as it destabilizes the habitats of local fauna. As a protective measure for endangered species, clear-cutting is forbidden in Estonia from April to Autumn.
Selective logging is considered to be a more ecologically sustainable harvesting method, though it is fundamentally an economic strategy. The method implies removing only the best timber and leaving the rest in the stand, this is why selective cutting has higher productivity. The forest is is disrupted to a lesser extent than with clear-cutting. However, selective logging can result in the deterioration of a forest stand's overall health and commercial value, since diseases may spread from a contaminated uncut tree.

Milk products

Diagram

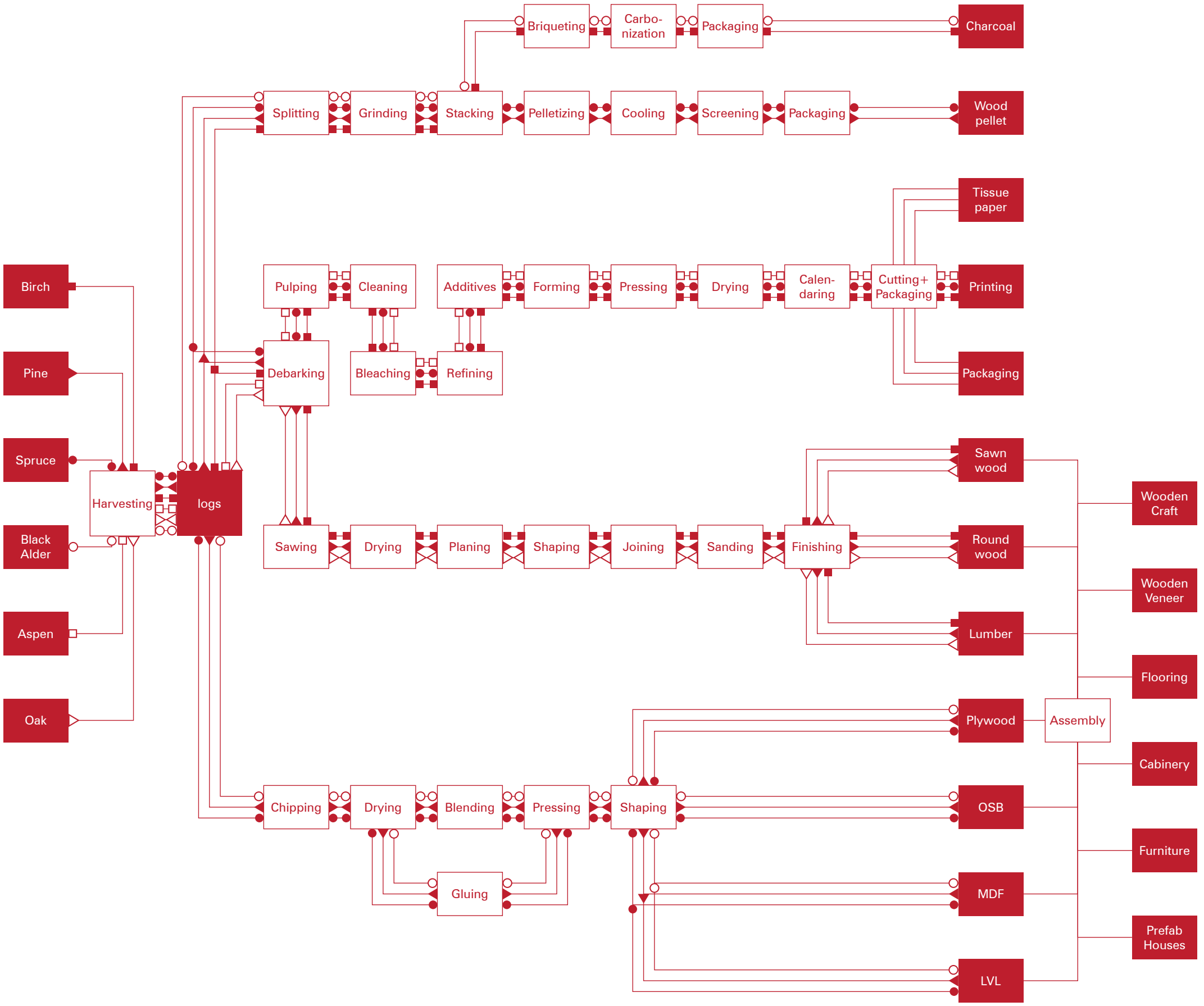


Type of product

- ■ Milk
- ▶ Cream
- ● Butter
- ○ Sour milk
- □ Cheese
- ▷ Whey

----- Not an end product

Dairy products are food products made from milk or containing milk as the main ingredient. The primary animals used for milk production include cows, water buffaloes, goats, and sheep. The diagram provides a visual representation of the range of products that can be made from raw milk, categorized into six types: Milk, Cream, Butter, Sour milk, Cheese, and Whey products. These products are often additive, with one serving as the starting point for another, resulting in a sequence of production stages. Alternatively, some of these products stem from a separation process, such as low-fat/skimmed raw milk and cream, or curd and liquid whey.



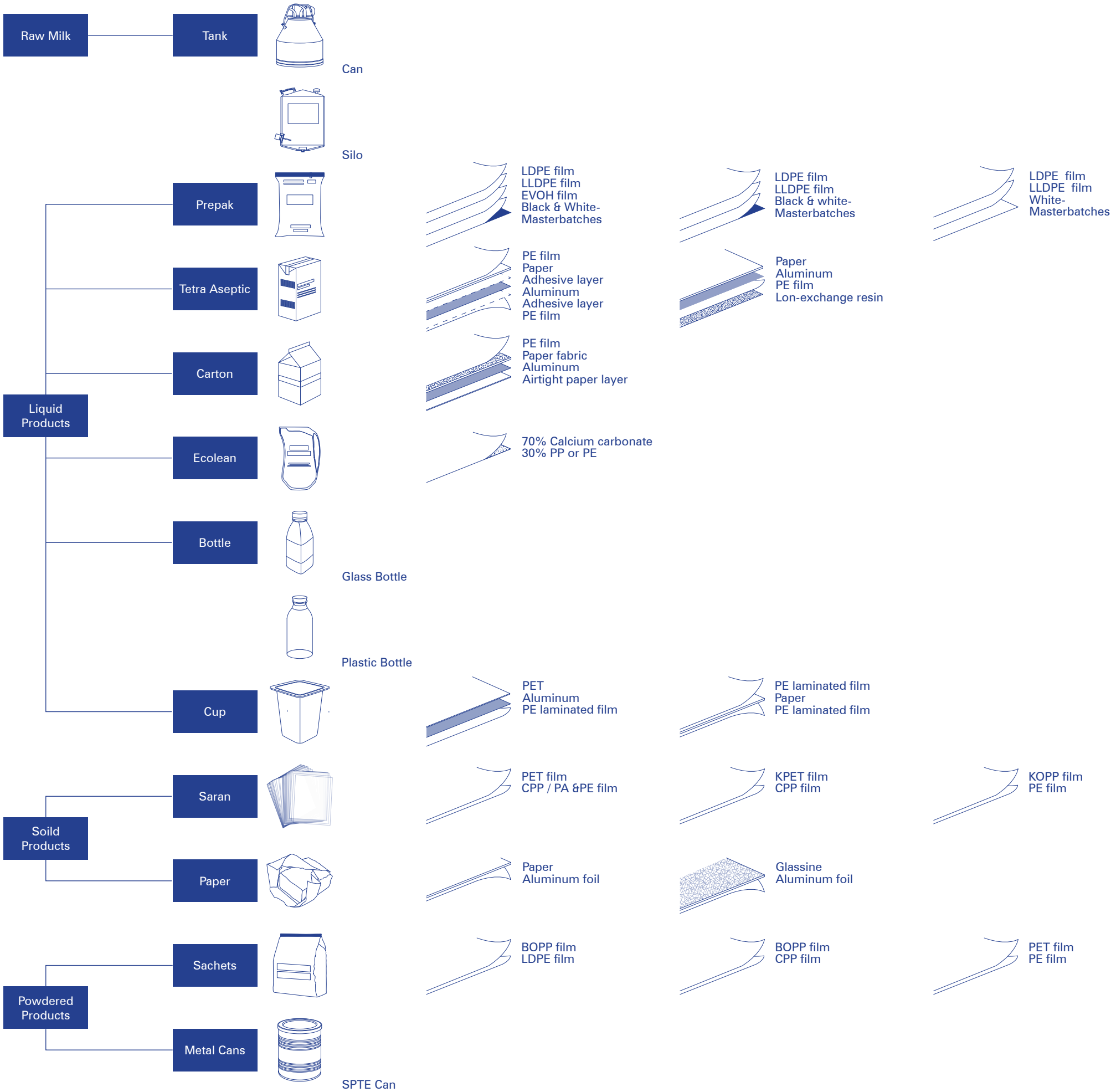
Timber products

Diagram

Type of product

- ■ Birch
- ▶ Pine
- ● Spruce
- ○ Black Alder
- □ Aspen
- ▷ Oak

The diagram illustrates the various stages of development and processing techniques employed in obtaining four types of timber products from six types of trees. The tree-types and resulting products are chosen based on the Estonian wood industry. The woods include Birch, Pine, Spruce, Black Alder, Aspen, and Oak, and undergo other processing methods to produce pulp and paper products, fuel wood products, solid wood products, and engineered wood products.
The transformation process is divided into primary, secondary, and ‘assembly’ product stages, each resulting in a different type of timber product.

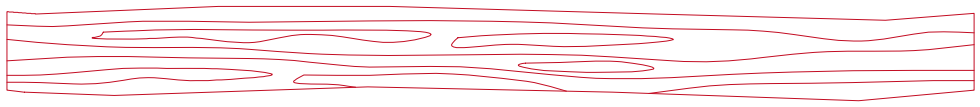


Transportation of milk products

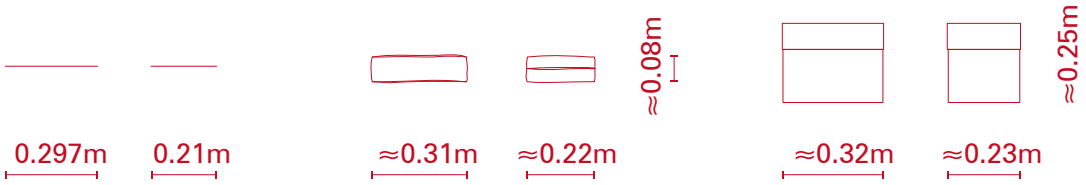
Packaging

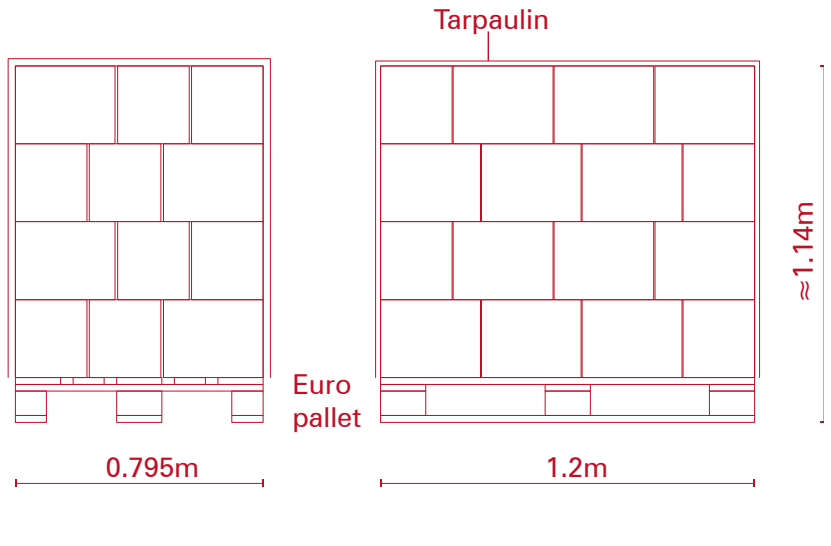
From cow to consumer, milk and dairy products are carried in different containers, according to their form, which varies from liquid, solid or powdered. After harvesting, raw milk is stored within the farm in stainless steel cans or silos for a maximum of forty eight hours. Following their processing, a variety of packaging methods and materials limit the risks of contamination of dairy products, extend their shelf life and expand their transportation capabilities.

Rough wood



Copy paper

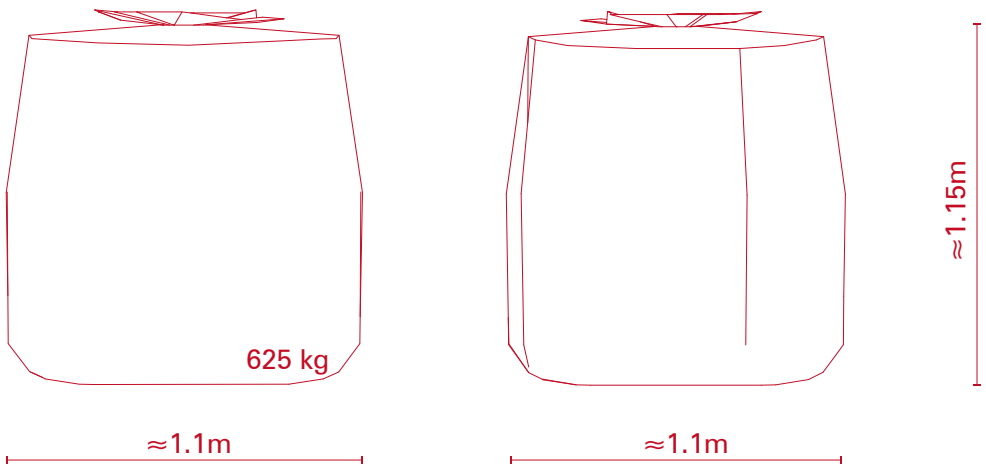




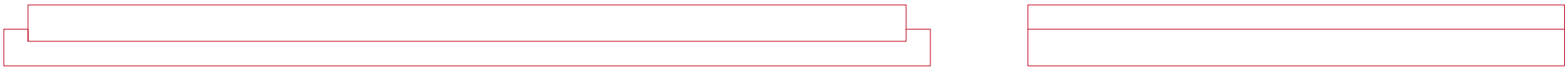
Wood pellet

3~12mm (diameter)

10~20mm (length)



Prefabricated wooden house

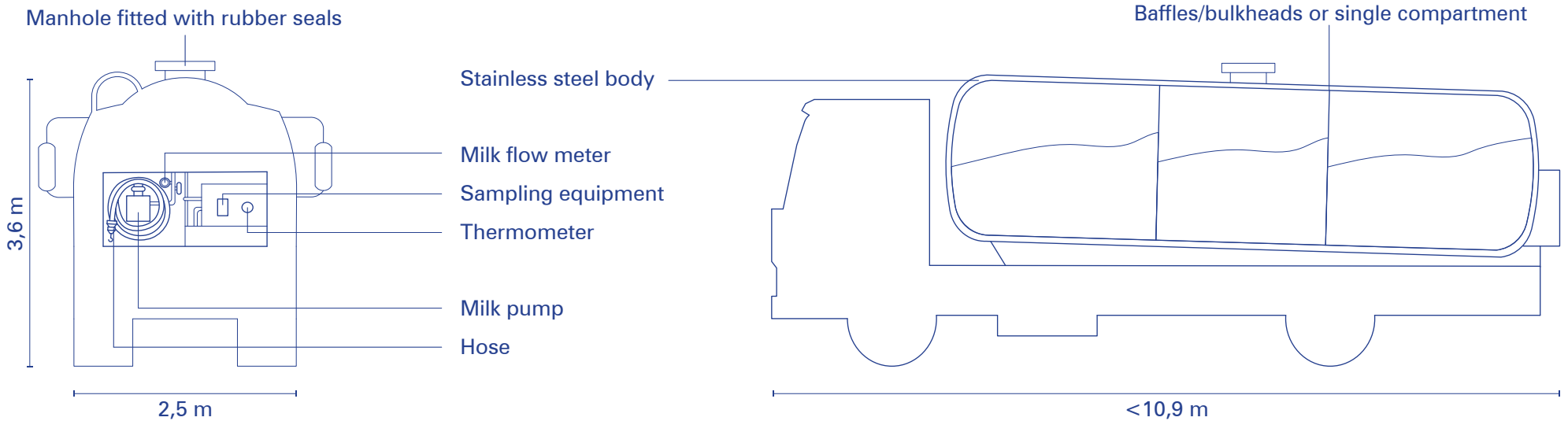


Transportation of timber products

Packaging

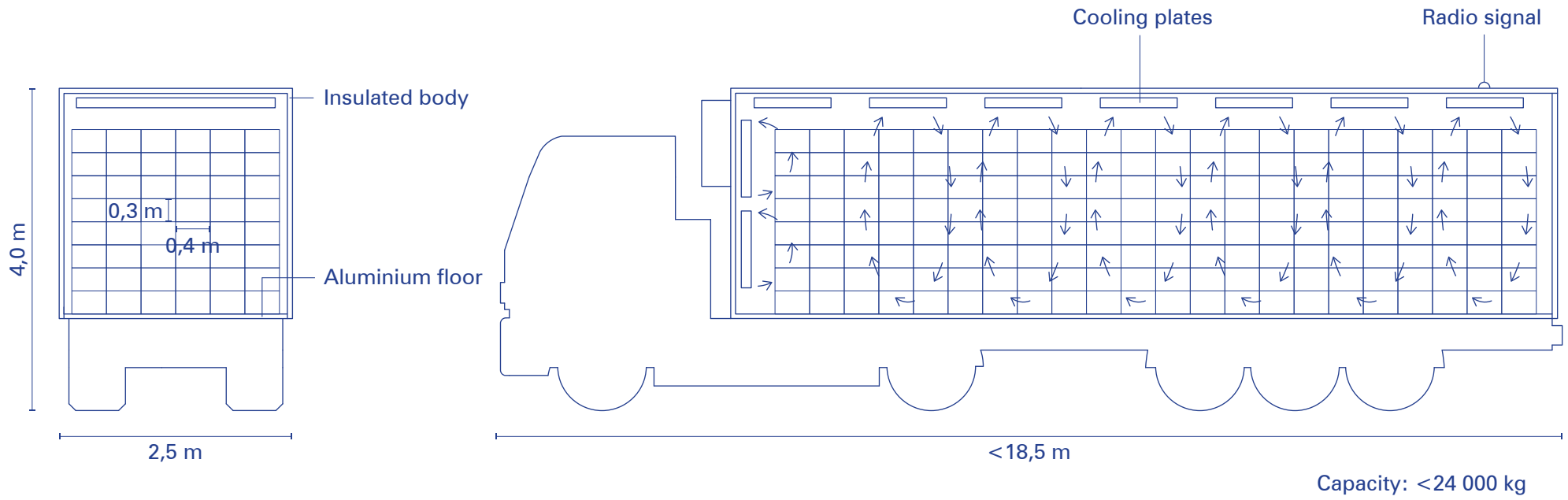
The requirements for the transportation of timber products vary according to two parameters:
1. the dimensions and weight of the product and its transportation equipment, and 2. the resilience of the product and its transportation equipment.
International, European, and/or national regulations and instruments for secure and efficient freight transport, standardize these parameters, either through set spectrums or through absolute specifications.
The range of transportation requirements for timber products is documented through two sets of extreme conditions. The first addresses material resilience, rough wood and copy paper. The second addresses dimensions, pellet and prefabricated wooden house. Timber products need to go through different packaging processes and be efficiently placed and firmly secured in different shipping carriers.

Bulk milk tanker



Capacity: 1 000 - 20 000 L
Temperature: <7°C

Refrigerated truck



Capacity: <24 000 kg
Temperature: <7°C

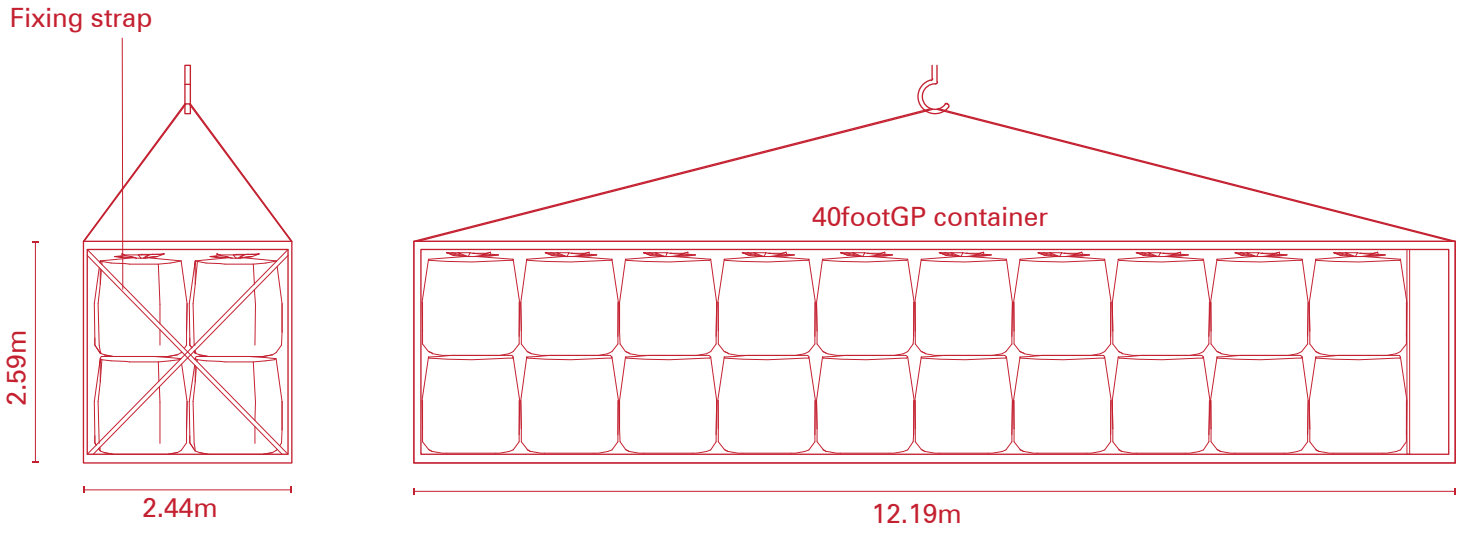
0 5 m

Transportation of milk products

Vehicles

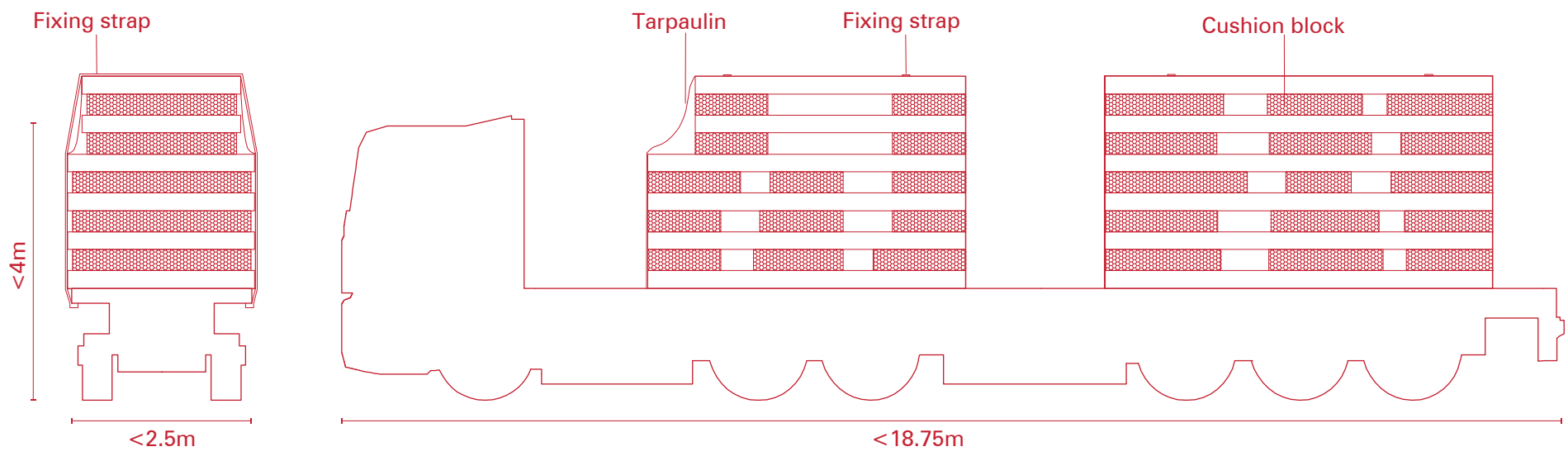
Milk, raw or pasteurised, is transported in bulk milk tanks, while after being packaged or converted into other dairy products, it is transported by refrigerated trucks in cartons or plastic boxes. The size of vehicles varies depending on the amount of products they have to carry, the distance they have to cover as well as the regulations related to the road network. All vehicles carrying milk and dairy products should be emptied, cleaned, and sanitised regularly. Drivers are credited milk graders and must always carry a verification label showing the washing and hygiene records of the trucks, as well as records verifying the chain of custody of the transport samples. Raw milk as well most dairy products should be exposed at temperatures that do not exceed 7°C. If these conditions are secured, milk and dairy products can be distributed to domestic and international markets by road, rail, sea and air.

Wood pellet - Container



Capacity: <30 480kg
Storage relative humidity: <40%

Prefabricated wooden house - Truck



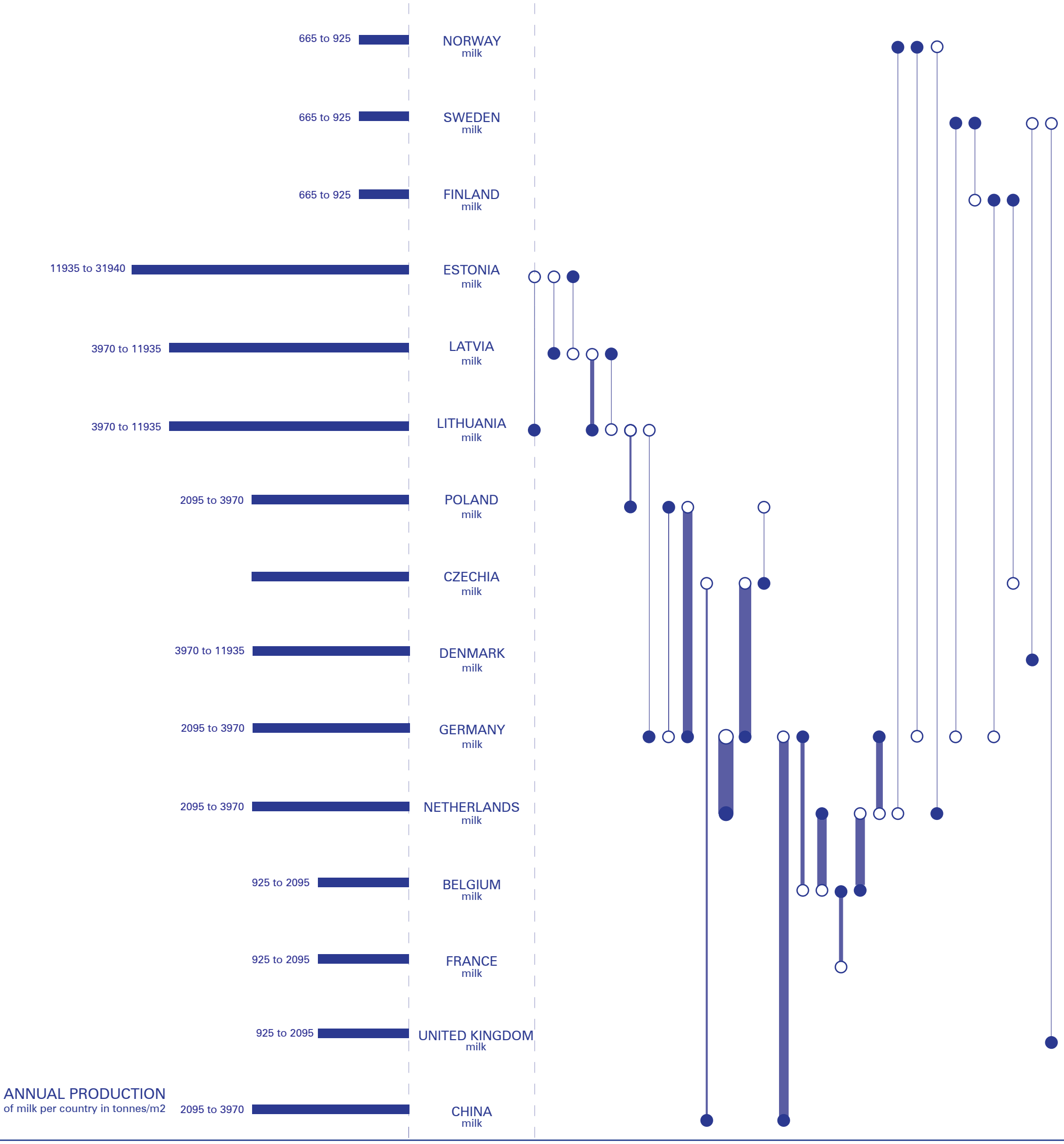
Capacity: <40 000kg

0 5 m

Transportation of timber products

Vehicles

Europallet specifications					Container specifications					Maximum vehicle specifications (length, width, height, weight)				
	LengthW	idth	Height	Weight		LengthW	idth	Height	Weight		EU	EstoniaF	inland	Germany
EUR1	0,8m	1,2m	0,144m	4,00t	20ootGP	6,05m	2,44m	2,59m	30,48t	Forestry truck	18,75m; 2,5m; 4m; 40t	20m; 2,55m; 4m; 44t	34,5m; 2,60m; 4,40m; 76t	20,75m; 3m; 4m; 40t
EUR2	1,0m	1,2m	0,162m	4,25t	40footGP	12,19m	2,44m	2,59m	30,48t	Truck	18,75m; 2,5m; 4m; 40t	40t	44t	40t
EUR3	1,0m	1,2m	0,144m	4,50t	53footHC	16,15m	2,59m	2,90m	30,48t	Rail wagon	31,7m; 3,2m; 4,8m; 135t			
										Train	750m; 3,2m; 4,8m; NA			



Trading of milk products

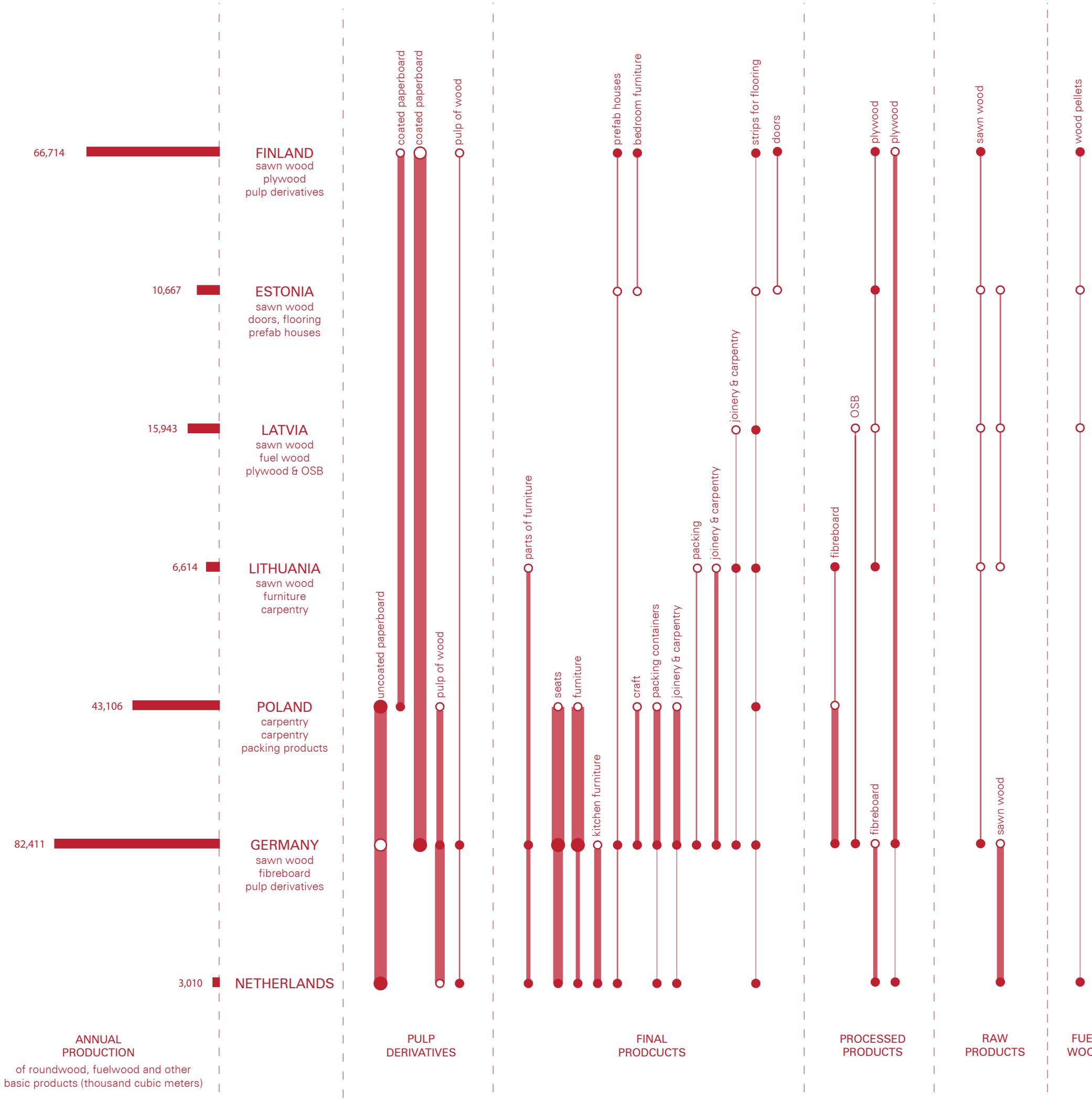
country of export

country of import

Revenue (in euros)

- more than 300M
- 250M to 300M
- 200M to 250M
- 150M to 200M
- 100M to 150M
- 50M to 100M
- up to 50M

One of the characteristics of the Estonian dairy sector is that the country exports more milk and dairy products than it consumes. The Estonian export of dairy consists of 40% of milk, out of which almost 55% is exported to Lithuania and 40% to Latvia. Amongst the Baltic states, Estonia produces the most raw milk while Lithuania is the largest processor of milk. The transportation of raw milk is limited to within the Baltic states due to its shelf life and hygiene limitations. Within the corridor, Germany receives the maximum milk to process into dairy products and exports the most to the Netherlands and also to China outside the corridor. Here we can see that the milk price in Estonia is significantly lower compared to countries like Poland and Germany that export processed milk and dairy products. There may be an oversupply of milk in Estonia, especially in light of the European Commission's prediction that "Europeans will consume less meat and milk by 2030 but the supply will remain stable".



Trading of timber products

Country of export

Country of import

Revenue

- more than 1 billion USD
- 500 million - 1 billion USD
- 300 - 500
- 100 - 300
- 50 - 100
- less than 50 million USD

North Baltic Corridor has several important anchors. Russia (followed by Finland and Germnay) is the foreign actor providing by far the biggest amount of raw material. This raw material is mostly imported to Estonia and Finland to be processed further. Generally Baltic states specialize in the export of processed goods, final products that have significantly more added value than the raw products imported. The biggest importer within the belt is Germany who pushes two competing markets: baltics and switzerland/austria/czech republic on the other. However the baltics also have the scandinavian market for exporting of processed timber and finished products.

■ Milk

Raw milk
3.25% fat
3–5⁻ days

Low-fat milk
1.5% fat
10⁻ days

Skimmed milk
0.15% fat
10⁻ days

Fresh whole milk
3.25% fat
12–14⁻ days

Sterilized milk
0.15–3.25% fat
6⁺ months

UHT milk
0.15–3.25% fat
6–9⁺ months

Powdered skimmed milk
2.7% fat
18⁺ months

Powdered whole milk
26–40% fat
18⁺ months

Condensed skimmed milk
0.15% fat
24⁺ months

Part-skimmed cond. milk
1.5% fat
24⁺ months

Condensed milk
7.5–15% fat
24⁺ months

▶ Cream

Schmand
20–29% fat
15⁻ days

Half and half cream
12% fat
20⁻ days

Soured cream
10–19% fat
20⁻ days

Clotted cream
30–40% fat
20⁻ days

Table cream
18% fat
30⁻ days

Whipping cream
30–40% fat
30⁻ days

Double cream
48% fat
20⁻ days

Crème Fraîche
30–40% fat
2⁻ months

● Butter

Cultured butter
86% fat
30⁻ days

Whey butter
80–90% fat
40⁻ days

Raw cream butter
80–85% fat
60⁻ days

Sweet cream butter
80–85% fat
1–3⁻ months

Clarified butter
99–100% fat
9⁻ months

○ Sour milk

Cultured buttermilk
0.5–1% fat
15⁻ days

Yoghurt
3.5% fat
30⁻ days

Mild yoghurt
3.5% fat
30⁻ days

Cream yoghurt
4–10% fat
30⁻ days

Kefir
3.5–10% fat
30⁻ days

□ Cheese

Cheese curds
12% fat
10⁻ days

Whey cheese
10% fat
15⁻ days

Sour milk cheese
15% fat
15⁻ days

Soft cheese
40–60% fat
15⁻ days

Quark
10–40% fat
20⁻ days

Cottage cheese
18–44% fat
20⁻ days

Semi soft cheese
30–45% fat
20⁻ days

Pasta filata
45–48% fat
20⁻ days

Blue cheese
50% fat
30⁻ days

Cream cheese
33% fat
3⁻ months

Semi hard cheese
40–60% fat
4⁻ months

Brined cheese
20% fat
6⁻ months

Hard cheese
60% fat
6⁻ months

▷ Whey

Acid/Sweet whey
0.3–0.4% fat
15⁻ days

Sweet whey powder
0.5% fat
24⁺ months

Dem. whey powder
0.5% fat
24⁺ months

Protein whey powder
0.5% fat
24⁺ months

Milk products

Catalogue

Type of product

■ Milk
▶ Cream
● Butter
○ Sour milk
□ Cheese
▷ Whey

– Refrigeration
\+ Room Temperature

Raw milk produces a diverse range of products, classified into six categories: Milk, Cream, Butter, Sour milk, Cheese, and Whey products. Each category illustrates the final products along with their packaging, indicating their size and suitability for transportation. The product's shelf life varies, determined by factors such as the production process, packaging, and fat content.

At Estonian Forest and Wood Industries Association

Berlage: Can you tell us a bit about the relationship between state owned and private lands?

Henrik Välja: So we can go into a small history class. The state forest is what used to be owned by the German Baltic Nobles, who lived in the mayors here minister. So in the middle of the 19th century, they started to sell off the agricultural lands to Estonian people living in the lands. But they kept the forest because they had built up a lot of industry, and the industry needed a lot of wood to operate. Mostly heating at that time. So they had vodka production and some pump mills back then. Then that means they started to manage forest systematically at the end of the 18th century already. So the state forest now still holds the same land that was then owned by the manors and it has been continuously for 200 years. So this is a really high quality tree composition forest. If we harvest in the state forest, we get the highest percentage of saw logs that are suitable for sawing and construction and then the least amount of wood that is only suitable for energy. If you go into the private forest, then these are the forests that used to be owned by the farms. The farms usually had very little forest and they didn't manage them properly because their main focus was on agriculture. And then after the second World War a lot of this land was basically empty because people either fled from the war or were deported. And then it started growing into forest on its own. Because in Estonia, if you don't put concrete on the ground, then it will still be forest sooner or later. Nowadays when we harvest in the private forest, then it is significantly lower quality wood that we get from that harvest. We get much less sawn logs and we get much more energy wood. First of all, because of the tree composition, you have more tree species. You have a lot of low quality, fast growing tree species. Secondly, because of the management practices, often the harvest is done, for example, too late. And then in the spruce you already have rot inside it. So you can't use it for high quality wood products it goes basically to the energy sector. In the 1990s, the land of these old farms was given back to the original owners or their ancestors. So a lot of people got old farms even though they had already moved to the cities and didn't have a connection to the land anymore.

So the majority of Estonias have an old farmhouse somewhere with some land. Majority of us don't really live there nor are active in the land management. So often the forest is just there. Sometimes you do the harvest, then you do the replanting but that's pretty much all you do with it. As a result, of course, a lot of these lands have started to move from these small private owners into companies who buy it up and then manage it professionally. So today I think it's like 50% of the forest land is owned by the state, I think around 25% of the forest land is owned by companies and 25% is owned by private individuals.

At Pajumäe Talu (Organic dairy farm)

Berlage: Do you own some of the forests around here, or do you just own arable land?

Viljar Veidenberg: Yes, yes. The forest is very helpful because if you want to get money from the bank, then you have to give something as security. This is why I think without the forest, maybe, this wouldn't be here. We have like 400 hectares of arable land and 150 hectares of forest. This is definitely good to have.

B: And is it a protected forest or theoretically, could you harvest these trees?

VV: Yes yes we could. Of course today there are specific procedures you have to follow and they can tell you that it's not good for picking yet for example but yes, we can use it.

B: So if it is used for your loan security, you cannot lease it out for rent?.

VV: I can lease it out if I want, but I cannot

sell it. Or actually I can sell it, but the new owner will take over this mandatory security [collateral]. If something goes bad with my farm, then the new owner must sell the forest to the bank.

B: But you can rent it right?

VV: Yes, yes you can rent it, yes.

B: But you do not rent it. Is there a reason that you don't? Could the money that comes from the forest rent support the farm?

VV: Uh, but, uh, why, why do you, what, who would want to rent the forest?

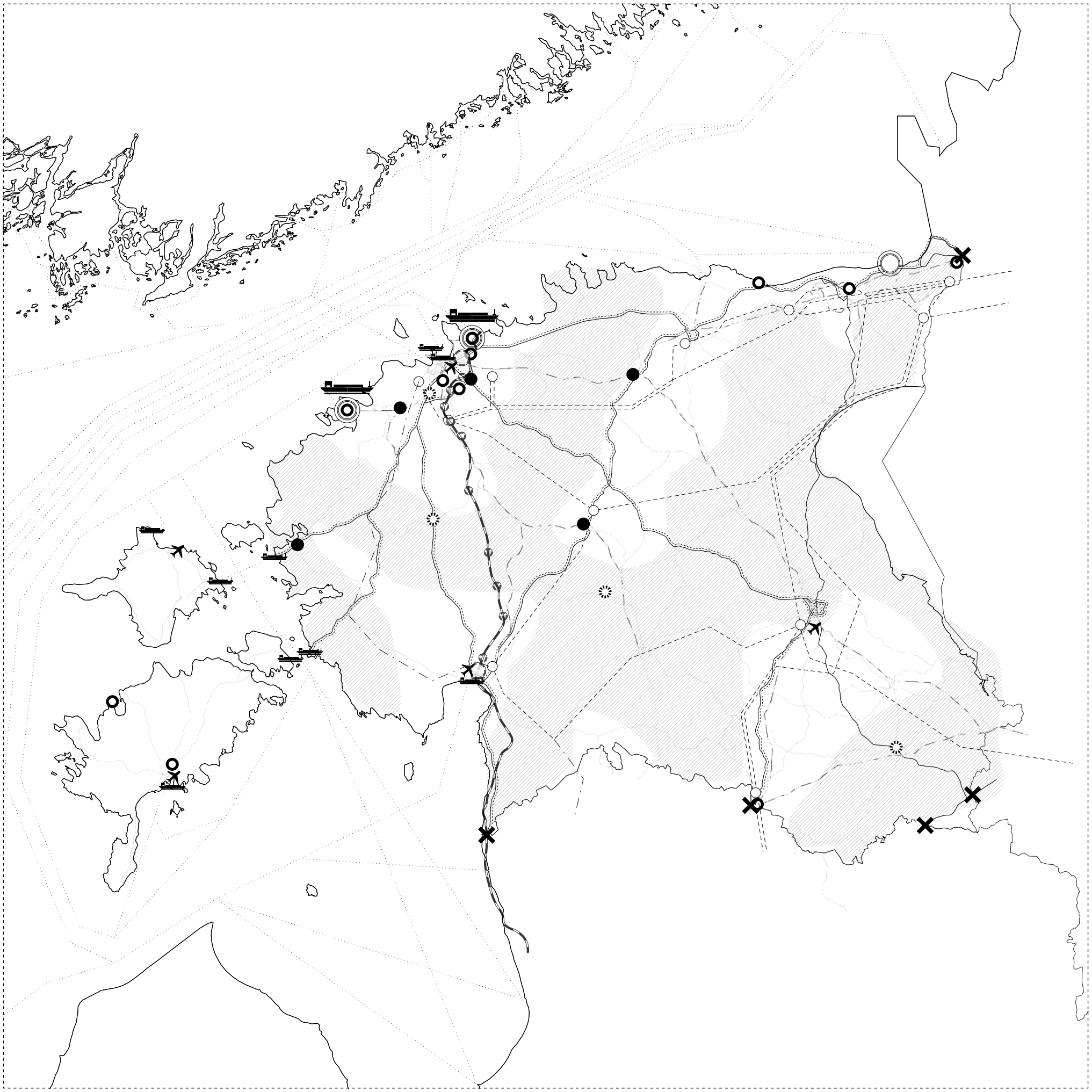
B: Yesterday when we went to Graanul Invest they were saying that people, owners, like if they have forest land and also part of the plot is agricultural, they don't want to use like half of it. They rent it out.

VV: But for arable land I guess if someone rents they can make money from it. Usually the forest is just there. But if you buy land you buy it for the arable land.

B: So do many farms have the same model that they use the forest lands as their collateral?

VV: I don't know. It's different.

The Corridor



Estonian logistics infrastructure network

In 2023

- Shipping route
- Road (to be upgraded)
- Road (completed)
- Existing railway
- Rail Baltica
- High-speed station
- Regional stop
- Truck border crossing
- Port
- Airport
- Free zone
- Logistic park (established)
- Logistic park (vacancy)
- Logistic park (planned)
- Power line
- Substation
- Third Estonian-Latvian power connection
- National green zone

The majority of Estonia's inherited freight infrastructural networks were built to convey goods to other socialist republics along an east-west axis, and to facilitate Soviet trade with Scandinavia from the port of Tallinn across the Baltic Sea.
Prior to the Russian invasion of Ukraine, a combination of this inherited east-west infrastructure with new north-south infrastructural connections funded by the European Commission led to a relative boom in private logistics investment, with the capital, Tallinn, set to become a sort of "Baltic Dubai."
After the start of hostilities, many existing logistics investments were either withdrawn or halted: planned logistic parks along underdeveloped highways lay unsold and empty, and shipping ports saw drastically reduced traffic.
Also affected was Rail Baltica Estonia, an in-progress, over-budget, and over-time European Commission passenger, freight, and military rail project which aims to supplant former Soviet track gauges with European standard gauge, and enhance weak north-south connectivity from cities Tallinn and Pärnu to the Latvian border.

Urban centers, hinterlands, and their commutes and wages

Per county

Urban center population

400k

90k

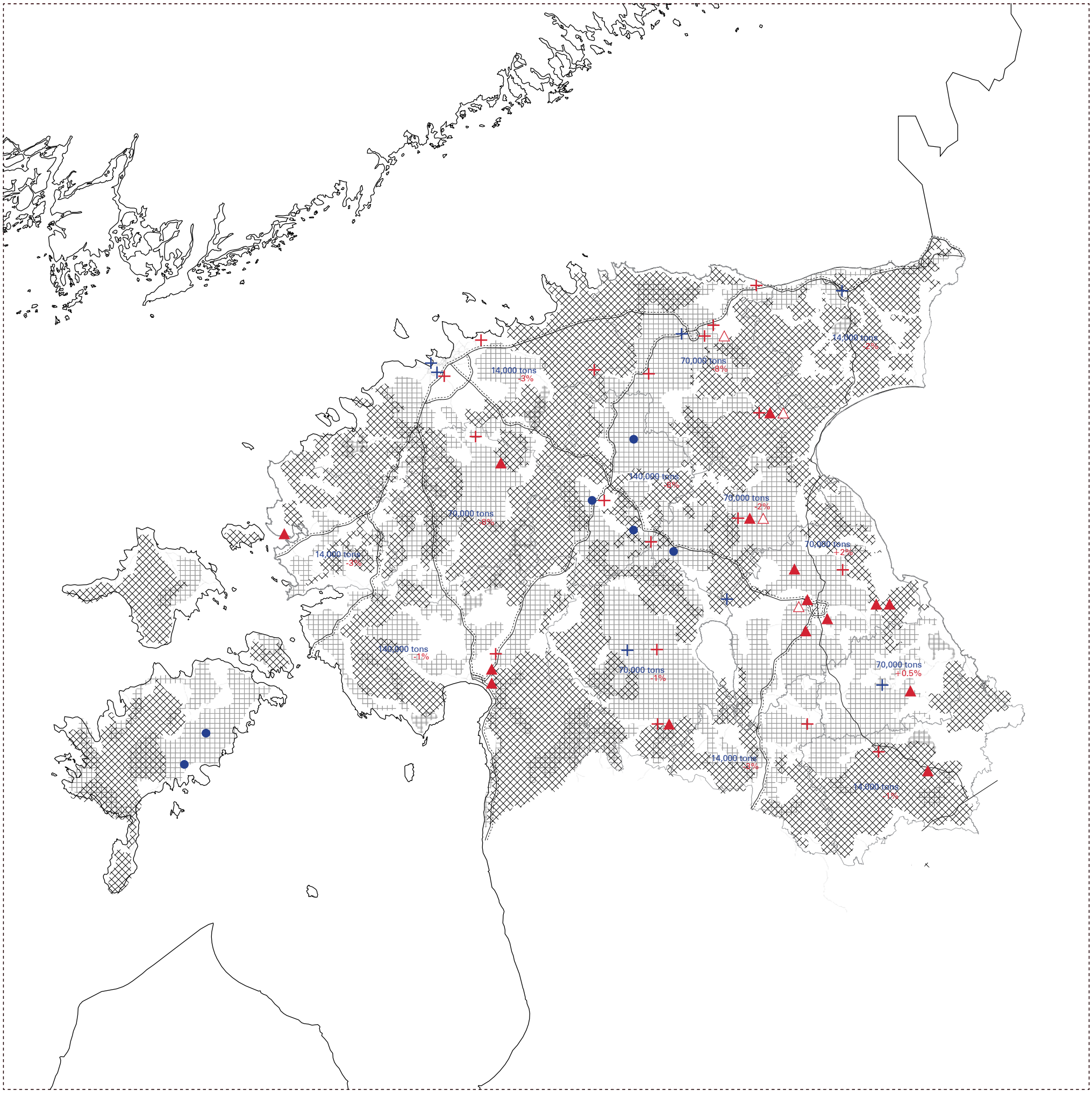
15k

Average monthly wages per county

€1,333

Urban center hinterland

Tallinn, the capital of Estonia, houses almost half of the entire national population. Due to their central position within the logistic network, Tallinn and Tartu have the most high-wage employment opportunities, and the longest commutes from their low-density satellite settlements within the hinterlands.

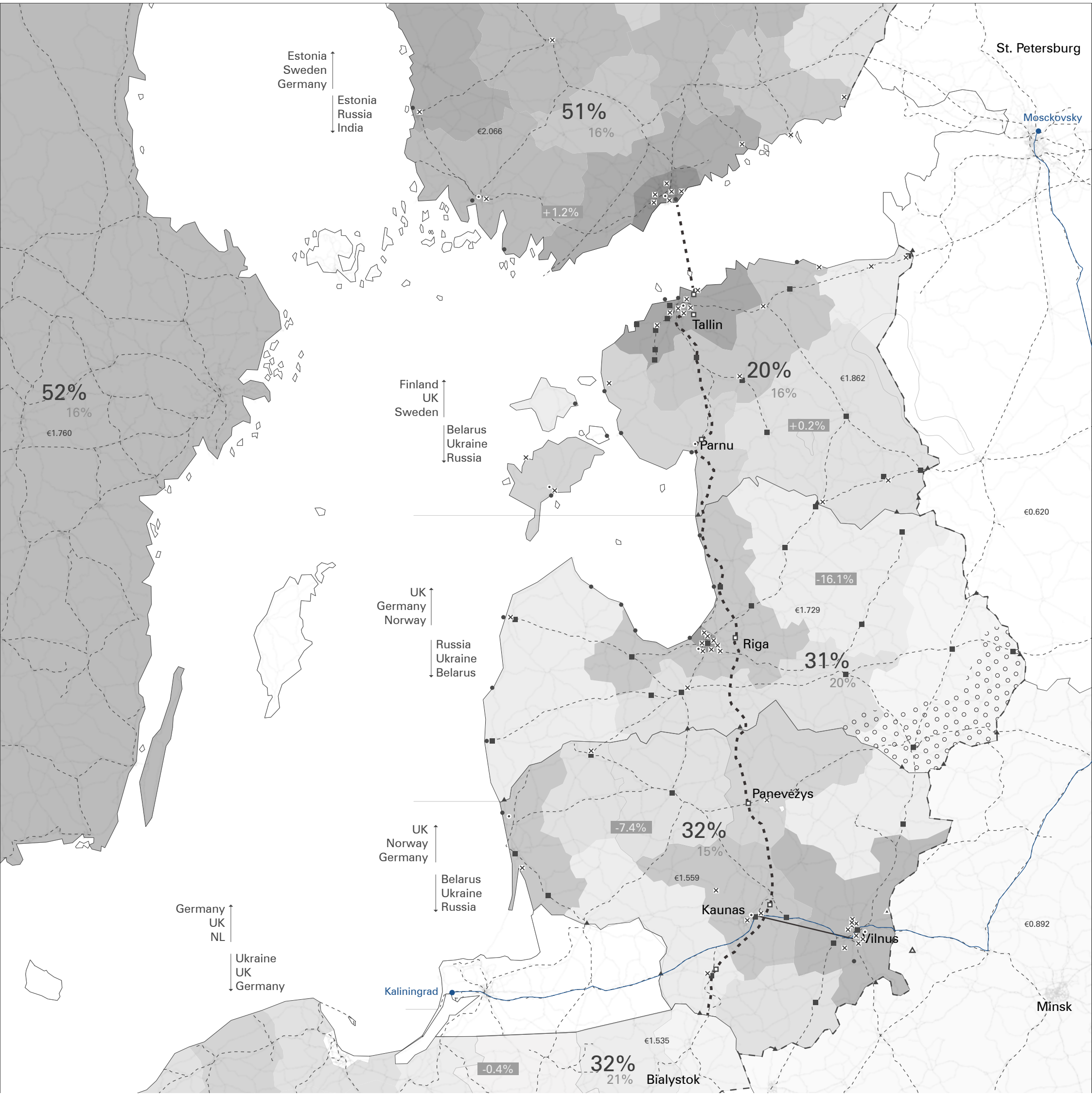


Milk and timber industry

- Road (to be upgraded)
- Road (completed)
- Forest
- Farmland
- Sawmill
- Wood manufacturer
- Pellet plants
- Dairy plant (co-operative)
- Dairy plant (industry)
- 140,000 tons — Average milk produced per year/county
- -5% — Net tree cover change (2000-2020)/county

Estonia consists of fifty-percent forestland, and twenty-five-percent farmland. The country has been losing tree coverage from 2000 to 2020. Timber production is relegated to the southeast half of Estonia, due to anti-deforestation measures and agriculture surrounding or adjacent to the capital. Major timber production sites are all located near highways. The coastal city of Parnu serves as a major site of timber import and export.

The dairy sector has a hierarchical structure of cattle herds and dairy farms. In Estonia, eighty-percent of raw milk comes from large herds with more than one-hundred cows, and twenty-percent from more than six-hundred cows. Five large companies dominate the dairy industry, while smaller producers are often working in the niche market. Considerably, most raw milk is collected to be processed in the total of forty industrial dairy units in Estonia, of which fifteen processing units are owned by these five large companies.



Baltics map

Socioeconomic map

16% Corporate income tax

20% Personal income tax

↑ Top emigration

↓ Top immigration

+0.2% Population change in last 5 years

Average income

900 3600

– – – EU Border

• Port

■ Railway Station

△ Passenger Border Crossing

▲ Freight Border Crossing

▫ freight station project

× Logistics

· Airport

Baltic states make up the biggest part of the North Baltic Corridor along with Finland to the North. With a rapid neoliberalization of the economy in the mid 1990s and eventual entrance to EU in early 2000s the Baltic trio finds itself in a very specific geopolitical situation both in terms of trade and labor force. It still depends considerably on the raw materials imported from the east and maintains the physical infrastructure for this exchange, yet as we see with the proposed Rail Baltica project there is a big push for the integration into the western trade networks. When it comes to the labor force Estonia and Finland have the highest wages that barely help them keep their population from shrinking unlike other Baltic countries that struggle from emigration and unemployment.

Baltics map

Land use

- Cities/settlements
- Arable Areas
- Forest Areas
- Bird and Habitats Directives
- Proposed or designated directives
- Protected sites
- Water Areas
- Railway

The Baltic economies rely heavily on milk and timber as essential commodities. However, these two industries often compete for land use, as arable land is obtained at the expense of forests. The result is a fragmented landscape of diverse land uses, including agriculture, pasture, timber forests, and protected habitats, among others. Although the UN has established several directives to safeguard vulnerable habitats and identify potential new ones, the challenge of reconciling conflicting land uses persists.

North Sea-Baltic Corridor

Overview - Transportation Routes

Inland Waterways - Current and Planned
Roads - Current and Planned
Rails - Current and Planned

The North Sea-Baltic Corridor (NSBC) is one of nine corridors established by the European Union to meet the goals of the Trans-European Transport Network (TEN-T). The core network will connect the EU by removing bottlenecks, improving cross-border connections, upgrading infrastructure, and connecting multiple modes of transportation. The NSBC connects the Baltic countries - newer member states, with less population density and lower wages - to long-standing western members. The Corridor connects to the Baltic-Adriatic corridor in Poland, the Scandinavian-Mediterranean and Orient / East-Mediterranean in Germany, the Rhine-Alpine and North Sea-Mediterranean corridors connecting on the west side of the NSBC in Germany, the Netherlands, and Belgium.

NSBC Inland Waterways

Waterways in the Corridor include inland waterways and ports. Various routes through the North Sea are critical connections between the countries in the NBSC. Inland Waterways are well developed and have limited investment in comparison to rails and roads.

Complete

Planned Construction or Improvement

Projected Annual Freight Volumes for 2030 (x1,000 tons)

1-40,000

40,001-80,000

80,001-120,000

40,001-80,000

NSBC Railways

Complete

Planned Construction or Improvement

Projected Annual Freight Volumes for 2030 (x1,000 tons)

1-40,000

40,001-80,000

80,001-120,000

40,001-80,000

Rail connections and bottlenecks are a significant challenge for the Corridor. Rails built during the Soviet Union do not follow the EU standard. Additionally, rail bottlenecks include differing country-specific laws regarding train length and maximum line speed.
Rail Baltica is a significant infrastructure project that aims to connect the Baltic States with standardized train rails. By establishing a high-speed freight and passenger line, the project seeks to promote economic growth across the corridor and improve the transportation of people, goods, and military equipment. Additionally, the initiative intends to expand its reach to Finland by constructing a channel tunnel. Extending rail lines throughout the European Union is a crucial component of the EU Green Deal, which strives to achieve net-zero emissions by 2050.

At Association of Estonian International Road Carriers (ERAA)

Berlage: How would you say the current requirement or trend to push for sustainability in transportation modes affect companies' choices in the carriers?

Ermo Perolainen: This is interesting from the side of the European Union. What we see is that we have set our targets to these organizations to be zero emission etc. but at the same time the real regulations that are adopted are just the opposite.

B: What regulations?

EP: For example, I don't know if you have heard about the mobility package in the transport which was adopted in 2020 and entered into force about one year ago. It says that every truck has to come home every eight weeks. So you have to organize your logistics,your work, whether you want or not, whether you have a load or you don't, you will have to come home. [...] Whether you have transport to Estonia or not you have to come home. And have to come empty. Big truck. And we're not talking about one truck. We are a small country but we still have 7000 - 8000 trucks in international transport. So then we have to organize this and it's a huge administrative burden. To take into account that your purpose of your work is not just to be effective and to carry more loads but also to avoid driving empty.

B: What's the argumentation behind this rule?

EP: Augmentation is, uh…actually, we don't understand the argumentation. The argument's real purpose is that they are protecting their market. They're pushing us [out]. They see that our clients are Western European countries, for instance French, Spanish or Italian. They, they don't have enough transport themselves, that's why we have increased in the last five years. [...]

B: So you think it's their lobby that's pushed for this regulation?

EP: It is lobby for so-called old Western EU countries. They say it's because of social issues but it's not a social issue because drivers have to come home anyway. Drivers have to come home every four weeks so this is not a driver issue. Employers have an obligation to arrange the possibility for drivers to come home. So it's not a social issue for drivers, it is something else.

At Estonian Forest and Wood Industries Association

Berlage: You mentioned that there's more and more regulation from the EU getting stricter across the board when it comes to forestry. How would you say that has changed harvesting in Estonia or if it hasn't?

Henrik Välja: So far it hasn't, but it probably will start to affect it. I think the issue for us is that the EU doesn't really understand forestry. If you look at the Nordics and the Ba;tics, we have roughly 40% of the total European forest. But if you combine our population, which is important when you have negotiations in the EU just by the number of parliament members, et cetera, then we are so small, we are combined smaller than Poland. So we see that the understanding of forestry is really weak there. On the other hand, they are coming in with more and more regulation. Easiest to understand all the, the heaviest debate is around the question "carbon in the forest or forest as absorbing carbon." So these are two different things if you want to keep carbon in the forest, that's a different strategy then if you want to keep the forest absorbing carbon. So, and that, that is the kind of the biggest conflict.

NSBC Roadways

Complete

Planned Construction or Improvement

Projected Annual Freight Volumes for 2030 (x1,000 tons)

1-40,000

40,001-80,000

80,001-120,000

40,001-80,000

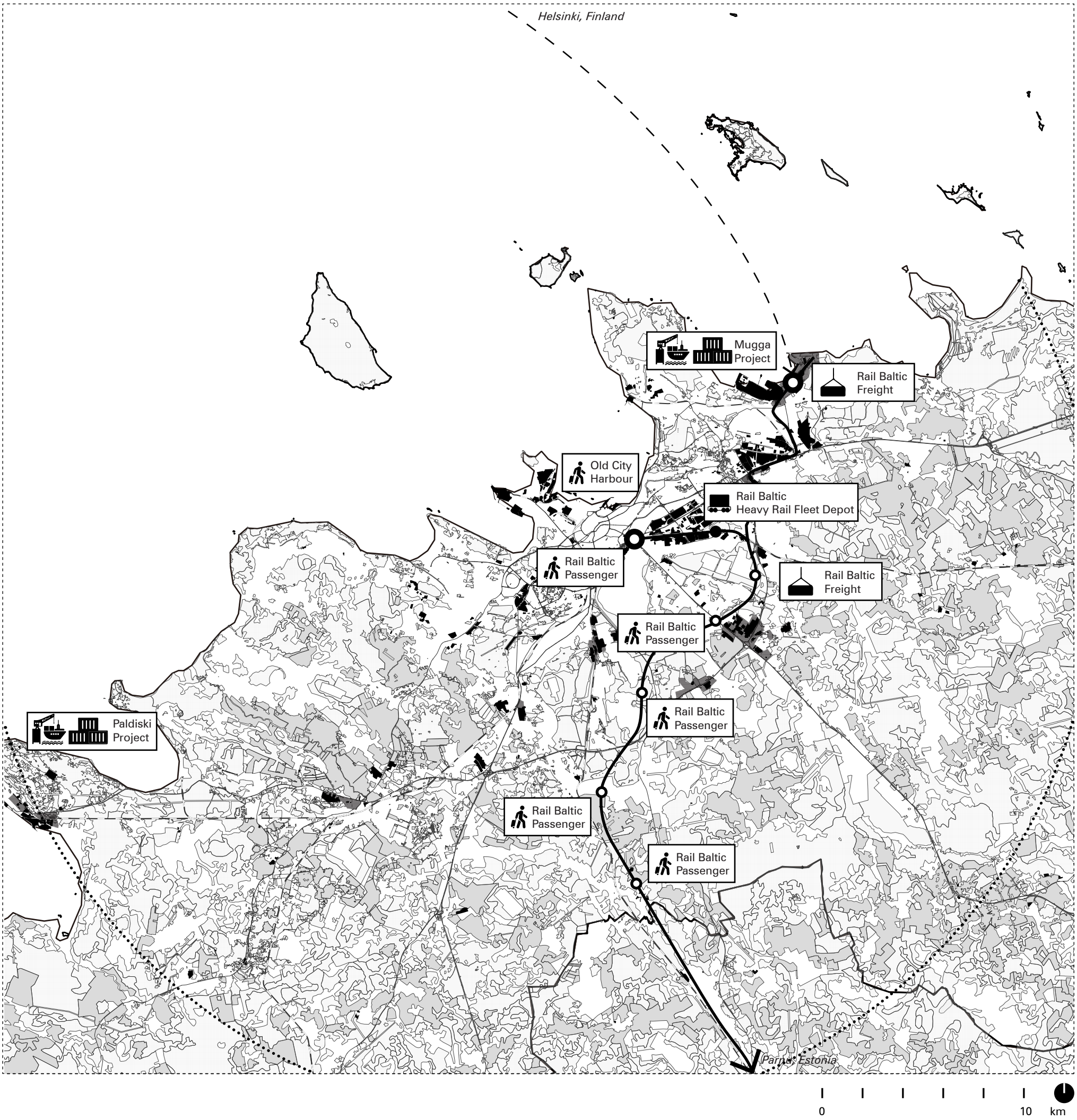
Roadways are currently the primary mode of transportation throughout the NSBC. Conditions and maintenance of roadways vary between countries. Investments in Rail Baltica have sparked concerns that funding for road infrastructure will be neglected, resulting in a decline in road quality. On the other hand, economic development of the corridor in this comprehensive network will strengthen the single market economy and individual EU member states, and help the EU achieve its Green Deal transportation goals by 2050.

1.3 Urban-Rural Distribution Map

Tallinn and Harju county metropolitan

- Building
- Forest
- Commuter region

Tallinn, Estonia's primary financial, industrial, and cultural center, is situated in Harju County and boasts a vital passenger and freight harbor, as well as the nearby free trade zones of Muuga and Paldiski Harbor, providing easy access to the international market via the Baltic Sea. The area surrounding the ports is home to various small towns and villages, all linked by a network of railways and roads. Due to the concentration of railway routes, around 80% of Estonia's population lives in or near the metropolitan area centered around Tallinn, where the cost of living tends to be higher. As of 2021, Tallinn has a population of 437,811, while the surrounding region has 58,847 inhabitants. Moreover, Harju County has experienced a population increase of 11.2% over the past decade, with 614,567 people living there permanently.
Regarding the county's land use, over 65% of Harju County's 283Kha land area is forested, but this figure has declined by 3.00Kha over the past decade.



1.3 Public Transportation Network

Tallinn and Harju county metropolitan

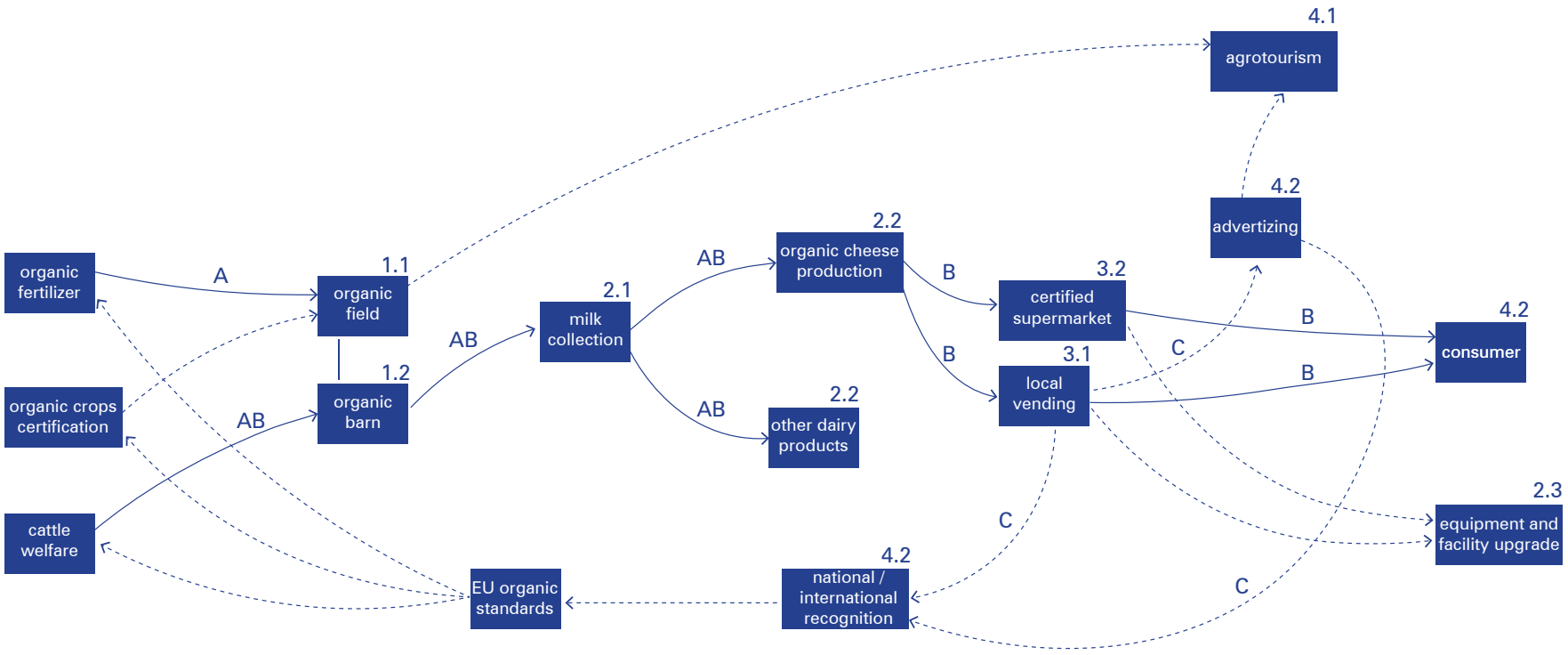
- Industrial Area
- Logistics Park
- Railway
- Rail Baltica
- Road
- One Hour Driving Radius

Tallinn's logistics and transportation infrastructure are highly developed, with two key harbors, Paldiski and Muuga, situated in close proximity(one hour driving radius). These ports provide access to international markets via the Baltic Sea and are supported by an efficient railway and roadway network that extends across Harju County and beyond. According to the data from Eurostat, road transportation accounted for approximately 69% of the total inland freight transport in Estonia in 2019.

One of the most significant developments in recent years is the Rail Baltica project. It entails the construction of a new rail network that will link Tallinn Muuga, a freight terminal, and Ülemiste, a passenger station, with other European capitals. This development will have a significant impact on the city's transportation system, as it will improve access to vital economic centers in the region and facilitate the movement of goods and people throughout the continent. Additionally, the project will significantly reduce the travel time between the Baltic countries, it will effectively cut the distance of the journey in half, reducing the travel time from nine hours to just four hours.

Tallinn benefits from a robust logistics infrastructure, which is supported by numerous companies specializing in warehousing and logistics services. These firms provide essential services such as storage, transportation, and distribution, bolstering the city's logistics capabilities.

Supply Chain



Organic cheese

Supply chain diagram

1.1	Organic pasture
1.2	Cow barns, feeding barns
1.3	Milking parlour
2.1	On farm processing facility
3.1	Nationally recognized organic retailers
3.2	On farm tasting rooms
4.1	Consumption
4.2	Digital advertisement
4.3	Government advertisement

A	On Farm: tractor, manure spreader, feeder
B	Road: refrigerated truck, trailer, company truck
C	Digital: website, government portal, organic certified resellers

Organic dairy farming in Estonia has become more financially sustainable by adopting a centralized approach to harvesting, processing, and packaging of products. Due to the rising costs of milk and organic feed, as well as the growing demand for raw milk, farmers have been forced to invest in their own production. At Pajumäe Talu, this strategy has enabled them to create unique products and establish strong relationships with customers throughout Estonia. To minimize costs, the farm practices extensive recycling of materials, such as using cow manure as organic pasture fertilizer and selling whey to other producers. Additionally, renewable energy sources have been employed to enhance production efficiency. The smaller scale of the operation allows for greater quality control, with local experts involved in milking, cheese production, pasteurization, and entrepr

0 100 km

Organic cheese

Supply chain map

1.1 Organic pasture
1.2 Cow barns, feeding barns
1.3 Milking parlour
2.1 On farm processing facility
3.1 Nationally recognized organic retailers
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A On Farm: tractor, manure spreader, feeder
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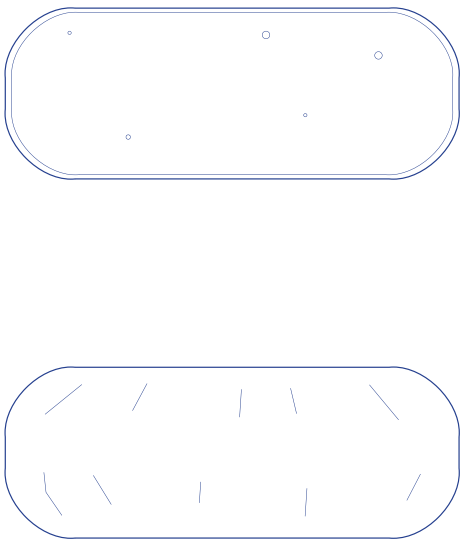
Pajumäe Talu has established a fully integrated production process from the cultivation of organic feed for their dairy cows to the packaging of their organic cheese. Their products are sold at various retail locations throughout Estonia. Customers can find their organic dairy products at specialty stores, organic markets, and supermarkets, among other locations. The farm's commitment to sustainable agriculture and successful advertisement has earned them a large customer base despite the relatively small scale of their operation.

400g
€6.92/pc



Organic cheese

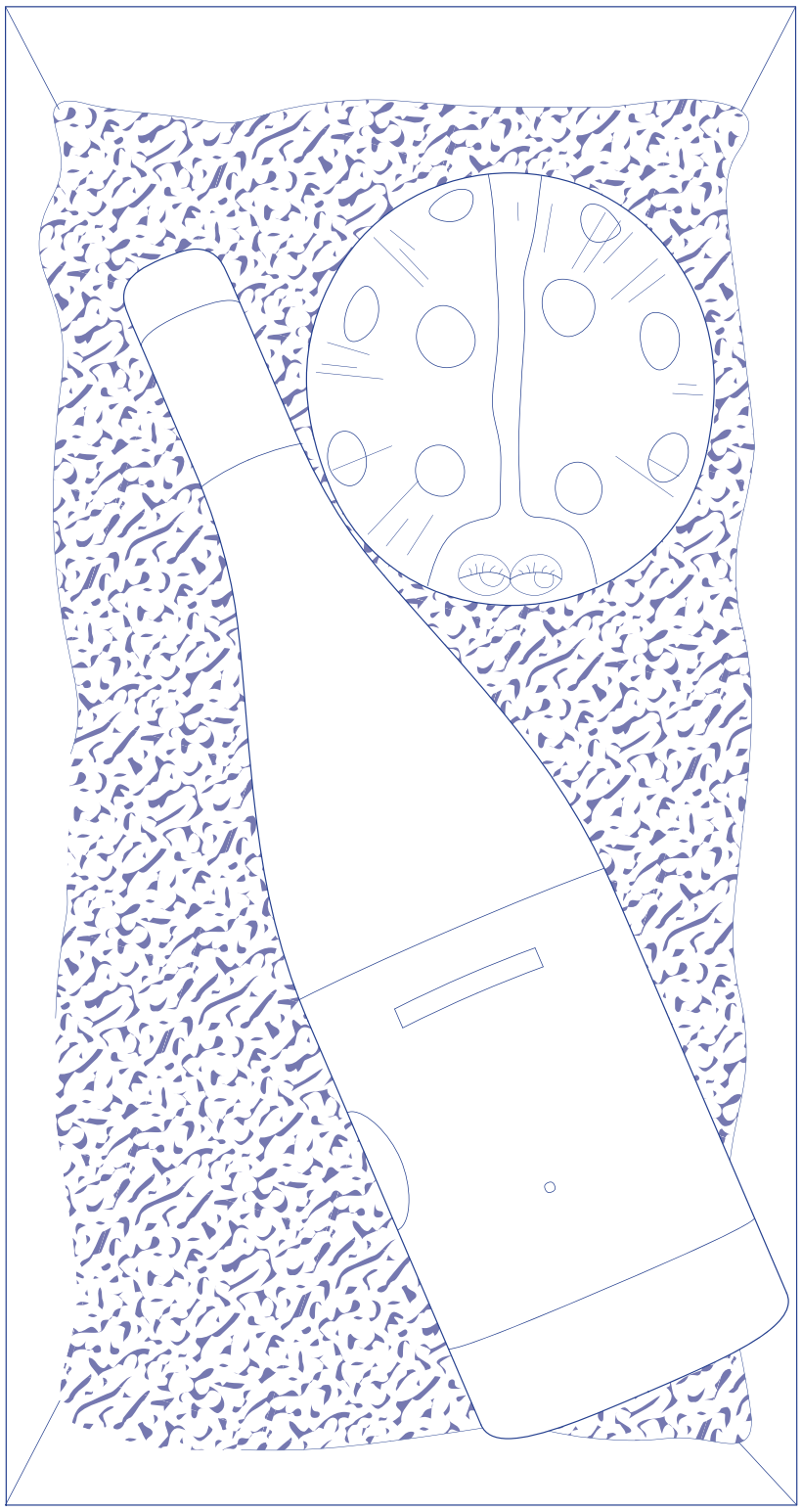
Product

EU Organic Logo provides certification and visual identity to European products labelled as organic. The logo allows European organic producers to market their products throuhgout Europe with a recognition of quality. The logo must be used for all pre packaged products labeled as organic.

The Estonian Farm Food Badge is accredited by the Central Association of Estonian Farmers and provides a certification of authenticity for farm raised products.

Pajumäe Talu (Pajumäe farm) produces a diverse range of organic dairy products available for sale at designated organic retailers across the local and national markets.
One of their most popular products is a hard cheese that is expertly crafted and aged for a period of two to three months. Once the cheese reaches the stores, it has an additional shelf life of two months. The higher profile product is often paired with wines of compatible palate.

€25

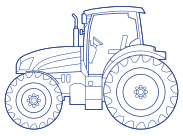


0 50 mm

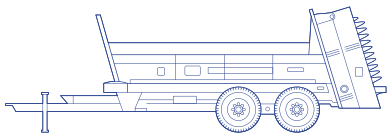
Organic cheese

Packaging

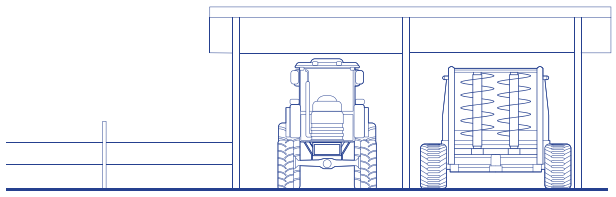
The farm first obtained certification for their dairy production in 2005, and since then, they have expanded their production considerably. The rules governing organic farming in the EU extend to a range of items, including seeds and other propagating materials like cuttings and rhizomes, which are used to cultivate plants or crops. Additionally, they apply to live or unprocessed agricultural products, feed, and processed agricultural products intended for use as food. To ensure compliance with these regulations, EU Organic Production rules prohibit the use of genetically modified organisms (GMOs), ionizing radiation, and hormones. The use of artificial fertilisers, herbicides, and pesticides is also limited, and the use of antibiotics is only permitted when necessary to maintain the health of animals.



1



2



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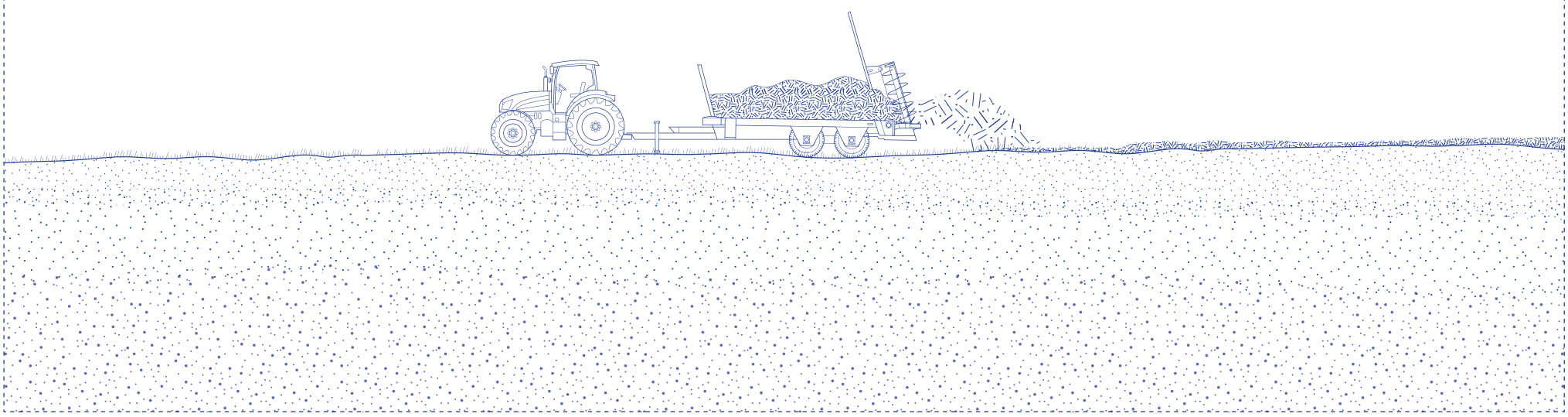


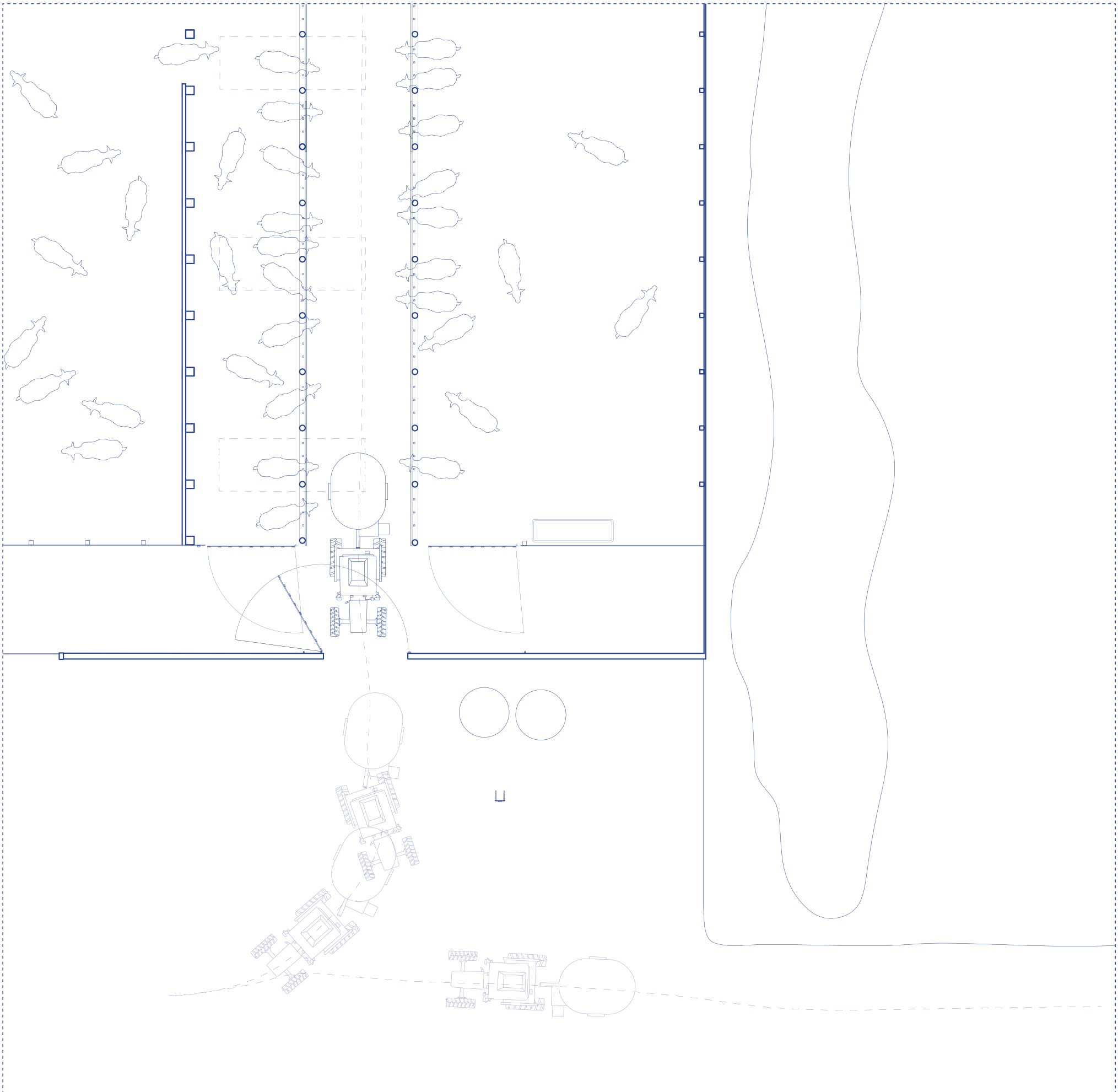
0 5 m

Organic cheese

Vehicle and behavior
Tractor and biospreader

1 Tractor
2 Biospreader
3 Vehicle shed

Given the farm's 400 acres of land and pasture, several tractors are essential for the transportation of materials and spreading of manure. The manure is accumulated in the barn and collected once or a year to use as fertilizer in accordance with the organic production guidelines set by the European Union. Organic manure is rich in nitrogen, potassium, and phosphorus, making it an excellent and renewable fertilizer option. Additionally, it can enhance soil composition and structure by depositing organic matter with a high water infiltration capacity. The farm has one feeder which is used to mix and distribute feed to the cattle in the barn. Recently, organic feed has become very expensive in Europe, making it difficult for smaller farms to adhere to EU organic standards.



Organic cheese

Vehicle and behavior
Tractor and feeder

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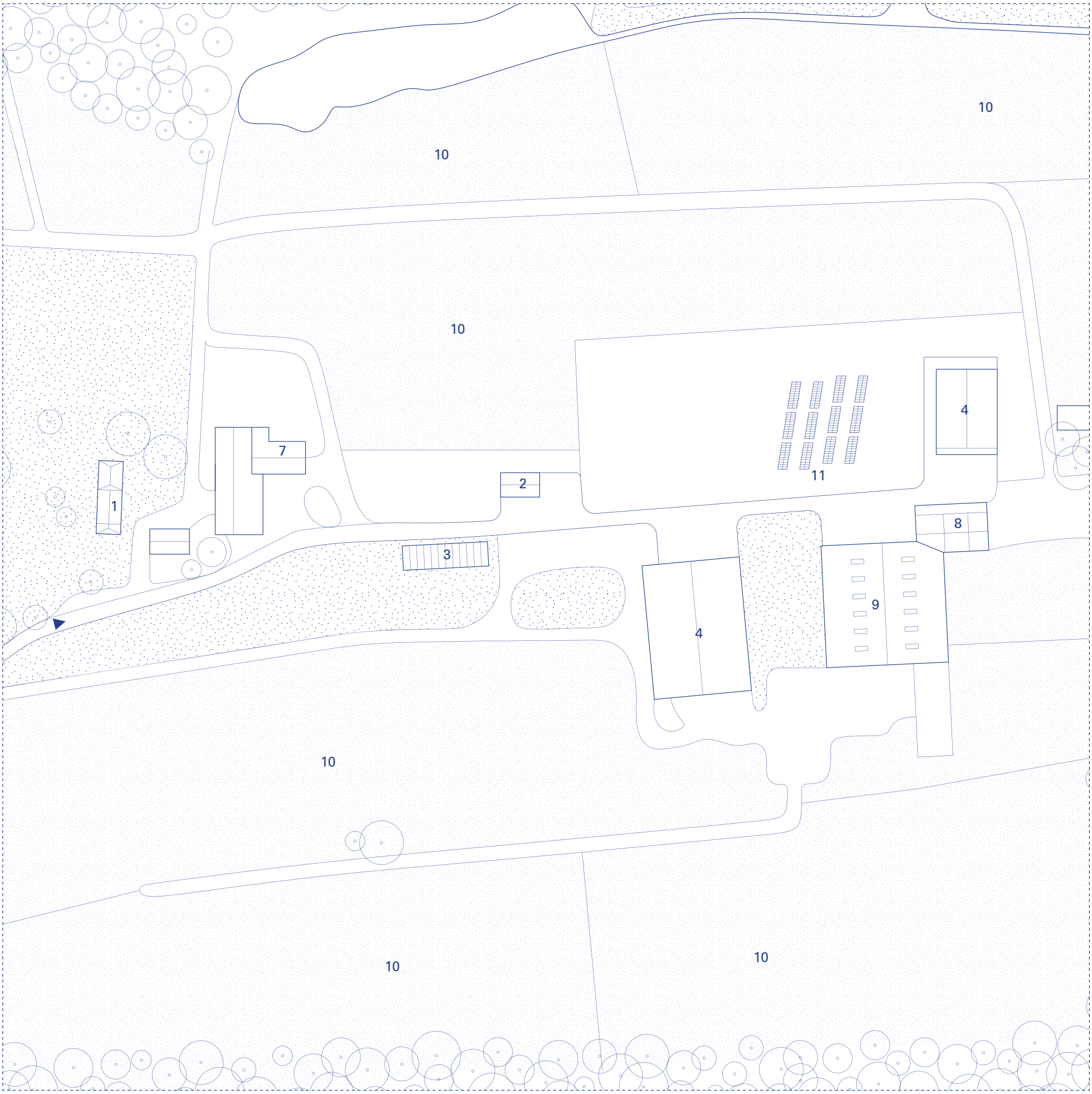
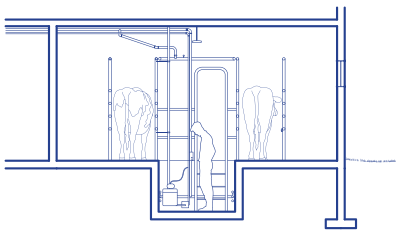


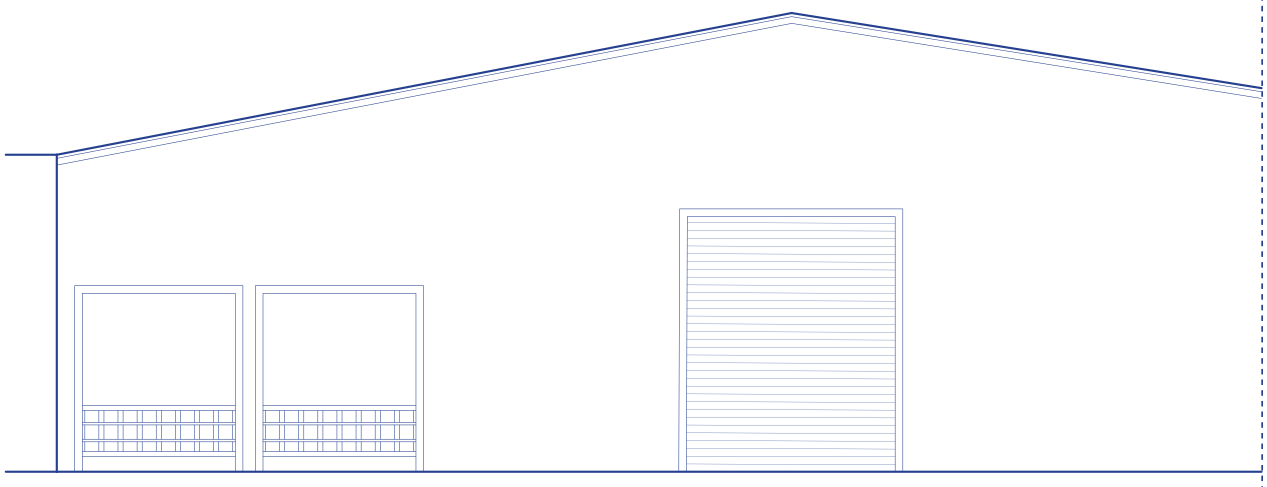
Organic cheese

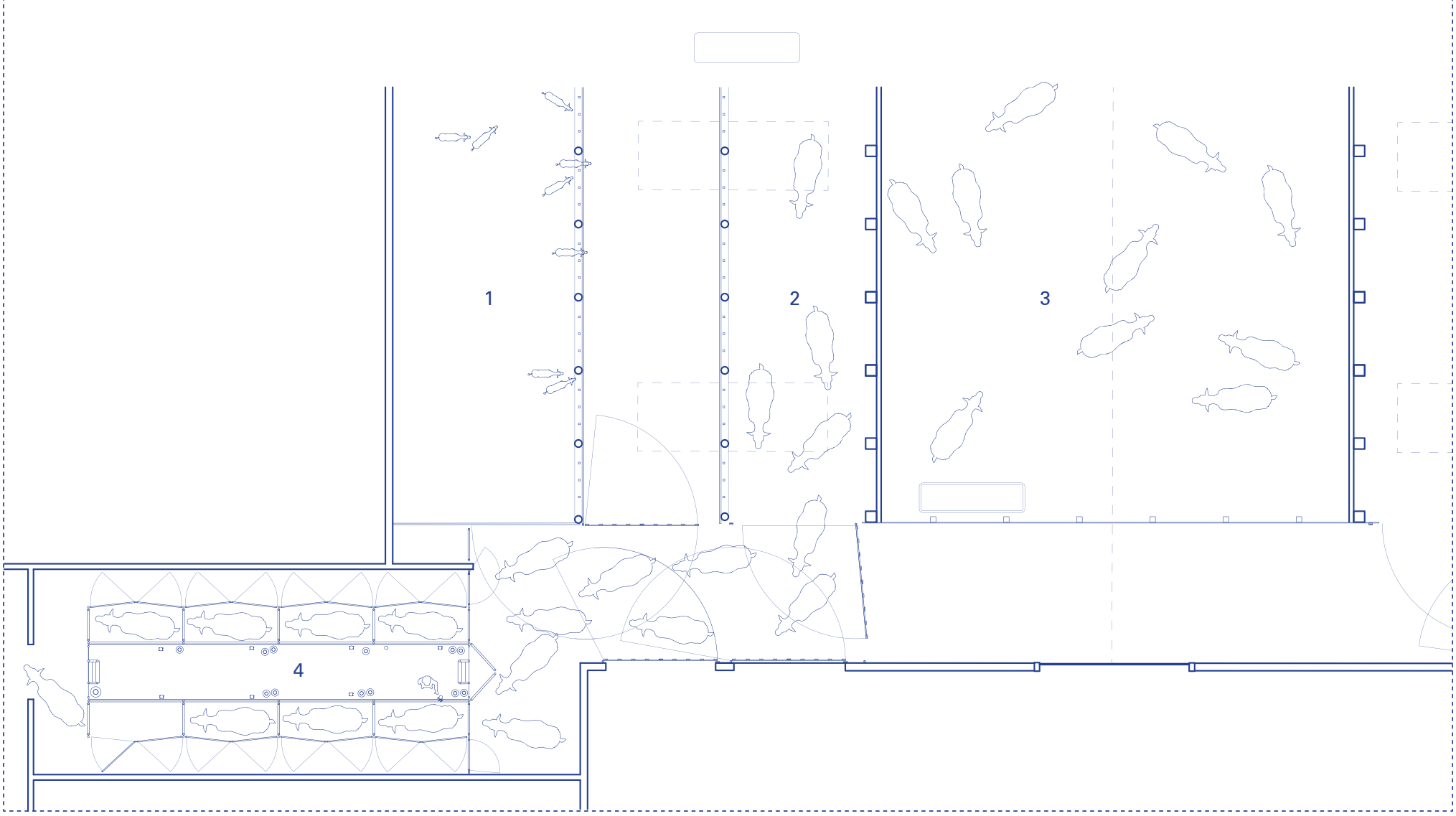
Site plan
Organic dairy farm

▶	Entrance
2	Farm house
3	Office
4	Equipment storage
5	Feeding barn
6	Dryer
7	Processing facility
8	Cheese cellar
9	Milking parlour and cow inspection pen
10	Cow barn
11	Pasture
12	Solar farm

Pajumäe Talu is a dairy farm with around 120 cattle, including eighty dairy cows. Over the past decade, the farm has undergone significant expansion, including the recent addition of a new dairy processing facility for producing milk and cheese products. The farm spans 400 hectares of land and features one feeding and one housing barn. In the 1990s, after Estonia gained independence, the government promoted private businesses and the farm acquired land, which includes not only arable land but also forested areas that serve as collateral for bank loans. During winter months, cattle are kept in the barn, while in spring and summer, they graze on pasture. In addition to agriculture, the farm offers an agrotourism program, allowing visitors to learn about dairy production firsthand.







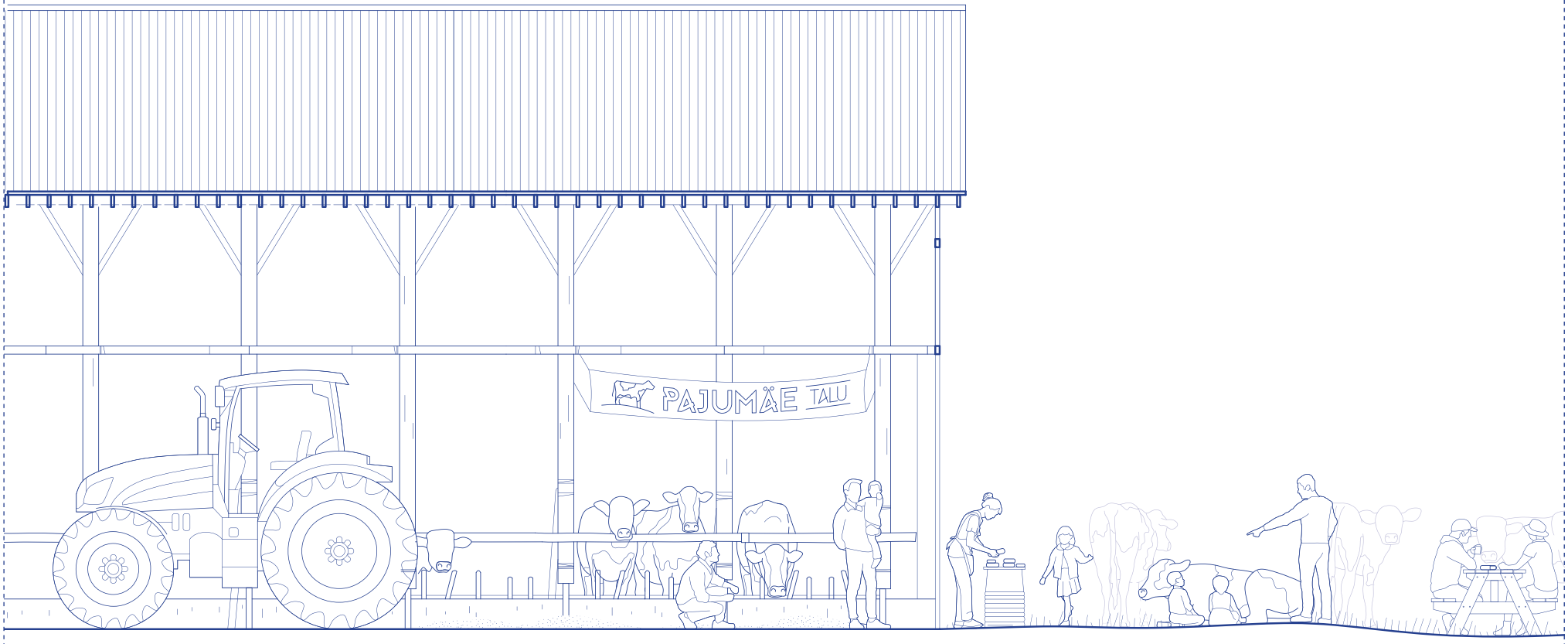
0 5 m

Organic cheese

Facility plan and section
Cow barn and milking parlour

1 Calf pen
2 Feeding area
3 Annual manure collection
4 Milking parlour

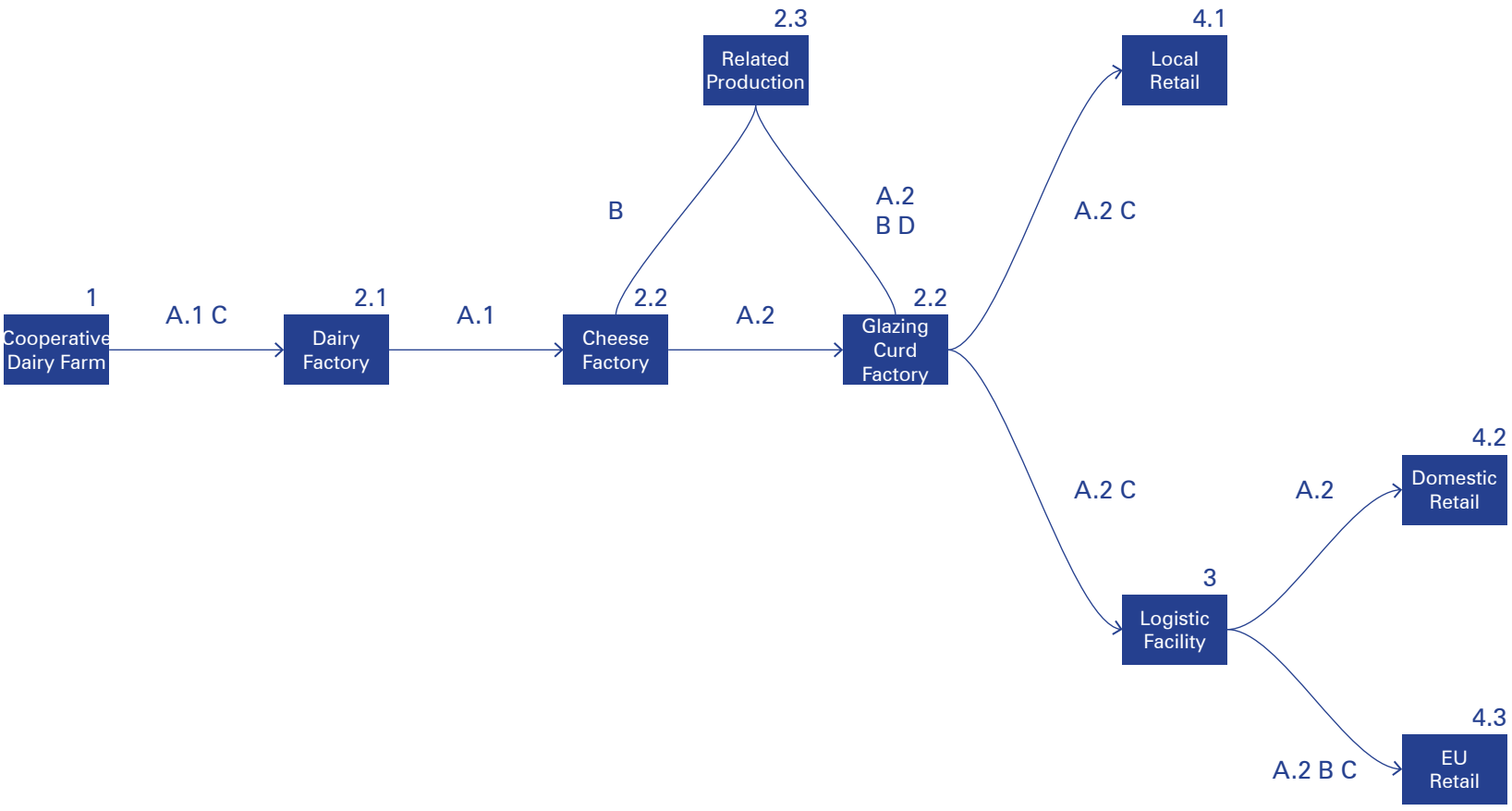
The cow barn at Pajumäe Talu is built from recycled parts of Soviet warhouses, a common practice for rural farmers in Estonia. The barn is connected directly to the milking parlour so that cows don't have to leave the barn in the winter months. Cows are milked twice a day in an eight-stall milking parlor. On each side of the parlor, cows walk into position parlor to a pit which is sunken into the ground for efficient milking. The milker will clean each cows' udders and then attach the milking machine which automatically detaches after the cow has been milked. After each row has been milked, a gate is opened, and cows are free to return to the barn or pasture. The process maintains the safety, hygiene, and stress-free environment during the milking of cows, promoting their overall health and well-being. Adherence to such practices is a crucial requirement for organic farming in the European Union.



Organic cheese

Narrative
Agrotourism

Pajumäe Talu offers tours and hosts events for locals and tourists to discover and experience its organic farming techniques. The farm receives substantial support from the Estonian government and the EU's organic funds, which highlights the country's commitment to environmental sustainability. Although it is a relatively small enterprise, the farm's organic certification and promotional efforts have earned a significant following in the agricultural and food industries. Their farm label is widely available in markets in Tallinn and Tartu, establishing their presence as a key player in the dairy industry.



Kohuke

Supply chain diagram

1.1	Saaremaa Piimatoostus Cooperative Dairy Farm
2.1	Saaremaa Piimatoostus AS
2.2	Saaremaa DeliFood
2.3	Related Products: PAKMA Company Lekkerkerker Dairy & Food Equipment KALEV Company POPI herb farm ELOPAK Company
3	AS Pinus, Tallinna
4.1	Retail in Saare Island
4.2	Retail in Estonia
4.3	Retail in EU Country
A	Road
B	Rail
C	Sea
D	Air

Saaremaa DeliFood Ltd (Saare) [2.2] was founded in 2002 and since then produces a variety of dairy products, while adhering to the highest standards for food safety and quality from the legislative acts of the Republic of Estonia and the European Union. Raw milk is collected from Saaremaa County farms [1.1] and its pasteurization process takes place either at the company's processing plant or at a facility owned by a partner of the Saaremaa Piimatööstus AS [2.1] (Saaremaa Dairy Association). Kohuke is prepared within two days [2.3], using specialized machinery from Lekkerkerker Dairy & Food Equipment to make cottage cheese from pasteurized skim milk, to cast the paste into the desired shape and fill the bar with jam or other fillings. With a production line designed and built by PAKMA, the snacks are glazed with chocolate from Estonian Confectionery Company KALEV. Finally, the snack is cooled and packed with supplies from ELOPAK, and transported from AS Pinus [3] to its cold storage, then to supermarkets [4.2] and finally to consumers' homes.

Kohuke

Supply chain map

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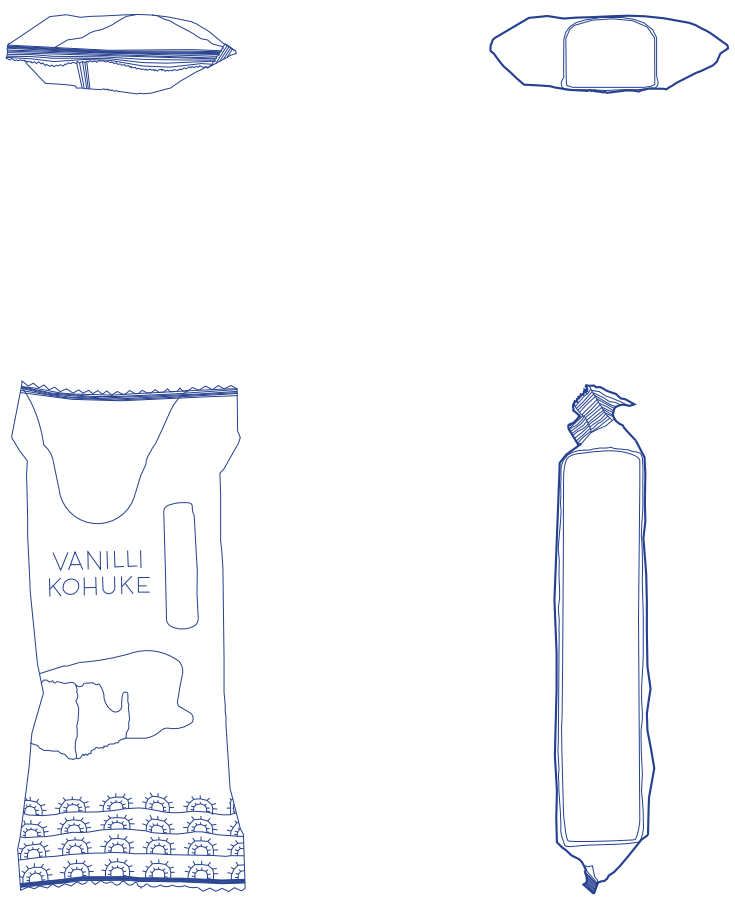
4.2	Retail in Estonia
4.3	Retail in EU Country
A	Road
B	Rail
C	Sea
D	Air

All Saare products are produced in the city of Kuressaare, on the island of Saaremaa and are accompanied by the label “Genuine product of Saaremaa”. This ensures customers that the product is manufactured in Saare County with high quality, ecologically clean natural resources, and with the specialized labour and experience of locals. Saaremaa DeliFood Ltd [2.2] logistics partner is AS Pinus [3], a company that since 1992 has established a long-standing partnership with the Saaremaa Meat and Dairy Industry. Since 2007, AS Pinus has been owned by Saaremaa Dairy Association [Saaremaa Piimatööstus AS [2.1], a cooperative organisation consisting of cow’s milk producers on the islands of Saaremaa and Hiiumaa. Since 2001, a cold storage facility has been operating outside Tallinn, with most products from the islands transported there by AS Pinus. The company is also responsible for the wholesale and retail trade of the products to local and international markets. Production equipment, relevant technologies and packaging materials used by Saaremaa DeliFood Ltd are acquired from companies and facilities that are spread across Northern Europe.

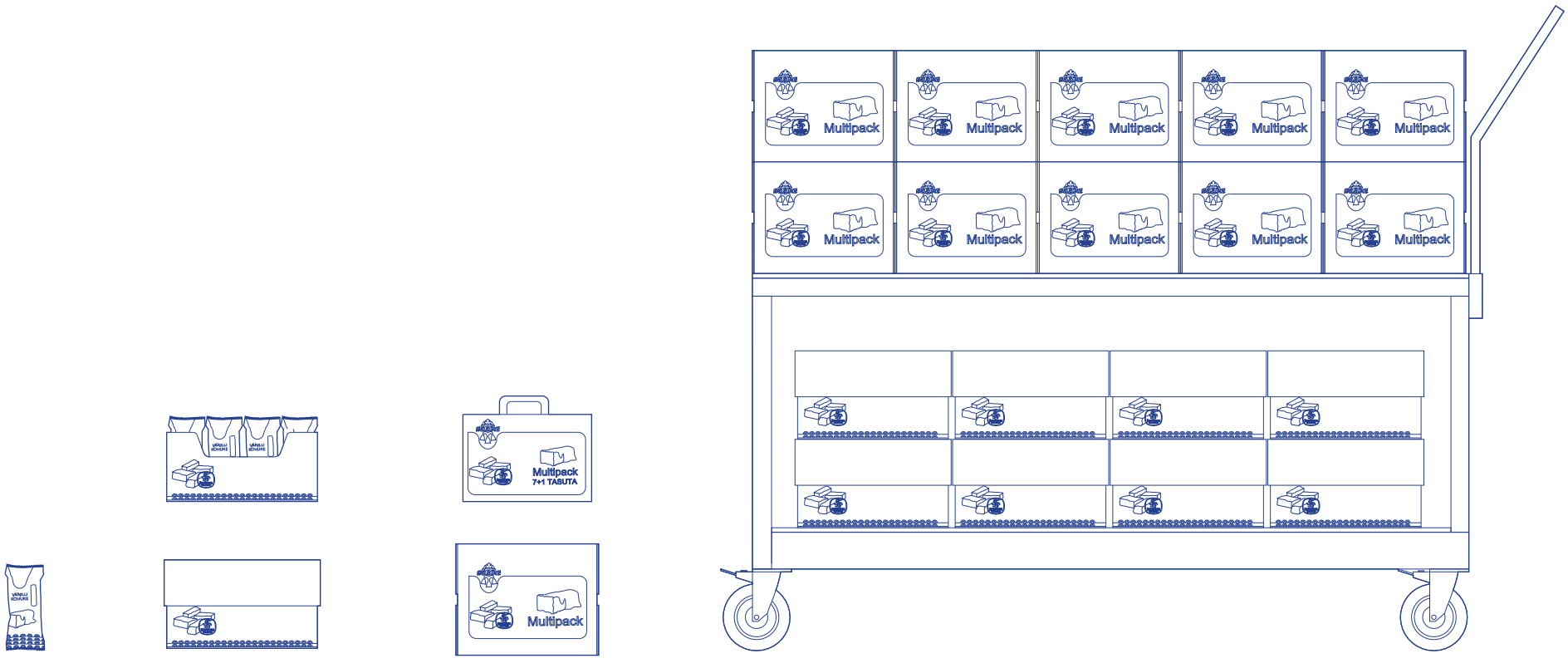


0 50 mm

Kohuke

Product unit

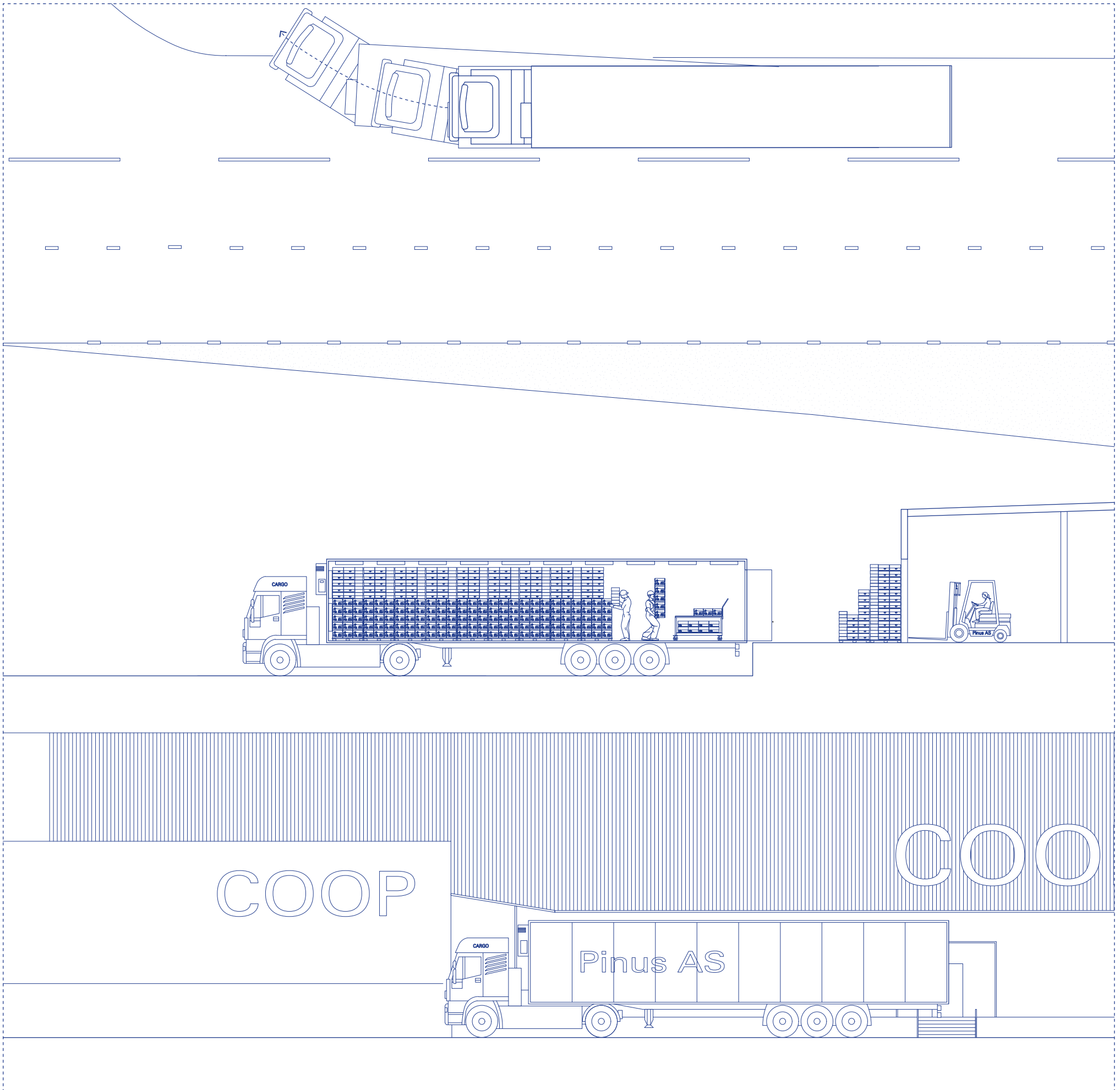
Kohuke (“little curd”) has been one of the most popular dairy snacks in the Baltic region since its introduction during the 1950s. Today it is available in a variety of fillings and glazings, and also as a lactose-free snack. Saare’s vanilla flavoured-coca glazed lactose-free kohuke comes as a 40g single packaged bar, with dimensions of 75 x 25 mm. The product should be stored at a temperature of 2°C to 6°C and it may contain traces of nuts and soy. The product holds the “Non-GMO Project Verified” label, validating that none of its source materials has been genetically engineered.



Kohuke

Packaging

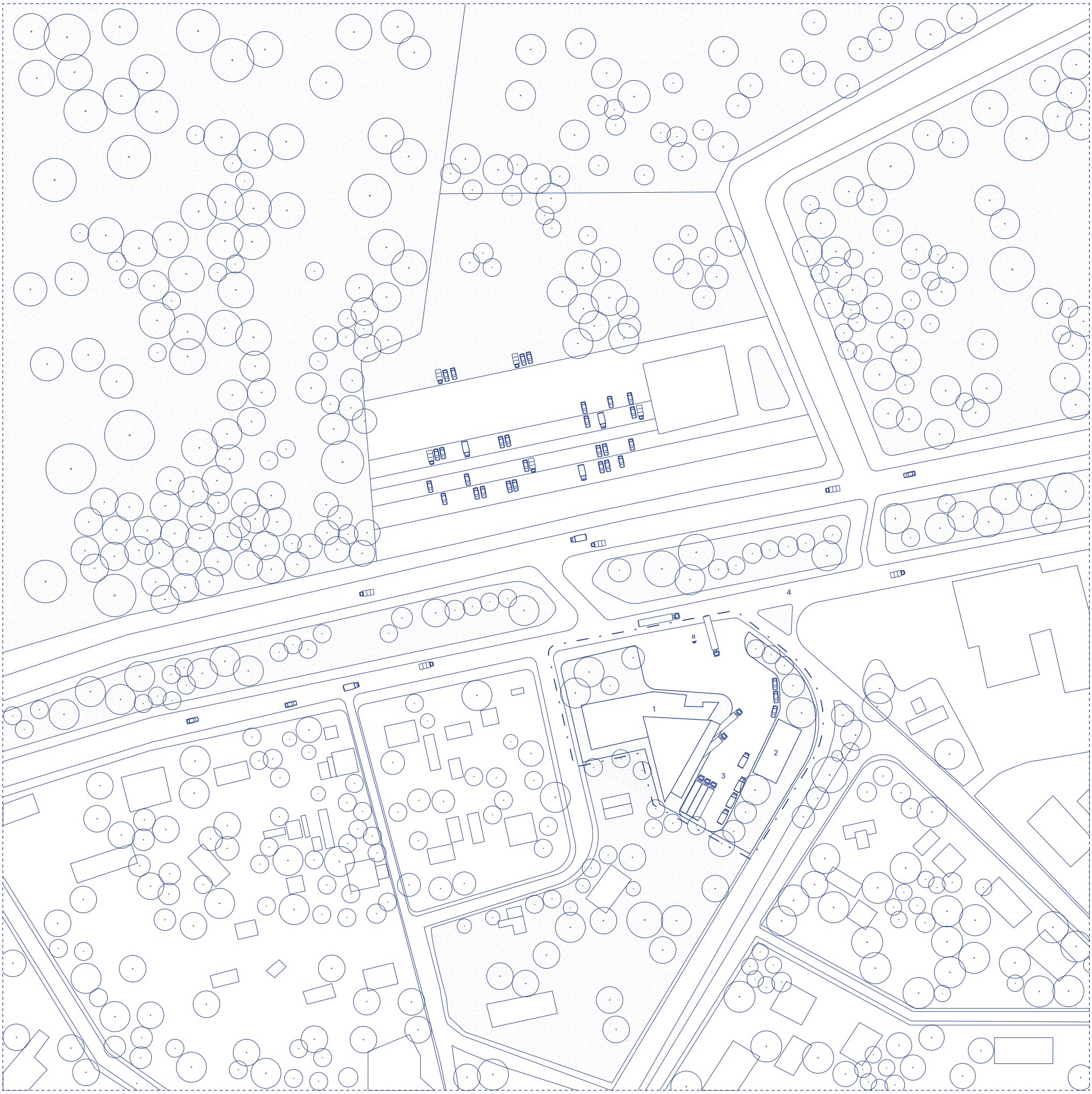
Using PAKMA's horizontal flow packing machines, each unit is sealed in a coating made of laminated polypropylene films (with metallisation and interlayer printing). Metallized films, unlike aluminium foil, have the same reflective glossy surface but are lighter and less expensive. The coating limits the permeability of the film to light, water, and oxygen, reducing contamination risks and extending the shelf life of the product. Carton packaging with ELOPAK supplies varies in size and quantities, from bulk packaging carton boxes of twenty units to complementary multipack boxes of eight units.



Kohuke

Refrigerated truck
Vehicle and behavior

AS Pinus, as a subsidiary of Saaremaa Dairy Association, provides logistical and distribution support to the multiple members of the cooperative. That means that refrigerated trucks use the road and highway network connecting the dairy processing plants of Saaremaa island as well as the cold storage facility in Tallinn with domestic and international retail outlets. Refrigerated trucks can also be transported by ships connecting Estonia's islands with inland ports. The standard refrigerated truck has dimensions of 13.3 x 2.5 x 2.65 m and can carry a maximum load of 24 000 kg. It consists of an articulated truck pulling refrigerated semi trailers. Mechanical cooling systems maintain the required temperature of the truck along its entire length. Products can be moved in and out of them directly to storage facilities or supermarkets using an elevated dock.



0 50 m

Kohuke

Cold storage facility
Site plan

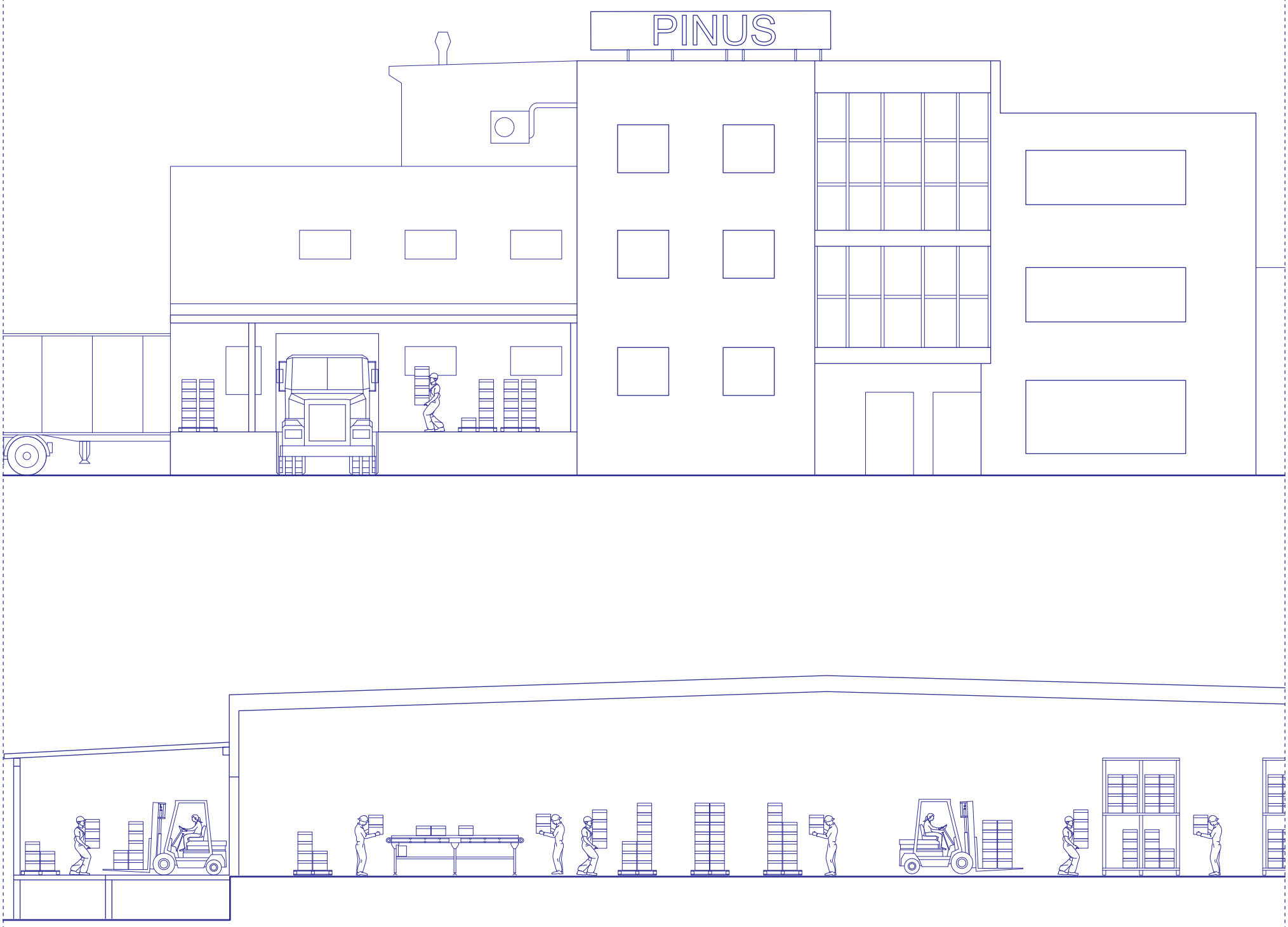
AS Pinus cold storage facility [1], is conveniently located by the Tallinn-Paldiski highway (National Road 8), which begins at Freedom Square in the centre of Tallinn, and runs for about 10 km within the city, allowing easy access to many supermarkets and restaurants. The facility is also relatively close to the Port of Tallinn as well as to Via Baltica (E67), having easy access to export opportunities towards international markets. The area around the facility is spacious enough to accommodate the loading, unloading, and parking of multiple refrigerated trucks.

Kohuke

Cold storage facility
Facility plan

1 Static storage
2 Dynamic storage
3 Staging area
4 Loading/unloading dock
5 Offices

The layout of a cold storage is crucial to the optimization and efficiency of the facility. All processes must be arranged in a logical sequence, to ensure fast product flow and worker safety. The L-shaped design of the facility features the reception area to the north of the building, while the shipping area is to the East. The loading and unloading areas [4] are located outside the facility, in covered docking areas, where the products move into storage compartments, using forklifts and conveyor belts. The staging area [3] is where the documentation, sorting and testing of products takes place. Separating dynamic and static storage ensures the efficient use of the space. The dynamic storage section [2] hosts the most popular products and thus is located closest to the docking areas, while the static storage section [1] accommodates products that remain in inventory for longer periods of time. The internal temperature of the facility should not exceed 7°C.

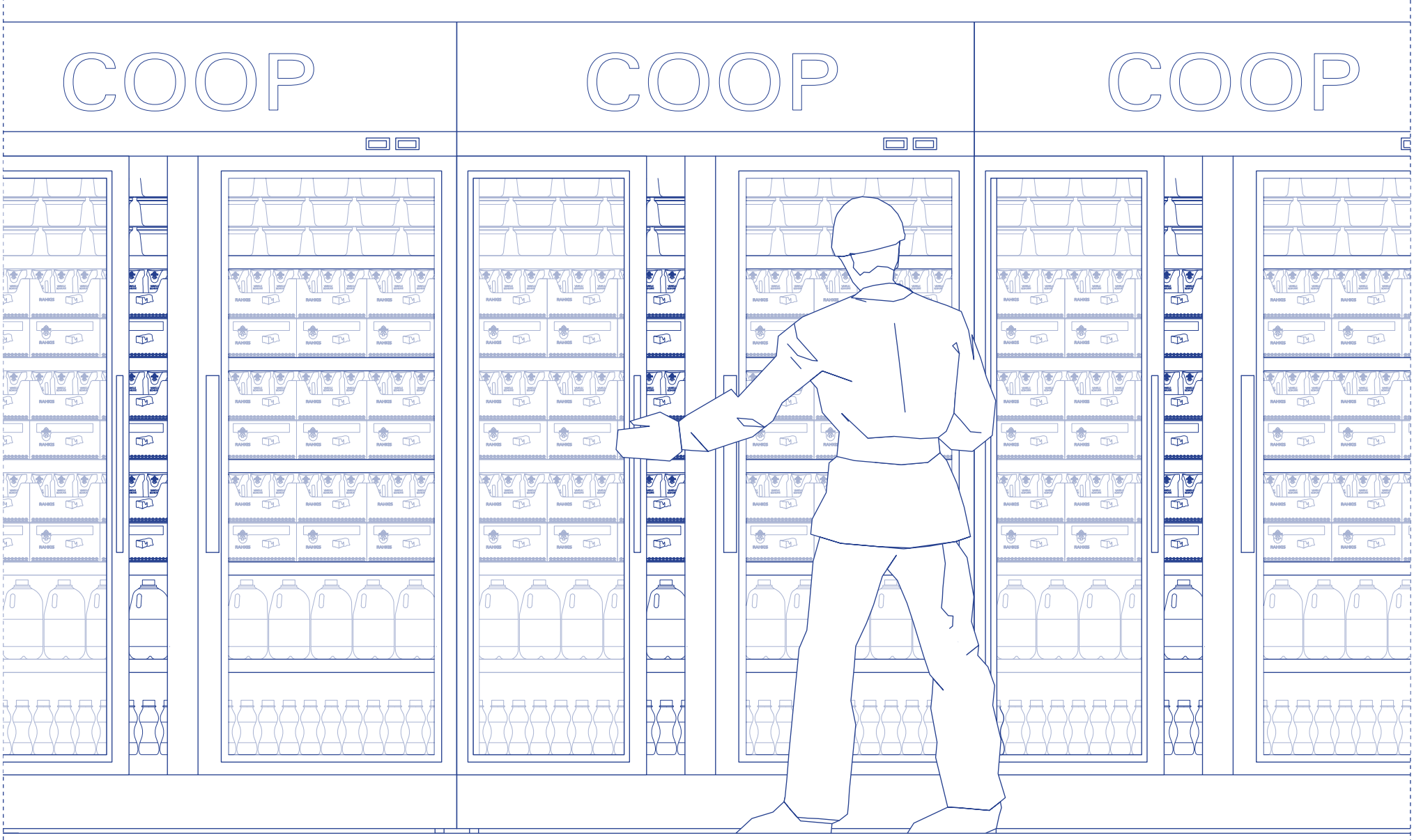


Kohuke

Cold storage facility
Facility elevation and section

1 Static storage
2 Dynamic storage
3 Staging area
4 Loading/unloading dock
5 Offices

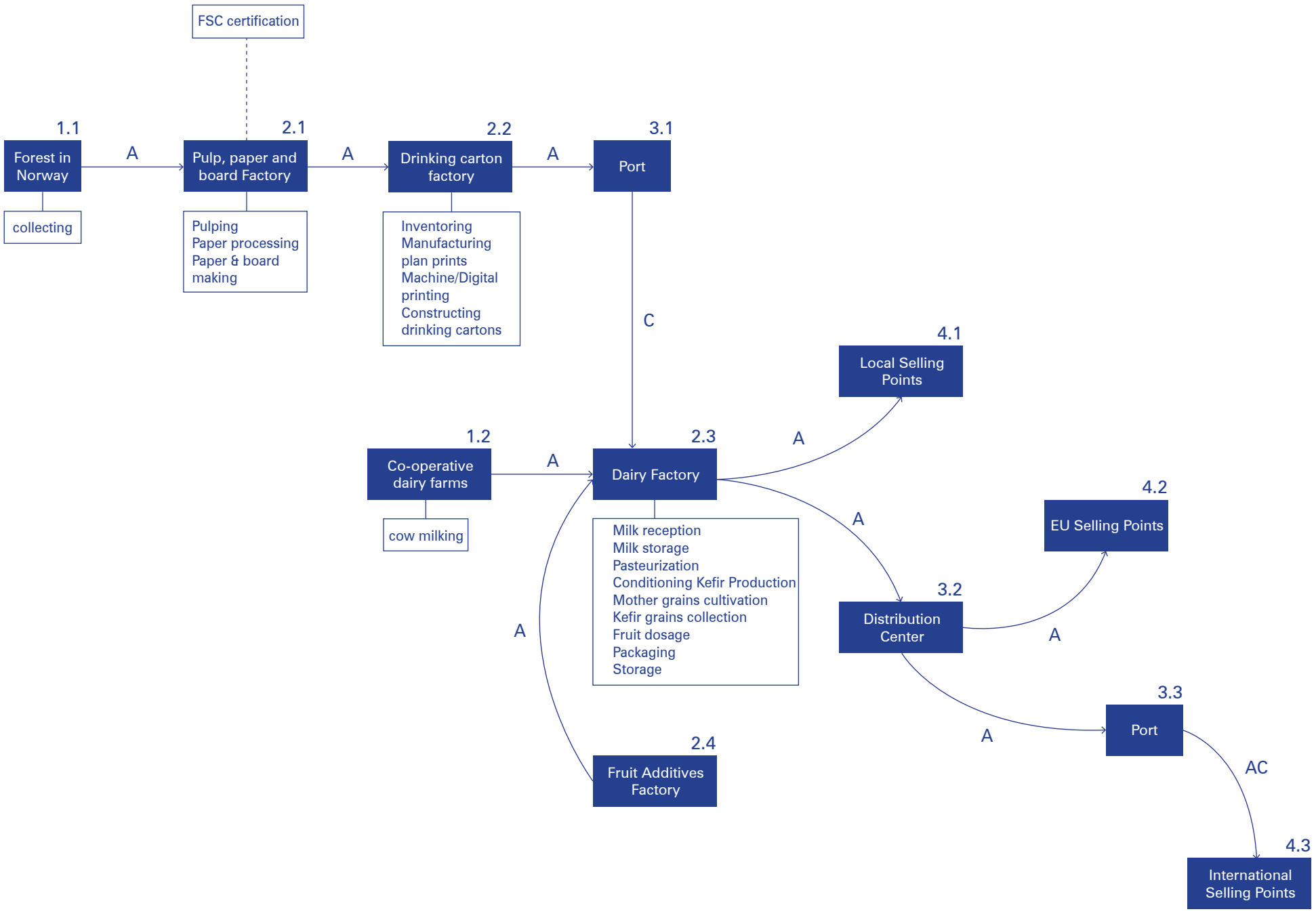
In order to achieve better space optimization, products are stored vertically using racking shelves. The docking areas are lifted off the ground to make the loading and unloading of products between the trucks and the facility easier. There are also ramps for smaller trucks.



Kohuke

Narrative
Supermarket refrigerator

Kohuke is a delicious, fully nutritious, cheap and easily accessible Estonian delicacy that can be found in most supermarket refrigerators among other dairy products.

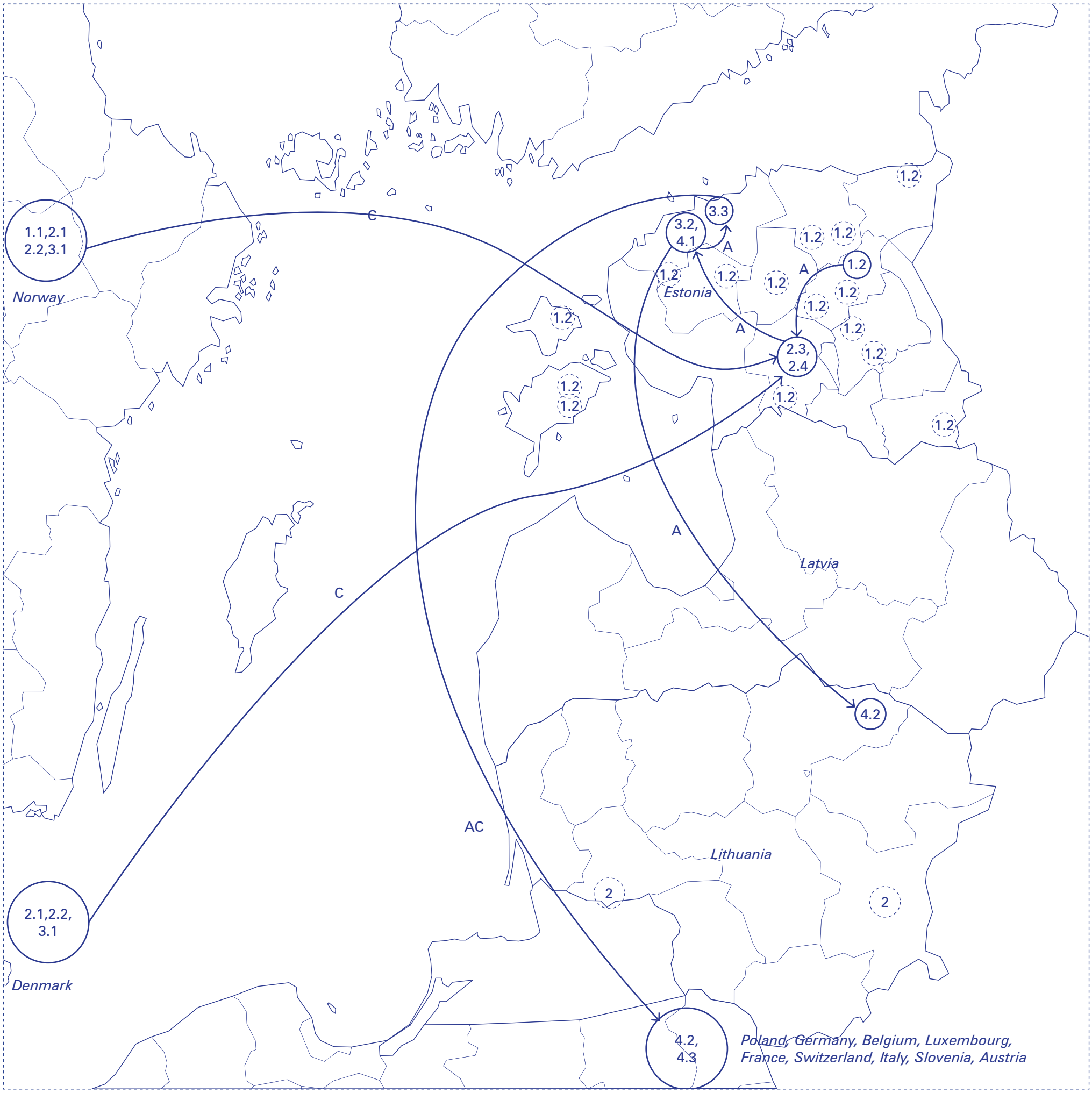


Kefir

Supply chain diagram

1.1	Forest, Norway
1.2	Co-operative dairy farm, Estonia
2.1	Pulp, paper and board factory (Norway & Denmark)
2.2	Elopak, Spikkestad, Norway
2.3	Tere AS, Polva, Estonia
2.4	Fruit Additives factory, Estonia
3.1	Port of Oslo, Norway (& Port of Denmark)
3.2	Distribution Centre, Estonia
3.3	Port of Maagu, Estonia
4.1-4	Selling Points
A	Road
B	Rail
C	Sea
D	Air

The Tere AS Factory processes raw milk from Estonian dairy herds and uses it to produce Kefir. Historically, Kefir was known as a legendary beverage renowned for its medicinal properties. Kefir is made by fermenting milk with a combination of bacteria, yeasts, alcohol, and carbon dioxide. Once considered a rare and divine brew, it is now available as a superfood for mass consumption.



Kefir

Supply chain map

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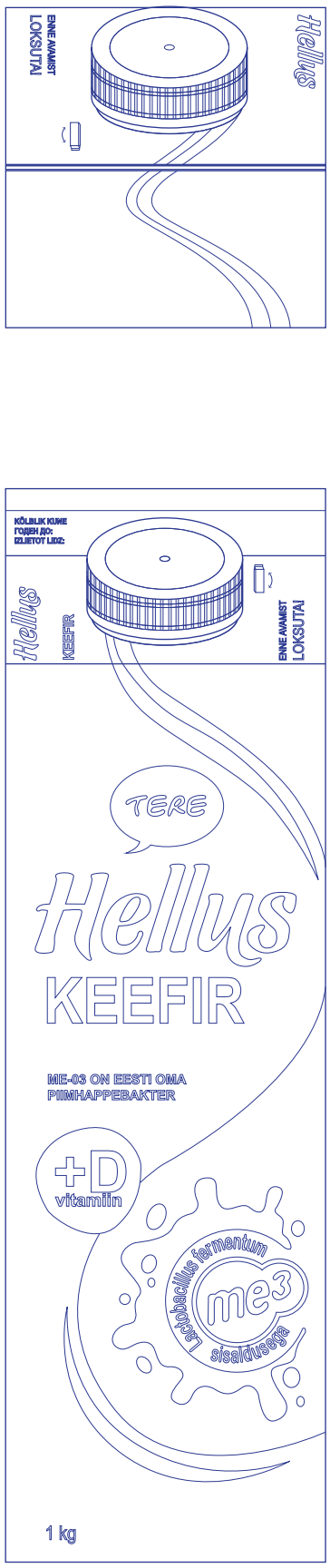
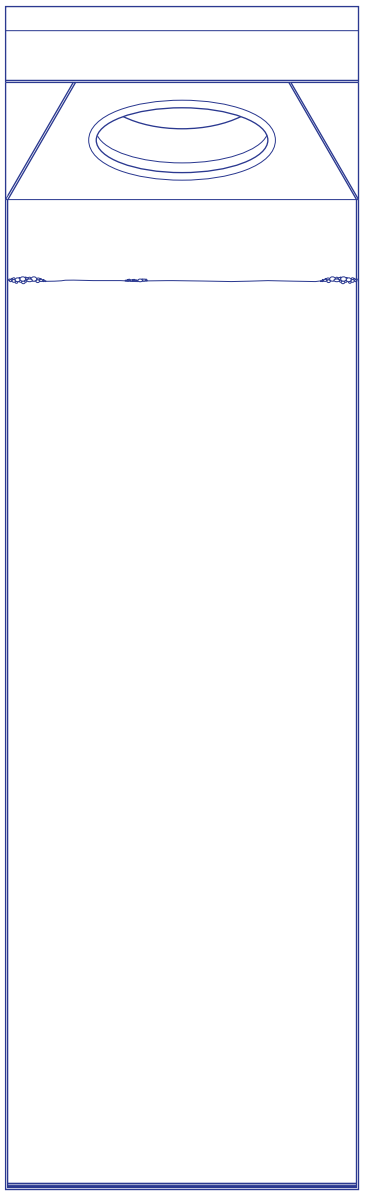
3.1	Port of Oslo, Norway (& Port of Denmark)
3.2	Distribution Centre, Estonia
3.3	Port of Maagu, Estonia
4.1-4	Selling Points
A	Road
B	Rail
C	Sea
D	Air

The Estonian production of Kefir has a significant relationship with the Norwegian drinking carton market. Elopak' drinking cartons are sold with a reduced footprint label, exported to the Tere AS factory. Tere AS sources raw milk from their cooperative dairy farms to process and package Kefir in Elopak's drinking cartons at their factories. The finished product is then distributed directly from the factory to national retail locations, as well as international locations via the port of Tallinn.

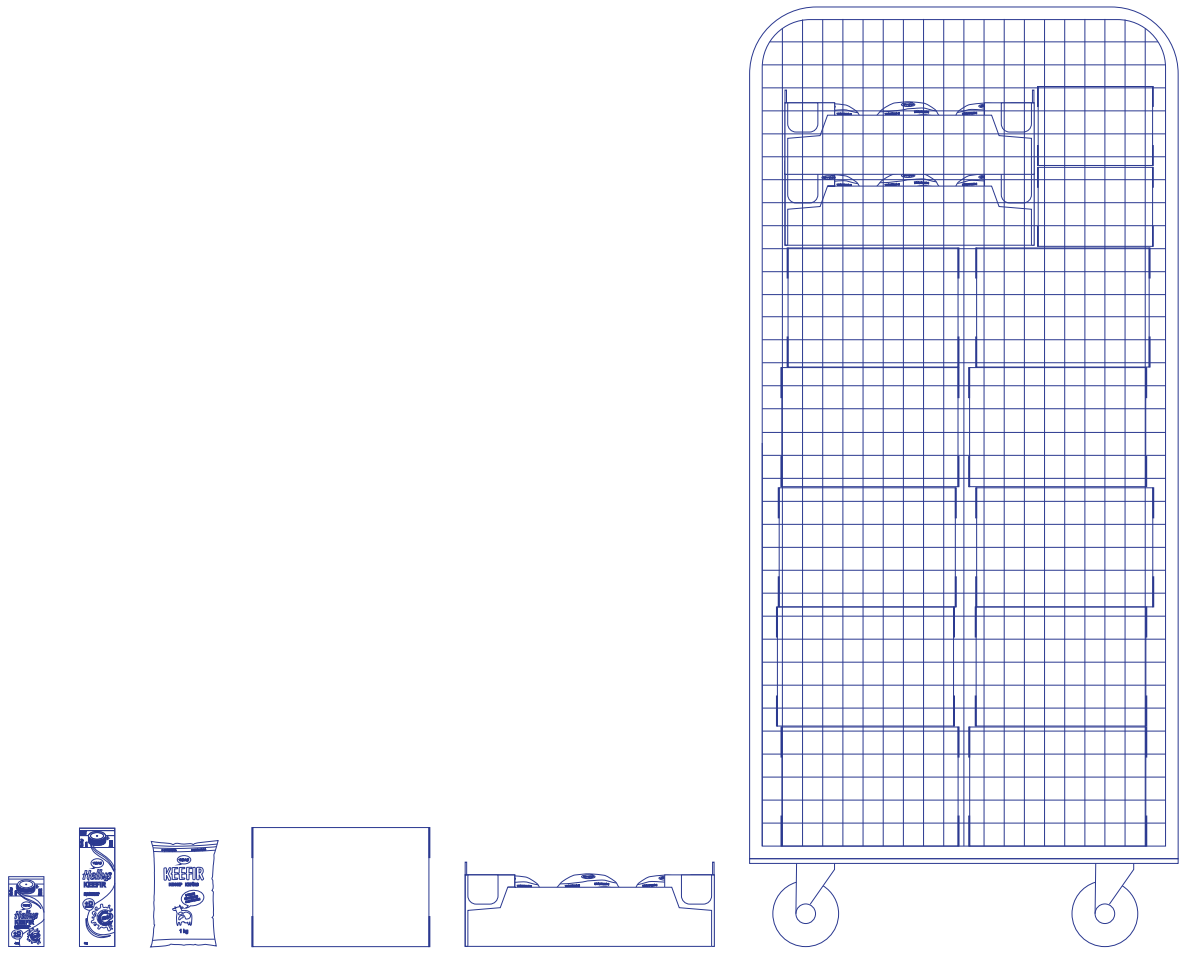




Kefir

Product unit

Tere AS introduced the new product line “Hellus,” which features lactose-free alternatives. This range is made possible with the discovery of the probiotic bacterium ME3 by Estonian scientists. Tere AS’s Kefir, a low-lactose milk drink, can even help alleviate lactose intolerance and improve digestion due to the kefir grain’s lactose digestion properties. The traditional method of kefir preparation involves the use of “kefir fungi,” but today a starter from kefir fungi is used. Kefir microflora includes both lactic acid bacteria and yeasts, which give the product its characteristic slightly sharp taste and effervescent texture. The recommended yeast content in kefir is 104 CFU/g. In addition to lactic acid fermentation, yeasts in Kefir also produce alcohol and CO2 as a byproduct. Most kefir today contains 2.5% fat.

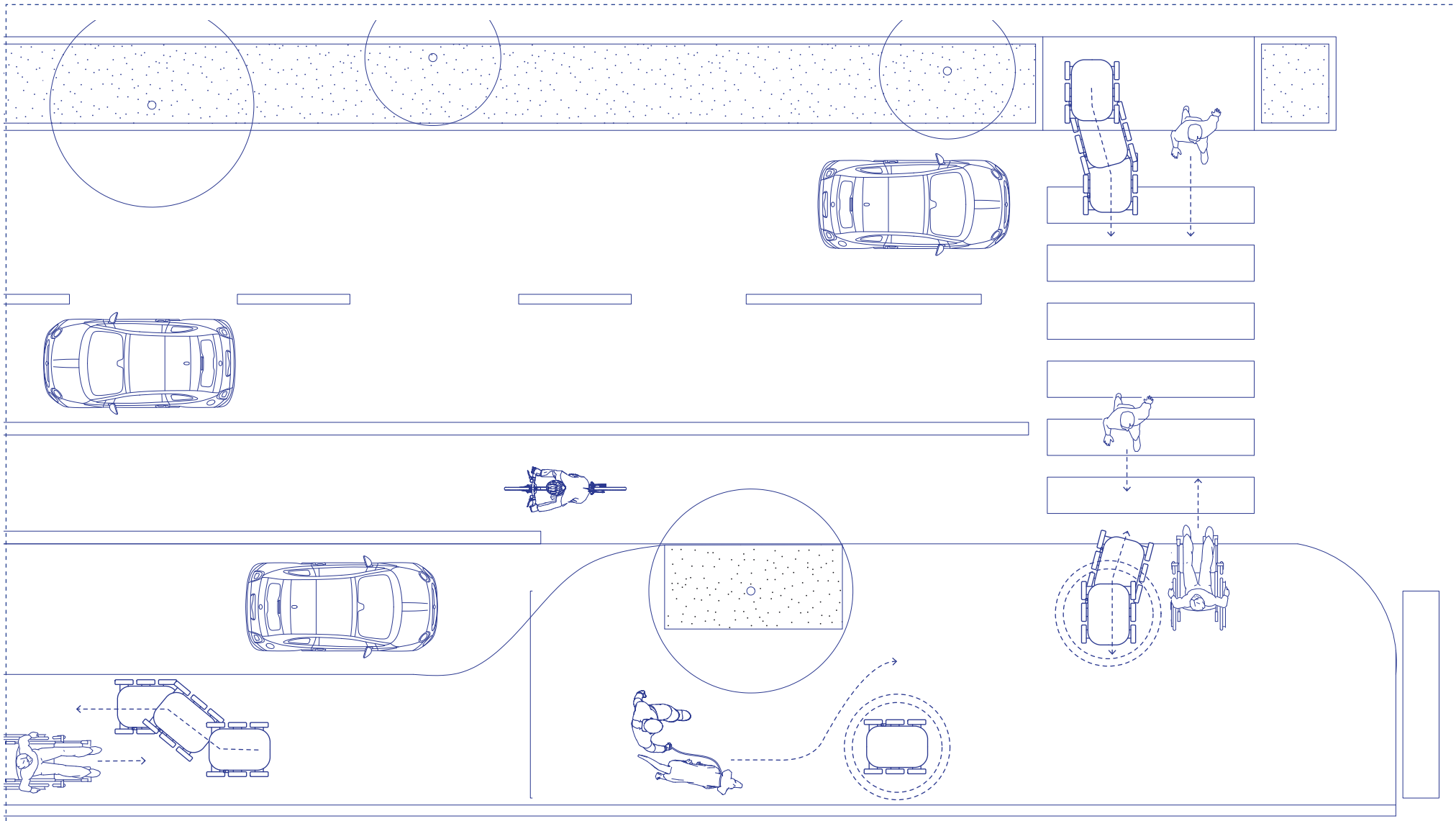


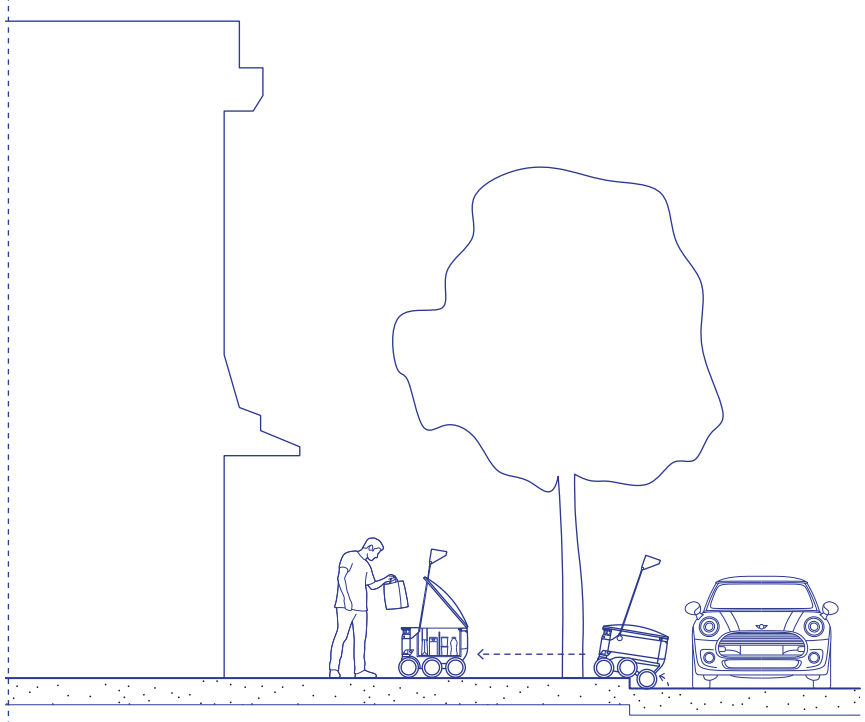
0 50 cm

Kefir

Packaging

Kefir is available in a variety of product units differing in size, composition, and additives. In 2021, Tere AS in Estonia launched its first packaging made from forest-based raw materials. The dairy introduced its Hellus Kefir range in one liter and 500ml Pure-Pak® cartons. Tere AS is one of Estonia's largest dairies and produces almost two million Pure-Pak® cartons for this product range every year, and the new cartons using plant-based raw materials will reduce its footprint by 42%.
The forest-based raw material used in the Pure-Pak® cartons from Elopak, spikkestad is an innovative material mainly originating from Nordic forests. The polymer layer in the carton and its cap are based on tall oil, a residue from the pulp industry. This is an excellent example of innovation in the circular economy, where one industry uses the waste from another in its production or manufacturing.

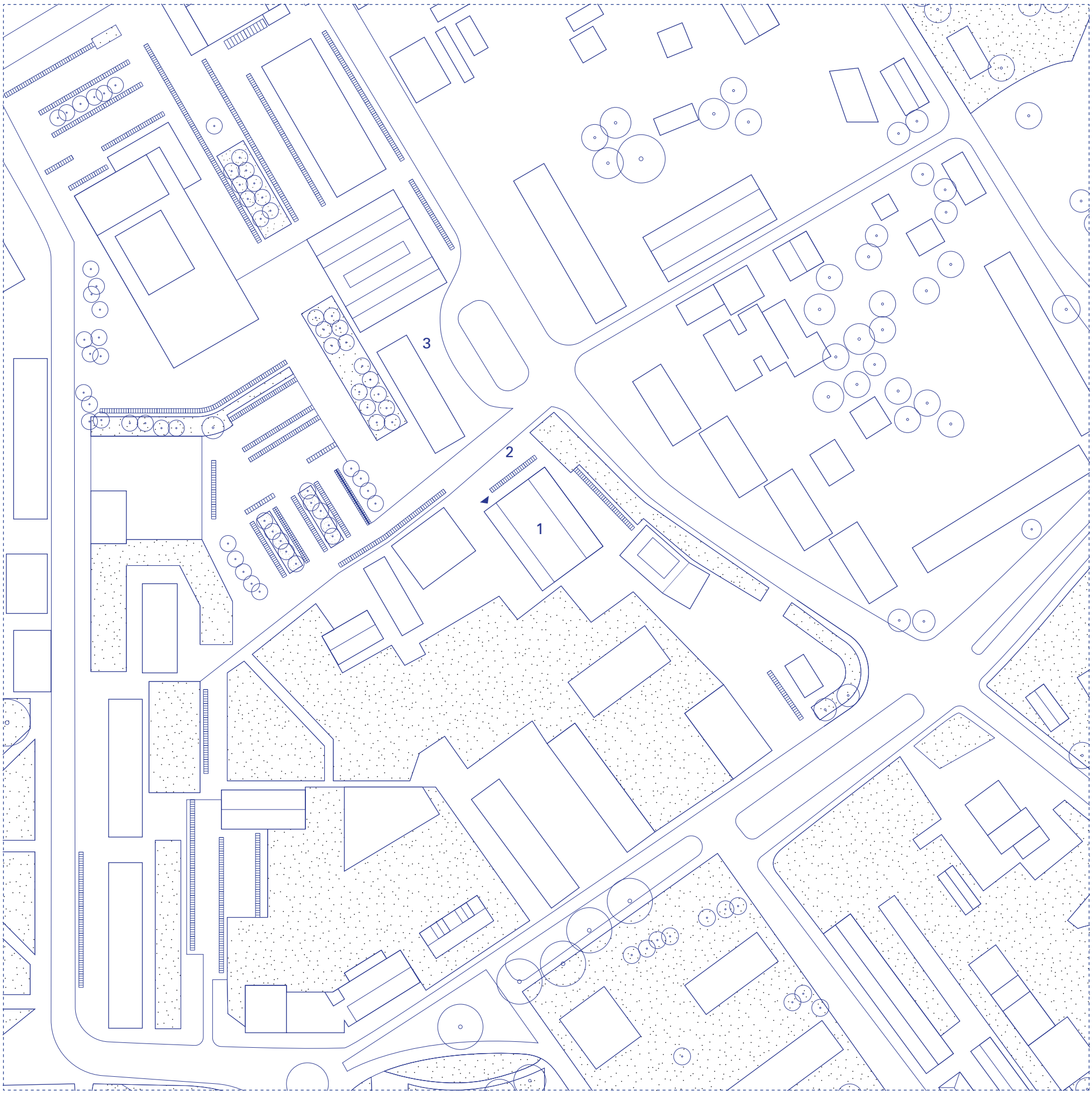




Kefir

Vehicle and behaviour
Delivery robot

In Estonia, Kefir production and processing operates in a highly automated manner, utilizing vehicles such as the starship delivery robot. The starship delivery robot, managed through an app, is utilized to transport Kefir cartons to customers' homes. It has two compartments and can accommodate up to four bags in it. The starship robot is a smart vehicle designed to navigate through pavements alongside humans.
At signal crossings, it will either wait for cars to pass or cross the road when a human does. If a robot is crossing the road with a human and they detect another human approaching from the opposite direction, the robot will move backward and wait until the other person passes before continuing to cross.
It is accessibility friendly wherein it can recognize people with limited mobility and navigate around them. It can also recognise animals and other moving obstacles.



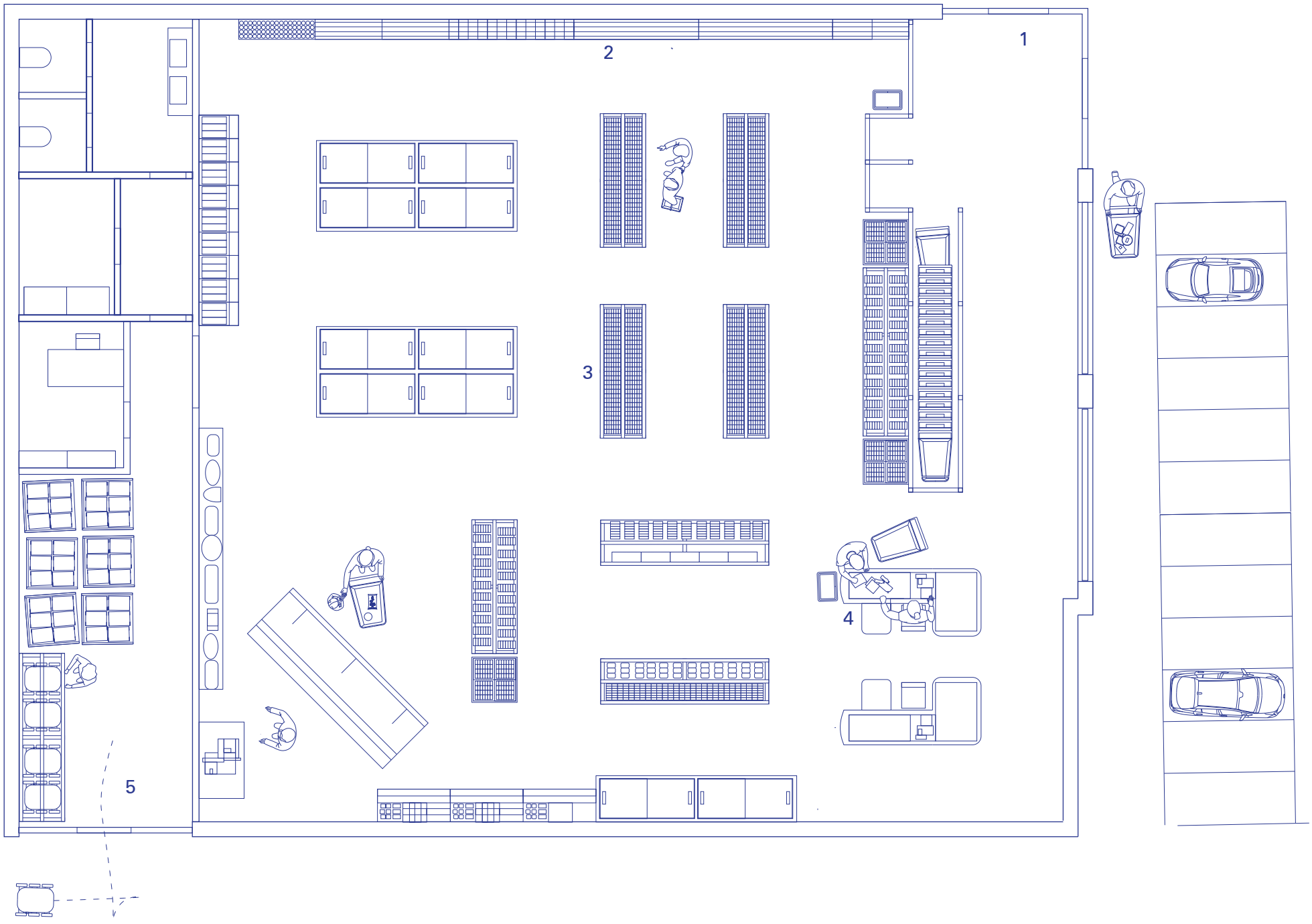
0 50 m

Kefir

Site plan
Supermarket

1 Rimi mini
2 Parking
3 Bus stop

Kefir is distributed for retail in many sorts of packaging to align with the supermarkets' varying sizes and stocks. Rimi Baltic is a large retail operator active in the Baltic States, with its headquarter based in Riga, Latvia. Rimi Baltic has four different store types; Rimi Hyper (hypermarket), Rimi Super (supermarket), Rimi Mini (supermarket/ convenience store), Rimi Express (convenience store) all with a variety in scale and conditions. In Rakvere, one hundred kilometers west of Tallinn, a Rimi Mini is situated in the middle of the city center.

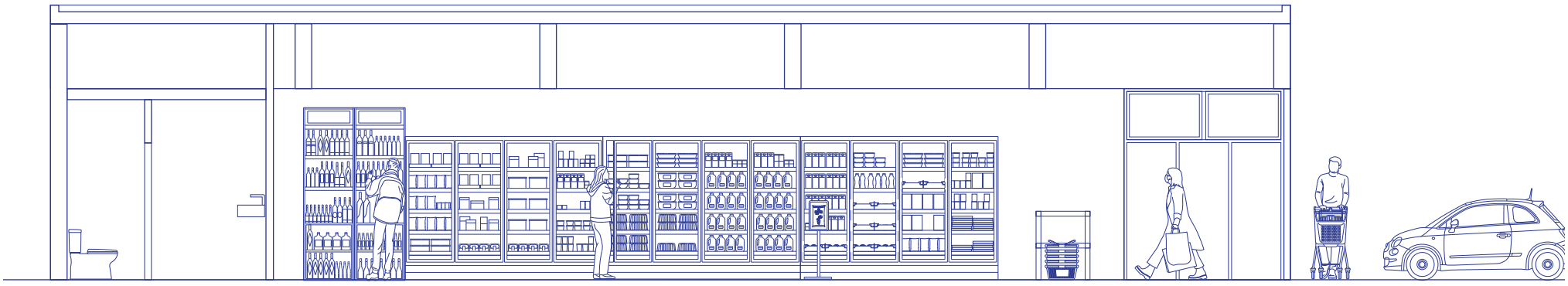


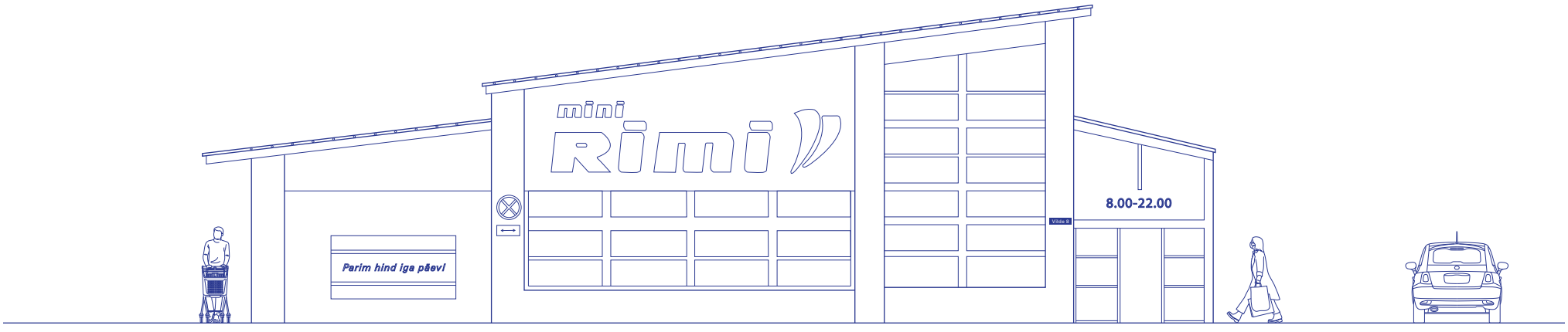
Kefir

Facility Plan
Supermarket

1 Rimi mini entrance
2 Cold Storage
3 Rack to buy kefir grains
4 Cashier
5 Starship robot docks

The Rimi supermarket has a variety of Kefir products. Access to Kefir is very easy in Estonia because of the mass production and wholesale of kefir by various dairy brands. Besides mass production, the supermarket also sells organic kefir which is produced in organic farms such as Pajumäe Talu in Viljandi county. Kefir grains are also sold at supermarkets allowing consumers to make DIY Kefir at home.





0 5 m

Kefir

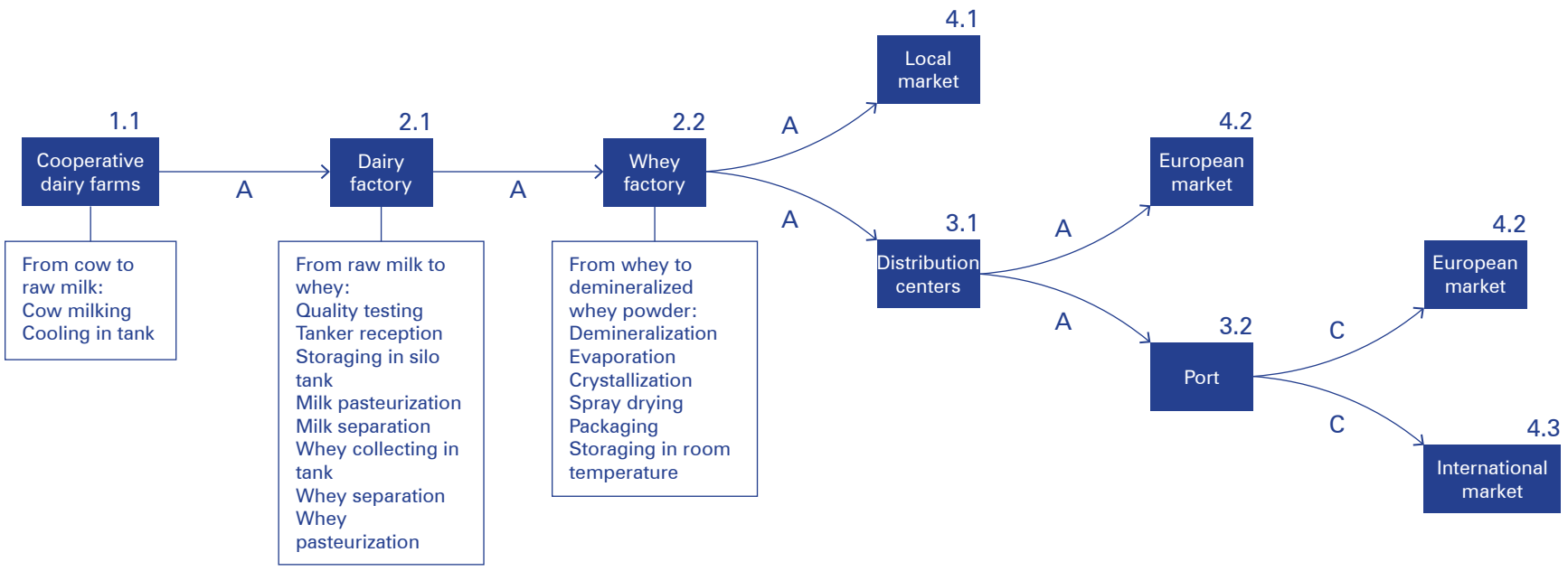
Facility section and elevation
Supermarket

In recent years, the digitization of the supply chain has found its way to the retailing of products. With initiatives like the upcoming starship robot delivery, an increase in remote sales may be expected. Supermarkets are integrating online retail, or making way for seperate distribution centers making it possible for customers to order Kefir online in the designated app and having it delivered to their homes.

Kefir

Narrative
Superfood

Kefir is promoted as a superfood. In almost all supermarkets kefir is available, in a variety of sizes and flavors. Kefir is advertised to have significant health benefits. Kefir causes fewer allergies compared with fresh milk, due to the reduction of allergenicity of the milk proteins and a fewer amount of lactose. It even goes so far as giving kefir to babies who are allergic to milk proteins. However, a new market has developed in recent years following the claim that the formula used for commercial retail has fewer health benefits. Therefore, another market has raised commercially sold kefir grains, which allows to prepare and consume home-produced kefir.

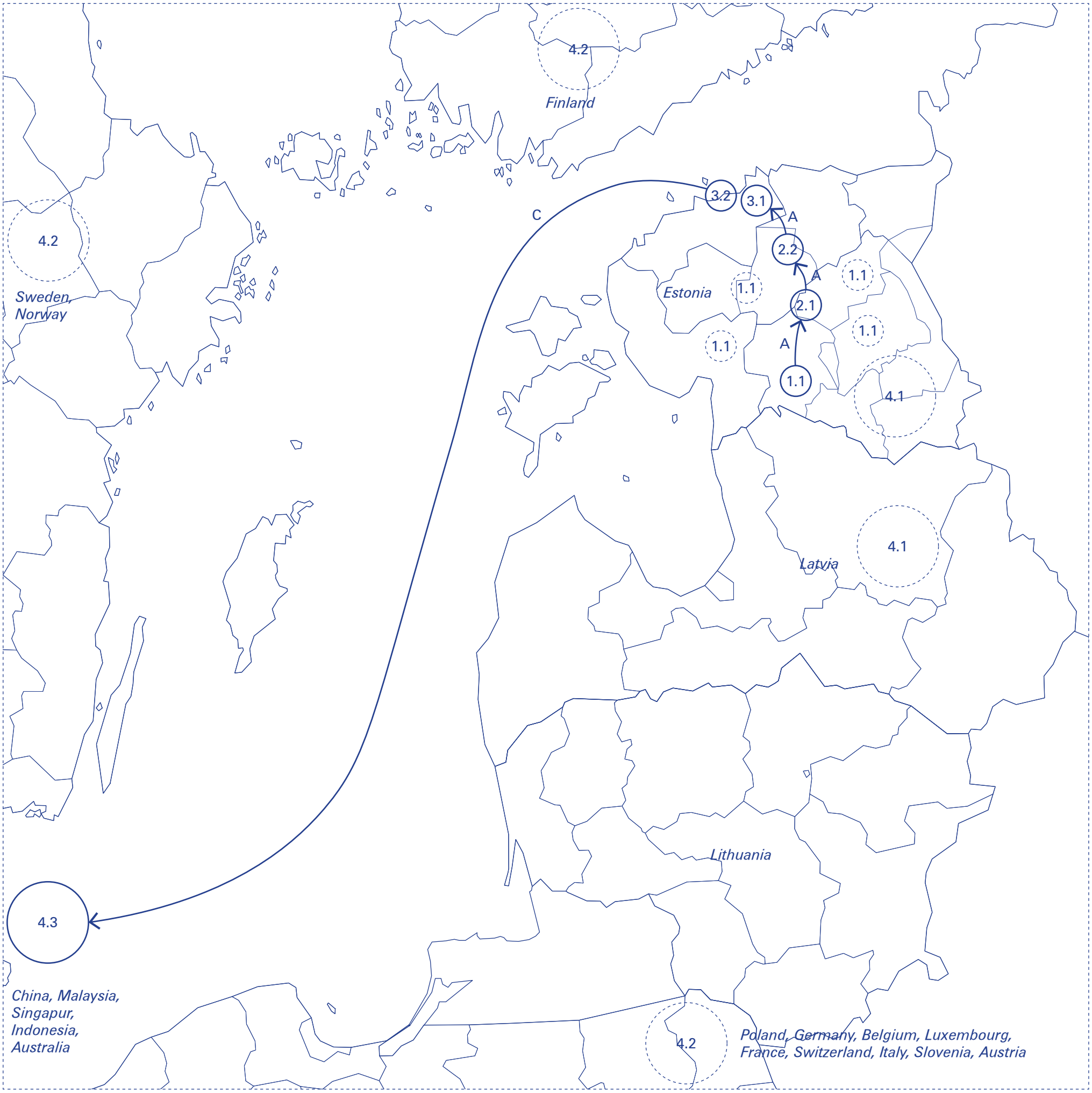


90% Demineralized Whey Powder

Supply chain
Diagram

1.1 Cooperative dairy farms in Estonia, E-piim
2.1 Dairy factory in Põltsamaa, E-piim
2.2 Whey factory in Järva-Jaani, E-piim
3.1 Distribution centers in Estonia
3.2 Port of Muuga
4.1 Local selling points in Estonia and Latvia
4.2 Export to European countries
4.3 Export to International countries, whereof main countries: China, Malaysia, Singapore, Indonesia, Australia
A Road: truck tanker, curtain side semi trailer attached to truck
C Water: Ship

Whey, a by-product of cheese production, is a rich source of protein and minerals with less than 0.4% fat. The 90% Demineralized Whey Powder, a crucial ingredient in the production of infant formula, is produced by Epiim in Estonia.
Raw milk is collected from the company's cooperative farms in Estonia and transported in insulated truck tankers to the Põltsamaa factory, where it is pasteurized, and separated into cheese and whey. The pasteurized whey is sent to Järva-Jaani factory, where it is processed into 90% Demineralized Whey Powder by demineralization, evaporation, crystallization and spray drying. The resulting powder is packaged and delivered in curtain semi-trailers to direct sales outlets in the area or to distribution centers for the European market. For international distribution, the product is transported to the port of Muuga and shipped to China, Malaysia, Singapore, Indonesia, or Australia.



90% Demineralized Whey Powder

Supply chain
Map

1.1 Cooperative dairy farms in Estonia, E-piim

2.1 Dairy factory in Põltsamaa, E-piim

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4.2 Export to European countries

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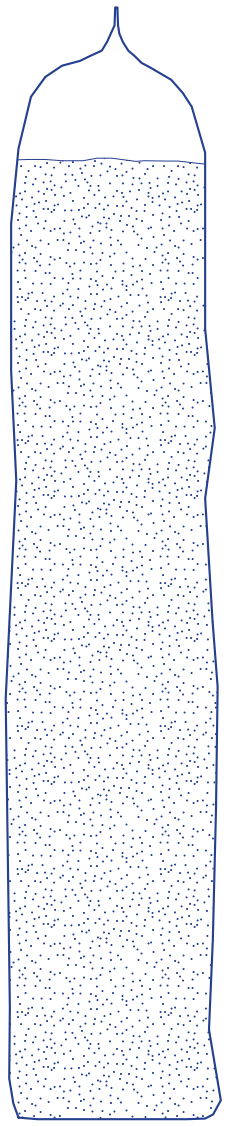
A Road: truck tanker, curtain side semi trailer attached to truck

C Water: Ship

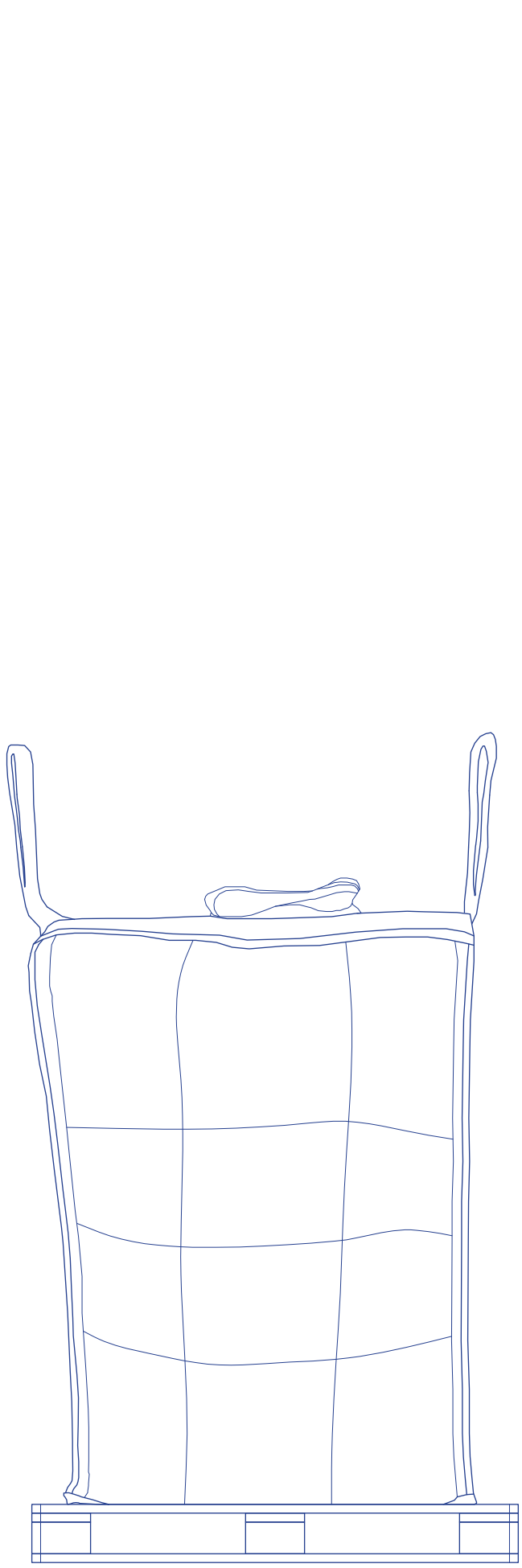
Epiim produces 90% Demineralized Whey Powder locally in Estonia by collecting raw milk from their dairy farms and processing it into whey and demineralized whey powder. The company has three processing facilities dating back to the beginning of the twentieth century and is currently building a larger plant in Paide, which will take over cheese production while the production of demineralized whey powder will continue at Järva-Jaani. The powder is distributed locally, to other European countries, and to China, Singapore, Malaysia, Indonesia, and Australia via the Port of Muuga, with China being the largest consumer.

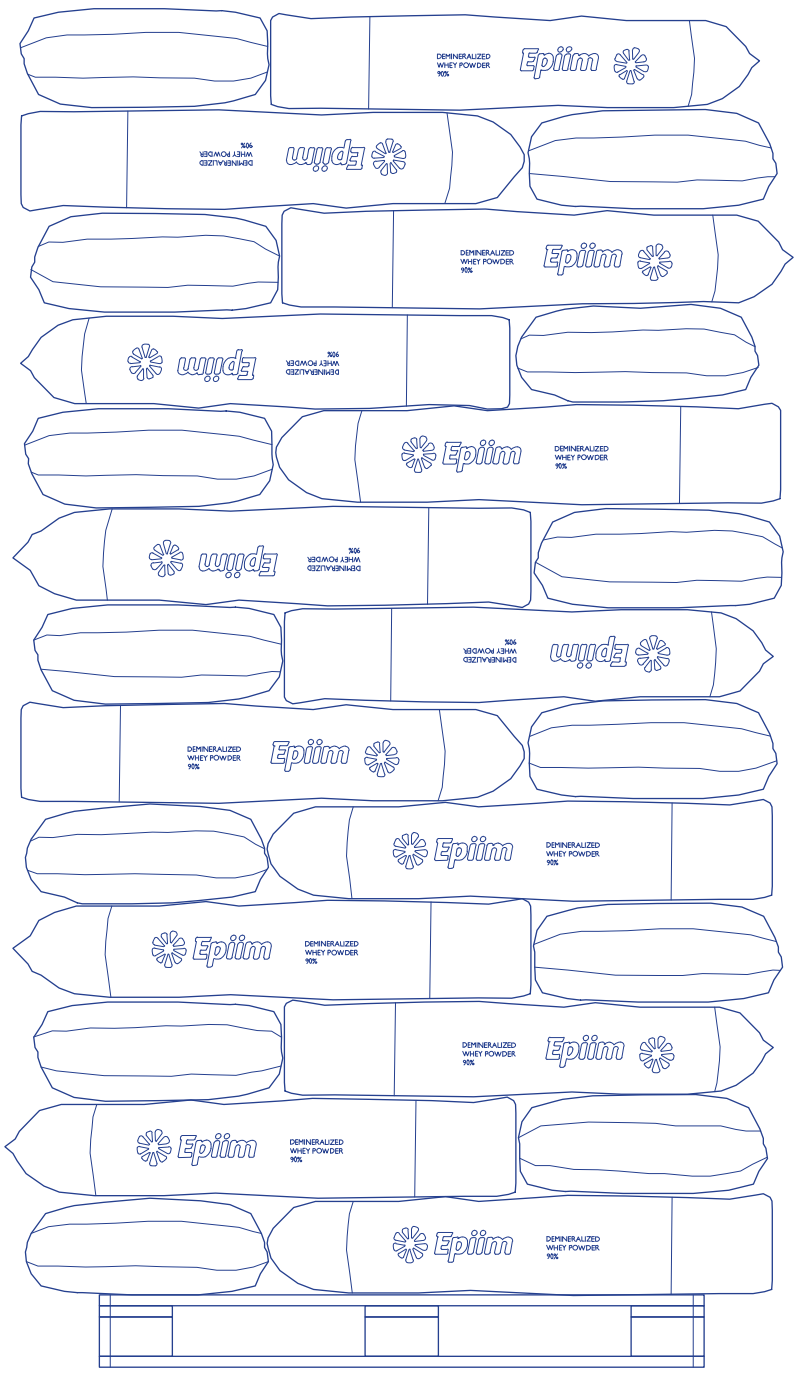


90% Demineralized Whey Powder

Product unit

90% Demineralized Whey Powder is a vital ingredient in the production of infant formula which gives required proteins without having the renal load of minerals on tender kidney. Proper storage is essential, requiring cool, clean, and dry ventilated rooms with a temperature of 18±2°C and relative humidity below 65%. The product has a shelf life of twenty four months under optimal storage conditions.



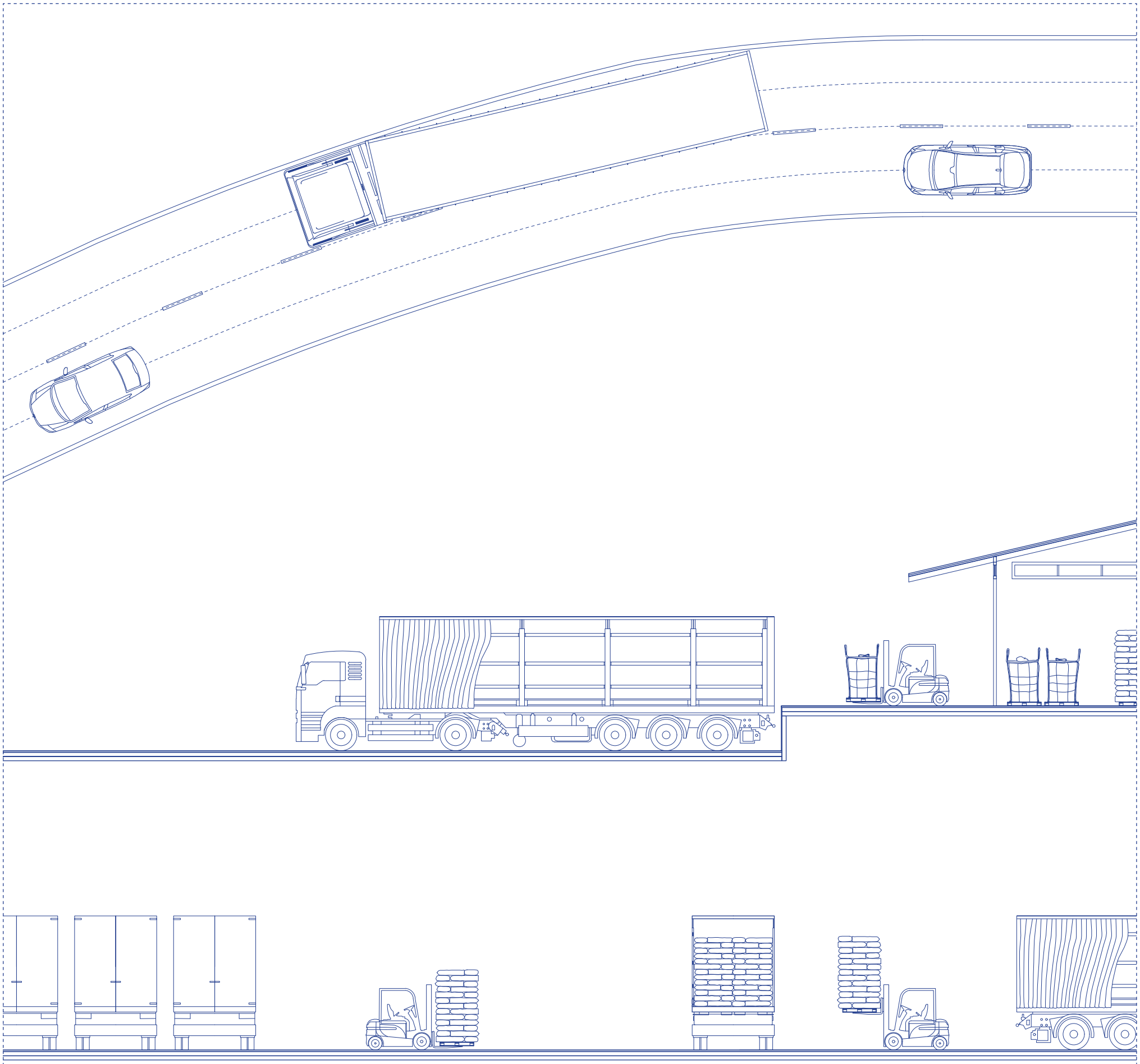


0 50 cm

90% Demineralized Whey Powder

Packaging

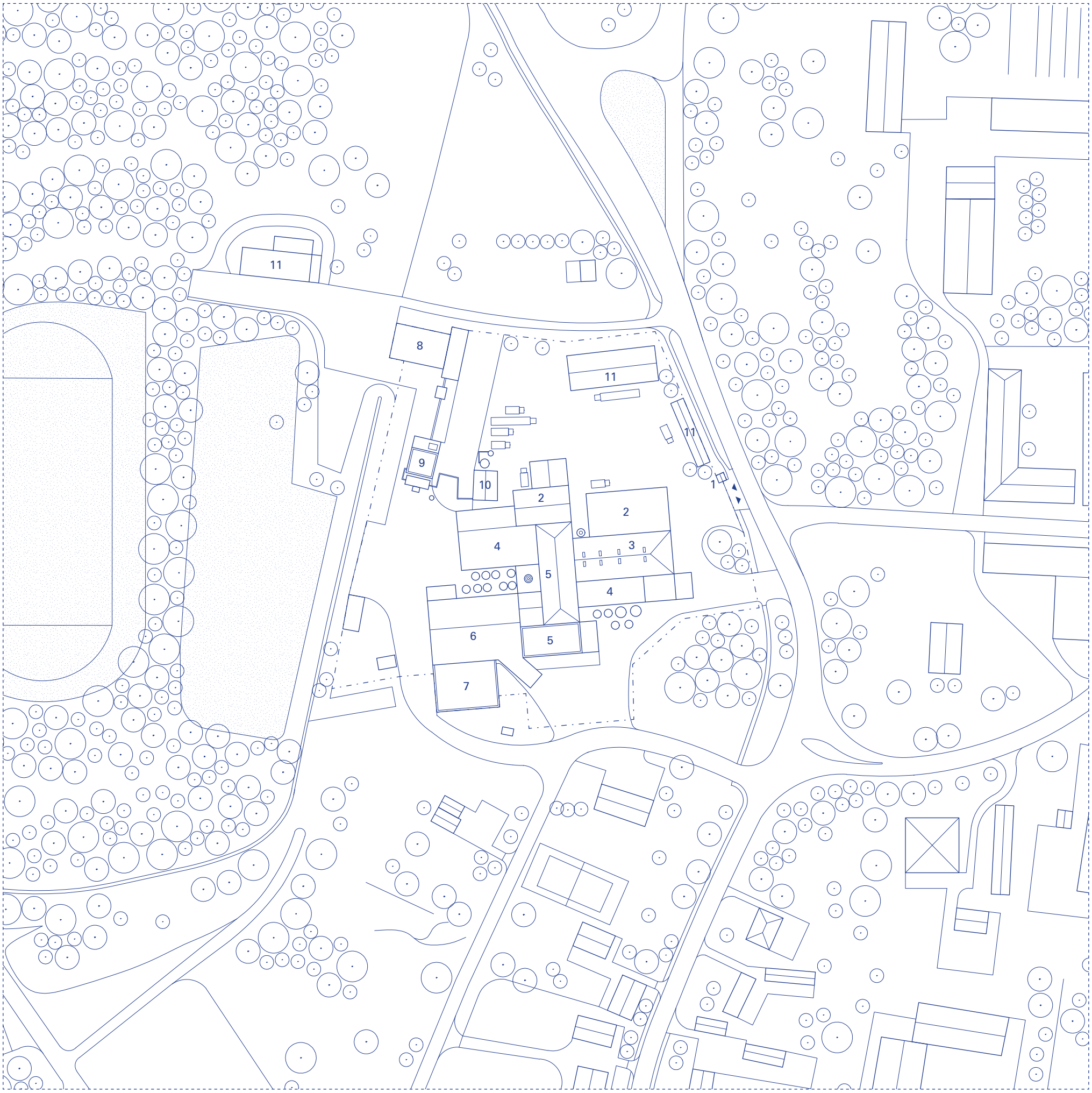
Epiim's 90% Demineralized Whey Powder is a highly concentrated powder product available in 25 kg polyethylene bags with kraft paper inner bags and in 1000 kg polypropylene "big bags". It is used as a raw material and ingredient in dairy products, bakery products, pasta sauces, chocolate, confectionery, and ice cream by food manufacturing companies.



90% Demineralized Whey Powder

Vehicle and behavior
Curtain side semi-trailer

The transportation of 90% Demineralized Whey Powder requires a curtain semi-trailer that can be towed by a vehicle with a fifth-wheel coupling. This trailer is designed for efficient transportation of heavy products, as it can be loaded from multiple directions. Thus, enabling forklifts to access it from both sides and the rear simultaneously, allowing drivers to quickly load and unload the product. The trailer's design allows drivers to access any part of the load at any point along the route, making it easy to drop off multiple loads from a single trailer. The trailer is equipped with durable yet flexible PVC-coated vinyl side curtains, which can be retracted from the front or rear of the trailer, as well as van-style swinging rear doors. This design allows the trailer to completely enclose the load for weatherproof protection and security.

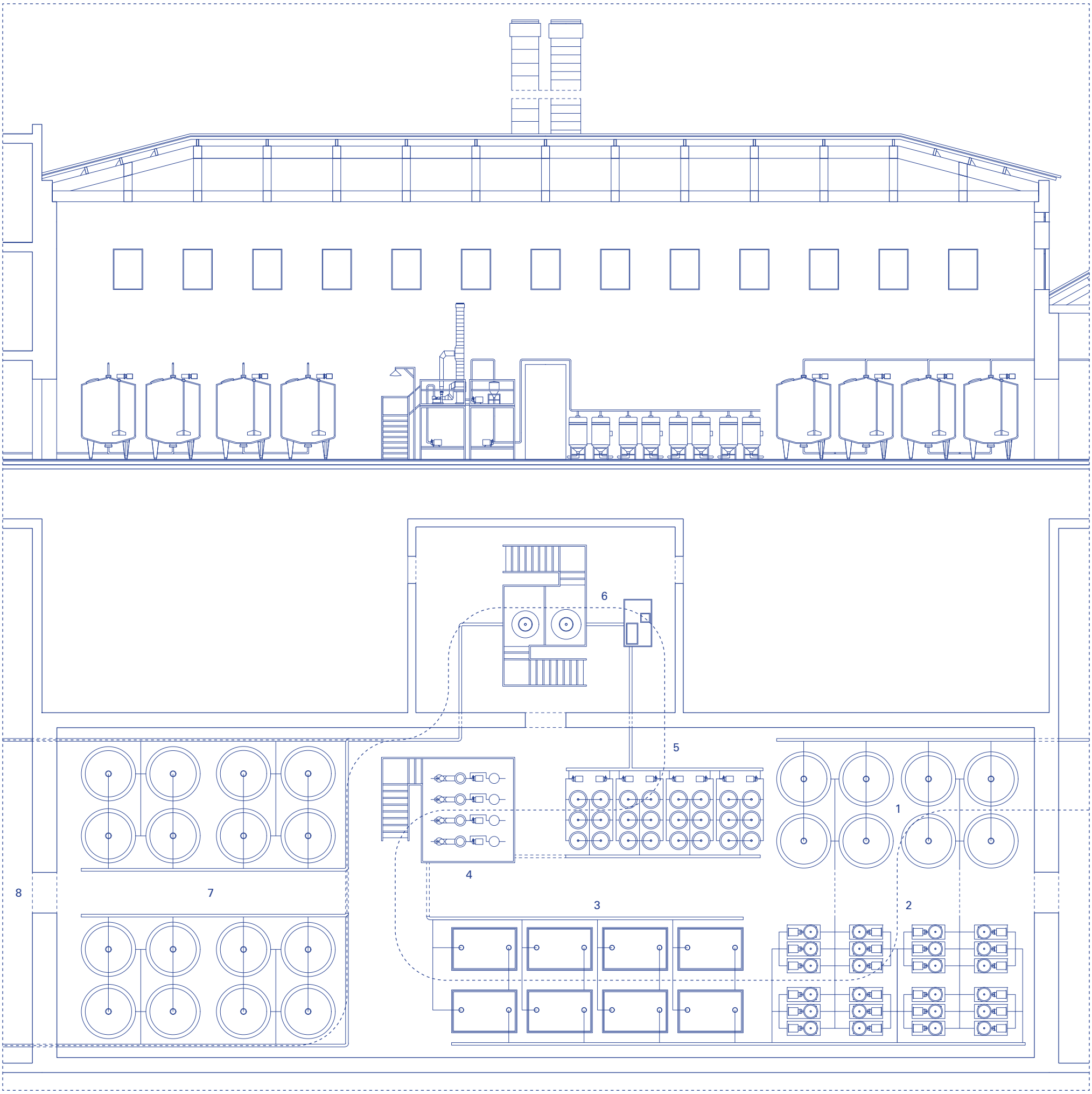


90% Demineralized Whey Powder

Site plan
Whey factory

1 Security
2 Reception
3 Offices and administration
4 Raw milk and whey silos
5 Whey processing facility
6 Packaging
7 Product storage
8 Wood chips storage
9 Boiler house
10 MEP facility
11 Storage

Epiim Järva-Jaani is the only producer of 90% Demineralized Whey Powder in Estonia, equipped with storage facilities, a vacuum evaporator, and processing facilities. It underwent a complete renovation process in 2011-2013, resulting in the launch of the latest and most environmentally friendly spray dryer in Järva-Jaani. The vacuum evaporator is a 19-meter-high and 150-square-meter spray dryer with top-of-the-line equipment.
In 2015, AS E-Piim Tootmise completed the construction of its chip wood boiler house, replacing the obsolete shale oil boiler house, significantly reducing its carbon footprint. The facility produces 8,000 tons of milk powder annually and premium-quality 82% fat Estonian butter.

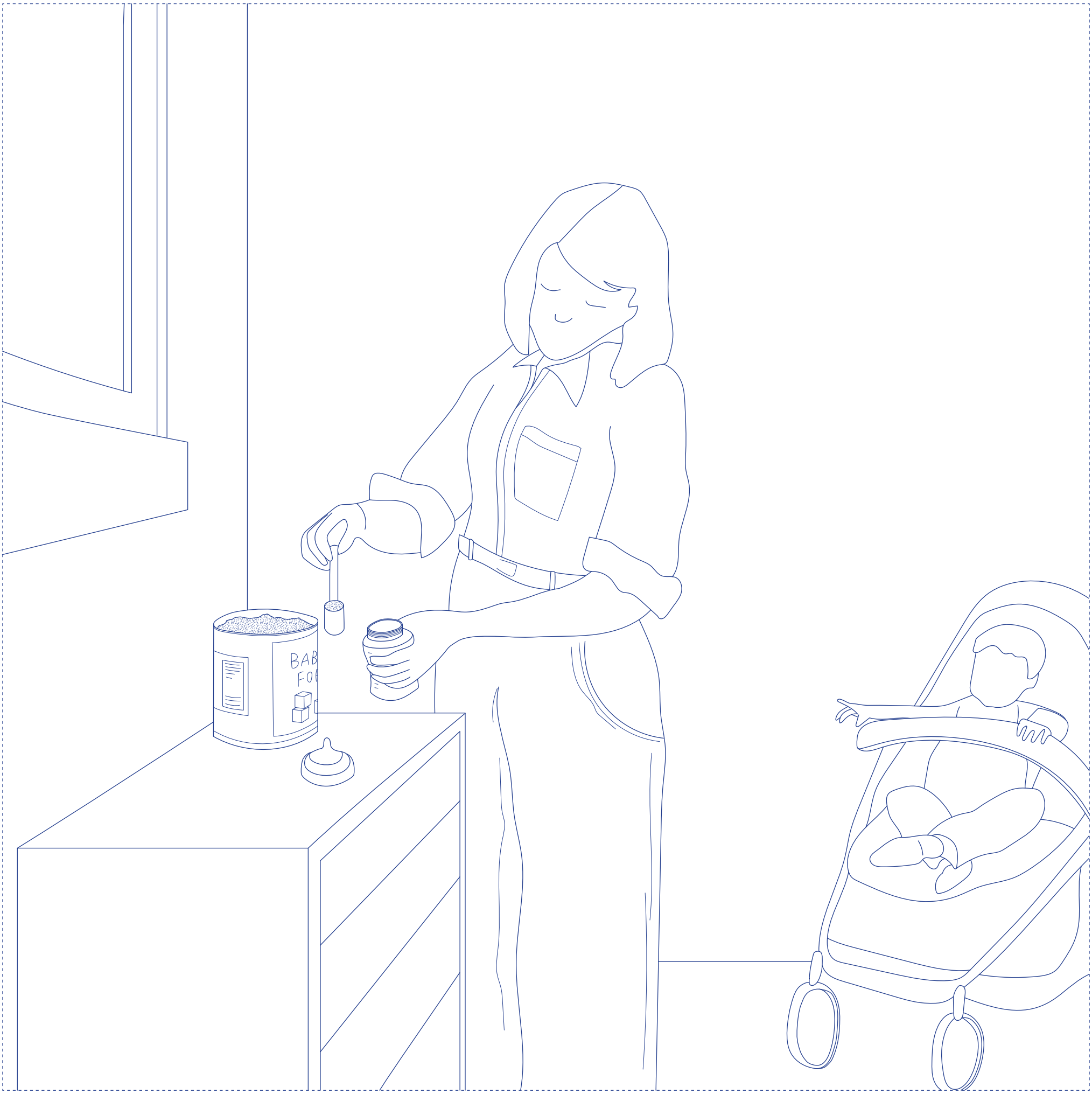


90% Demineralized Whey Powder

Facility
Whey factory

1 Whey storage
2 Buffer tank
3 Ion exchange
4 MVR evaporator
5 Crystallization tanks
6 Spray dryer
7 Whey powder storage
8 Packaging

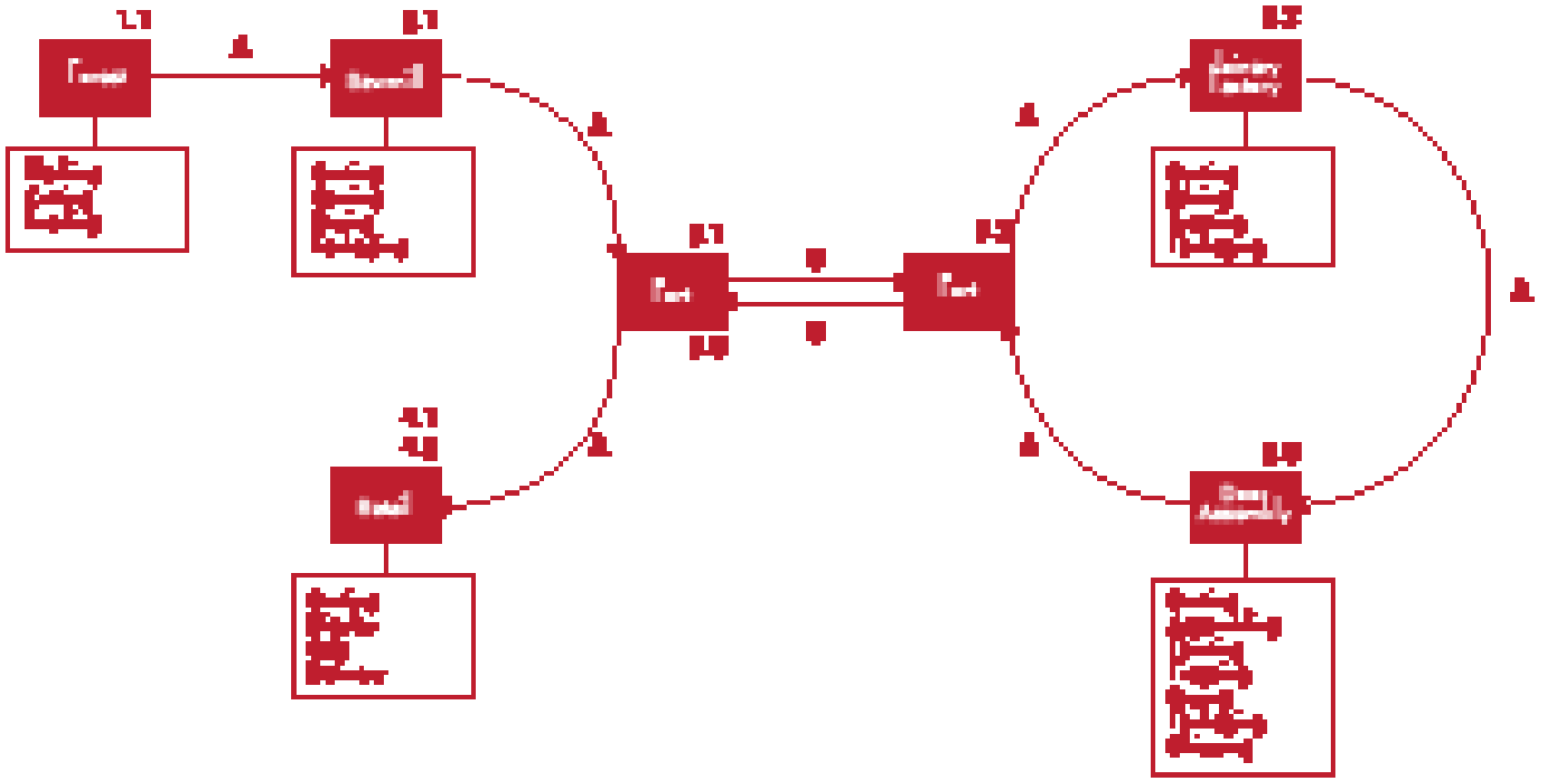
To prepare whey for processing, it must first be stored and either chilled or pasteurized as soon as the fat is removed. The chilled liquid whey is then transferred to a storage tank and pumped into buffer tanks for the next stage of processing, which is ion exchange. This process uses resins in a column or batch operation to adsorb positive and negative ions. At the outlet of the ion exchange, the dry matter content is around 18-19%. To increase the content to 60-61%, the whey is passed through an evaporator equipped with a flash cooler, which reduces the concentrate's temperature to 35°C and initiates crystallization.
The concentrate is then transferred to crystallization tanks, where a precise cooling and crystallization program is applied to control the amount and size of lactose crystals in the concentrate. Once the desired crystallization is achieved, the concentrate is transferred to a 19-meter-high spray dryer with a cylinder and a cone. The spray dryer optimally atomizes the concentrate to produce unflavored whey powder. The centrifugal atomizer achieves the desired atomization type with a specific cylinder diameter-to-height ratio. The resulting whey powder is packaged in tank containers and tested for purity before being sent for final packaging.



90% Demineralized Whey Powder

Narrative
Processed nurture

Introducing 90% Demineralized Whey Powder – the gold of milk processing. In order to be consumed, whey powder is diluted with water in the right proportions. In the realm of infant nutrition, demineralized whey is utilized to achieve a composition that is similar to breast milk, which has a lower mineral content compared to cow's milk. The goal is to avoid placing too much pressure on the infant's kidneys, which may struggle to excrete these minerals.
Beyond infant nutrition, demineralized whey has various applications in the food and nutrition industry, from dairy products to baked goods and confectionery. An economical substitute for sweet whey with a high lactose and low mineral content, demineralized whey is also highly stable in its thermal, emulsifying, browning, and wettability properties.

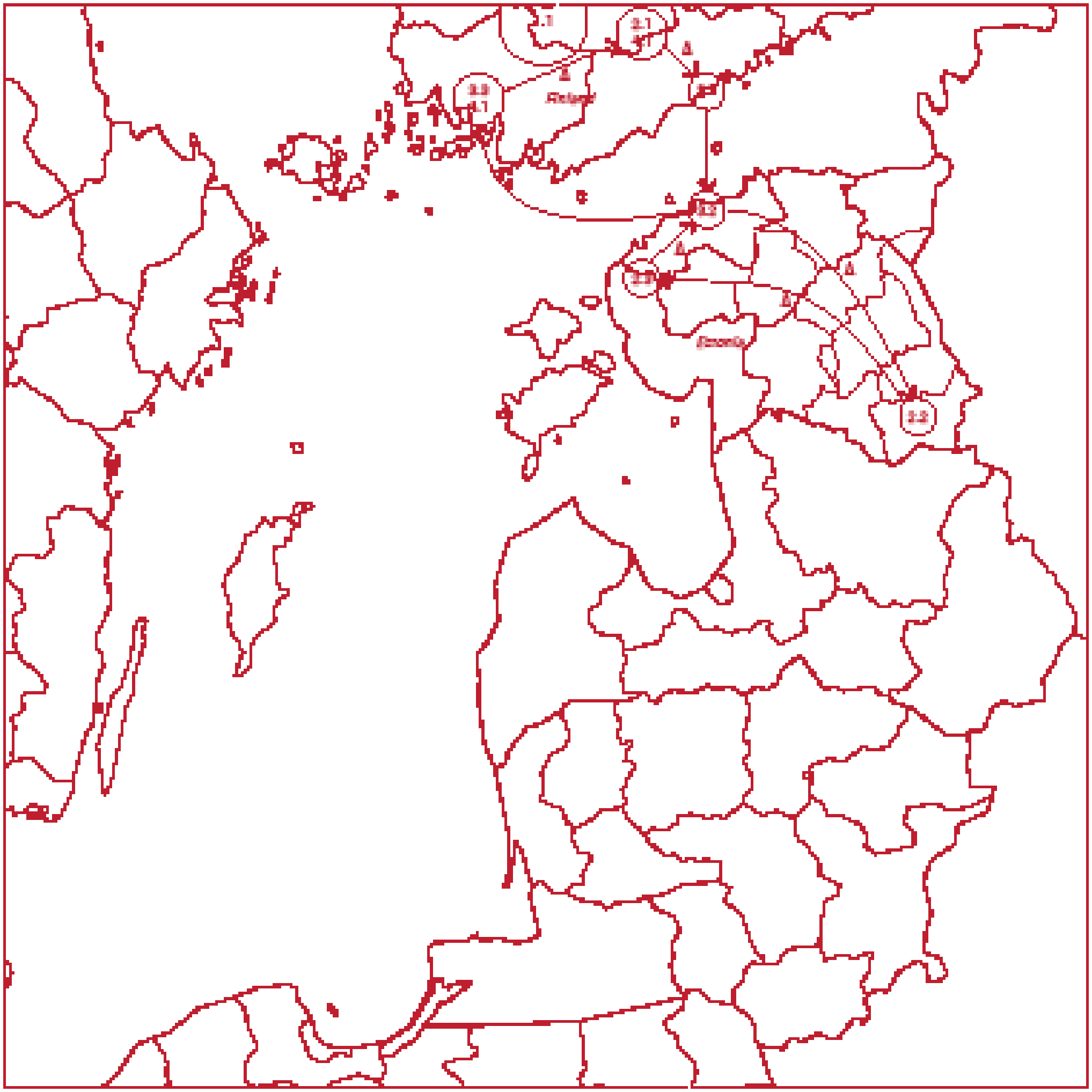


Fire Repellent Door

Reference Symbol Diagram

1.1	Hinged Flush Fire Door		Fire Door
1.2	Hinged Flush Fire Door with Vision Panel	4.1	Polyurethane Foam Core Fire Door
1.3	Hinged Fire Door with Vision Panel and Glass Louvers	4.2	Timber
1.4	Hinged Flush Fire Door with Vision Panel and Glass Louvers	4.3	Timber Frame
2.1	Fire Door Frame
2.2	Fire Door Frame
2.3	Fire Door Frame
3.1	Door Hinge (3)
3.2	Polyurethane Foam Core Fire Door

In order to achieve the maximum fire resistance rating for the door, the door leaf is constructed with a polyurethane foam core. The door leaf is then covered with a fire resistant board on both sides. The door frame is also made of fire resistant material. The door is hung on three hinges, which are also fire resistant. The door is fitted with a vision panel, which is made of fire resistant glass. The door is also fitted with louvers, which are made of fire resistant glass. The door is fitted with a fire resistant seal around the edges of the door leaf and frame. The door is also fitted with a fire resistant threshold. The door is fitted with a fire resistant letterbox.

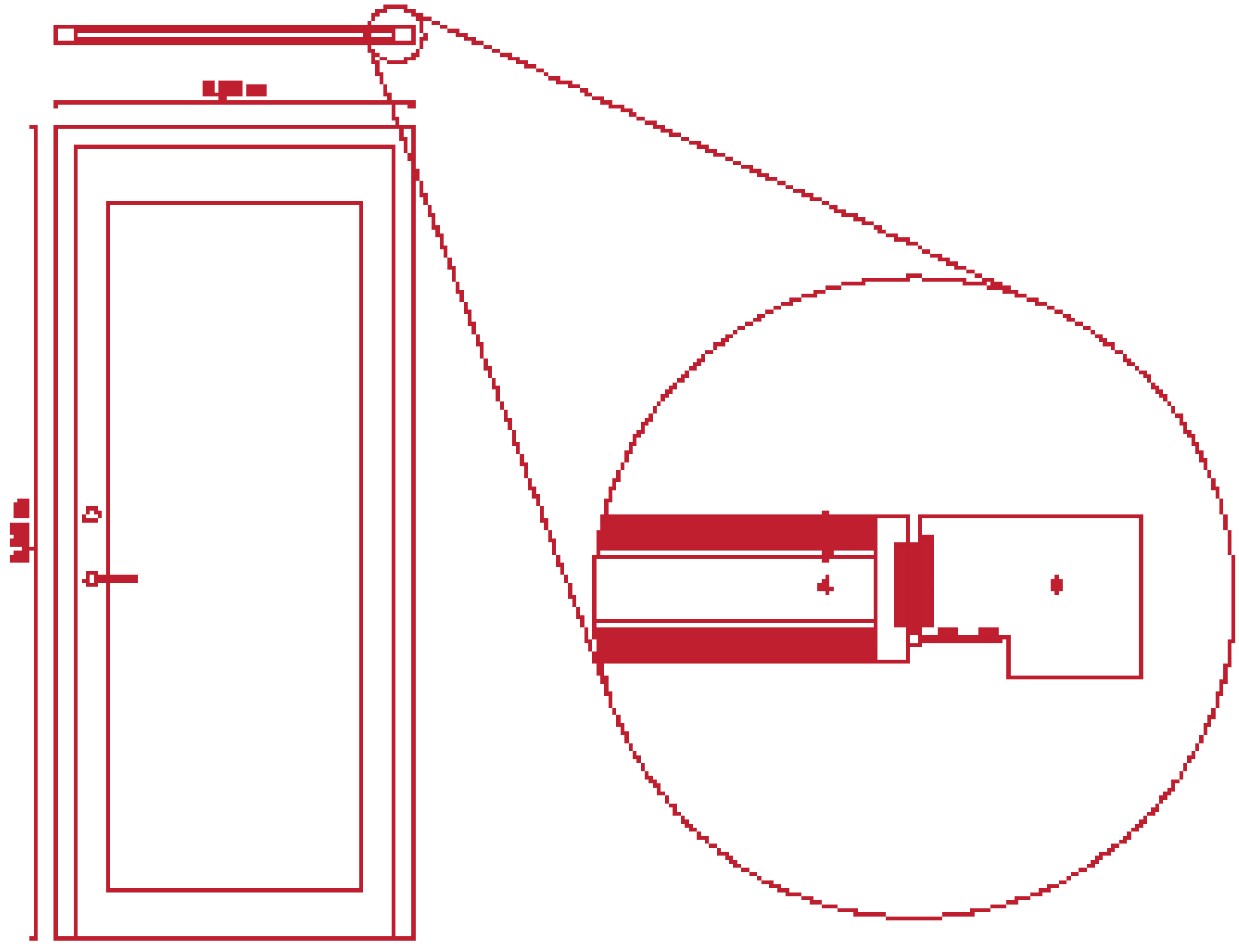


Fire Repellent Door

[illegible]

1.1	[illegible]		[illegible]
1.2	[illegible]	1.4	[illegible]
1.3	[illegible]	1.5	[illegible]
1.4	[illegible]	1.6	[illegible]
1.5	[illegible]	1.7	[illegible]
1.6	[illegible]	1.8	[illegible]
1.7	[illegible]	1.9	[illegible]
1.8	[illegible]	1.10	[illegible]
1.9	[illegible]	1.11	[illegible]
1.10	[illegible]	1.12	[illegible]
1.11	[illegible]	1.13	[illegible]
1.12	[illegible]	1.14	[illegible]

[illegible]

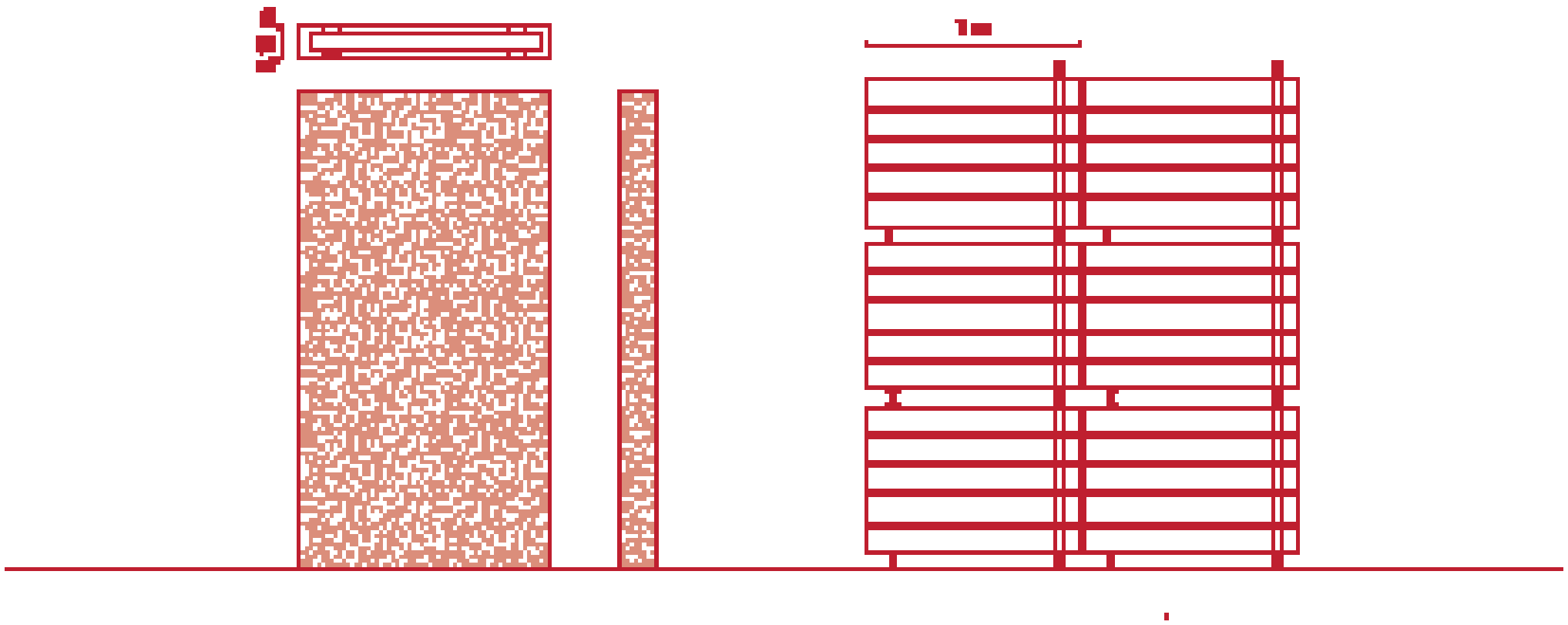


Fire Repellent Door

Features

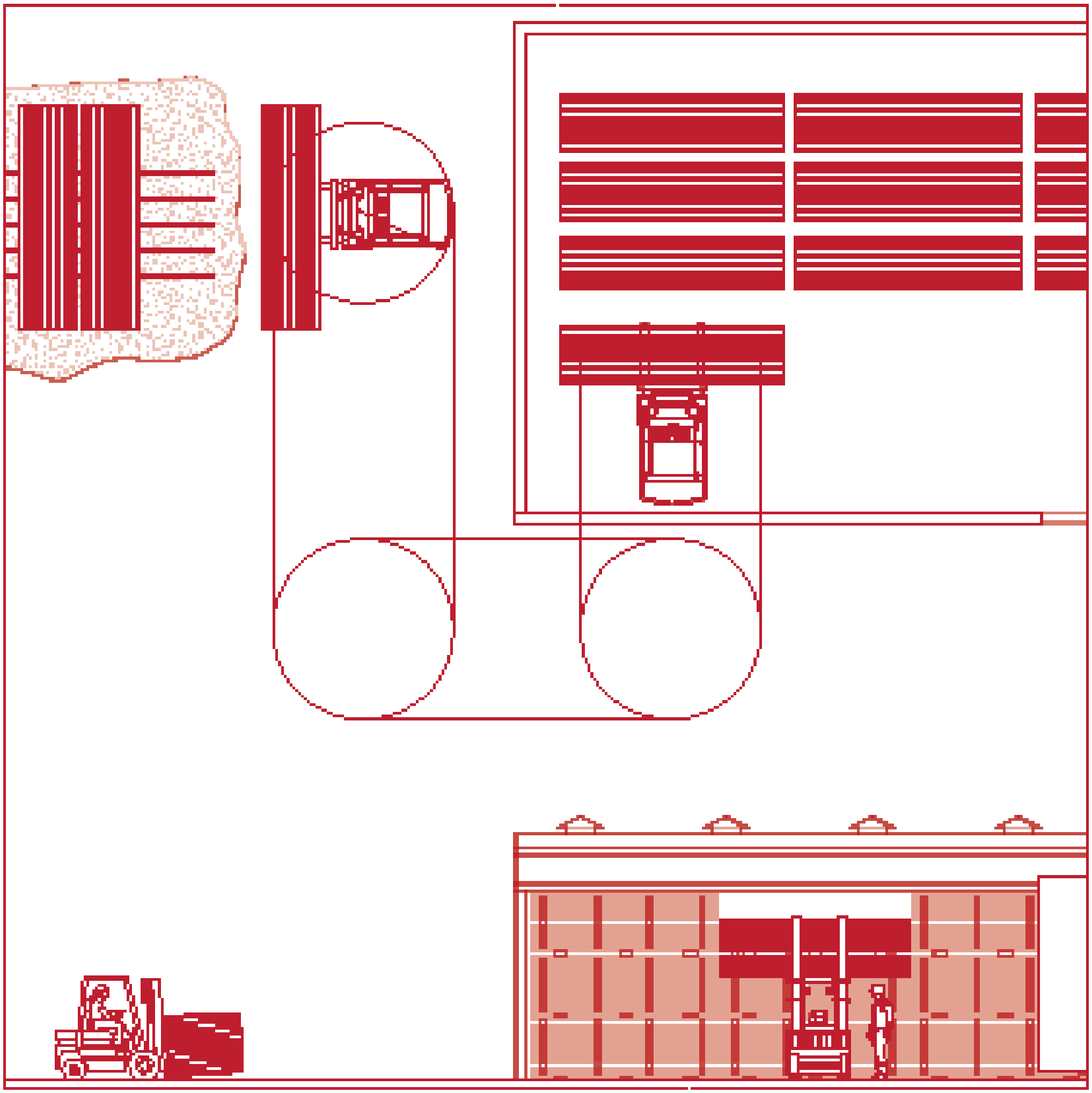
1. [illegible]
2. [illegible]
3. [illegible]
4. [illegible]
5. [illegible]
6. [illegible]
7. [illegible]

[illegible]



Fire Repellent Door

Packaging



Fire Repellent Door

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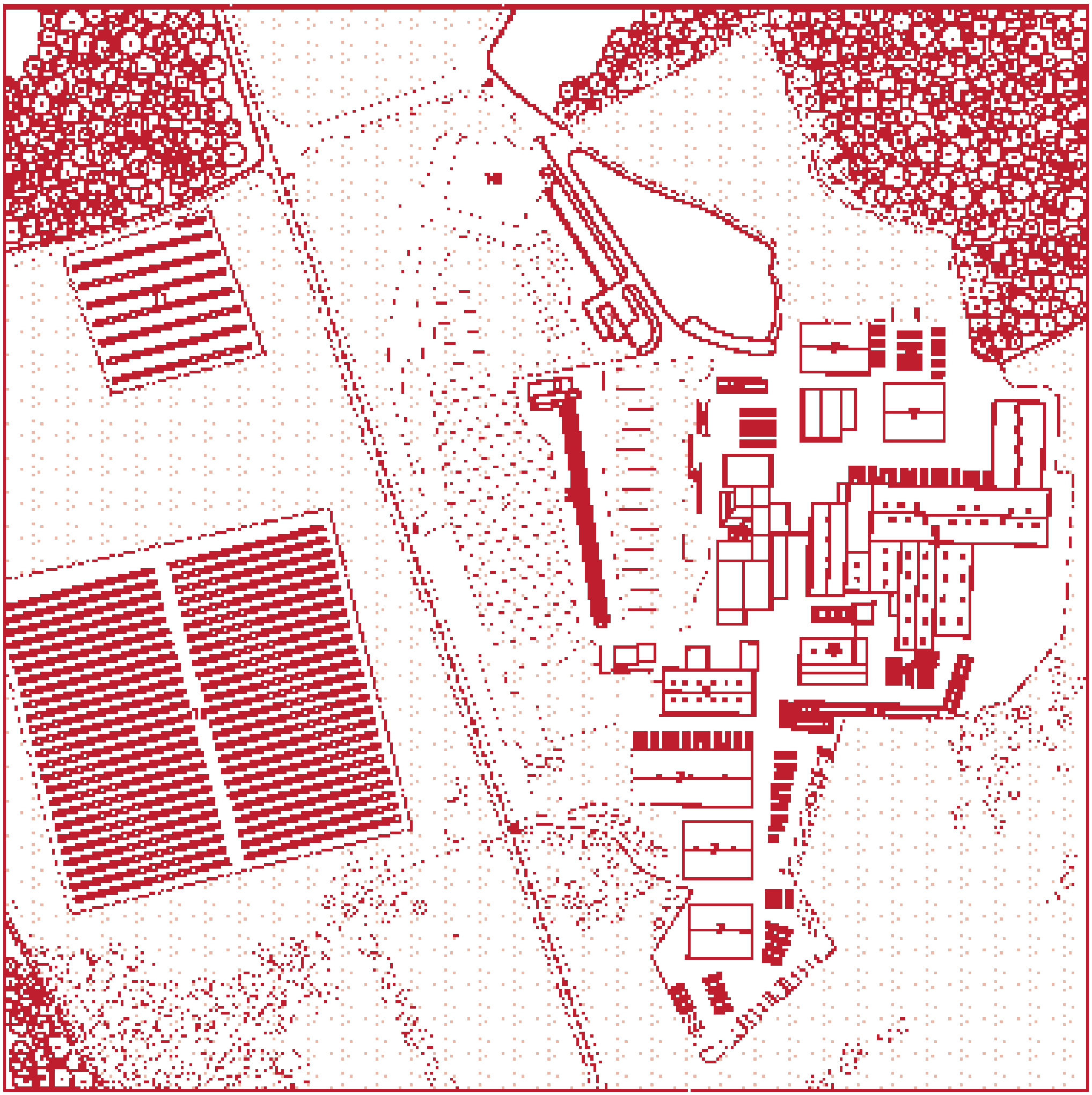

Fire Repellent Door

1
2
3
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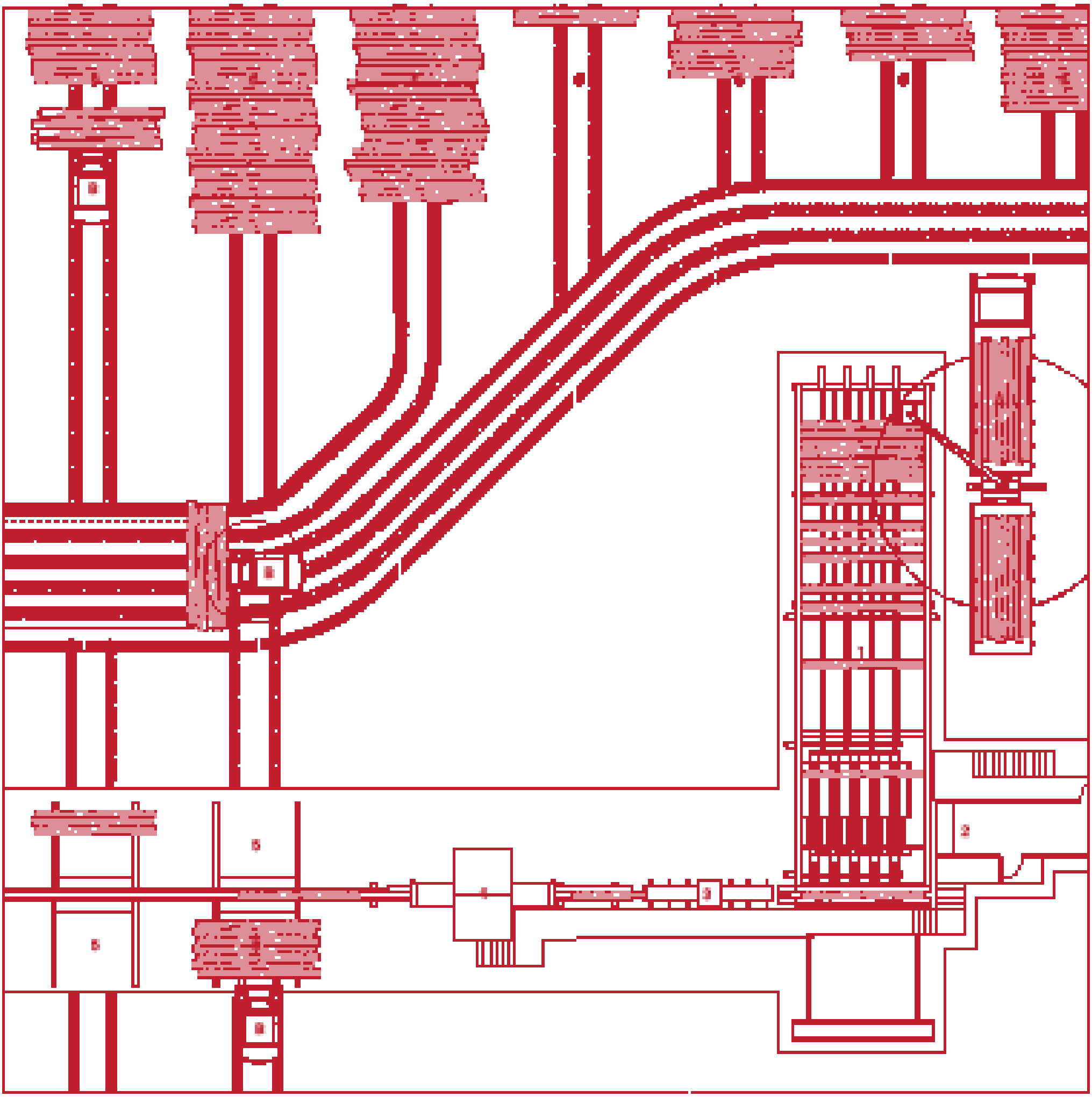
10
11

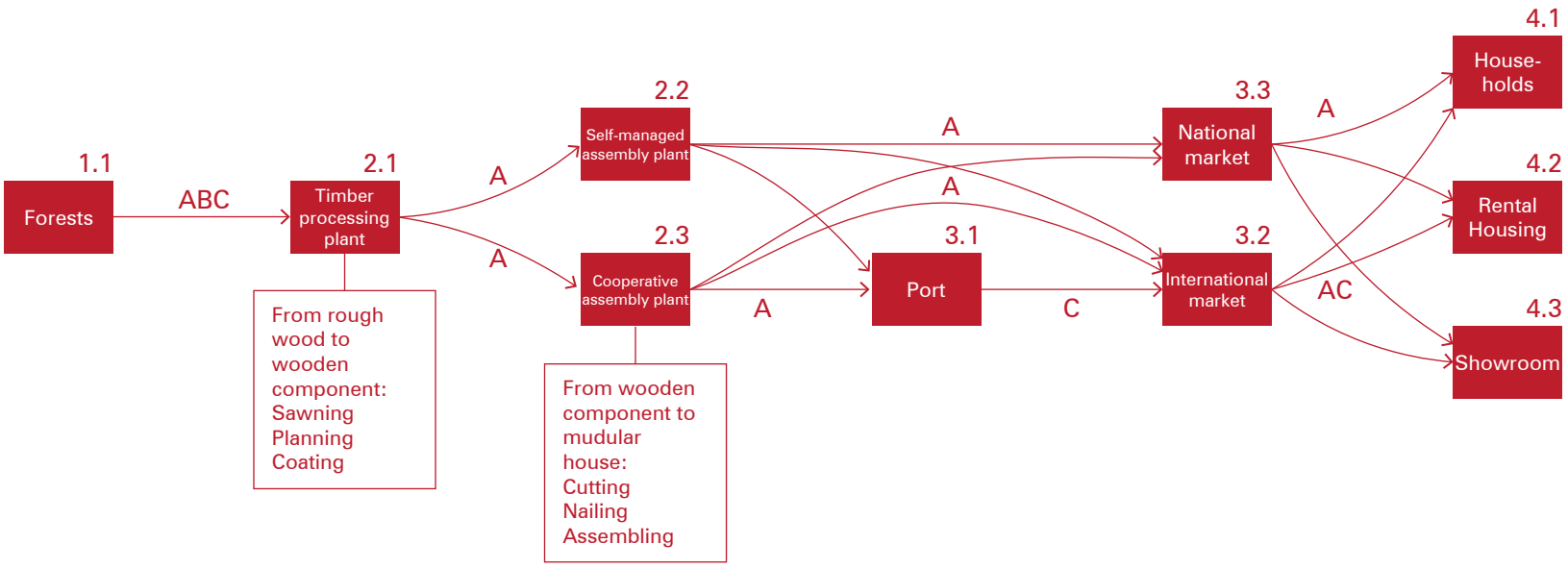


Five resolutions above

Reading plan
Long road and long passage

1 [illegible]
2 Long chamber
3 Inclined passageway
4 Hall of passage
5 Long passage
6 Long ramp
7 Antechamber with five passageways
8 Small hall

The passage begins with a horizontal entrance, leading to the long inclined passageway. Along the way, there are five passageways of equal height, but of different lengths. The passageway to the small chamber and the passage of equal length, are inclined. Long passageways, leading to the chamber of equal length, are horizontal. The long passageway leading to the chamber of equal length, is inclined. The long passageway leading to the chamber of equal length, is horizontal. The long passageway leading to the chamber of equal length, is inclined.

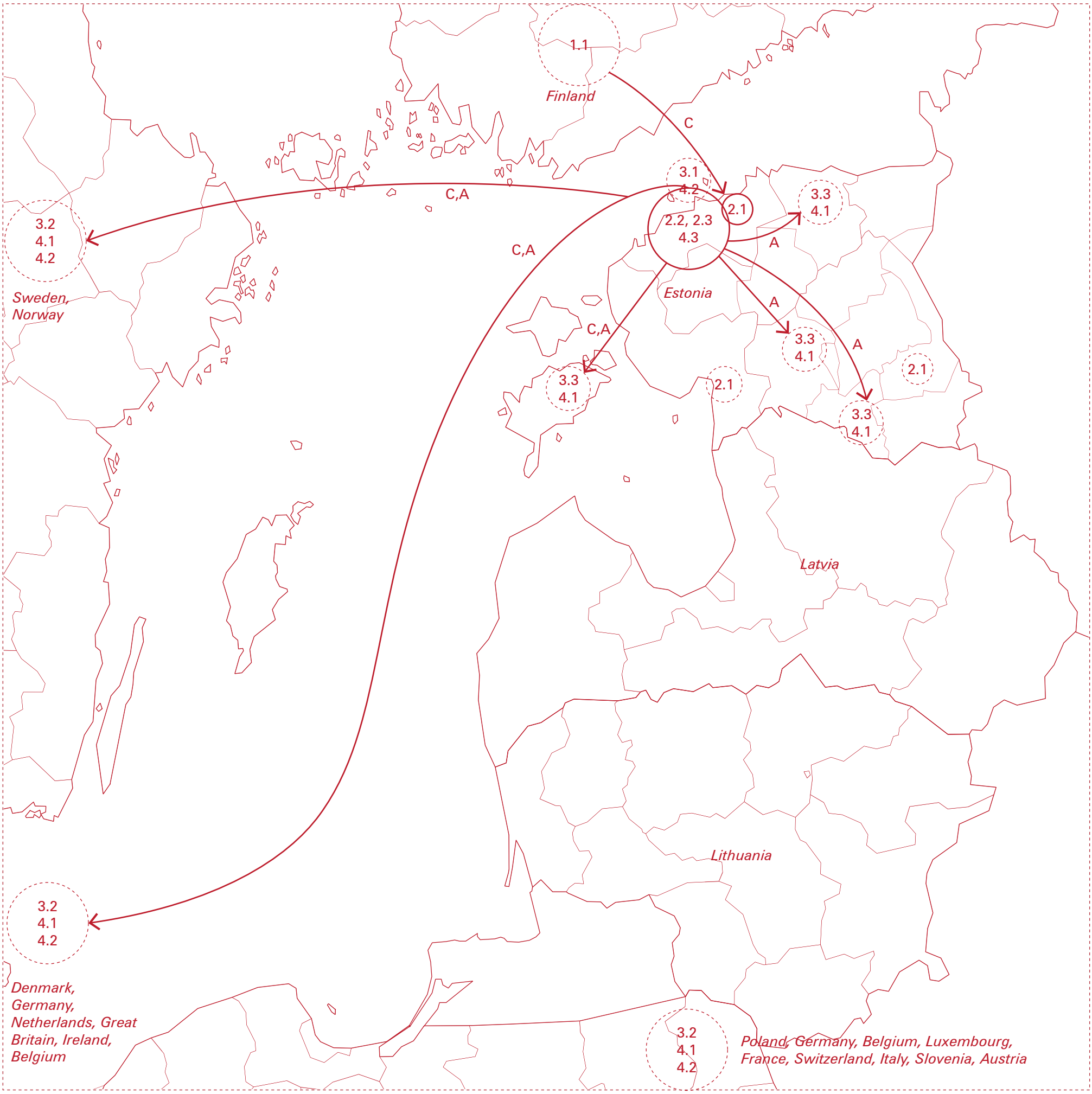


Prefabricated wooden house

Supply chain diagram

1.1	Finnish forests
2.1	Wood processing factory, Raitwood
2.2	PWB assembly plant, Kodasema
2.3	PWB assembly plant, Harmet OÜ (cooperative)
3.1	Port of Tallinn
3.2	Export to international market, Germany, Netherlands, Switerland, UK, Australia
3.3	Market in Estonia
4.1	Buyers aiming for private living
4.2	Buyers aiming for public rental
4.3	Sample houses for visiting
A	Road: log trailer, container trailer,tractor-trailer
B	Rail: train with covered wagons
C	Water: Container ship

After its extraction from the forest [1.1], timber is transported [C] to the metropolitan area of Tallinn, where it is processed into sawn components [2.1], that are appropriate for the patented design of the prefabricated wooden house construction company. Modifications to the design and the contextual suitability of the products are possible and are agreed upon between the client and Kodasema. The components are transported [A.1] to be assembled either in Kodasema's manufacturing facility or in Harmet's super factory, in case they were ordered to facilitate the construction of a large-scale order. Kodasema's ready-made products, marketed under the name KODA (Eng: hallway, house), are delivered [A.2, C] within five months after their prepayment and are installed within a day, in any logistically accessible location chosen by the client [3.2, 3.3, 4.1]. The product's shipment and on-site installation costs are covered by the client.



Prefabricated wooden house

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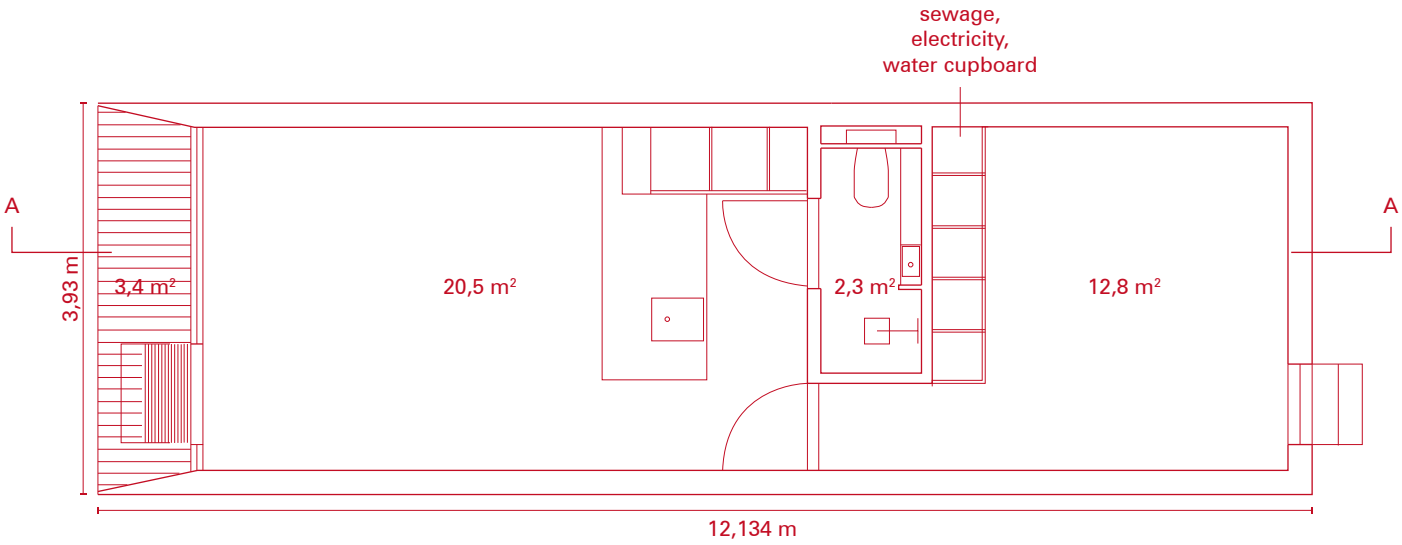
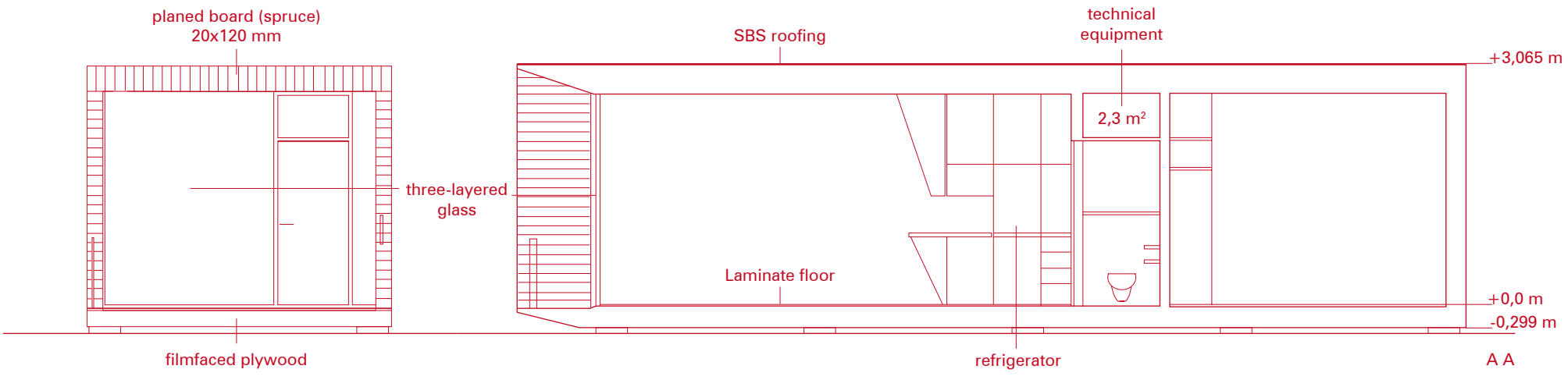
4.1 Buyers aiming for private living
4.2 Buyers aiming for public rental
4.3 Sample houses for visiting
A Road: log trailer, container trailer,tractor-trailer
B Rail: train with covered wagons
C Water: Container ship

Kodasema is a sustainability-driven design, architecture, and engineering firm manufacturing transportable, prefabricated, modular wooden buildings. It was founded as an Estonian design collective in 2013, registered its first PWB design patent in 2016, and attained construction standards certifications in 2019. The location of Kodasema's showroom and construction facility [2.2, 2.3, 4.1] and Harmet's super factory [2.2] in Tallinn is relevant to Estonia's current and past supply chain capacities. The historically high availability of timber allowed for the development of advanced building techniques in the capital, that responded to industrialization housing needs, stemming from commercial or political interdependencies in the broader eastern Europe and Baltic area. Consecutively to the post-independence growth of the Estonian PWB sector, supported by the EU since its integration in it, the high export demand for the sector's products is satisfied through the import of unprocessed timber, mainly from Finland [1.1] in the case of Raitwood sawmill [2.1], which is located close to the Muuga Harbour in Tallinn.
The proximity of PWB companies such as Kodasema and Harmet to their production source material is logistically profitable. Similarly, the installation of recognizable products that are either used for private housing [3.3] or as rentable accommodations [3.3] in strategic areas promotes the expansion of the company's market reach. The most unnegotiable limitation on the distribution and installation of products [A.2, C] is topographical, due to the sector's high logistic reliance on sufficient road and/or sea-port infrastructure.

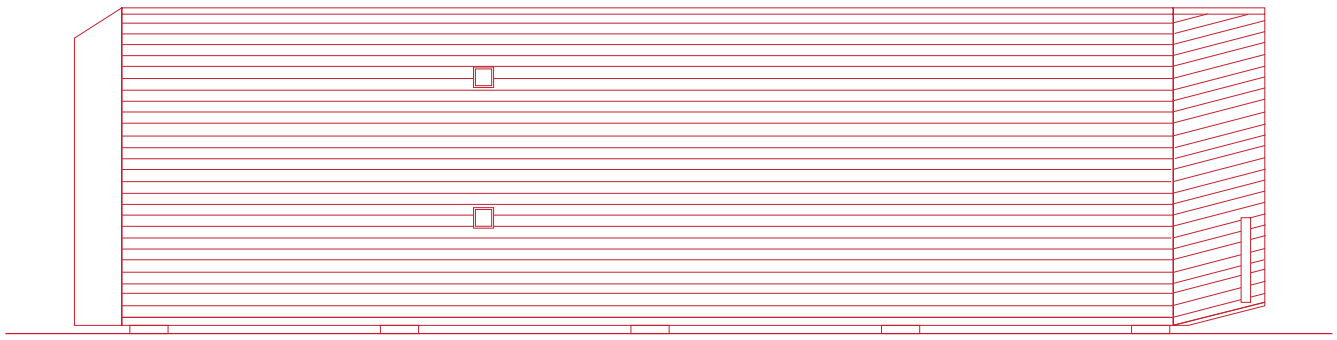




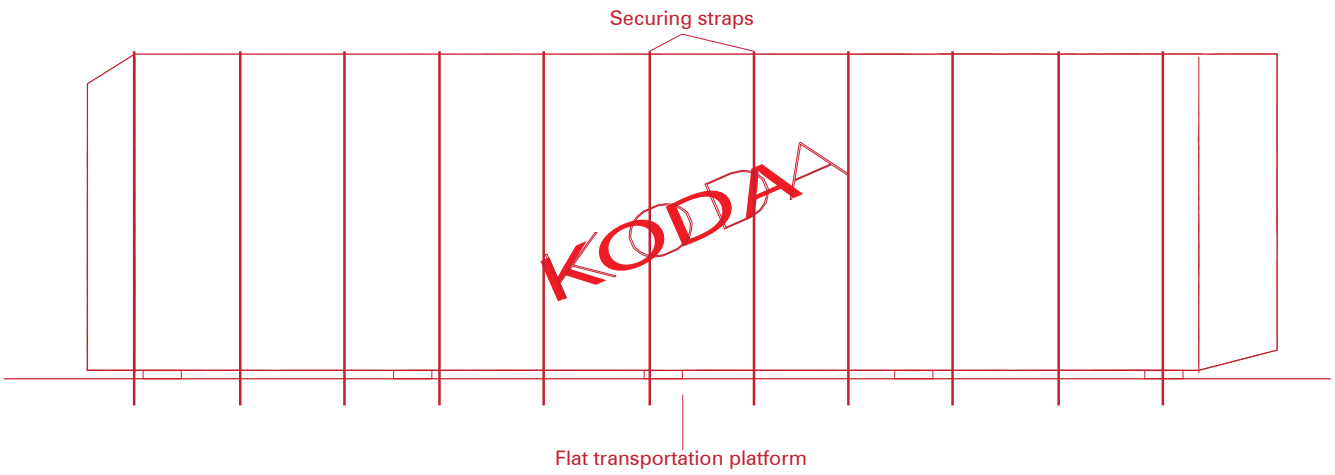
Prefabricated wooden house

Product unit

The Compact Extended model of KODA PWBs provides living comfort with a relatively small ecological footprint, reduced costs in transport, and contextual flexibility – the buildings can be transported from one installation location to another. Its lower height of 3,1 m allows installation to sites and lots to which road access was more complex.
Its usable floor area of 35.9 m², is created by internal laminate floors, timber cladding walls and terrace floors, with plywood internal finishings. The three-layered glass facade and glass back door allow for sufficient lighting and thermal insulation, while electrical, heating, and sewage infrastructure are pre-installed. It comes with wooden kitchen cabinets, a built-in fridge, a bathroom equipped with sanitary equipment, and a bathroom mirror. Its external amenities include an open mailbox and a bicycle holder.
It retails for 121 287 €, while modifications, equipment, and finishings beyond the standard specifications may be possible at extra costs, upon consultation. Prior to ordering, the client receives a detailed overview in the form of a list of equipment with links to specific products – from sockets and kitchen appliances to color codes. Any replacements are pre-agreed with the customers and done using equivalent items.



Left elevation

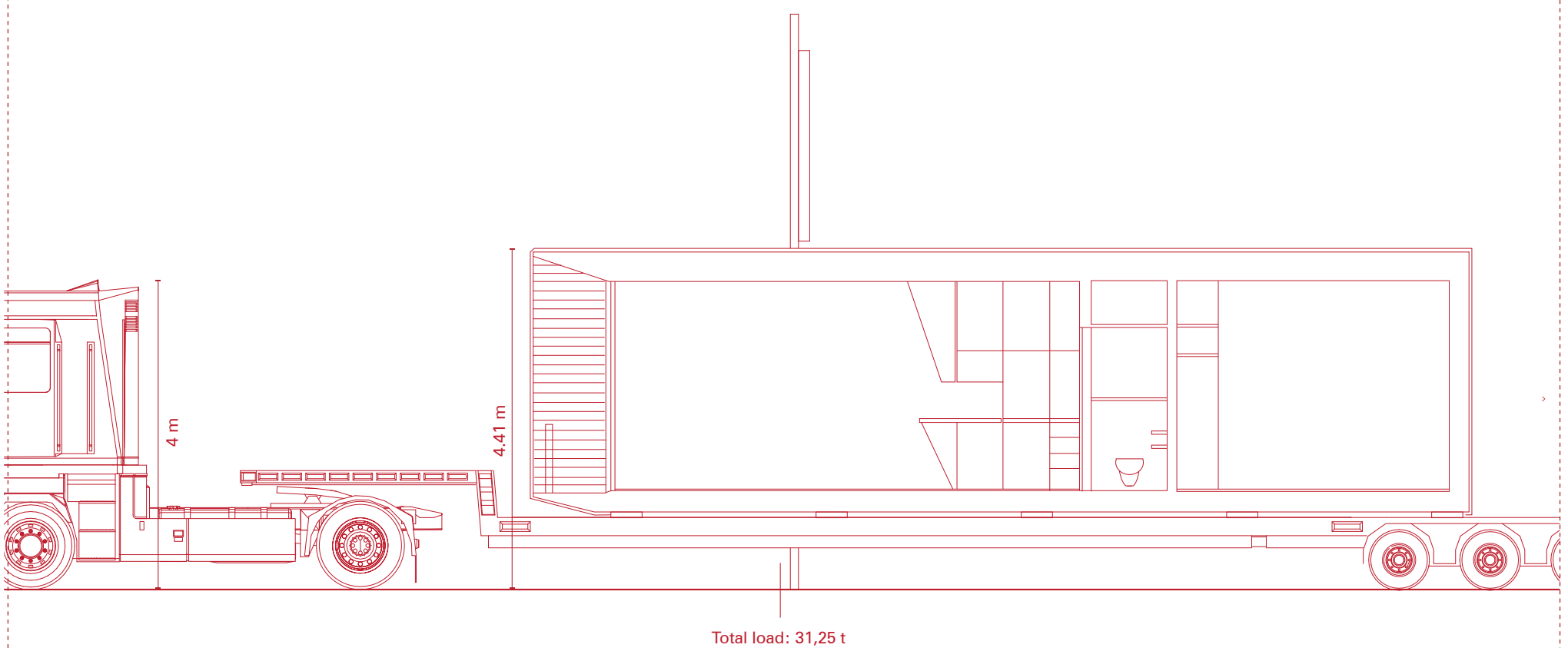


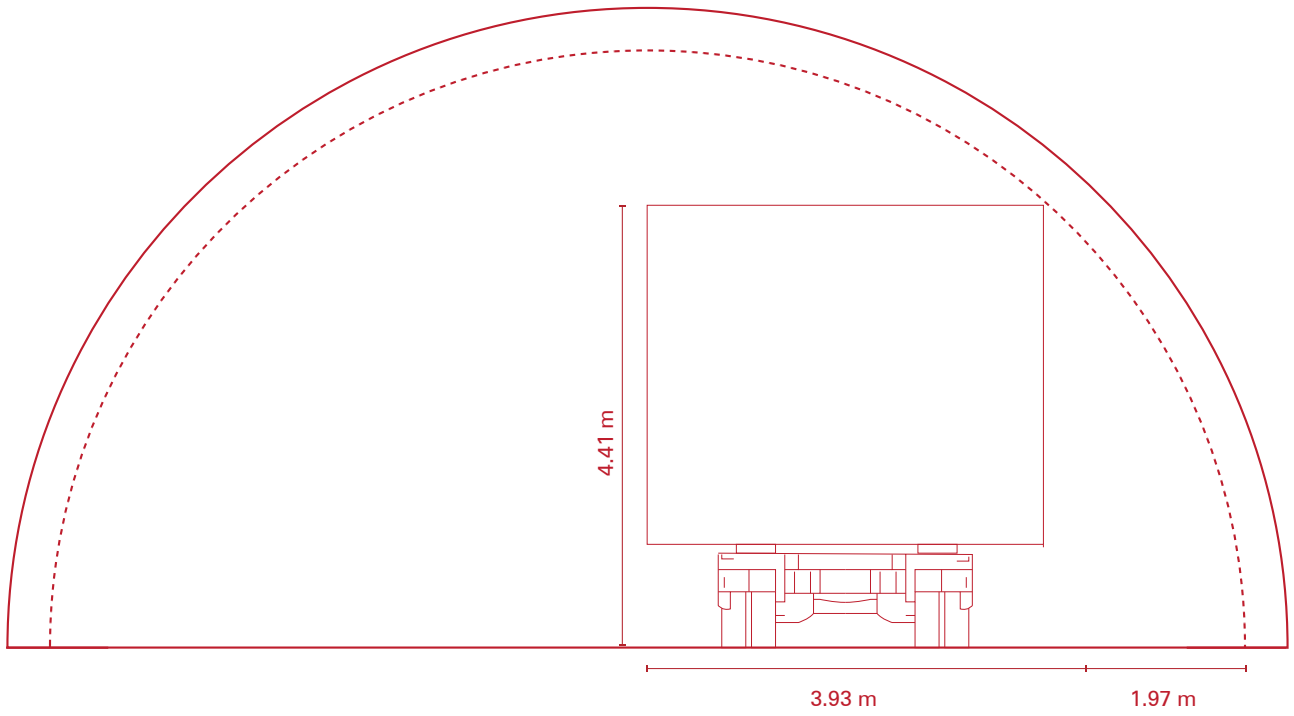
0 5 m

Prefabricated wooden house

Packaging

The Compact Houses that travel from the manufacturing facilities across countries need to be securely wrapped. In addition to fastening the furniture inside, the PWBs are secured in shrink-wrap plastic covering bags that are tailor-made for each product by the Estonian company HEAT3. HEAT3 uses materials imported from the US-based Dr. Shrink. The HEAT³ EasyPack™ heat-shrinkable bags are prefabricated with or without flame retardancy and are optimal for packing PWBs in a process that produces the least amount of waste compared to shrink-wraps extracted from rolls. The material is three to five times lighter than PVC (which constitutes a difference of up to 150 kg for the packing of a PWB). It is more durable than biodegradable plastic and can be recycled by waste management companies.
The product is covered with the EasyPack™ bag that is shrinked through the use of special heat tools. Upon loading on an appropriate transportation vehicle, the Compact House is fastened to it with securing straps.



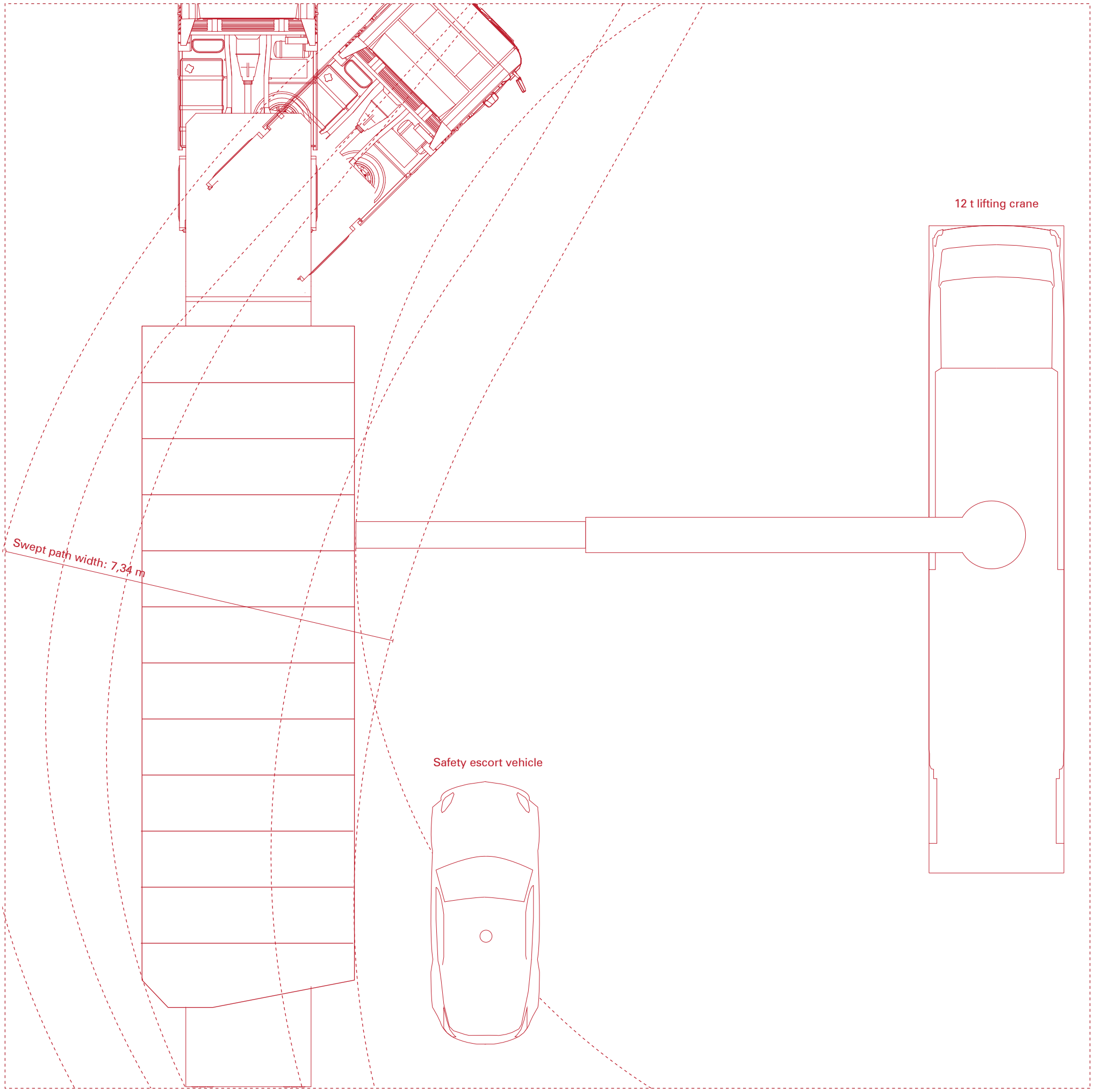


0 5 m

Prefabricated wooden house

Vehicle and behavior
Lowbed truck

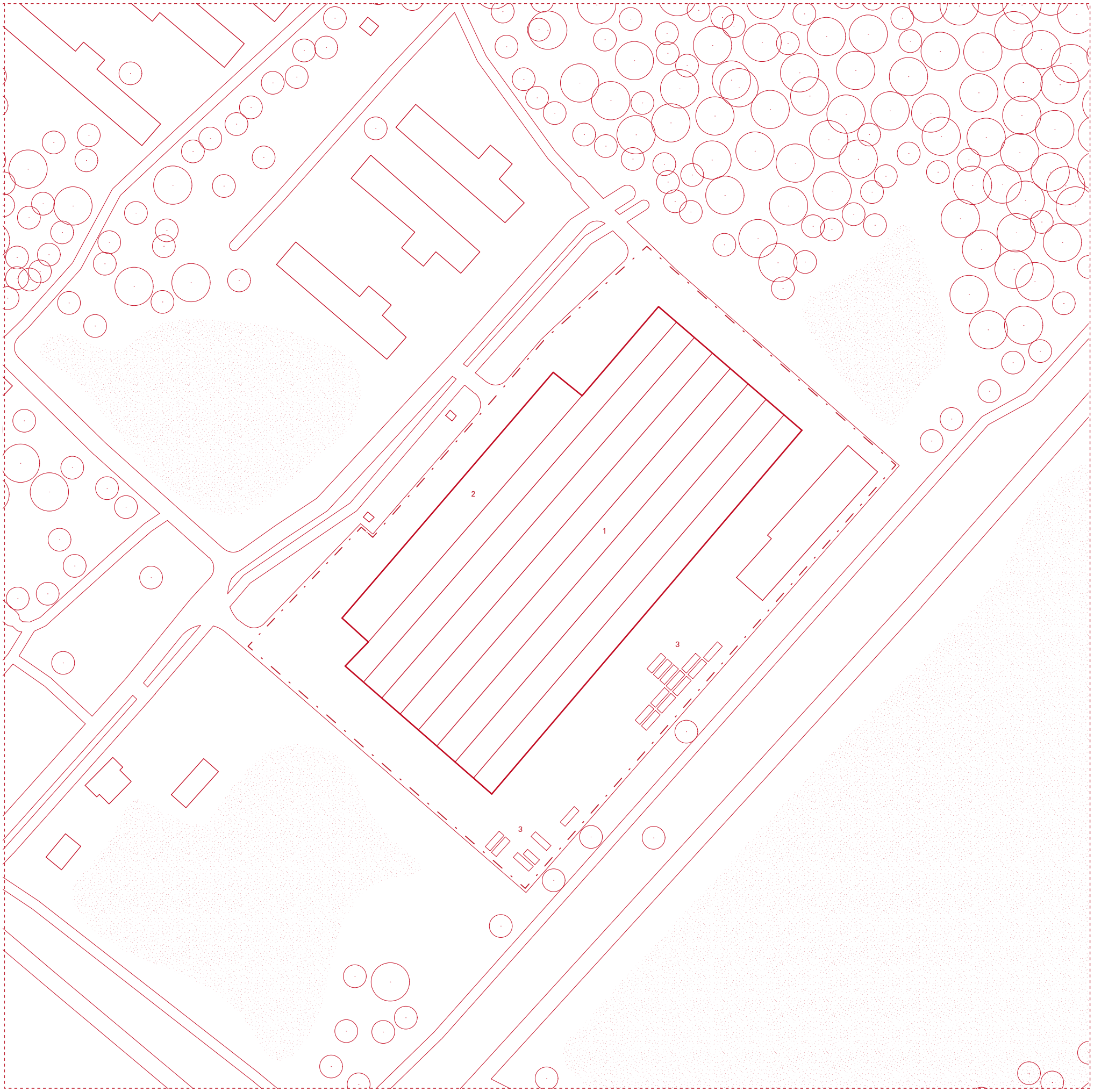
In the case that the product is transported via road or intermodal means, the use of low-bed trucks is integral to the logistic planning of the journey. The minimum trailer height of the low-bed trailer largely depends on its total required length, tonnage capacity, and off-road capabilities. Lowering the KODA to 3,1 m in the case of the Compact series has several advantages over the traditional KODA height of 4 m. It enabled access to locations where tunnels, bridges, power lines, and trees are restrictive or to particularly distant market locations.
Five-axle trailers with a net weight of about 16-20 t are most often used to transport Compact Extended KODAS that weigh 12 t respectively. The calculation of the combination's gross tonnage is equally essential in the route planning process, since damage may be inflicted and relevant regulations are particularly strict. For the EU, a transportation or road permit is required and this may take 1-5 weeks depending on the issuing national authorities.



Prefabricated wooden house

Vehicle and behavior
Lowbed truck

The challenging maneuverability of three-axle low-bed trucks loaded with oversize cargo, such as a Compact Extended house, constitutes a risk. In certain cases, the truck-cargo combination is required to be escorted by vehicles of local road or transport authorities that monitor the process at a close distance and that moderate the movement of vehicles around the truck-cargo combination.
In addition, a static crane, or sufficient space to accommodate a movable one, is required for the loading and unloading process of the product, to and from the truck.



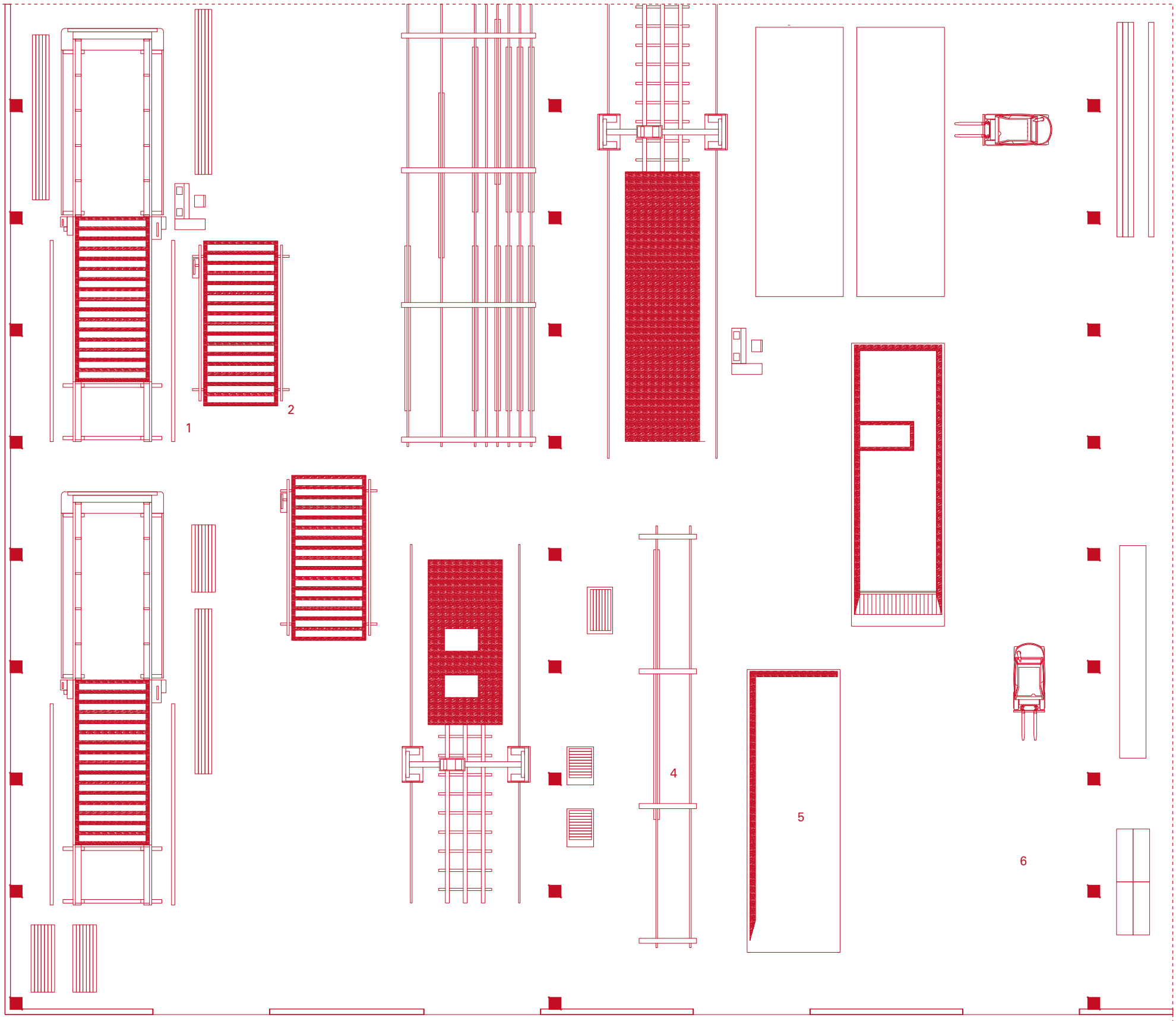
0 100 m

Prefabricated wooden house

Site plan
PWB superfactory

1 Production area
2 Office area
3 Outdoor storage area

To deliver large-scale orders for developments such as hotels, apartment buildings, and senior homes, Kodasema collaborates with the internationally established PWB construction company, Harmet. The agreement between the companies entails that Kodasema's products can be manufactured according to the brand's handbook and design patent, on the assembly lines of Harmet's newest super factory in Kumna, near Tallinn. Only smaller-scale orders are processed, manufactured, and delivered Kodasema's construction plant.
Harmet, the largest wooden modular house producer in the Baltics, is a company with 28 years of experience, over 800 employees and a construction capacity of 7,000 modules a year. Their operations are based in three manufacturing plants. The Kumna super factory extends into an area of 22 000 m2. Its production capacity is approximately 3600 modules or in other words appr. 130 000 m2 per year.

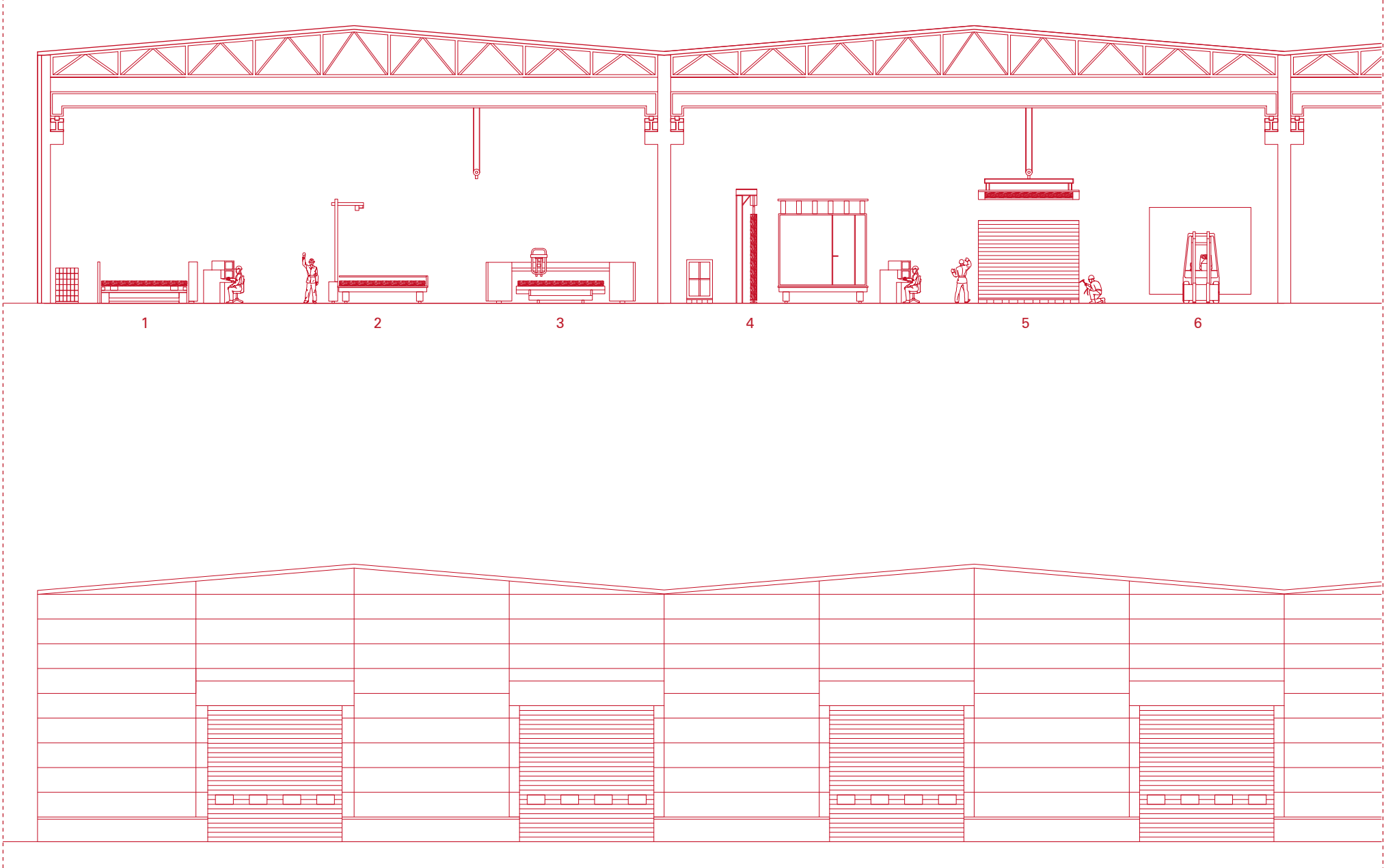


Prefabricated wooden house

Facility plan
PWB superfactory

1 Frame work station
2 Up-lifting and distribution trolleys
3 Muti-function bridge for cutting and nailing
4 Element storage system
5 Assembly platform
6 Transportation corridor

In Harmet's Kumna factory, the cut beams and panels are transported by forklift to the assembly area of the factory and into the framework station. The assembled frames are stuffed with filling material and then transported to the multi-function bridge to be cut and nailed. Next, the walls or roofs are transported into the element storage system, where they are hung and the windows and doors are installed and polished. Inside the factory, the transfer of the elements is carried out by up-lifting and distribution trolleys.



Prefabricated wooden house

Facility section and elevation
PWB superfactory

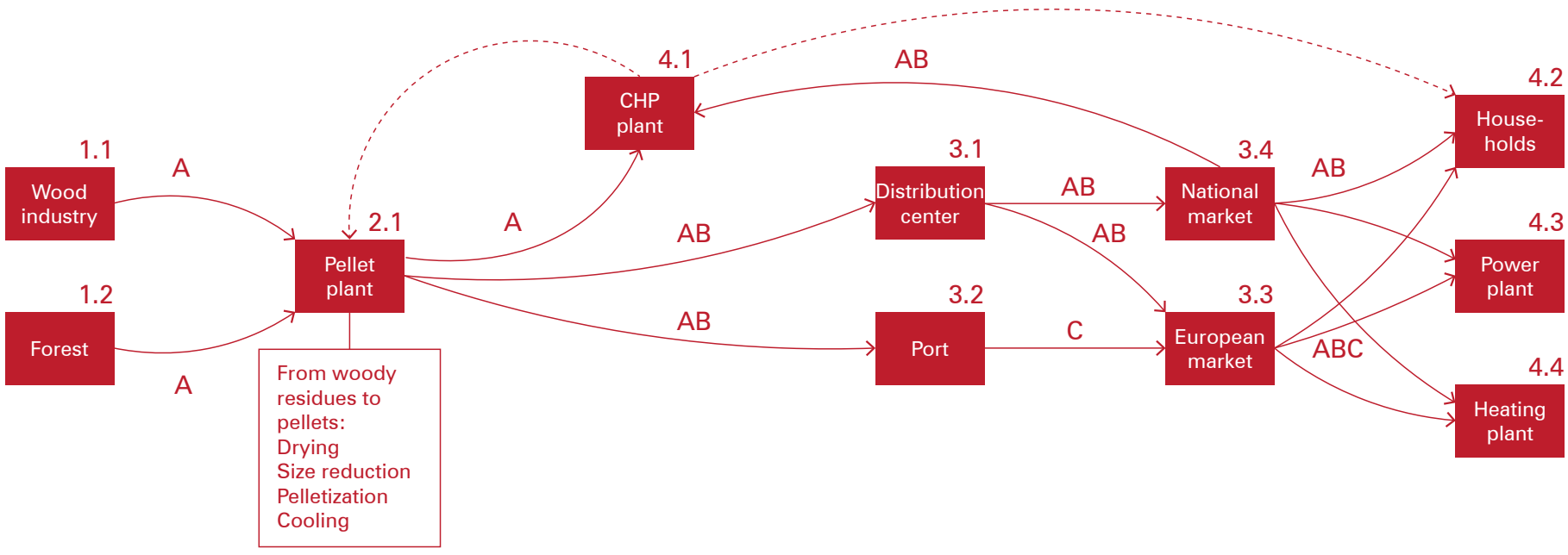
1 Frame work station
2 Up-lifting and distribution trolleys
3 Muti-function bridge for cutting and nailing
4 Element storage system
5 Assembly platform
6 Transportation corridor

A lifting system mounted on a spanning steel beam under the factory roof is responsible for transferring the building from the storage system to the assembly platform and placing it in the correct position, where it is fixed and connected with the assistance of workers. The workers then complete the installation of the internal equipment and piping. Finally, the PWB is secured in EasyPack™ heat-shrinkable bags and awaits delivery to the customer's location.

Prefabricated wooden house

Narrative
Stackable

The Compact Extended houses are fully stackable, allowing the creation of two-story apartment buildings, that make better use of the space available in tight urban or rural locations. The products comply with stacking building codes and enable optimization of investment of their owners to get a better yield on their capital invested.



Wood Pellets

Supply chain diagram

1.1 Forestry company, Karo Mets OÜ

1.2 Wood processing factory, Karo Mets OÜ

2.1 Pellet plant, Imavere Energia OÜ

3.1 Intermediate warehouse

3.2 Port of Maagu

3.3 Export to European countries whereof main countries: UK, Netherlands, Italy, Belgium, France

3.4 Export to selling points in Estonia, Latvia and Lithuania

4.1 Heat and Electricity Plant, Osula Graanul OÜ

4.2-4 Consumption

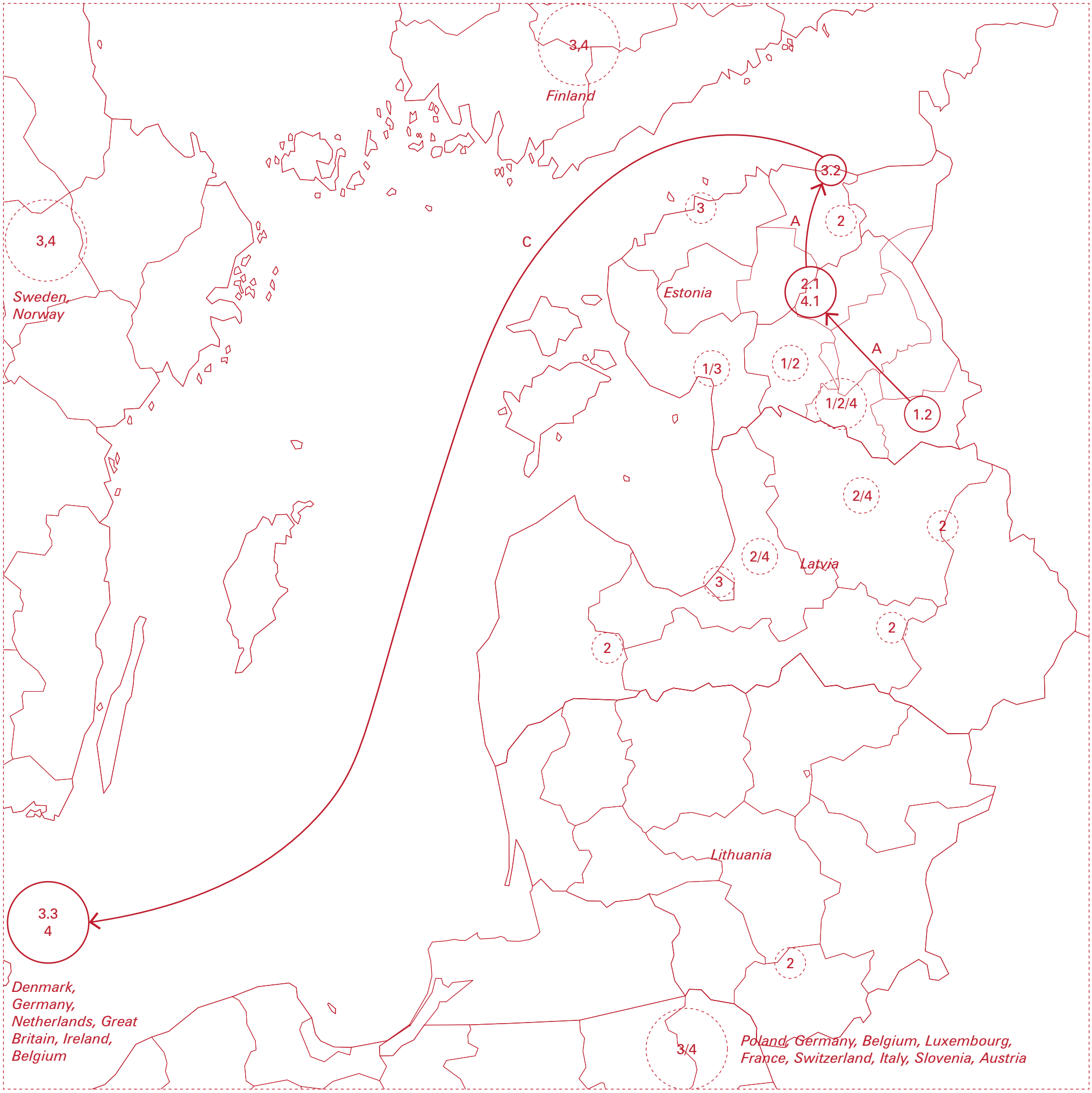
A Road: log trailer, container trailer, bulk van, tractor-trailer

B Rail: train with covered wagons

C Water: bulk wood vessel

D Air: none

The raw material collected stems from secondary feedstock can be differentiated in two types. The first type is primary residues derived from forestry surpluses. The second type is secondary residues derived from the wood industry. These primary and secondary residues are transported by truck to a processing destination, a pellet plant. In the pellet plant the woody residues are transformed into pellets, which reduce handling and transportation costs of the biomass. When the wood pellet products are finished, they are either packaged and sent for distribution or converted directly on the manufacturing site in a Combined Heat and Power plant (CHP plant). In the CHP plant the pellets are burned and converted into heat and electricity. If the wood pellets are not consumed on the manufacturing site they are brought to distribution centers. In the case of distribution on a national or Baltic scale, it can be speculated that they are stored on site in adjacent warehouses. In case of distribution to outer baltic markets, pellets are brought by truck or train to ports where they are shipped for further distribution. Two markets can be distinguished: the residential / commercial — heating by mainly households, and the industrial — power plants, heating plants and CHP plants.



Wood Pellets

Supply chain map

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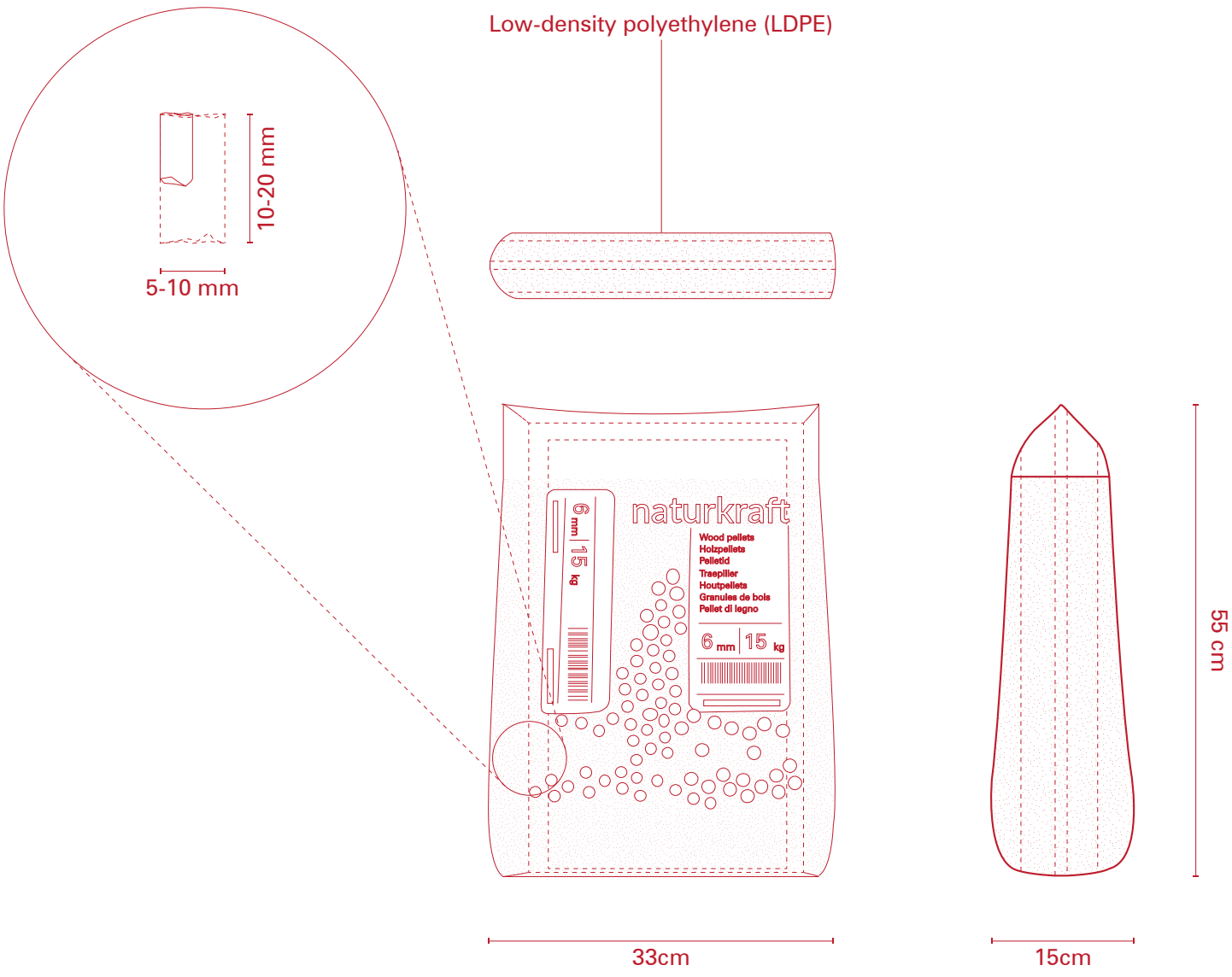
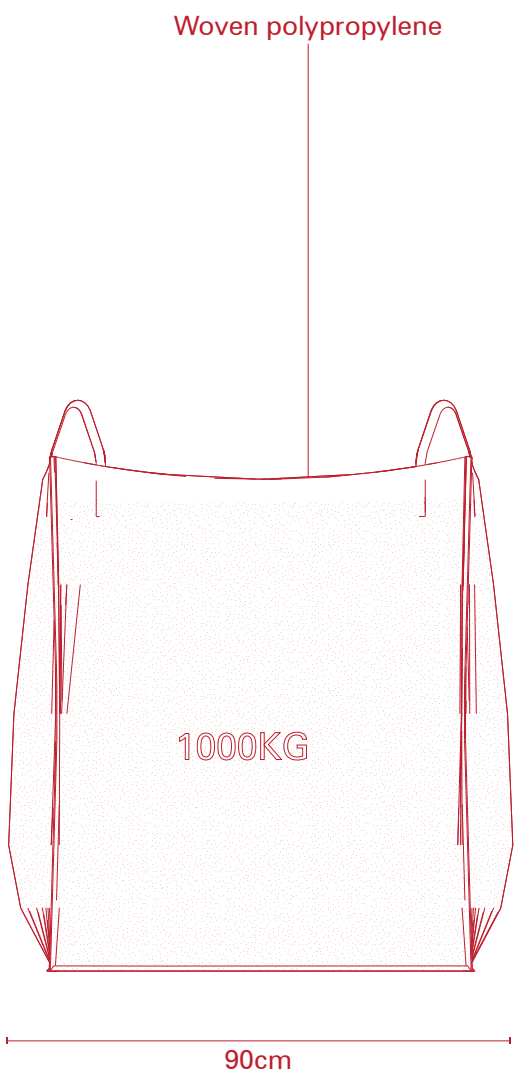
Graanul Invest is one of the biggest pellet producers in Europe. With its headquarter located in Tallinn, the overarching organization owns not only pellet plants but also CHP plants and forestry companies across the Baltic states, controlling the whole chain from harvesting to conversion into energy. An exemplifying supply chain is depicted in the map with a possible connection of specified actors. Karo Mets OÜ is one of the biggest forestry companies of Graanul Invest. Together with Roger Puit OÜ and Valga Puu OÜ, it makes up 2% of the Estonian forest. The harvested biomass is brought by truck from a forestry company, such as Karo Mets OÜ, to a pellet plant combined with a CHP plant, such as Imavere Energia OÜ. In the pellet plant, the woody residues are processed to pellets. After that they are partly converted by burning into heat and electricity in the CHP plant. The vast majority of pellets nevertheless are stored for distribution to be sold and consumed to commercial, residential or industrial destinations. As the domestic market of pellets is comparatively small and most of the pellet stock is consumed outside the Baltic states. A large portion of the pellet stock is transported by truck to close-by ports, such as Maagu in the case of Imavere Energia OÜ. From the ports, the pellets are shipped with a bulk wood vessel to outer Baltic markets. One of the largest recorded pellets shipments was made in 2021 from the port of Muuga to the UK.

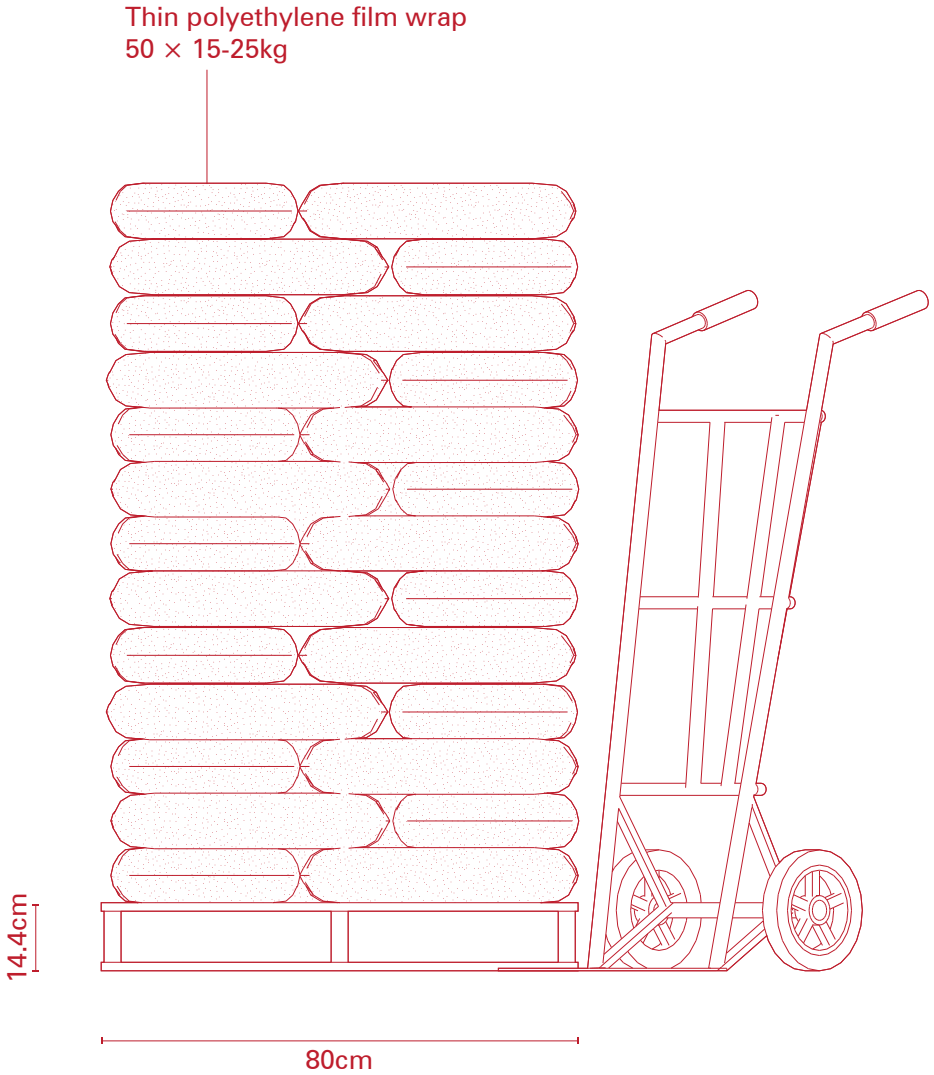


Wood pellets

Product unit

Wood pellets are a widely used type of renewable fuel for heating and power applications, both residential and industrial. The pellets are carefully packed in robust bags to protect them from moisture and physical damage during transportation. Depending on the consumer type different packaging sizes and material are adopted. Smaller bags ranging from fifteen to twenty five kilograms are suitable for residential heating and commercial selling, as they are more manageable and can be stored in smaller tanks. High-density or Low-density polyethylene (HDPE/LDPE) bags are also a common choice, offering exceptional strength and durability, as well as resistance to moisture, abrasion, and tearing. Both materials are designed to withstand the weight of the pellets without tearing or rupturing, providing reliable protection against environmental damage during transportation and storage.

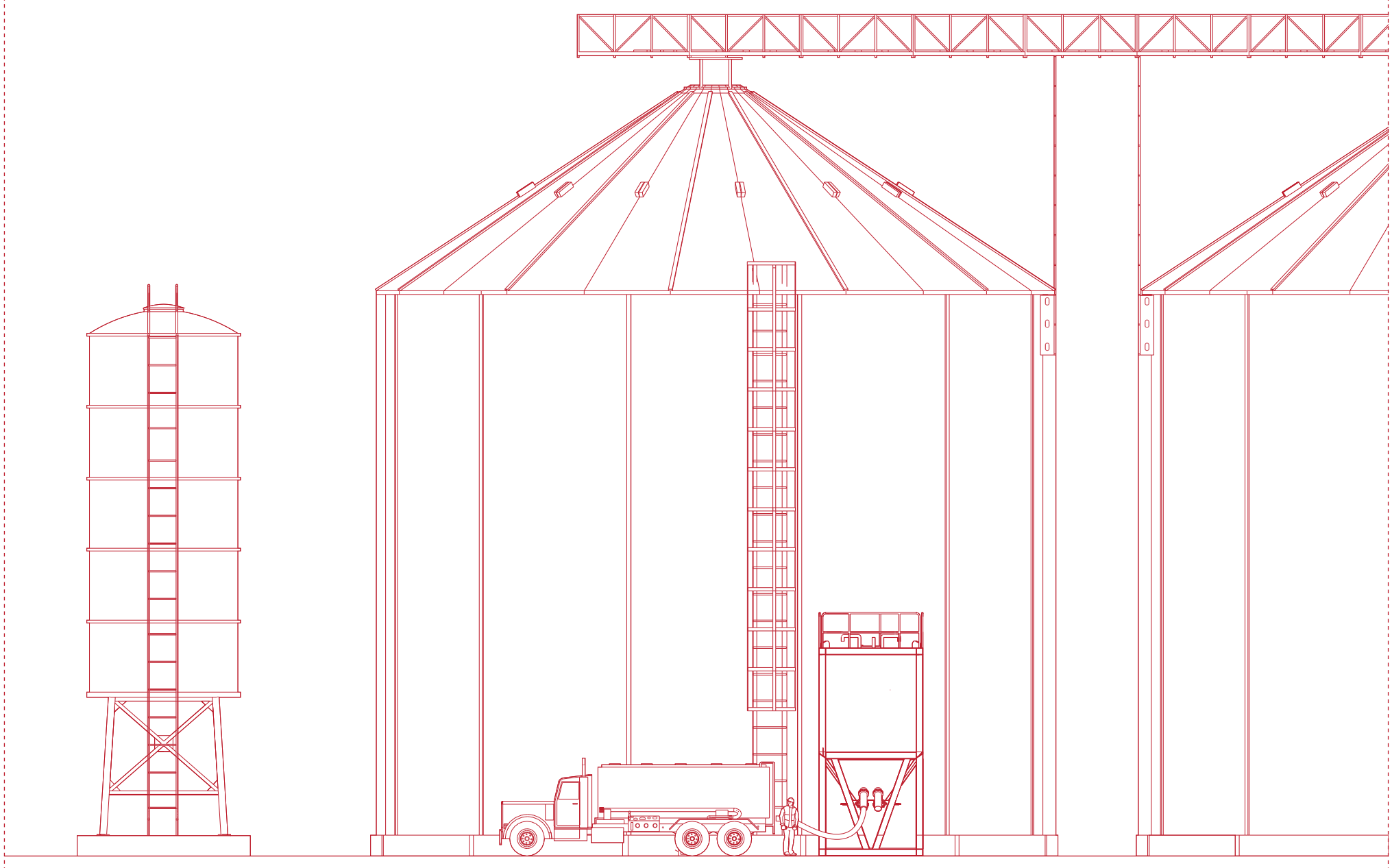




Wood pellets

Packaging

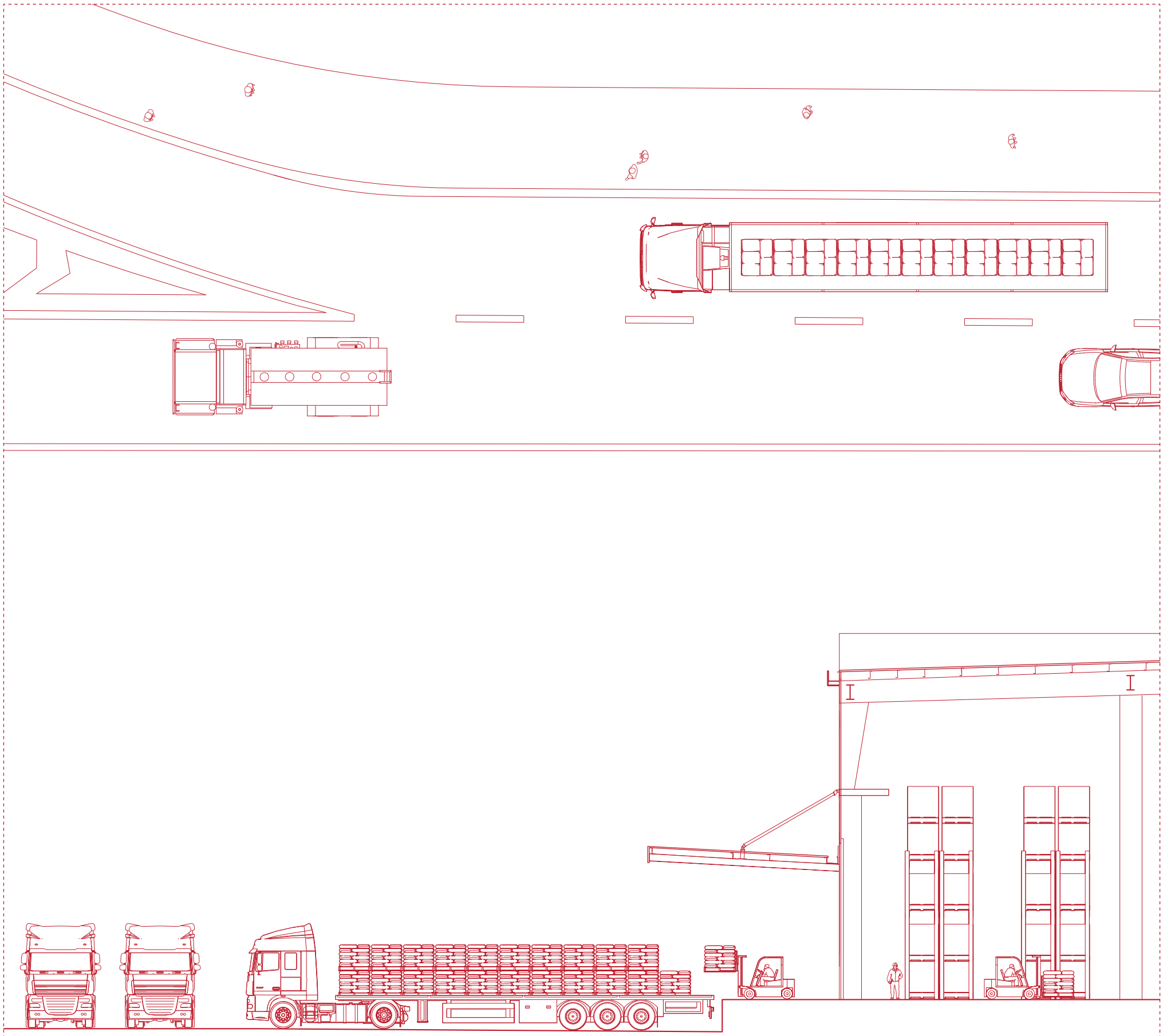
For industrial application, wood pellets are commonly packaged in bulk containers weighing one tonne, such as Woven polypropylene bags, or transported in tanker trailers that can hold approximately eighty tonnes of wood pellets. Woven polypropylene bags are preferred for their durability and resistance to wear and tear, making them suitable for heavy-duty applications. Moreover, their UV resistance ensures protection against damage from prolonged sunlight exposure. For domestic use, wood pellets are packaged in fifteen to twenty five kilogram bags and stacked onto wooden pallets. The pallets are then wrapped in plastic or stretch wrap to secure the bags in place and protect them during transportation. The EURO-pallet, a four-way wooden pallet measuring 800 mm × 1,200 mm × 144 mm is assembled with 78 specialized nails in a specific pattern. The weight of a EUR/EPAL-pallet (EPAL 1) is approximately twenty five kilograms. A forklift is often used to lift the pallets and move them onto trucks or into storage. A pallet jack can also be used to move pallets around within a warehouse or storage facility.



Wood pellets

Packaging

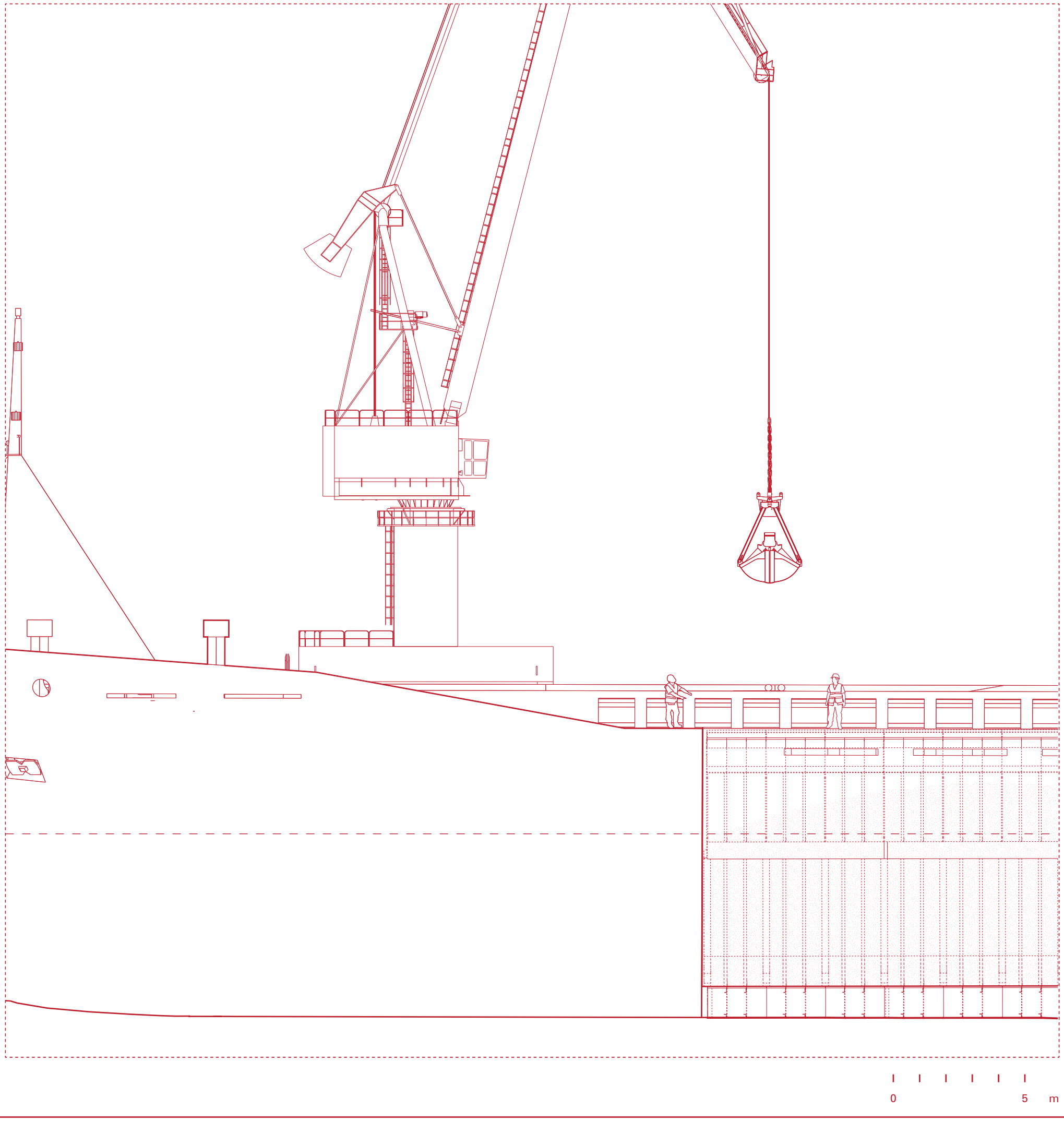
Silos and fabric warehouses are two common methods used for bulk storage of wood pellets in industrial and commercial heating applications. Silos are cylindrical containers made of materials like concrete or steel, designed to hold large quantities of wood pellets. They are equipped with ventilation systems, temperature sensors, and moisture control mechanisms to ensure safe storage of the pellets. Fabric structures, on the other hand, offer a versatile alternative to traditional building materials. These structures consist of a durable fabric stretched over a metal frame and offer several benefits, such as rapid installation, cost-effectiveness, natural light, ventilation, customizability, and portability. For industrial use, bulk wood pellets are transported using specialized trucks, such as pneumatic bulk trailers and walking floor trailers. These trucks are designed to carry and unload large quantities of loose pellets efficiently and safely. Pneumatic trailers load and unload using pressurized air. At the manufacturing site, pellets are loaded into the truck's compartments via a conveyor. Upon arrival at the industrial facility, the truck connects to the storage silo or conveying system. Pneumatic trucks engage a blower system, forcing air through a hose, pushing pellets into the silo or system.



Wood pellets

Vehicle and behavior
Flatbed truck

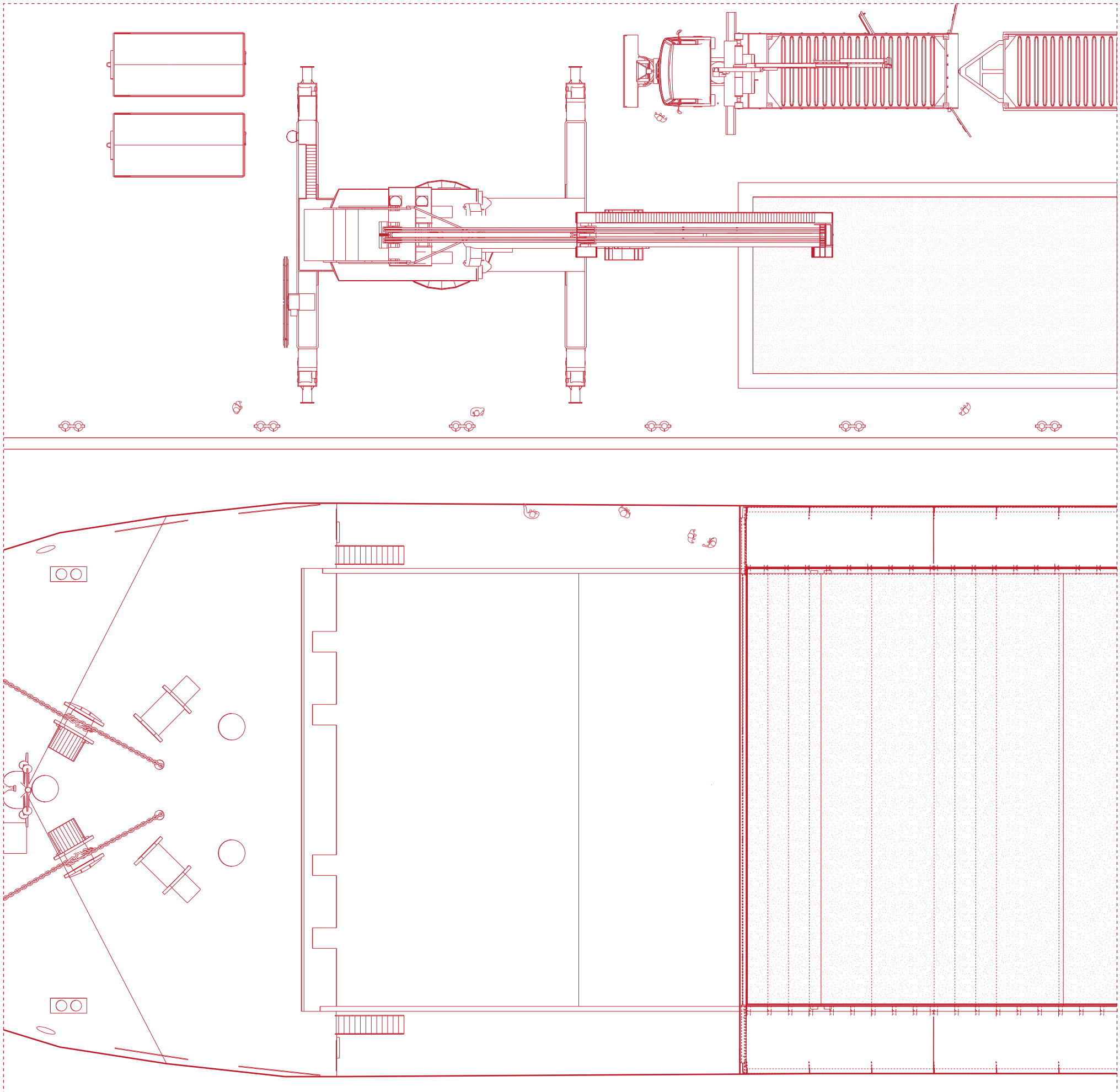
For domestic users of wood pellet products, they are commonly packed in fifteen kilogram bags made of durable plastic to protect the pellets from moisture and damage. The bags are then stacked and secured onto pallets, with each pallet holding a certain number of bags depending on the pallet size and weight restrictions. The loaded pallets are usually wrapped in stretch film to keep the bags in place and provide additional protection during transportation.
Trucks play a significant role in domestic wood pellet transportation. Pallets of wood pellets are loaded onto flatbed trucks, box trucks, or curtain-side trucks using a forklift or pallet jack. The choice of truck depends on the delivery route, accessibility, and required delivery speed. Once loaded, the truck driver secures the pallets with straps to prevent movement and potential damage during transit. After arriving at the delivery location, the driver unloads the pallets using a forklift or tail lift, ensuring proper handling to maintain the product's quality. The pellets are then stored in a dry and well-ventilated area until needed for use.



Wood pellets

Vehicle and behavior
Dry bulk carrier

Wood pellets are transported in bulk using cargo ships, especially for long-distance and international transportation. Bulk carriers are specifically designed for carrying dry bulk cargo like wood pellets. These vessels have large cargo holds to store the pellets, which are loaded and unloaded using specialized equipment and methods.
At the loading port, the wood pellets are typically transferred from storage silos or warehouses to the ship using conveyor systems, chutes, or grab cranes. The pellets are carefully loaded into the cargo holds, ensuring even distribution and minimizing breakage.
Depending on the port's facilities, several methods can be employed for unloading the wood pellets. Common methods include grab cranes, pneumatic vacuum systems and continuous ship unloaders. Grab cranes use large buckets to scoop the pellets from the cargo holds and transfer them to shore-based storage or conveying systems. Pneumatic vacuum systems use suction to unload the pellets through a hose, while continuous ship unloaders employ a combination of conveyor belts and buckets to unload the cargo.



Wood pellets

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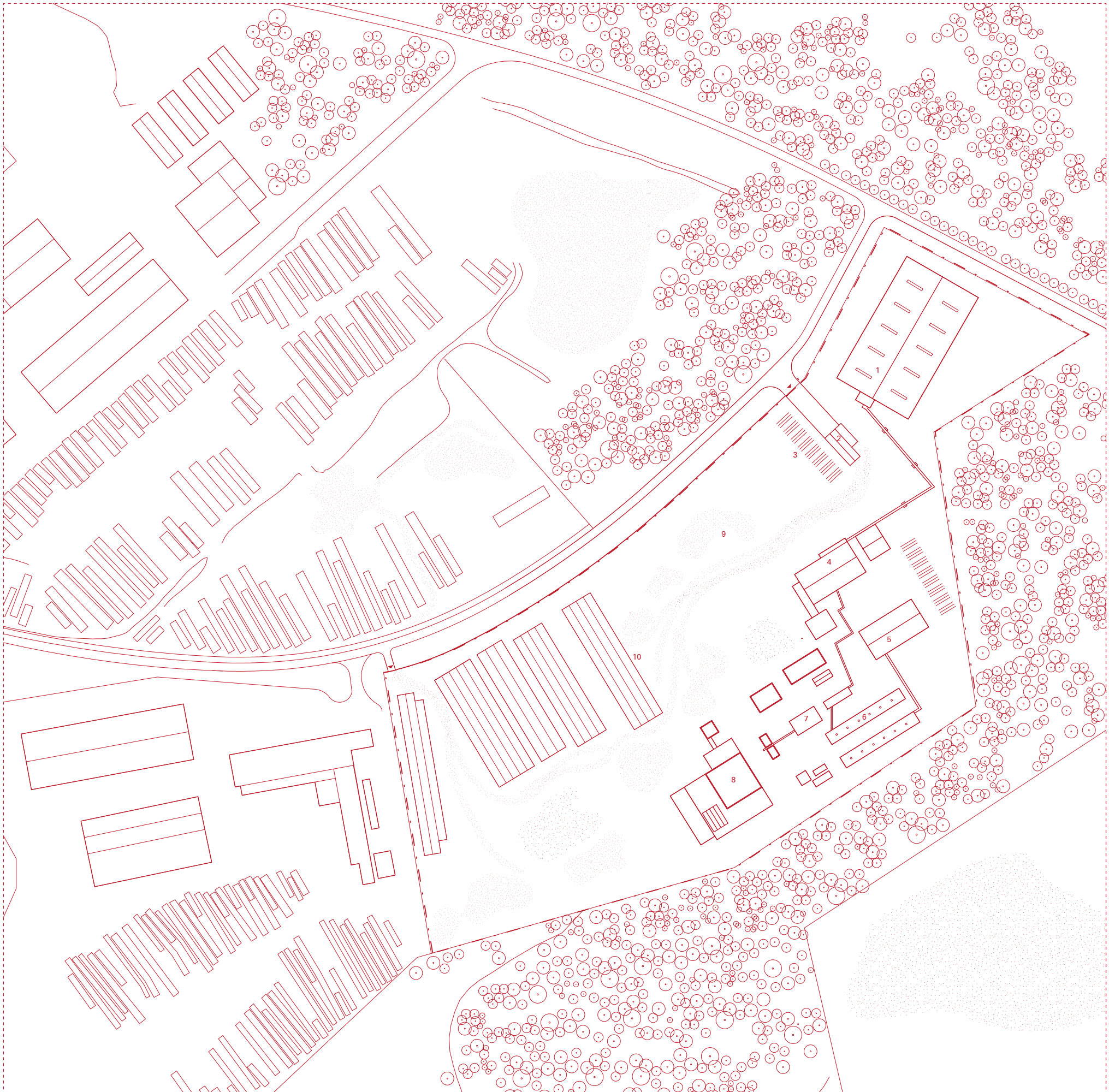


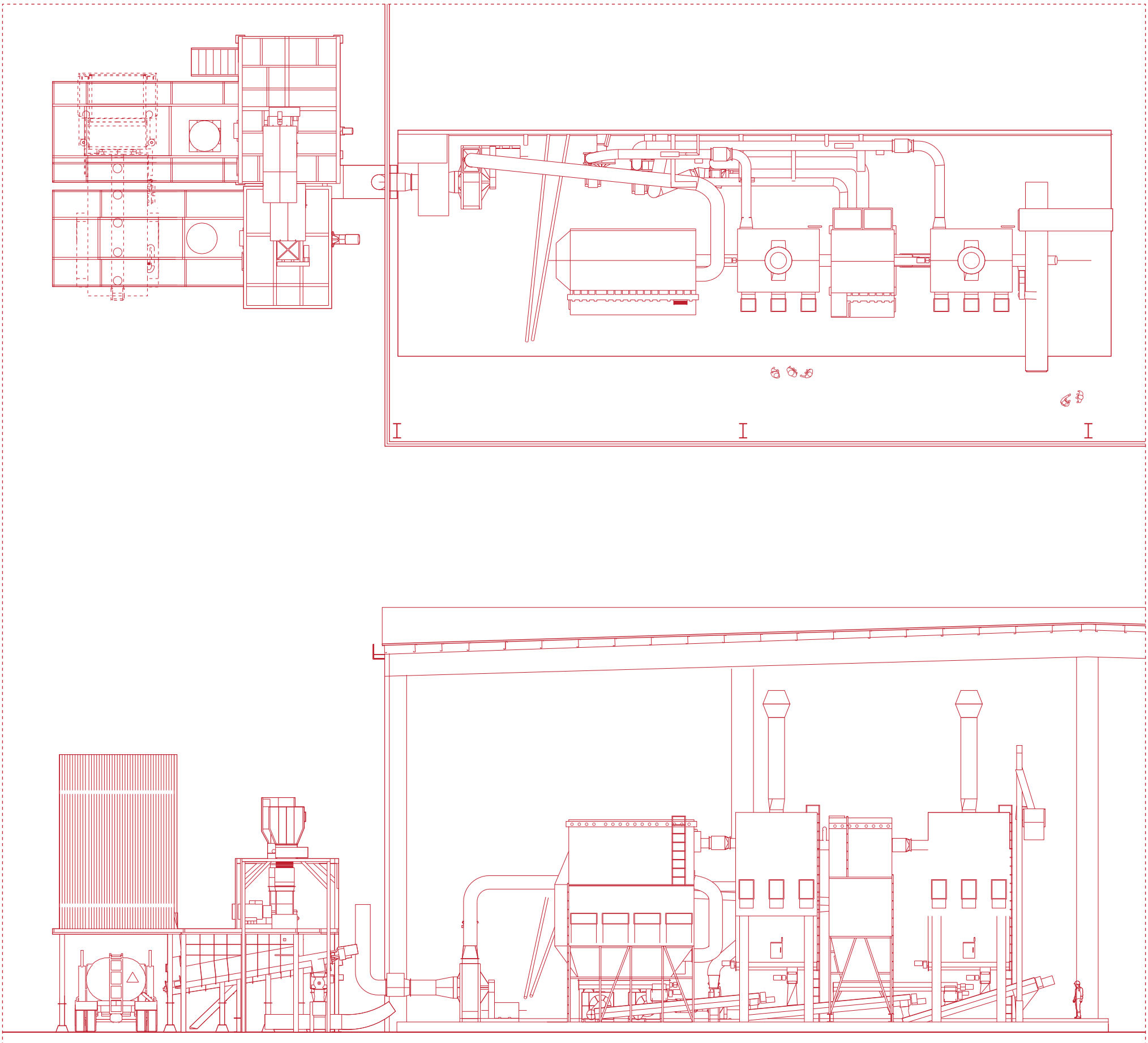
0 100 m

Wood pellets

Site plan
Pellet plant and CHP plant

1 Warehouse
2 Weighing Station
3 Parking lot
4 Cyclone separation
5 Pelleting mill
6 Cooling conveyor belt
7 Screening machine
8 Power Plant
9 Sawdust
10 Lumberyard

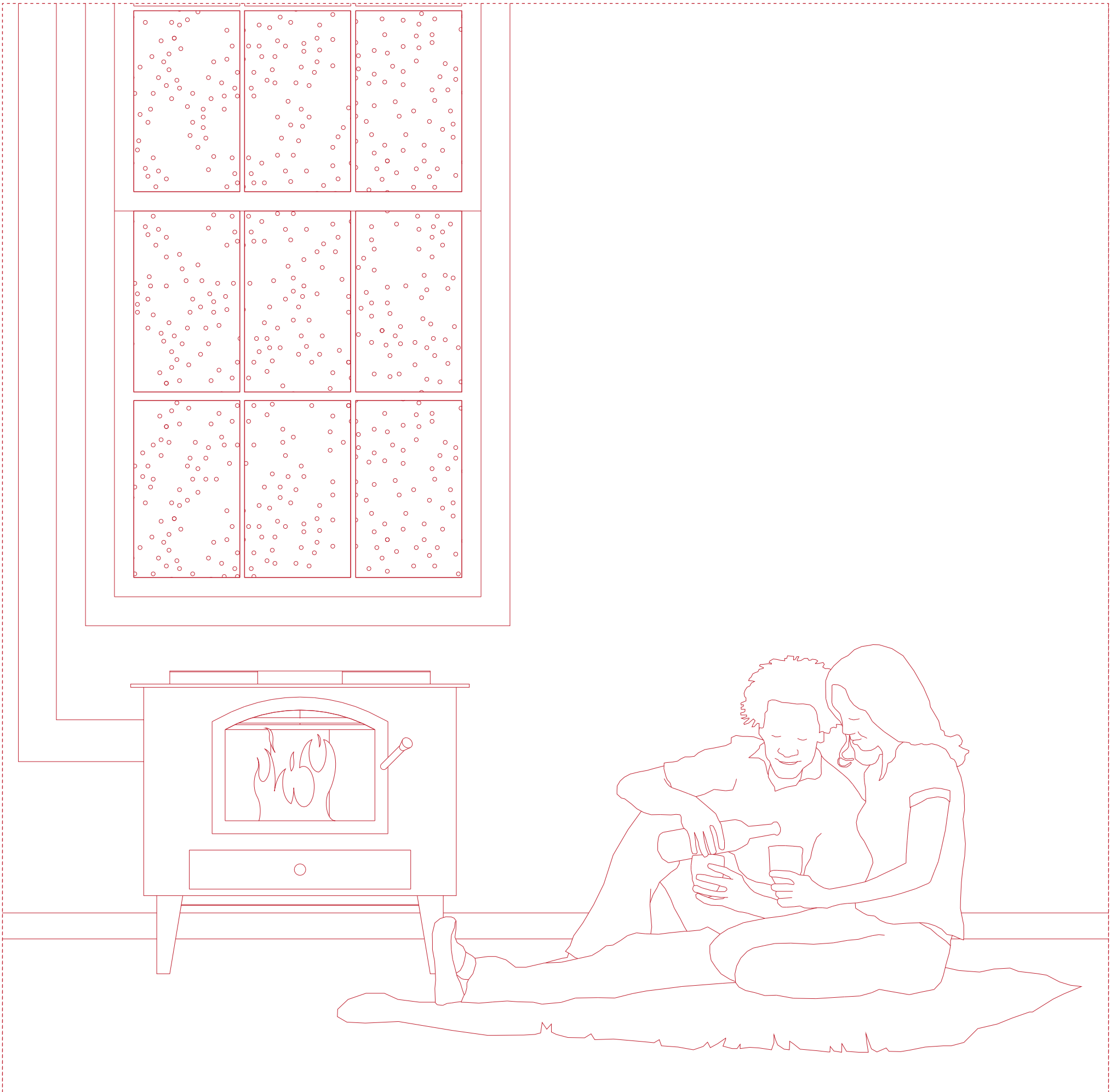
A wood pellet CHP (Combined Heat and Power) factory is a facility that processes wood biomass into pellets that can be used as a fuel source for heating and power generation. The function of a wood pellet CHP factory is to convert wood waste and other wood products, such as sawdust, wood chips, and wood shavings, into a uniform, high-density pellet form that can be easily transported and stored. These pellets are then burned in a CHP system to generate both heat and electricity. The heat is typically used for space heating or manufacturing processes, while the electricity can be used to power homes and businesses or fed back into the grid. This process provides a sustainable and renewable energy source that can reduce greenhouse gas emissions during the transportation. Additionally, the use of CHP technology increases the overall efficiency of the system, resulting in cost savings and environmental benefits, to achieve the goal of a circular economy.



Wood pellets

Facility plan and elevation
Pellet plant and CHP plant

Wood pellet production involves several steps. Initially, raw materials like sawdust, wood chips, or other wood waste are collected, ensuring uniformity in size and moisture content. The material is then dried, usually with a rotary dryer, to achieve a moisture level of around 10-12%. Next, it is ground into a fine powder using a hammer mill. The powder is mixed to distribute the natural lignin evenly, acting as a binding agent during pelletizing. The mixture is fed into a pellet mill, where it is compressed under high pressure and heat, forcing the lignin to melt and bind the particles together, forming small cylindrical pellets. The newly formed pellets pass through a cooling system to solidify the lignin and increase durability. Finally, the pellets are sieved to remove any dust or broken pieces and then packaged for storage and transportation.



Wood pellets

Narrative
Warmth

Wood pellets are a renewable energy source used for heating in domestic households. In a residential setting, wood pellets can be used in various heating appliances, such as pellet stoves and pellet boilers. A pellet stove is a standalone heating appliance that burns wood pellets to provide heat for a single room or a small area. These stoves are typically installed in living rooms or other common areas where warmth is most needed. They have a built-in hopper that stores the wood pellets, and an automated feed system delivers the pellets to the combustion chamber. The heat generated by the burning pellets is then radiated into the room or distributed through a forced-air system. Pellet boilers, on the other hand, are used to heat an entire home by replacing or supplementing traditional oil, gas, or electric boilers. These systems work similarly to pellet stoves but are connected to the home’s central heating and hot water systems and heating load from 3.9 kW to 1 MW or more. A pellet boiler burns wood pellets in a combustion chamber, and the heat is transferred to water circulating in the home’s radiators or underfloor heating system. The hot water can also be used for domestic purposes, such as showers and washing dishes.

At Pajumäe Talu (Organic dairy farm)

Berlage: What do you think the farm will look like in five or 10 years? Any expectations?

Getter Niilo: Maybe some new robots? Definitely less people than right now, because, if there are more robots and more automatics then we don't need so many people.

B: You mentioned there are 180 or 200 cows?

GN: There are 461 cows. Milking cows. The total number is 520, but in milking there are 461.

B:And then how many workers are working here right now?

GN:There are 3 people per shift and there are two shifts so six people per farm.

B:Mm-hmm. Okay. So you are expecting even less workers. I see. So it'll be almost all automated. Hopefully?

GN:Ideal would be one person per farm in one shift. Because the robots will do everything and this one person will just see and help if needed. One leader and one worker.

At Estonian Forest and Wood Industries Association

Berlage: I have a question about the labor market in the timber industry. How has that changed since the beginning of the century? Do you need more skilled workers or less skilled workers? What is the availability in general?

Henrik Välja: When it comes to the workers in the forestry the number of employees has decreased and the majority of operations are done with machines. Many reasons for that: efficiency, but also safety. And also that, you know, in the Estonian climate working year-round outside with the chainsaw has bad impacts on your health. So we have switched mostly to machines, machine operated forestry. In the wood industry the employment has stayed pretty much stable, but the added value has increased, I think, like tenfold during that. So again, it's moved from like somebody standing at the line taking two pieces of wood from here and putting them there it has moved to operating part of the automated line. Mm-hmm. Definitely a lot more supporting activities in the office. We have sustainability certification schemes that you then need to have the data on where what came from and managing all the data and everything. So it's similar employment, but different jobs.

14 Questions

Nien Han Yang

Question:
How do the mechanisms of energy pricing and subsidies for renewable energy by the EU impact the harvesting and processing strategies of the timber industry for fuel wood and wood pellet production, and how do these factors shape the industrial landscape of the timber industry by integrating it with with biomass energy power systems?

Framework/Discussion:
In recent years, the production of wood pellets for use in power generation has surged due to the rising energy prices and government subsidies for renewable energy, particularly in CHP systems. Proponents argue that wood pellets are a cost-effective and sustainable alternative to fossil fuels, as they are made from waste materials such as sawdust and wood chips. Nevertheless, critics have raised concerns about the environmental impact of the industry, specifically in regards to sustainable forestry management. Meanwhile, the availability of EU subsidies for renewable energy has further fueled the growth of the fule wood industry.

Felix Verheyden

Question:
Can CHP plants play a vital role in the fuel transition that is aimed for the NSBC? If so, what will Baltic tank stations in the future look like if biomethane, hydrogene, and electricity charging points replace fossil fuels? How can territorial planning of CHP plants in relation to tank stations contribute (or not) to the potential of this transition?

Framework/Discussion:
From achieving net zero emissions to ensuring energy security. The transition to renewable energy sources has become more pressing since it is not solely a matter of countering climate change—With the Paris agreement in 2015, the European green deal in 2019—but also a matter of dealing with the ban on Russian gas since the Russian invasion in Ukraine in 2022. Just as in the rest of Europe— although because of the war with a more pressing urgency—the Baltics are looking for energy security through a diversity of supply channels.
Such alternative energy sources are biomethane and hydrogen when it comes to replacement of fossil fuels as transportation fuels. Biomethane and hydrogen can be generated by the upcoming CHP plants, which were initially built to provide power and heat to agricultural and industrial destinations. Thus, CHP plants have the potential to serve an energy transition when updated and transformed in light of biomethane and hydrogen.

Ana Nuño de Buen

Question: The transformation of cow manure into biogas in Estonia is part of an active national strategy to increase the production of renewable fuels. From the logistical infrastructure on a territorial scale to the typology of biogas plants and stations on an architectural scale, how can the design of a promising emerging industry be approached?

Framework/Discussion: Renewable energies, biogas, biogas plants and stations, European Union green targets for 2030, rise in gas prices, Russian gas embargo, carbon quota trading system in agriculture, nitrogen crisis

Lenneke Slangen

Question:
How can we redefine animal, robot and human (conditions) in the harvesting and retailing of milk products in response to the future robotization of the milk supply chain?

Framework/Discussion:
Investigating relations of cow and robot, human and robot, cow and human, human and human; redefining the conditions of animal, human and robot.
Through the evaluation of selves and others; conceptions and performances; conditions of labor (feeding), work (consumption), and action (supply chain).

Thomas Gkikas

Question:
The implementation of automation in logistic centers is often accompanied with an inability to handle irregularities. Thus, new forms of residual spaces are emerging. Determined by future digital development, what is the relationship between the fundamental productive nature of logistics centers and their non-productive spaces, and the different actors that will come to interact with them?

Framework/Discussion:
Possibilities for defining the spatial boundaries of new landscapes both within the facility and with its surroundings, through the lens of co-existing microcosmic environments. Landscapes in which different parties engage and interact, animals, trees, people and robots, while performing different tasks and governed by new rhythms.

Eliott Moreau

Question:
How can logistic centers be used as testing grounds for prefabricated housing construction and housing typologies? Can modulation allow for easy maintenance through automation? Looking at Paldiski as a site study of residential and industrial growth, how can logistic centers become laboratories for housing models?

Framework/Discussion:
A prefabricated housing “laboratory” could bridge the gap between industrial and residential development at Paldiski, an Estonian site seeking investment and workers. Local product testing may increase involvement in housing management and facilitate the creation of a mixed industrial and social zone.

Optimization and Customization

Maria Stergiou

Question: How would the Harmet prefabricated houses superfactory look like if higher automation was integrated in its supply chain since the design and order phase of a product, to optimize the assembly of fully customizable and license-protected PWBs for customers and installation sites across the NSBC and across the three different climate zones that it crosses?

Framework/Discussion:
Affordable housing needs are increasing and Estonia's positioning in the trans-european prefabricated wooden house industry is becoming more apparent/established. it is still a question of how the design of the a PWB serves customer-valued and for contextually appropriate customization and to ensure the sustainability of harvest-to-installation supply chains.

Chaomin Chen

Question:
If recycled wood from Germany becomes an economically sustainable raw material for timber production in Estonia, what would its logistic center in both Germany and Estonia/ recycling facility in Germany/process facility in Estonia look like?

Framework/Discussion:
With the effect of EU's sanction against Russia and its Forest Strategy for 2030, supply of sawnwood for the Estonian timber industry faces great reduction. Germany as both the hub of wood consumption and the leading country in wood recycling could export its recycled wood via shipping/ railway to Estonia and be processed as new products.

How can timber harvesting and recycling facilities be consolidated in a circular economy? What would be its spatial affect to the production/distribution facilities?

Han Yang

Question:
As automated parcel machines roll out in rural areas, what opportunities will this expanding last-mile logistics network present to local dairy suppliers? How will the network serve the retail sector in rural areas? How will the state-owned logistics company investing in this network cooperate with the government to give this logistics facility more social service functions?

Framework/Discussion:
Driven by the covid, e-commerce orders in rural areas were surging because people were leaving cities, supported by high network courage in Estonia. The largest occupier of the Estonian parcel market, the state-owned postal and logistics company, Omniva, proposed a plan to equip every village or municipality with more than 150 inhabitants with a parcel machine. This plan will open up opportunities for local dairy suppliers, retail businesses, and the renewal of public service facilities in remote areas.

Nicolaos Charalambous

Question:
What if local farms, transport vehicles and physical pick-up points scattered around Tallinn's city center fall under the umbrella of a delivery app? How can the concept of 'milk run' help farms in rural Estonia access larger urban retail outlets?

Framework/Discussion:
The term "milk run" generally describes a predefined route with several stops. From the milkman, who brought milk to people's homes, to the trains that collected milk from many farms, the aim was to minimize transport time so that the product could reach its destination as quickly and fresh as possible.
How merging the collection and delivery aspect of milk run will help improve milk and dairy logistics from now isolated farms to major markets?

Yuhe Tan

Question:
In the context of the EU Green Deal, how to support the small scale farms on Saaremaa, by using the way of producing the by-products, increases the diversity of dairy products while maintaining sustainability?

Framework/Discussion:
The abundant coastal grasslands on Saaremaa provide a solid feed base for the development of the dairy industry and the quality assurance for raw milk. As only the local raw milk is used for its production, the products have distinct geographical features that were allowed to be registered and protected by national laws. It has shown competitiveness in the dairy market of the Baltic Sea in the form of cooperation between only the small farms and factories.

However, the independent geographical location hinders the further development of the brand to a certain extent. Meanwhile, small scale farms give up on the potential utilization of the by-products in pursuit of profit, which brings the environmental pollution.

Sneha Gireesh

Question:
How can the current export and consumption of milk in Estonia be an opportunity to develop the situation in a sustainable manner with the development and sustenance of organic dairy farms with focus on measures for animal welfare ?

Framework/Discussion:
The current export amount of dairy products is higher than the local consumption thus resulting in increased commercial dairy farming and less care for cows in Estonia. Can the development of organic farms lead to the following benefits such as animal care, evolution of organic as a brand, development of a collective distribution system and using historic development of the dairy sector in Estonia as means to sustain the organic.

Kelly Ollinger

Question:
How can consumer empowerment and education go beyond the food label and address daily routine to foster sustainable food consumption and reduce food waste?

Framework/Discussion:
To meet sustainability goals, the EU aims to increase demand for more sustainable products by empowering the consumer. With an emphasis on consumer knowledge and clarity of choice, food labels are the main method of communicating sustainable food choices. How can education expand beyond the food label? Beginning with the scale of the neighborhood, how does the daily routine influence overall food consumption? How can various scales of intervention increase awareness of our food systems and subsequent waste?

Ujal Gorchu

Question: Other than timber extraction, how can the forest become a year-long source of income and employment for rural communities?

Framework/Discussion:
Over 50 percent of Estonia’s land is labeled organic yet when it comes to forests, felling is the predominant mode of value extraction. How can EU’s already existing Non Timber Forest Product programme and organic certification schemes create a market for products such as forest “superfoods”, herbs, spices, drinks and even bio cosmetics and the necessary spatial and legal infrastructure to sustain it. Even though timber extraction is a necessity there are microclimates and soil types in Estonia for which monocultural plantations are a missed opportunity both in terms of biodiversity and creating year-long income for the rural communities.

Glossary

Glossary

General terms

Nature
the external world in its entirety.

Resource
a natural source of wealth or revenue.

Cattle
domesticated bovine animals that are raised for their meat, milk, or hides or for draft purposes.

Tree
a woody plant that regularly renews its growth (perennial).

Logistics
the time-related positioning of resources to meet user requirements. The overall process of managing how resources are acquired, stored, and transported to their final destination.

Product
something that is marketed or sold as a commodity.

Supply chain
the total sequence of business processes, within a single or multiple enterprise environments, that enable customer demand for a product or service to be satisfied.

Harvesting
the act of removing an organic resource from where it was growing and moving it to a more secure location for processing, consumption, or storage.

Processing
a series of actions or operations conducing to an end : a continuous operation or treatment especially in manufacture.

Distribution
the spatial or geographic property of being scattered about over a range, area, or volume : the commercial activity of transporting and selling goods from a producer to a consumer.

Retail
the sale of commodities or goods in small quantities to ultimate consumers

Cow and tree

Cow
“a mature female cattle with eight permanent incisor teeth used for breeding. “

Calf
the young of a cow from birth until weaning (typically three to sixth months)

Steer
male cattle that have been castrated

Heifer
female cattle that have not given birth to any offspring

Bull
intact male cattle, often used for breeding

Seedling
a young plant that is grown from seed.

Sapling
a young tree, specifically one not over 10 centimeters in diameter at breast height.

Root system
a below-ground structure that serves primarily to anchor the plant in the soil and take up water and minerals.

Product

Raw milk
milk that has not been pasteurized, a process of heating liquid foods to kill pathogens for safe consumption and extending the shelf life.

Round wood
timber used without being squared by sawing or hewing. It can be used for industrial purposes, either in its round form (e.g. as transmission poles or piling) or as raw material to be processed into industrial

products such as sawn wood, panel products or pulp.

Sawn wood
timber that is cut from logs into different shapes and sizes. Sawn wood normally exceeds 6 mm in thickness. Lumber is the main sawn wood product. Lumber of large dimensions—more than about 10 cm (4 inches) in width and thickness—and suitable for heavy constructions is called timber.

Pulp
a lignocellulosic fibrous material prepared by chemically or mechanically separating cellulose fibers from wood, fiber crops, waste paper, or rags. Mixed with water and other chemical or plant-based additives, pulp is the major raw material used in papermaking and the industrial production of other paper products.

By-product
a secondary product derived from a manufacturing process or chemical reaction. It is not the primary product or service being produced. A by-product can be useful and marketable, or it can have little to no value. Some examples of by-products include whey in cheese making, molasses in sugar refining, and sawdust in lumber production.

Woody biomass
derived from organic material such as trees, plants, and agricultural and urban waste. It can be used for heating, electricity generation, and transport fuels.

Sawdust
a by-product or waste product of woodworking operations such as sawing, sanding, milling, planing, and routing. It is composed of small chippings of wood. These operations can be performed by woodworking machinery, portable power tools or by use of hand tools. Wood dust is also the byproduct of certain animals, birds and insects which live in wood, such as the woodpecker and carpenter ant.

Offcuts
pieces of timber that are too small to process as logs. They can be used for various purposes such as woodworking projects or firewood.

Harvesting

Farm
also called an agricultural holding, is an area of land that is devoted primarily to agricultural processes with the primary objective of producing food and other crops. It is the basic facility in food production. The name is used for specialized units such as arable farms, vegetable farms, fruit farms, dairy, pig and poultry farms, and land used for the production of natural fiber, biofuel and other commodities.

Dairy farming
a class of agriculture for long-term production of milk, which is processed for eventual sale of a dairy product. It encompasses the breeding, raising, and utilization of dairy animals, primarily cows, for the production of milk and the various dairy products processed from it.

Pasture field
a land used for grazing by domesticated livestock, such as horses, cattle, sheep, or swine. The vegetation of tended pasture, forage, consists mainly of grasses, with an interspersion of legumes and other forbs (non-grass herbaceous plants).

Full hand milking
a method of milking cows where the whole teat is held first with the thumb and the index finger encircling the base of the teat. The teat is squeezed between the hollow of the palm and with the middle, ring, and index finger. This process is repeated in quick succession. Full hand milking stimulates natural suckling of a calf, removes milk quicker than stripping because of no loss of time in changing the position of the hand, and is considered to be the best method as it causes minimum injuries to the teats.

Machine milking

the process of extracting milk from cows using a milking machine. The principle of machine milking is to extract milk from the cow by vacuum. The machines are designed to apply a constant vacuum to the end of the teat to suck the milk out and convey it to a suitable container, and to give a periodic squeeze applied externally to the whole of the teat to maintain blood circulation.

Milking parlor
a room or structure designed to mass milk a large group of cows at once. These can be large rooms, specific factories or warehouses, your own barn or even an outside portable milker setup, and all of them speed up the milking process.

Forest
a large area covered with trees and underbrush. There are three general types of forest that exist: temperate, tropical, and boreal. It is estimated that these forests cover approximately one-third of Earth's surface. Forests support a huge diversity of life, provide oxygen, and help to regulate the Earth's climate.

Commercial forestry
the practice that aims to get maximum production of timber, fuel wood and other forest products as a business enterprise.

Industrial forestry
the practice that aims at producing raw material required for industry.
Forest stand a contiguous community of trees sufficiently uniform in composition, structure, age, size class distribution and growing conditions to be distinguishable from adjacent communities. It is the basic unit of forest management and can be managed as a single unit.

Selective cutting
a specific way of organizing a forest. It means trees of different ages, size and sometimes species stand alongside one another.

Clear-Cutting
the removal of all plants in an area.

Feller buncher
a type of heavy equipment used in logging. It is a self-propelled machine with a cutting head capable of holding and cutting down trees before placing them in piles for pickup and transport. Feller bunchers have been around since the late 1960s, when Erv Drott is believed to have created the first feller buncher.

Grapple saw truck
a combination of a knuckleboom crane, grapplesaw and truck. By adding a grapplesaw to the end of a knuckleboom crane, the unit is turned into a grapple saw crane. The operator can safely remove a tree from the ground via wireless remote control. Called a game changer in the tree removal industry, the grapple saw truck is the safest and most efficient method of tree removal.

Delimber
a machine used to remove branches from trees. There are numerous types of delimbers depending on the specifics of the job at hand.

Forwarder
a forestry vehicle that carries big felled logs from the stump to a roadside landing. Unlike a skidder, a forwarder carries logs clear of the ground, which can reduce soil impacts but tends to limit the size of the logs it can move.

Stump
the bottom part of a tree left projecting from the ground after most of the trunk has fallen or been cut down.

Roadside landing
an area near a road where logs are temporarily stored before being transported to a mill or other destination. It is typically used in logging operations to facilitate the loading of logs onto trucks for transport.

Processing

Primary processing
the conversion of raw materials into food

commodities. For example, milling wheat into flour is a form of primary processing.

Debarking
the process of removing bark from wood to make it processible. The residues are usually used for biofuel.

Pulping
the process where fibers are separated and treated to produce pulp. The wet pulp is then converted into paper at an integrated pulp and paper mill or is dried and transported from the pulp mill to a paper mill. Different pulping processes are used depending on the fiber material and the desired end product.

Chipping
the process of cutting wood into small pieces called wood chips. This is typically done using a machine called a wood chipper, which grinds the wood into chips of a uniform size. Wood chips are often used as a raw material in the production of paper, particleboard, and other wood products. They can also be used as a fuel source or as a mulch in landscaping and gardening.

Separation
a thermally processed step where Centrifugal operations deal with removing some or most of the fat.

Pasteurization
a heat treatment process that extends the usable life of milk and reduces the numbers of possible pathogenic microorganisms to levels at which they do not represent a significant health hazard.

Homogenization
the mechanical process of shearing milk fat globules via pressure to reduce the size of the fat globules and reduce the separation of the cream portion of the product.” “It takes place post-pasteurization, followed by cooling.

Secondary processing
the process in which the primary product is changed to another product.

Pelletizing
the process of compressing or molding a material into the shape of a pellet. A wide range of different materials can be pelletized, including chemicals, iron ore, animal compound feed, plastics, and waste materials. The process is considered an excellent option for the storage and transport of these materials.

Demineralization
the process of removing inorganic salts and decreasing some organic ions like lactates and citrates.

CHP plant
a Combined Heat and Power plant that generates both electricity and heat from a single fuel source. It consists of an electrical generator combined with equipment for recovering and using the heat produced by that generator. The generator may be a prime mover such as a gas turbine or a reciprocating engine. Alternatively, it may consist of a steam turbine generating power from high-pressure steam produced in a boiler. CHP plants can be located in an individual building or facility, or they can produce energy for a district or a utility.

Joinery factory
a workshop or factory where joiners, craftsmen who join wood, produce items that are added to a project at the end of the construction process, such as furniture and decoration. Joiners usually work with wood boards, planks, panels, and finishings, such as veneers and natural or synthetic coatings.

Quality testing
a process that checks the quality of a product or service. It can be part of quality assurance, which is a series of techniques to prevent issues and satisfy customers. Quality testing can use different technologies and methods depending on the product or service under test. Quality testing is generally completed in each step of a manufacturing or business process, beginning with testing

raw materials, pulling samples from the manufacturing line, and testing the finished product.

Distribution

Balance of trade
(BOT) the difference between the value of a country's exports and the value of a country's imports for a given period. It is also referred to as the trade balance, the international trade balance, the commercial balance, or the net exports. A country that imports more goods and services than it exports in terms of value has a trade deficit while a country that exports more goods and services than it imports has a trade surplus.

Free trade (laissez-faire)
an economic philosophy that advocates for minimal government intervention in economic affairs. In a laissez-faire system, the government's role is limited to protecting property rights and enforcing contracts, while the market is allowed to operate freely without interference. This approach is based on the belief that the market, through the forces of supply and demand, will naturally regulate itself and produce the best outcomes for society.

Protectionism
the theory or practice of shielding a country's domestic industries from foreign competition by taxing imports. Protectionist policies place specific restrictions on international trade for the benefit of a domestic economy. They typically seek to improve economic activity but may also be the result of safety or quality concerns. Tariffs, import quotas, product standards, and subsidies are some of the primary policy tools a government can use in enacting protectionist policies.

Economic potential
the potential of a region, nation, or corporation for economic development and growth. Typically, discussions of economic potential occur when available resources have not yet been tapped and fully developed or exploited, possibly because of missing infrastructure.

Trade corridor
a major route that facilitates the movement of people and goods between regions and between countries. They enable regions and countries to offer high-capacity transport systems and services that reduce trade and transport costs by creating economies of scale.

Multimodal transport
(also known as combined transport) the transportation of goods using multiple modes of transportation, such as road, rail, sea, and air. In a multimodal transport system, a single operator or carrier is responsible for the entire journey, from the point of origin to the final destination. This can provide greater flexibility and efficiency in the transportation of goods, as well as reduced costs and environmental impact.

Logistic company
a company that plans, implements, and controls the movement and storage of goods, services, or information within a supply chain and between the points of origin and consumption.

Logistic facility
a warehouse for storage and transportation of goods. It can also include distribution facilities and logistics services such as material handling, production, packaging, inventory management and transportation.

Fullfilment center
a warehouse space used by businesses to stock and process items for shipping. When orders are processed through an online store, the fulfillment center takes over the role of a retailer's warehouse where the order will be picked, packaged and shipped by specialized teams.

Warehouse
a building for storing goods. Warehouses are used by manufacturers, importers, exporters, wholesalers, transport businesses, customs, etc. They are usually large plain buildings

in industrial parks on the outskirts of cities, towns, or villages.

Regional connectivity
the development of infrastructure and systems that improve the connections between different regions. This can include transportation networks, telecommunications infrastructure, and other systems that facilitate the movement of people, goods, and information between different areas.

Loading gauge
a diagram or physical structure that defines the maximum height and width dimensions in railway vehicles and their loads. Their purpose is to ensure that rail vehicles can pass safely through tunnels and under bridges, and keep clear of platforms, trackside buildings and structures. Classification systems vary between different countries, and gauges may vary across a network, even if the track gauge is uniform.

Rail gauge
the distance between the two rails of a railway track. All vehicles on a rail network must have wheelsets that are compatible with the track gauge. Since many different track gauges exist worldwide, gauge differences often present a barrier to wider operation on railway networks.

Customs
an authority or agency in a country responsible for collecting tariffs and for controlling the flow of goods, including animals, transports, personal effects, and hazardous items, into and out of a country. Customs officials carry out checks to determine whether travelers and businesses are required to pay taxes when importing goods.

Bulk cargo
Bulk cargo is commodity cargo that is transported unpackaged in large quantities. This cargo is usually dropped or poured, with a spout or shovel bucket, as a liquid or as a mass of relatively small solids (e.g. grain, coal), into a bulk carrier ship's hold, railroad car, or tanker truck/trailer/semi-trailer body. Bulk cargo is classified as liquid or dry.

Perishable cargo
Perishable cargo is cargo that can deteriorate if not stored or transported under appropriate conditions or if exposed to adverse temperature, humidity and other environmental conditions. Examples of perishable cargo include fruits, vegetables, meat, dairy products, and medical department biologicals. Shipping perishable cargo requires special expertise to ensure that the cargo is handled and transported appropriately to maintain its integrity.

Oversize cargo
Oversize cargo is cargo that is unusually large and cannot be shipped in a standard container. Shipping heavy equipment, industrial machinery, or fragile and oversized cargo requires special expertise.

Standardized container
often called a shipping container or intermodal container, is a large container designed and built for intermodal freight transport. This means that these containers can be used across different modes of transport – from ship to rail to truck – without unloading and reloading their cargo. Standardized containers are primarily used to store and transport materials and products efficiently and securely in the global containerized intermodal freight transport system.

Europallet
officially known as a EUR-pallet, is a wooden pallet with dimensions and specifications that are set by the European Pallet Association (EPAL). The dimensions of a Europallet are 800×1200×144 millimeters and it can carry a load of at least 1500 kilograms2. Pallets that conform to this standardization are eligible for the European Pallet Pool (EPP), which allows for an exchange of pallets on a "pallet for pallet" basis.

Swept path
the required room for turning vehicles to

operate safely on the road network and to avoid causing damage to roadside furniture. Turning radius "the minimum radius required for a vehicle to make a U-turn without any obstructions."

Showroom
a large space used to display products or show entertainment. There are many types of showrooms, including those for cars, furniture, appliances, fashion and more. Some showrooms provide live performance broadcasts by idols and celebrities in virtual stadiums.

Pallet jack
a tool used to lift and move pallets. It is also known as a pallet truck, pallet pump, pump truck, hand truck, scooter, dog or jigger. Pallet jacks have forks that slide underneath or into openings on pallets, skids and containers. They have a hydraulic pump that lifts the loaded forks. Pallet jacks are the most basic form of a forklift and are intended to move pallets within a warehouse.

Roll container
a tool designed to allow the movement of heavy and bulky items easily through the warehouse and logistics chain. By using the right container, customers benefit from reduced risk of damage to goods in transport as well as saving storage and return to base costs.

Organizations and regulations

Sector
an area of the economy in which businesses share the same or related business activity, product, or service. Sectors represent a large grouping of companies with similar business activities, such as the extraction of natural resources and agriculture.

Industry
a group of companies that are related based on their primary business activities.

Trade policy
a government's set of practices, laws, regulations, and agreements that govern international trade practices, or imports and exports to foreign countries. Trade policies aim to strengthen the domestic economy by setting standards and laws regarding international trade.

Market intervention
measures that modify or interfere with the market, usually done by governments but also by philanthropic and political-action groups. Examples of market interventions include bailouts, competition laws, minimum wages, monetary policy, nationalization, regulation, subsidies, and taxes.

Marketing standards
a set of guidelines and principles that define quality characteristics and certain requirements for the product content and presentation. They can apply to both domestic and imported products placed on a market.

Codex Alimentarius
a collection of standards, guidelines, and codes of practice adopted by the Codex Alimentarius Commission. The Commission, also known as CAC, is the central part of the Joint FAO/WHO Food Standards Programme and was established by FAO and WHO to protect consumer health and promote fair practices in food trade. It held its first meeting in 1963.

European Union Timber Regulation
an EU legal framework that prohibits the placement of illegally harvested timber and products derived from such timber on the EU market It requires EU operators who place timber products on the EU market to exercise due diligence to minimize the risk of placing illegally harvested timber, or timber products containing illegally harvested timber. It also requires EU traders to keep records of their suppliers and customers.

European Organic certification
a set of regulations for organic food

starting all the way from seed to when the final product enters the retail market. This process provides rules and guidelines to multiple sources of production including farmers, retailers, seed suppliers, and food processors. The European Union has created an organic label that defines the standards for all organic products that are produced in any of the countries included in the European Union. The impetus behind the EU-Organic certification was the goal of producing healthy food with maximum nutrition and minimal environmental impact.

EU due diligence requirements
a horizontal framework for better human rights and environmental protection, creating a level playing field for companies within the EU and avoiding fragmentation resulting from Member State's national approaches.

Forest management certi□cation
the assessment of whether forests are being managed according to a specified set of standards (sustainable and/or legal).

Chain of custody
a certification that certified material is identified or kept separate from non-certified or non-controlled material through the production process, from the forest to the final consumer.

Transport license of the European Union
a special document, issued by public authorities and entitles the company to carry cargo across the countries of EU.

Abnormal road transport permit
an exemption or permit needed prior to carrying out an abnormal road transport operation. Abnormal road transports often need to travel considerable distances, in many cases, across national borders. As they do not comply with the general legal requirements on vehicle weights and dimensions, an exemption or permit is needed.

European Union
a supranational political and economic union of 27 member states that are located primarily in Europe.

European Commission
a part of the executive of the European Union, together with the European Council. It operates as a cabinet government, with 27 members of the Commission headed by a President. It includes an administrative body of about 32 000 European civil servants.

Schengen Area
an area comprising 27 European countries that have officially abolished all passport and all other types of border control at their mutual borders.

Eurozone Area
a currency union of 20 member states of the European Union (EU) that have adopted the euro (□) as their primary currency and sole legal tender, and have thus fully implemented EMU policies.

European Commission – Directorate General for Mobility and Transport
the Directorate-General of the European Commission that is responsible for developing and implementing European policies in the transport field.

European Commission – Directorate General for Trade (DG Trade)
the Directorate-General of the European Commission develops and implements the EU's trade policy in order to help secure prosperity, solidarity and security in Europe and around the globe. It covers a wide area from manufactured goods to services, intellectual property and investment.

European Trade Association (EFTA)
a regional trade organization and free trade area consisting of four European states: Iceland, Liechtenstein, Norway and Switzerland. The organization operates in parallel with the European Union (EU), and all four member states participate in the European Single Market and are part of the Schengen Area. They are not, however, party

to the European Union Customs Union.

Trans-European Transport Network
a planned network of roads, railways, airports and water infrastructure in the European Union. The TEN-T network is part of a wider system of Trans-European Networks (TENs), including a telecommunications network (eTEN) and a proposed energy network (TEN-E or Ten-Energy). The European Commission adopted the first action plans on trans-European networks in 1990.