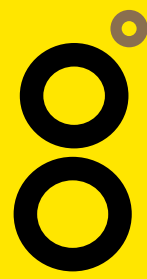


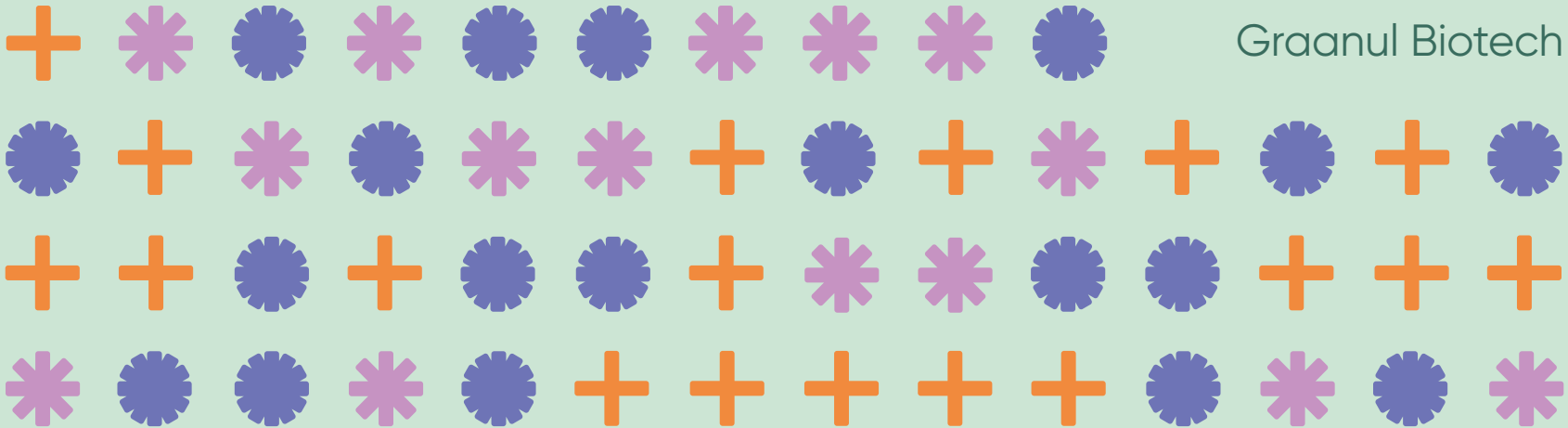
Sustainability report 2020



Graanul Invest

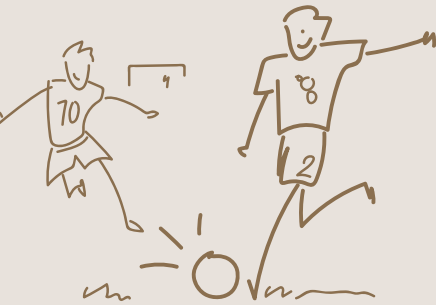
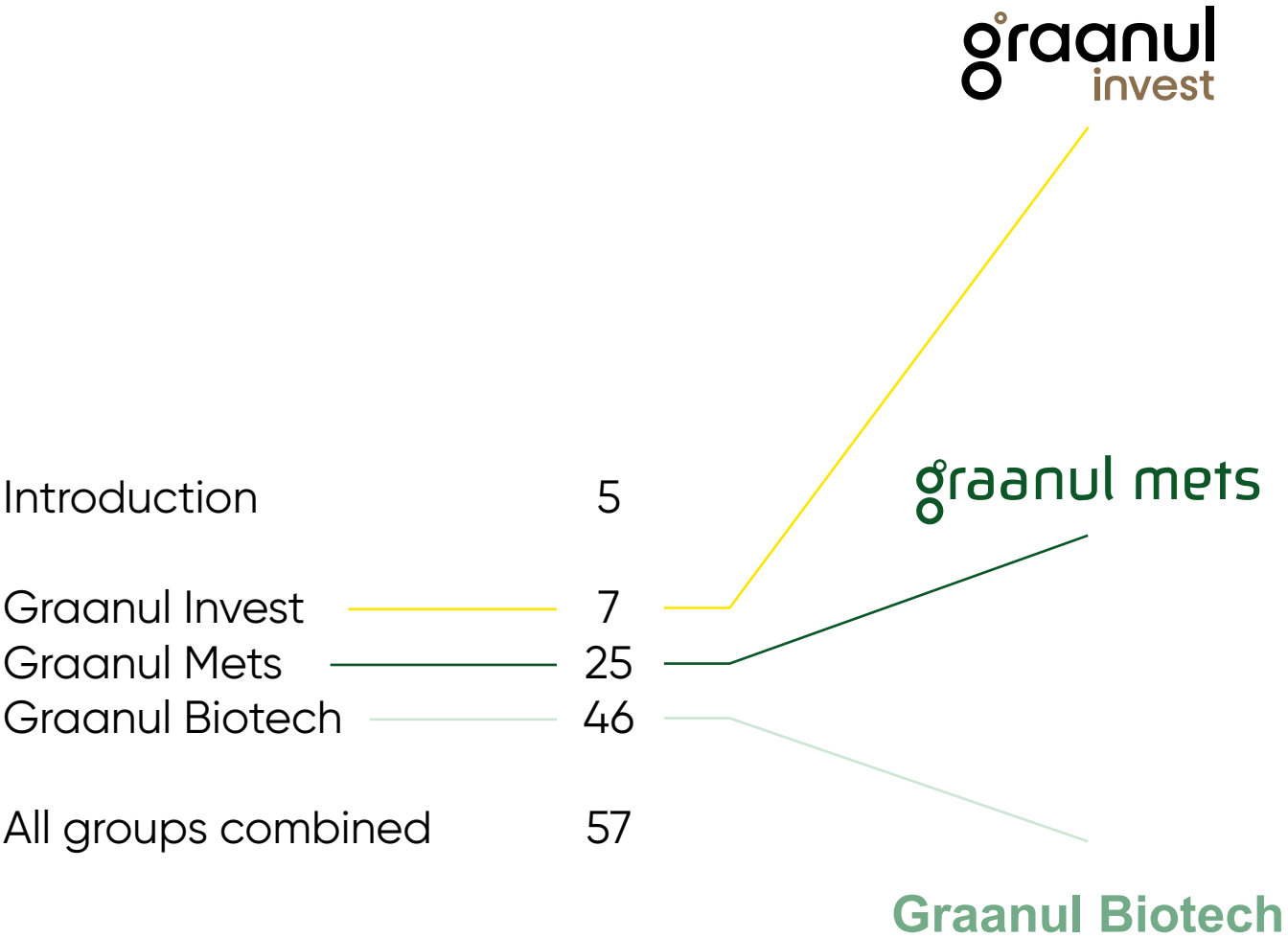


Graanul Mets





Sustainability report 2020



Our key achievements in 2020

- We planted 1.28 million forest plants.
- We focused more on the forestation of former agricultural land – about 140 hectares in total.
- We supported more than 70 activities, focusing on supporting recreational and sports activities for young people in rural areas.
- Our production carbon footprint has been declining for three years in a row.



 **Raul Kirjanen,**
CEO



The year 2020 was a difficult one, with a lot of uncertainty and risks. As a company, we were able to respond quickly and put employee safety first. We were able to reorganize work promptly so that people could be safe working remotely and have minimum contacts working at our plants. It was also good to see that the whole team took an extremely responsible attitude to the risks. Fortunately, neither our people nor the company itself suffered badly in the crisis. An important part of this was our previous work on digitizing our processes, and we are very grateful to the people who have contributed time and energy to this effort over many years.

The COVID 19 crisis certainly left its mark on our operations: the launch of the demo plant in Imavere was slightly delayed as the necessary top specialists could not travel; it was challenging to provide group support for the restructuring of our Texas plant; and, there was a lot of uncertainty in the market. By the end of the year, the restructuring of the Graanul Invest Group was completed, during which we divided our activities into three areas: (1) pellet production and energy, (2) forestry, and (3) biomaterials. Therefore, this report will be the last to cover all these sectors together.

Despite the difficulties, we continued to meet and promote our sustainability criteria. In pellet production, we were able to continue operations despite a difficult year – due to the high demand for wood material, there was no shortage of residues available for pellet production. Strong, long-standing relationships with our customers allowed us to cope with difficult circumstances. Our position is clear: we are committed to adding value to the lowest quality biomass, fulfilling its valorization potential, and ensuring efficiency and compliance with the circular economy requirements in the wood sector. The use of pellets is also one of the fastest and most effective ways to reduce carbon emissions in the energy sector. With the current climate problems, we have reached a point where action must be taken now – doing nothing and waiting for new technology to arrive has long since ceased to be an option.

In forestry, the first half of 2020 was very challenging. Due to an extremely mild winter in the Baltics, wet conditions were a significant obstacle to forestry work. We carefully selected the places where we could carry out forest management activities with the least possible environmental impact. In the end, we were able to fulfil all our contracts. It is gratifying to note that our forest generation volumes are going up from year to year, and our forestry company is increasingly moving towards planting mixed forests.

The biomaterials sector underwent impressive development last year. Although the COVID 19 pandemic delayed many efforts and developments, we were able to test the first phase of our technology only a few months behind schedule. By now, the key contracts for the second stage have also been signed. If everything goes according to plan, we will be able to deliver the first consignments of high-quality and high-purity biomaterials to our customers in 2022.

Our greatest thanks, of course, go to our people – the greatest asset we have. Despite the challenges, we have done very well. The past year has brought an even clearer understanding of the value of contacts between people and the importance of simply sitting down and discussing critical issues with your colleagues, or even just making small talk.



Sustainability report 2020

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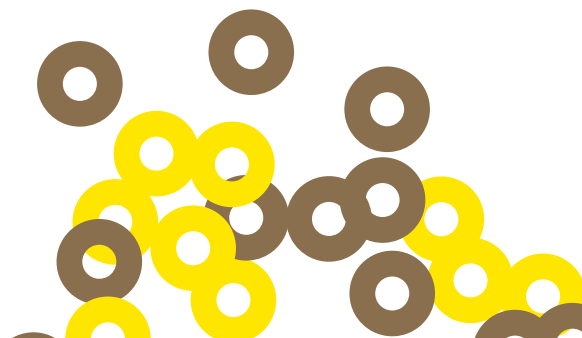
Graanul Invest Group is a world-leading biomass and bioenergy producer. In 17 years, the small Estonian company has grown into an international group while being one of the world's most sustainable producers of wood pellets. Today, we manage production units in the Baltics and the US, and we employ 500 people in the biomass and bioenergy fields.

Wood pellets are a renewable heating material with a high energy content that can replace gas, oil, coal or oil shale. By burning fossil fuels, we release new carbon from the earth into the atmosphere and boost anthropogenic climate change. Any fossil material that we can leave in the ground is a step closer to solving climate problems. By leading the development of bioenergy, we play an important role in addressing global climate issues.

The European Commission Joint Research Centre's report also confirms that bioenergy plays a key role in tackling the two major environmental challenges of the 21st century – biodiversity and climate change – if the biomass used for it is sourced sustainably and used efficiently. In bioenergy and biomass production, Graanul Invest leads the way in terms of these parameters and makes an important contribution towards resolving the environmental crisis.

The mentioned report also points out that residues from the sourcing and processing of raw materials for wood products as well as wood sourced during forest quality improvement plays a significant role in energy production and contribute to sustainable forest management. A well-functioning bioenergy industry is essential for the emergence of a European bioeconomy and the development of wood-based biochemistry. It is also clear from the activities of the different members of our Group that biomass production and forest management, as well as our latest initiative in biochemistry, are all closely interdependent, and the greater the synergies between them, the closer we are to a waste-free bioeconomy and a balanced carbon cycle.

graanulinvest.com





Our production footprint

Dry sawdust and wood shavings

come from post-processors, whose input material is sawn timber, which they use to produce furniture or parquet, for example. The by-product of post-processing is dry sawdust or wood shavings with low moisture content and a fine fraction, which makes it very easy to use as a raw material in biomass production. Potential challenges arise from the fact that we can only use chemical-free raw materials, and we cannot use post-processing residues that may contain varnishes or adhesives. Sawdust that enters the energy sector must be free of chemicals, so it is important to closely monitor and understand the supply chains and production processes of this feedstock.

Wet sawdust is the main by-product of the sawing process in sawmills. It is historically the most common material used for the production of pellets, as it requires very little processing because it already has a small fraction and uniform quality.

Wood bark is sourced by Graanul Invest from the debarking lines of our own plants and from sawmills. The bark is mechanically removed from logs and used in on-site green energy production instead of being directed to a land-fill, this way, we gain maximum value from each gram of wood.

In 2020, Graanul Invest's plants produced a record 2,651,713 tons of wood pellets, including 37.4% in Estonia, 47.8% in Latvia, 11.8% in the US and 3% in Lithuania. This number also includes a full year's production at our Texas plant.

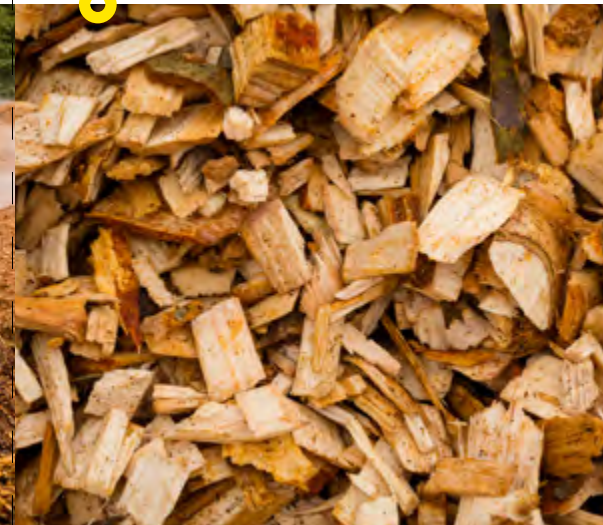
What are pellets made from

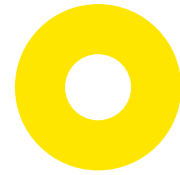
We produce wood pellets from five categories of raw material:

1) dry sawdust and wood shavings, 2) wet sawdust, 3) wood bark, 4) woodchips, 5) low-quality stemwood

Woodchips are divided into sawmill chips and forest chips. Forest chips consist mainly of fine twigs, brushwood, and other harvest residues, which generally cannot be mechanically treated as this material contains soil and sand. The content and appearance of chips produced in the sawmill are different from those of forest chips. These are produced during the processing of debarked logs in a sawmill and have a consistent fraction and purity. We use chips from the wood industry to produce pellets, while forest chips are mainly used in our combined heat and power plants and dryers to produce fossil-free electricity and heat.

Low-quality stemwood reaches us because forestry work sometimes produces residual low-quality stemwood that cannot be used in industry. To a small extent, we also use discarded wood from sawmills that cannot be used because it has bends, damages, or for example, contains pieces of metal that could damage equipment and pose a danger to workers. As this defective and low-quality stemwood does not meet the physical quality requirements of other industries, it is sorted separately. In total, up to 50 different assortments are separated in Estonian mixed forests, of which hardwood and softwood firewood have the lowest quality. Therefore, in addition to high-value assortments – such as birch plywood logs and saw logs – there is always surplus material produced during the forest management process that is moved on to the lower value industry, following the principle of the circular economy. Lower quality wood is also produced during various types of forest management work (cleaning and thinning), where smaller, low-quality trees are felled to leave room for higher-quality trees to grow. Sometimes, stemwood can also reach the pellet plant in cases where the forest owner decides to manage his low-quality deciduous forest, containing, for example, brushwood such as willow or alder, and replace it with higher-quality trees such as spruce, pine or birch. This can also happen in cases where logs in storage areas have lost their value for various reasons; for example, have they rotted, causing this timber to become a raw material for the production of pellets.





The 'recipe' behind our production

In this financial year, the average distribution of raw materials for our pellets was **54.52% bulk material** (i.e., wood industry waste, including woodchips, sawdust and wood shavings, which accounted for 33.15%, 17.07% and 4.31% of all raw materials, respectively) and **45.48%** low-quality stemwood that could not be used in other industries.



In 2019, 45.6% of the raw material for pellets came from wood industry waste (sawdust, chips and wood shavings), and 54.4% came from low-quality stemwood. It means that low-quality stemwood share in our production fell more than 9% in 2020.

Margus Milk,
manager of the Osula pellet plant:

"When using different materials, the specific properties of the wood must be taken into account. For example, birch material is denser, and this puts more stress on the production equipment. Alder has one of the lowest specific weights, which affects the density and final quality of the pellets. When crushed, aspen becomes very light and airy, cotton-like and can clog the cutting equipment. Even the use of only very fresh softwood material does not guarantee high-quality and mechanically durable pellets. With good planning and the application of the most suitable technology, different materials can be combined in a way that makes it possible to use most of the residual material produced in the forest and sawmills in the production of pellets."



LOW-QUALITY STEMWOOD SHARE IN OUR PRODUCTION FELL OVER 9% IN 2020

Based on direct deliveries, the countries of origin of our feedstock are Latvia, Estonia, Lithuania, Belarus, Poland and the United States.

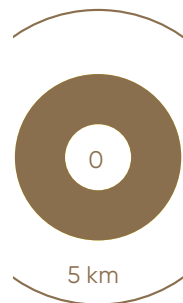
- Pellet production involves all five categories mentioned above, which are mixed together to obtain uniform pellet quality. To achieve resource efficiency and accurately follow the waste hierarchy, the energy sector cannot choose its raw material, so we flexibly use all these categories of raw materials that come from all common tree species. Whatever residues the local wood industry produces, the energy industry must use. The production manager must have fine skills to meet the extremely complex requirements of a pellet for length, hardness, particle size and calorific value with ever-changing materials and weather.

We use all the main local tree species that are the most common in the sourcing area.



Kristo Vahar,
manager of the Helme pellet plant:

"Since alder as a hardwood lacks the resin present in softwood, it is a challenge to use it in high proportion in pellet production, as there is no binding component to hold the pellets together. Due to strict quality standards, alder must be mixed with other species to keep the pellets together and meet all the requirements."



Distances

Graanul Invest aims to make the production of pellets as local as possible and to have the smallest possible carbon footprint. The transport of raw materials is one of the few activities based on fossil fuels that remain in our value chain today. This is why raw materials come to the plants from the closest geographic sources, so as not to distort the movement of raw materials but to operate where waste from the wood industry already exists. Each additional kilometer that raw material travels leads to more carbon emission.



Tõnu Ehrpais,
chairman of the management board of Nordwood:

"Growing a forest is a decades-long process, and the timber we get from the forest must be used very sustainably. The primary trend in timber processing is to use as much wood as possible in durable products that sequester carbon in the long term, along with the principle of waste-free production. All the timber that arrives at our sawmills from the forest must become a product. The by-products of the sawmill industry are woodchips suitable for the production of pulp, woodchips and sawdust suitable for the production of pellets, and tree bark. To a small extent, sawmills also receive raw materials of unsuitable quality, which contain rot or cannot be processed due to shape defects; such material is also moved on to the energy industry. A large part of today's sawmill industry centers around logistics, as large stocks cannot be stored, and therefore by-products from the sawmill industry have to be moved from the plants on the same day or within a couple of days. In terms of the supply chain, the pellet industry is a vital part of timber processing, without which it would be very difficult to operate efficiently."

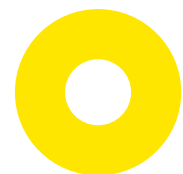
We set the weighted average target distance for sourcing all raw material at 70 kilometers several years ago. This distance allows us to comply with all the above principles while also ensuring economic sustainability. **Data on this indicator from previous years have already shown that we remain in a very stable 5 km range, between 53 and 58 km.** Once again this year, the weighted average one-way distance for all types of raw materials transported by truck is within this range. The stability of our suppliers and supply base is so well established that adopting an even lower target would force us to give up some materials or suppliers for the wrong reasons, which we will, of course, not do.

We use rail transport for almost a third of our raw materials. The higher capacity and significantly lower environmental footprint per ton-kilometer of rail transport also makes it possible for us to transport material from greater distances than sustainability and efficiency principles would allow with road transport. For example, we have a number of wagons regularly moving in and out of Belarus to collect wood industry waste because there is no bioenergy sector there to complement an active forest and wood industry.

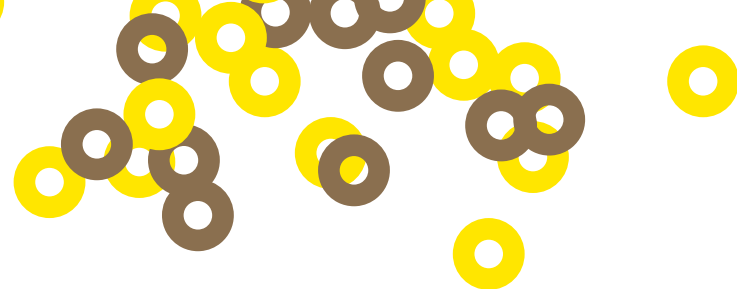


We use rail transport for almost a third of our raw materials

- Previous years have already shown that we remain in a very stable 5 km range, between 53 and 58 km.



Certificates



Graanul Invest has been awarded several certificates that support sustainable forest management and guarantee unbroken supervision of the supply chain from forest to consumer. These certificates are used to prevent material from socially and ecologically harmful sources from entering the market. In addition, the certificates help to ensure that our production systems comply with best practices and both local and international requirements. Internationally recognized certification systems make our work transparent and reliable for our partners. Today, the use of certificates is no longer relevant just for forestry. It is equally crucial to verify the environmental footprint of production, the efficiency and transparency of supply chains, and the scale of green energy used in all operations.

We have two primary areas that are subject to certification and audited multiple times each year.

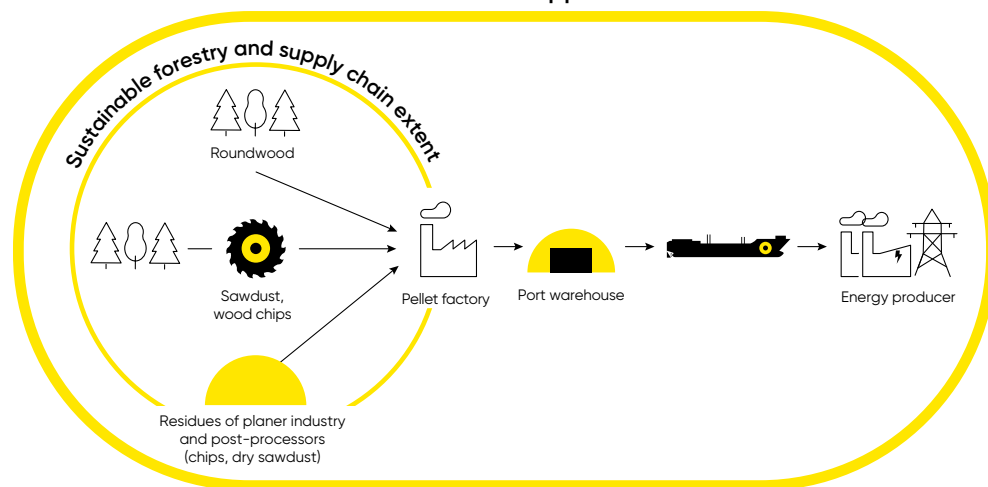
First, there are certificates on the production unit level, which assess quality, environmental, occupational safety, and energy management systems and fulfil of the respective requirements and objectives. In this area, we rely on the requirements of the International Organization for Standardization (ISO) and the most recognized audit firm in the field. We apply this certification of the four key aspects equally across 11 of our plants. This thoroughness is by no means a result of market requirements but rather a desire to be progressive and achieve full transparency.

The second area concerned with certification is the supply and production chain, which includes certification of forest management and the movement of wood from the forest to our plants via different processing chains. This also involves monitoring the procedures for avoiding wood from protected and restricted areas and proof that the wood assortments used are suitable for bioenergy. It also includes evaluating energy use and the types of energy used in transportation and production. The certification process checks and verifies the assortments and quantities of wood used for production to the nearest 10 kg. All this information is also provided in an audited form to the next user of the biomass, i.e., the end user,

who can then be equally transparent to stakeholders and regulators. There are very few value chains in the world with a certification process as detailed and requirements as precisely regulated as bioenergy. We currently use the only SBP certificate that meets the ambitions and requirements set out in the European Green Deal for our value chain certification. We follow FSC® and PEFC certification requirements when selecting raw materials and suppliers. These certifications only follow the raw material on its journey from forest to processing to pellet plant, which is no longer sufficient on its own. All Graanul Invest Group plants are SBP certified, and all our raw materials come through either FSC® (FSC-C103815) or PEFC certified supply chains.

Stakeholder feedback and criticism also play an important role in Graanul Invest's certification systems. Public accusations require the allegations to be investigated and, if necessary, followed up with improvement actions. No violations were identified based on the allegations recorded and information submitted during 2020. Most publicly made allegations were grossly erroneous, either regarding felling conditions or volumes, and presented an unproven link with the bioenergy sector, ignoring the fact that the forest management was done to supply higher-value wood industries. The handling of stakeholder allegations is also monitored by independent third-party auditors. We encourage stakeholders to provide feedback directly to us rather than through the media so that we can address these issues immediately. Once the allegations have been addressed with accurate responses and relevant evidence, the topic can be shared with the public and the media, if necessary.

Graanul Invest's approach



Electricity consumption

Our combined heat and power plants produce green energy with the highest possible efficiency. An efficient network supplies our own pellet plants with heat and electricity and partly supplies the local electricity network with renewable energy. The Group has a total of six combined heat and power plants in the Baltics. The key to the efficiency of cogeneration technology is the storage of both the electricity and heat produced with as few leaks and losses as possible. Current and future projects expanding the use of bioenergy produce and use bioenergy on this very principle.

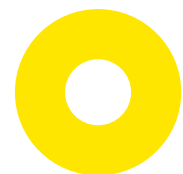
- In 2020, Graanul Invest generated over 17% of all renewable bioelectricity in Estonia (217.5 GWh / 1259.7 GWh; source: Elering). Bioelectricity, or electricity produced mainly from wood-based biomass, accounts for over 56% of the total renewable electricity produced for the Estonian grid and 26% of the total electricity in the grid. In all the Baltics, we produced a total of 337 GWh of fossil-free green electricity in 2020. This is almost 6 GWh more than in the year before.

It is equally important to put the energy produced to use in producing pellets as efficiently as possible. Specific electricity consumption is one of our key sustainability indicators that we have been setting targets for and monitoring for years. We have achieved the general target and a new level of economy for our European plants, having brought the average electricity consumption down to 140.68 kWh/t. With consistently high production numbers, the specific energy consumption is already low, and such progress is made possible through smart methods that do not require production to be halted. The Osula pellet plant merits a special mention, as it found a way to reduce specific consumption by more than 5%, from 148.36 kWh/t to 140.55 kWh/t. As the production volume was similar to the previous year, it is an impressive improvement in the efficient use of electricity, which was possible thanks to the production process being continuously optimized and adjusted for cost-effectiveness.

With the addition of the Woodville plant in the US, the global average specific electricity consumption of our Group's plants has increased by almost 7% to 151.97 kWh/t, as was expected. Due to repairs and modifications, the Woodville plant has not worked consistently, but the technology it uses is also considerably less efficient than in our European plants. The average specific electricity consumption of our European plants is 68% lower than the specific consumption of the Woodville plant, which is a good indicator of the efficient operation of our Baltic plants and the future savings potential of the US plant. Unfortunately, many European technologies are not yet licensed by the US authorities, so we will not be able to implement them there in the near future.

Graanul Invest aims to use as much fossil-free renewable energy produced in combined heat and power plants as possible, but we also use the increasingly green local grid energy.





Heat

We produce heat on-site from low-quality biomass that is unsuitable for pellet production (such as bark or chopped twigs). The raw material must be dried before pressing to increase the calorific value of the pellets and improve their handling properties. This is a critical process that is also energy-intensive, and the only viable option for it today is for the energy used for drying to be fully renewable and environmentally friendly. The thermal energy used in Graanul Invest is 100% renewable energy that we have produced in our combined heat and power plants as a by-product of efficient electricity production or as secondary energy in biomass furnaces.

- **We produced 919 GWh of heat in combined heat and power plants (CHPs) and 869 GWh in biomass furnaces. The increase in the share of heat produced in CHPs is a logical and welcomed trend, as it is more efficient and the best current technological practice for this purpose.**

The world's focus on green energy is somewhat unjustifiably limited to electricity. The latter already has many efficient production solutions, and the possibilities of scaling are within reach. Unfortunately, electricity accounts for only half of all final consumption of energy in Europe. To meet climate goals, the focus must quickly shift to heating and cooling solutions. This is particularly the case in heat-intensive fields, such as the food and metal industries, where in Europe, on average, only 22% of thermal energy is produced from renewable sources, and recent years' progress has been modest due to the continued use of fossil fuels still being permitted. As an industrial company operating on and producing renewable energy, Graanul Invest can set an example and be part of the solution for its international customers in any sector.



- **The thermal energy used in Graanul Invest is 100% renewable energy that we have produced in our combined heat and power plants as a by-product of efficient electricity production or as secondary energy in biomass furnaces.**



Water consumption

We use little water in our production, mainly for washing equipment and human consumption. Our goal is to continually reduce the special use of water and carry out the necessary actions to ensure that the water leaving our premises and combined heat and power plants meet all requirements.

- **Graanul Invest has reduced the specific consumption of water per ton of production to 0.092 cubic meters. Compared to the previous year, specific water consumption decreased by 7.6%, which was achieved thanks to consistently high production levels. There was also the new addition of the Woodville plant, which has one of the lowest specific consumption rates of production and water in the Group. This had a significant impact on the overall specific consumption of the Group as a whole.**

The most significant increase in specific water consumption occurred in the Ebavere (36.5%), Jēkabpils (34.1%) and Gulbene (30.1%) plants. The increase was caused by various factors.

The increase in Ebavere was due to the energy savings and productivity increase of their hammermills, and as the year 2020 was quite warm, the water consumption of the scrubber also increased.

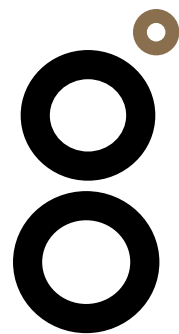
There was also a significant increase in the Jēkabpils and Gulbene plants, which began adding water during pellet pressing to improve the quality of wood pellets while reducing electricity consumption and equipment wear.



● **2019**
0,10

● **2020**
0,092 m³/t
7,6%

↓
Compared to the previous year, specific water consumption decreased by 7.6%



Carbon footprint in our production

Life cycle performance plays a key role in energy carriers and, by now, many other products. The carbon balance of the wood pellet value chain defines its potential to reduce fossil emissions. For the past three years, we have had the carbon balance of each plant calculated based on audited data and in accordance with the requirements of the Renewable Energy Directive (RED II). Through great efforts to ensure reliability and efficiency, we have been able to lower this, one of the sector's most important parameters, for three years in a row. The figure for our total pellet production in 2020 was 7.08 gCO₂-eq/MJ, meaning 7.08 grams of carbon dioxide equivalents per megajoule of green energy contained in the pellets.

Three-year overview:



gCO₂-eq/MJ

7,7

7,45

0,79
2020

3,50
2020

2,79
2020

7,08

The progress made in 2020 is due to the work routine being stabilized at the Woodville plant, the change of seasons having followed traditional patterns, and the increase in the share of bulk material among the raw material.

The energy efficiency of wood pellets is compared with fossil fuels (coal and natural gas) in similar end-uses, and Graanul Invest pellets make it possible for energy producers to prevent more than 90% of fossil emissions without compromising energy production output. And this is while having a fully transparent value chain and knowing that the areas where the raw material was sourced will be in a better

condition in the coming decades than they were before. This is in stark contrast to the coal and gas industries, where the damage to the landscape is permanent.

Lowering this indicator consistently is extremely important, and we will do our best to ensure that this trend continues. In the context of the sector, our performance has been exemplary across the years, but today's climate challenges do not allow any industry to stop trying to reduce its footprint. That is why Graanul Invest will continue developing and upgrading its systems until a climate-friendly solution has been found for the last remaining sources of fossil emissions in our value chain.

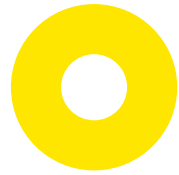
Combined heat and power plants' footprint



Graanul Invest's combined heat and power plants (CHPs) are highly efficient renewable electricity and heat producers. However, they still have a carbon footprint due to the transport chain of the biomass used as fuel. Bark and forest chips are mainly transported by trucks, and biomass is handled with front-end loaders. The total emission footprint of CHPs in 2020 was 2344.47 tCO₂-eq. This decrease compared with the previous year was due to the reduced sourcing radius for biomass. This development is logical and necessary, and it shows that forest management residues receive the highest possible valorization locally and that biomass with a high moisture content does not travel too far. Another important aspect of the decreasing sourcing radius is the efficient functioning of the bio-economy within the local wood industry, where, for example, the bark left over from sawmills and pellet production is moved on to a different unit within the same production park and used for the production of green energy that powers that same local industry and grid.

Although Graanul Invest Group achieved carbon negativity in 2019, the end of 2020 saw the division of the Group into three main activities, with the pellet production and biochemistry unit having to minimize their carbon footprint without taking into account the carbon sequestration of Graanul Mets' forest portfolio.





Innovation



Woodville, Texas

Michael Rastatter,
Woodville Pellets
plant manager:

"2020 brought much change to the facility in Woodville, Texas. From large acquisitions, such as the fleet of five fuel-efficient Volvo trucks used to haul pellets, to small equipment upgrades, Graanul Invest has shown its commitment to improving the future of Woodville Pellets. As you walk through the manufacturing site, there is hardly an area the technology department has not made improvements in during 2020. Whether the efforts were made towards the awakening of equipment not being utilized by our predecessors or applying newer, proven technologies to existing systems, Woodville Pellets has benefited greatly. These improvements positioned Woodville Pellets to be a more efficient manufacturer and better partner with the Tyler County community. As we enter 2021, we have many more items on our "to do" list to continue to push Woodville Pellets to be the best it can be."

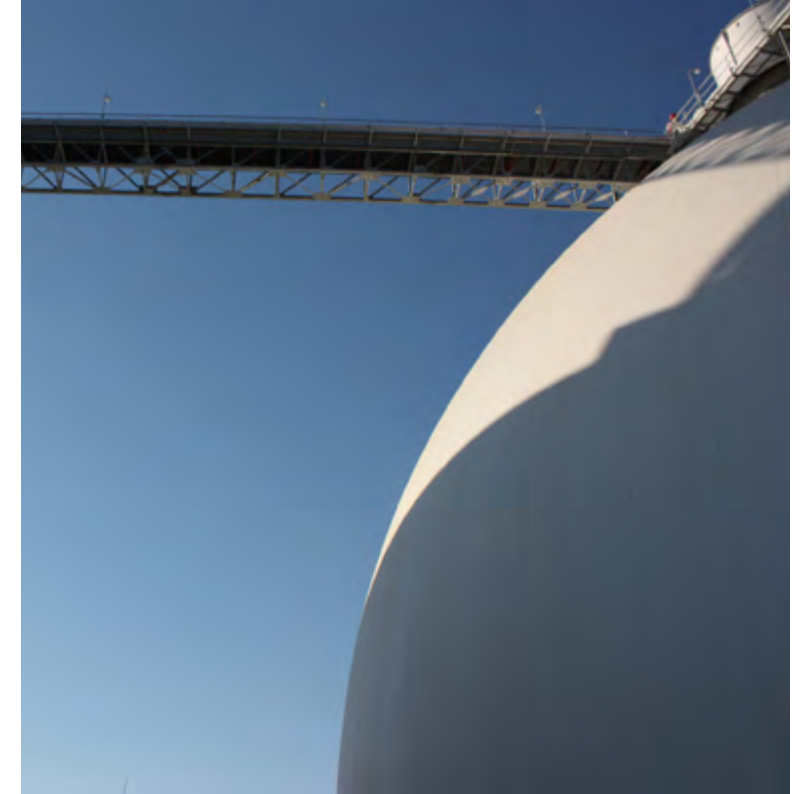
Drax's BECCs

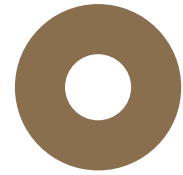
A significant trend in recent years has been to move energy production away from fossil fuels and towards using renewable fossil-free fuels while maintaining the affected region's energy security and local jobs. The countries that have already been producing bioenergy for a long time are planning their next steps to become even more efficient and climate-friendly.

Shifting energy production from coal to biomass is an essential step towards ending the emission of climate-warming fossil CO₂ and aligning production with a balanced biogenic carbon cycle through the use of biomass. As the world's largest producer of bioenergy, Drax has worked hard and achieved this. Their next step is to capture and collect carbon to convert their production cycle from carbon-neutral targets to carbon-negative by 2030. This revolutionary step means that the carbon stored in wood waste is directed into the ground after removing useful green energy, and biogenic carbon with some excess fossil carbon goes back to where it was once extracted from. This is a bioenergy revolution for countries that have developed an efficient biomass and bioenergy infrastructure and are dedicated to meet or exceed their climate targets.

Ørsted combined heat and power plant

The assumption that pellets are mainly exported to low-efficiency Western power plants is entirely false. The reality is very different, and more so with each year. Like Graanul Invest's combined heat and power plants, the Danish energy company Ørsted is extremely efficient in producing both heat and electricity from biomass. Their Avedøre production unit operates at 89% efficiency, which is the highest that modern technology allows. The plant supplies 600,000 households with electricity and 200,000 households with heat. While mostly coal-free already, Avedøre will become completely coal-free by 2023, and Graanul Invest has and will continue to have the honor and pleasure of supplying biomass to this highest-efficiency production unit.





Socio-economic impact

Jaanus Nilp, member of the management board of the Imavere Sports Club:

"For 10 years already, Graanul Invest's Imavere plant has been helping to promote sports in Imavere. The will to get involved and contribute financially to the development of youth and adult sports in Imavere is remarkable and important. Thanks to their support, we can organize trainings in ball games and indoor hockey, we have a gym, and we hold various larger and smaller competitions. Football and volleyball have become the most popular local activities."

Laine Tormis



We help to create opportunities for recreational and sports activities for young people

We have continued to follow the established principle whereby regional initiatives are supported by our Group's local subsidiaries, as they are best able to assess the region's support needs and have a connection with the local community.

In 2020, Graanul Invest and the Group's plants supported more than 60 different initiatives, most of which aimed to develop recreational and sports activities for young people in rural areas. In total, the Graanul Invest Group sponsored initiatives in the Baltics and the US in 2020 with almost 397,000 euros.

For example, we supported the Väike-Maarja rural municipality sports club, Imavere sports club, Tõrva sports society, Sõmerpalu youth centre, Gulbene basketball team, Woodville high school and several other local sports clubs.

In addition, to support the local level, Graanul Invest has been an ardent supporter of volleyball over the years. We are the main sponsor of the Estonian men's and youth team and a supporter of the Latvian youth team. For a long time, we have also sponsored Estonian skiing and contributed to the development of young skiers. As supporters, we follow professionals like alpine skier Tormis Laine and Nordic combined skier Martin Ilves. At the end of 2020, we also signed a sponsorship agreement to support youth cycling, becoming the main sponsor of the Estonian junior road cycling team. We have also continued our cooperation with the University of Tartu Youth Academy in contributing to the long-term development of the in-depth study of natural sciences and wood sciences to raise young people's awareness of the opportunities and potential of the field.



Imavere sportclub

We help promote local life

As the production of wood pellets must take place as close as possible to the raw material, all of the Group's plants are far from larger cities, located in smaller settlements and areas where there has always been a functioning wood industry. Our plants are an important part of the local community, providing professional work opportunities for locals who want to live away from the hustle and bustle of the city. Our plants also pay considerable tax in their operational areas.

For example, Ebaevere Graanul OÜ, a member of the Group, was the top taxpayer in the Väike-Maarja rural municipality in 2020, while our subsidiary Helme Graanul is one of the largest taxpayers in the Tõrva rural municipality.

Osula Graanul, our plant in southern Estonia, was among the 30 best employers in Estonia in terms of pay (according to Äripäev's list of employers offering the best salaries in 2020), and Graanul Invest AS has been named among the most successful wood industry companies in Estonia in 2020 (second place in Äripäev's top 100 most successful Estonian companies).



Osula

We supported local governments during the COVID-19 crisis

During the COVID-19 state of emergency in 2020, Latgran, a subsidiary of the Graanul Invest Group, helped local governments in Latvia by procuring personal protective equipment and providing food to students, with nearly 54,000 euros support for these activities. Our plants in Launkalne and Inčukalns partnered with local governments in acquiring personal protective equipment. In the regions of Jaunjelgava, Krustpils, Jēkabpils, Krāslava and Gulbene, Latgran helped to resolve the day-to-day needs of disadvantaged families by providing students with gift cards for buying groceries.



Socio-economic impact

We created a park in Võrumaa

In May 2020, Graanul Invest planted the first trees in a cooperation partner park being created in Võrumaa County. Graanul Invest's park is located at Varese in Võrumaa, next to the Group's Osula Graanul plant, where the company planted the first 45 trees on 15 May. The trees planted in the park included silver birch, Swedish whitebeam, common oak, northern red oak, Serbian spruce, and black pine. The planted trees are between 1.5 and 3 meters high, and each tree was also equipped with a name tag displaying the name of the cooperation partner.

The idea for a cooperation partner park first emerged in the early autumn of 2019 when the company discussed how to thank and recognize its most significant clients and partners. The desire was to find an environmentally friendly solution that would follow the company's sustainability principles and create something permanent and long-lasting. From there, the idea was born to create a park with trees dedicated to the company's largest partners.

Along with Christmas greetings, the company sent the chosen partners a link to a web environment to choose the tree species that suited them best. Based on the trees selected by the partners, a plan was developed for the park's creation while considering the possibility of adding other trees to the park over the years. The project plan will allow the park to be further developed over the years, allowing Osula Park to become a beautiful stopover or picnic place for everyone.



We contributed to the development of the Estonian forest and wood industry

In October 2020, Raul Kirjanen, chairman of the management board of Graanul Invest AS, was elected chairman of the management board of the Estonian Forest and Wood Industries Association.

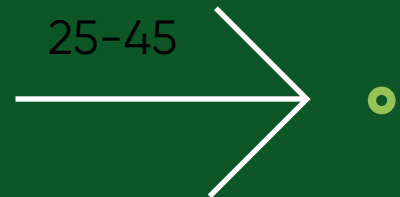
"We need to work to ensure that the general quality of Estonian forests improves, that our forest and wood industry is internationally competitive and that we can sufficiently contribute to innovation to create new value chains for wood with high added value," said Kirjanen when taking over the role. "I believe that a sustainable and modern forest and wood industry will ensure a self-sufficient country and allow us to pass down healthy and strong forests for the next generations."

The Estonian Forest and Wood Industries Association, established in 1996, is a non-profit umbrella organization for companies of the forest and wood industry. The association comprises 67 members, including four educational institutions providing professional education.

Sustainability report 2020

graanul mets

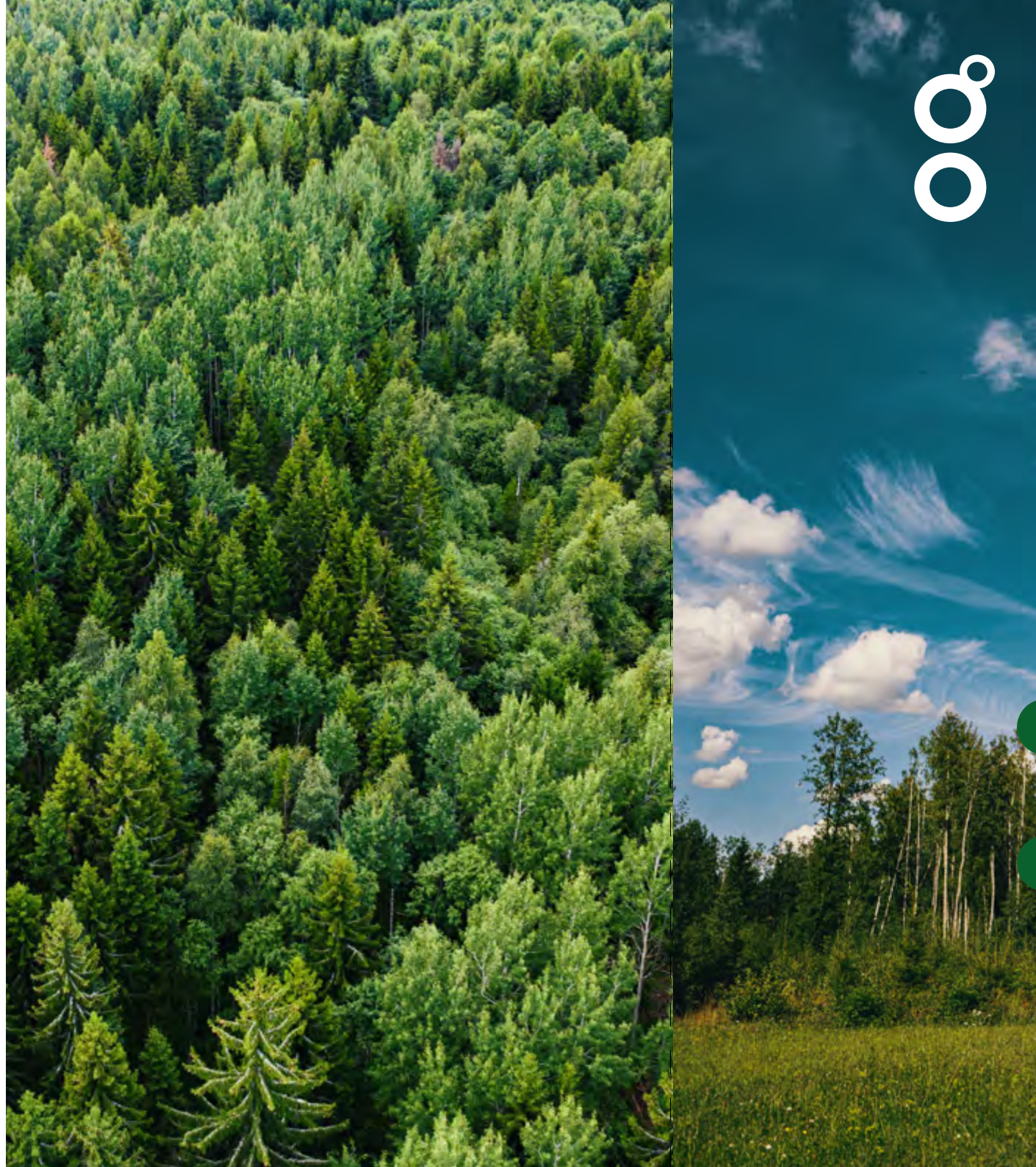
25-45



The Graanul Mets forestry group brings together our forest companies and portfolios in Estonia and Latvia. At the end of 2020, Graanul Mets split off from Graanul Invest Group to form a separate group comprised of our forestry companies Graanul Assets SIA, Karo Mets, Roger Puit, and Valga Puu together with their subsidiaries.

Sustainable forestry

By taking care of our forests, we ensure sustainable forestry, which will determine the state of the forests that we can pass on to future generations. As most forests in our region are planted or created through human activity, we are responsible for both present and future forests. Neglecting forests is not responsible forest management. Sustainable forestry means active participation and constantly evolving maintenance techniques and monitoring. In forest management, we rely on long-term experience and research. Sustainable forestry means that we appreciate the role of rare species, habitats, carbon, fungi, bioresources as well as cultural heritage in forests. It is important to remember that we have inherited today's forests from the previous generations and must pass them on to future generations in at least as good or even better condition.



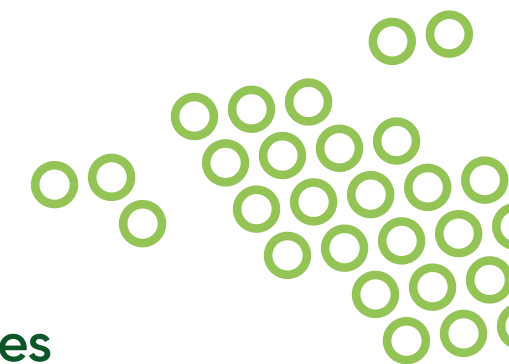
Our forestry strategy aims to ensure the increase of growing stock, protect sites of natural value in forests, increase the carbon sequestration capacity of forests, and grow the highest-quality wood to be used in wood products with the longest possible lifecycle. We follow these goals when managing each new or existing property purchased by the Graanul Mets Group.

Forest management objectives

The long-term goals of Graanul Mets have not changed during the year; we want to make sure that our forest portfolio can remain diverse, sustainable, and productive now and in the future. To do this, we follow two key principles:

1. We are increasing the reserves of growing forests to accelerate the carbon sequestration capacity of our forests and thus the availability of quality raw materials for the production of long-lived wood products.
2. Well-thought-out management means taking into account the mosaic/rotational development cycle of each forest unit, the current situation of the forest and the specificities of each key aspect of each stand. This includes implementing correct and timely methods to ensure the continued functioning or improvement of biological processes.

The companies of Graanul Mets Group aim to manage their forests responsibly and prudently. We use innovative solutions and best practices to achieve this goal.





Afforestation of agricultural land

Overgrown or wooded grasslands and agricultural land can be planted with tree species suitable for the particular habitat, the management of which increases site level – biodiversity and carbon sequestration capacity. Graanul Mets considers it important to use such arable and grasslands for afforestation in order to increase the area covered by forest and store increasing amounts of carbon. It is imperative to contribute to the achievement of future climate goals and influence Estonia’s carbon balance positively. With the increase in the reserves of our forest portfolio, forests sequester carbon better, which also contributes to improved wood quality.

In 2020, 139 hectares of obsolete arable and grassland were afforested by our forest companies. The vast majority, 85 hectares, was afforested with birch, 47 hectares with spruce, and a small part, 7 hectares, with pine.

In their report on using wood-based biomass in bioenergy, researchers from the European Commission’s Joint Research Centre have also examined different forest management scenarios to map win-win situations whereby innovative, maintenance, and land conversion activities have both positive climate effects and neutral or improving effects on biodiversity and ecosystems. The report confirms that planting a mixed selection of species and low-intensity management on disused agricultural land is a win-win scenario. This is vital for our region, and Graanul Invest is actively working in this direction. All disused agricultural land can serve as essential carbon sinks, habitats for many species and suppliers to the bioeconomy. They certainly have an untapped potential in our region, which should be put to use as a matter of urgency.

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2020 AFFORESTED 139 ha



Reimo Lutter,
PhD in Forestry,
Estonian University of Life Sciences:

“In co-operation between the Estonian University of Life Sciences and Valga Puu, a joint research experiment was launched near Elva in the spring of 2020. The experiment aims to determine how and to what extent it is possible to increase the production and carbon sequestration capacity of birch plantations in non-forest land. Photosynthesis is the main natural way to sequester CO2 from the atmosphere and process it to form organic matter. Improving the capacity of photosynthesis by reducing nutrient deficit can increase the carbon sequestration capacity of trees and, ultimately, forests. An alternative use for abandoned agricultural land involves planting a fast-growing tree species to produce additional wood as raw material and to mitigate climate change through carbon sequestration. To achieve this, innovative intensive forestry methods involving nutrient optimization are being tested. The experiment tests various methods to improve the nutritional conditions for trees: a novel environmentally friendly biostimulant based on organic nitrogen, mineral nitrogen, and phosphorus, wood ash, and combinations of the abovementioned methods. The experiment concerns ten different experimental treatments, repeated in triplicate. In addition to studying tree productivity, the experiment also looks at the associated environmental and biodiversity effects: soil nutrient and carbon stocks have been described to monitor long-term changes; soil lysimeters have been installed to monitor nutrient leaching; the number and coverage of vascular plants and mosses have been described. The experiment has been planned as a long-term study, and the aim is to find the optimal balance between productivity and environmental impact.”





Our forest portfolio

Last year, our forest portfolio grew by 7,149 hectares in Estonia and by 991 in Latvia. Despite significant growth, the principle that every property purchased should meet our long-term goals is more important than the figures. Forests must be productive; based on this principle, we make our choices accordingly to ensure the best possible quality and diversity of our properties in the future.

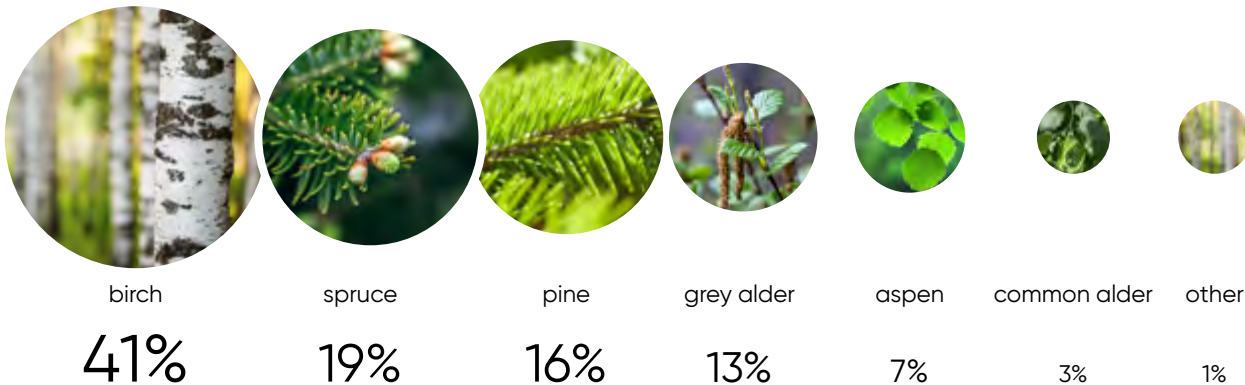
While the distribution of main tree species might show one picture on paper, the actual view in the forest is quite different. Other species grow in each forest alongside the main tree species but are excluded when documenting species distribution. Forests are diverse, and secondary species have a considerable share in Baltic countries' forests.

In addition, it is worth noting that the large proportion of grey alder in our forest portfolio comes from disused agricultural land, where grey alder has started to spread with the greatest success. However, a closer look at the change in the share of grey alders shows that it has decreased by 4% across our entire portfolio. The leading cause of this change is renewal by replanting with spruce or birch after regeneration felling; in addition, the share of alders has been lower in the new properties acquired compared with previous years.



As of the end of 2020, the size of our land portfolio was 60,800 hectares in Estonia, and 2,200 hectares in Latvia.

Distribution of forest land area by main tree species:



Regeneration and maintenance

When looking at a forest, you may not notice that a young forest has already undergone various maintenance work to help the stand grow. In our climate, early maintenance is essential to improve the forest's quality, shape the combination of tree species, and ensure their survival throughout the forest life cycle. The companies of the Group pay great attention to forest regeneration and maintenance work in order to achieve our goals. The same principles are applied in managing the forests of our co-operation partners. In 2020, planted and sowed areas were maintained on 1,820 hectares, cleaning was carried out on 1,150 hectares, and thinning on 1,270 hectares.

Compared to 2019, young forest maintenance work volumes have increased significantly: planting and sowing maintenance by 38%, cleaning by 21%, and thinning by 25%.

In 2020, we carried out sanitation harvest on 340 hectares to eliminate storm, *fungal*, and insect damage. A sanitation harvest saves the forest from further damage by removing trees that have been affected by bark beetles, storms, or heterobasidion annosum. Sanitation harvesting helps to maintain the health of the forest and provides an opportunity to grow healthy trees. It is also becoming increasingly important for the maintenance of drainage systems and access roads. Graanul Mets is restoring old forest roads to make it easier to access the properties in our forest portfolio, to reduce the distance of wood transport and thereby the consumption of fossil fuels. The reconstruction of drainage systems decreases the duration of floods in wet areas and accelerates wood growth. As a result, species that did not previously grow in a wet area because they prefer drier soils will move into the area. It is important to underline that we are reconstructing old drainage systems, not building new ones. The condition of forest roads is also essential for extinguishing forest fires, which are unfortunately becoming increasingly widespread.





Forest regeneration

An integral part and basis of forest management is regeneration, which initiates the new life cycle of a forest. About half of our forests regenerate naturally, and half of the forests are planted. In some areas, the forest needs support to complement its regenerative capacity. The aim is for new genetically valuable trees to start growing on all regeneration sites as soon as possible. The main regeneration species is spruce, in combination with birch, which is mainly planted on disused agricultural land. In 2020, we established a new forest generation on 795 hectares, including 760 hectares by planting and 35 hectares by sowing. In 2020, we planted a total of 1,281,000 forest plants. This figure dropped by 206,000 plants compared with 2019, as autumn planting volumes were reduced. The reason for reducing autumn planting was the unstable winter weather, which has caused frost damage in wetter areas.

The natural regeneration of forests and the resulting emergence of healthier ecosystems must play a key role in the strategy for adapting to climate change. Naturally regenerated forests have been subject to natural selection and consist of healthy ecosystems capable of controlling invasive alien species, pests, and diseases, which have already become a serious problem in our region.

Young plants are very sensitive and can suffer extensive damage caused, for example, by roe deer. Against this, we use natural repellents with sheep fat, which is unpleasant for wild animals, allowing plants to grow successfully without damage. We used repellents on a total of 120 hectares.



Raimonds Zutis,
manager of
Graanul Assets SIA:

"I guess the best thing for us in 2020 was that we created a network of stable contractors for all kinds of forestry works, despite the difficulties that come from small management units that are covering quite a large area."



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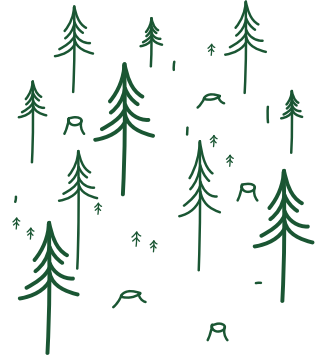


Different harvesting methods



Clear cutting

With this method, the forest is cut all at once, leaving only retention trees that are thicker and stronger, so that they can stand on their own exposed to the weather. To reduce windthrow, retention trees are preferably kept in groups – then part of the second front and the underlying forest will be preserved as well. Although clear-cutting drastically changes the appearance of a forest, this technique is useful because it only involves a one-time disturbance to the forest. Young trees can grow faster when light reaches the ground and get enough nutrients from the soil because there is no competition from large trees. This is the fastest and most reliable forest regeneration method, which is also the most common in Estonia. It is also the regeneration felling method that we use the most often in our own forests.



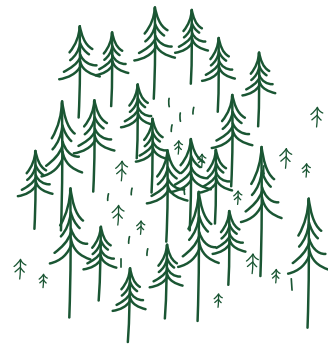
Uniform shelterwood cutting

A new generation of seedlings is grown under the cover of an old forest. Shelterwood cutting is mainly used in restricted zones and near densely populated areas, where regeneration is carried out in two or three felling stages spread out over up to 20 years. There are a number of disadvantages to this: the development of a new forest generation is slow due to insufficient light and root competition for nutrients and water. Soil mineralization and felling also damage the large trees and their roots, posing a risk of the spread of wood pests. The total amount of trampling is also more extensive than in the case of clear-cutting, and the main disadvantage is that the forest becomes vulnerable to storms. In 2020, we carried out shelterwood cutting mainly in areas with economic constraints, the surface area of which is modest due to the factors mentioned above.



Shelterwood strip cutting

Felling takes place in 20- to 30-meter strips, on which new forest can be planted. However, it must be taken into account that the impact of the old forest on the young forest is great and slows down the growth of the new forest. This method is used mainly in zones with management restrictions and resembles small-scale clear-cutting. We practically do not use this method for the reasons mentioned above.



Group selective cutting

The forest to be regenerated is felled in patches. For example, in the first stage, there may be five selected groups with a diameter of up to 40 meters per hectare. In the next stage, when the patches have been reforested, their size will be expanded. The cleared patches make the forest vulnerable to storms, and the method is more suitable for pine forests. The edges of harvested patches are impacted by the roots and side shade of the remaining forest, and as a result, the regeneration may suffer. We practically do not use this method for the reasons mentioned above.



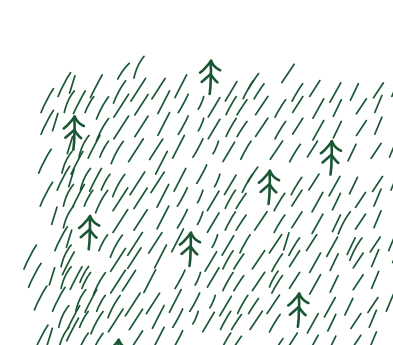
Thinning

Carried out in stands aged 20–50 years, two or three times during the forest lifecycle. The aim is to cut down weaker trees and give the preferred tree species better growth opportunities. When trees have more space, their crowns and roots also grow, making the trees more stormproof and reducing windthrow. Late or too extensive thinning makes the forest vulnerable to storms and can do more harm than good. However, thinning does not make the forest poorer: the tops and branches of the felled trees remain in the forest as fertilizer, maintaining fertility. We can extract and use a significant amount of wood from the forest during thinning, the main uses of which are pulp production, energy, and, more recently, timber production, as local sawmills have learned to cut ever slimmer logs. Every year, we have increased the volume of thinning and invested into the acquisition of small forest machines. We will continue to do so in the future to increase the quality of forests.



Cleaning

Used in 5–20-year-old forests to shape the species composition of the forest and give young trees room to grow. This is most important in natural forests, as many species start to grow simultaneously, and cleaning provides better opportunities for the tree species better suited to this area. In addition to the young forests already in our forest portfolio, we continue to buy additional plots with young forests among them. Therefore, cleaning volumes are increasing.



The improvement of a forest culture

It mainly means mowing hay one to three years after planting or sowing. This protects young plants from high hay, and they are more likely to benefit from nutrients and light. Even in winter, young trees can be buried under other plants due to the weight of the snow and suffer from hindered growth and lack of light. We perform care of those planted areas where it is necessary.



Sanitation felling

This is designed to prevent damage and the spread of diseases or pests. This method includes removing damaged trees or windthrow so that others can grow more successfully and healthily. The main reason for the sanitation harvests in 2020 was the elimination of spruce bark beetle damage.





Wood procurement

The felling volume of the Graanul Mets Group in 2020 was almost 700,000 cubic meters, of which 60% was harvested in the Group's own forests and 40% as a service in other private forests.

In 2020, we produced nearly 900,000 cubic meters of wood chip, of which 27% came from our own forests, 30% from other private forests and 43% from purchased logging residues and shrubs.

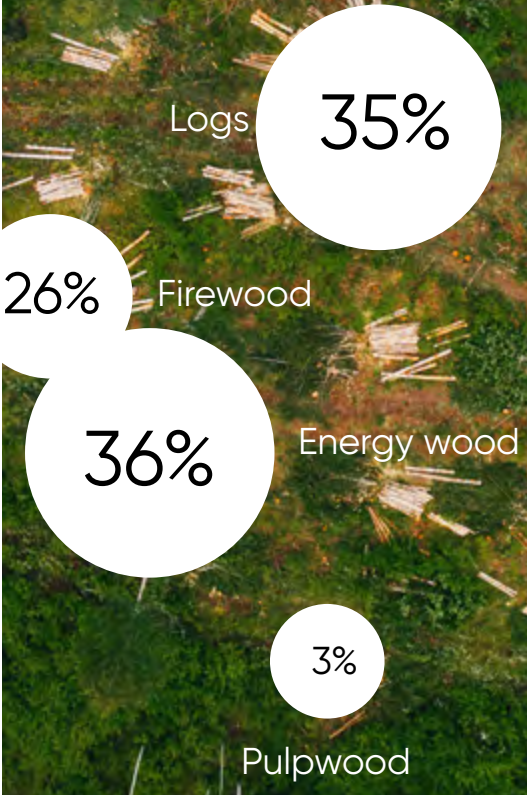


The volume of wood harvested has not changed significantly: the volume of roundwood harvested increased by less than a tenth, while the volume of wood chips from our forests and other private forests decreased by almost a tenth, as an increased share of residues was used to reinforce access roads. Although the total area of properties increased by 15% in 2020 and the ratio of wood sourced from our forests to that sourced from other private forests remained the same, this was not accompanied by an additional increase in logging volumes; instead, we increased the volume of wood stock in our portfolio.

The distribution of assortments shows that the share of logs has remained at the same level as last year. The pulpwood volume has decreased significantly due to a feeble demand for pulpwood from the Scandinavian pulp industries.

By increasing the share of log output, we are moving toward our goal to increase the share of logs in our forestry returns to 50 per cent by 2050. This process is slow and begins with planting and improvement cutting and will not bear fruit until decades later, like many other decisions and activities in forestry.

Distribution of harvested wood by assortment:



The journey of wood

The length of the journey of different assortments from the forest to the destination is also important when harvesting wood. This helps to assess the ecological footprint of both the forest company and the wood products company. The figures for 2020 are similar to 2019, with pulpwood requiring the longest voyages – 86 km on average – to which we need to add the journey by sea and from the destination port to the paper mill. All this speaks to the detriment of the sustainability of pulpwood sourced in Estonia and emphasizes the need to add value to this assortment locally. The other assortments are upgraded by local Estonian industries, resulting in a short transport distance from forest to industry.





Conservation

Protected forests make up about 10% of the area of our forest portfolio. Areas with strict protection account for 6% of protected forests and areas with other management restrictions for 94%.

Of the strictly protected areas, the most common are the special protection zones related to nature reserves or permanent habitats of a specimen of a species where no economic activity can take place. In addition, woodland key habitats are strictly protected within our group. These are habitats suitable for rare and endangered species on managed forest land, where structures typical of natural forests, such as very old trees, large lying and dead trees or burnt trees, have been preserved. The conservation of such forest areas is important to ensure the conservation of rare and endangered species.

Of the economically restricted areas, the most common are the limited management zones related to coasts and shores, protected areas, and permanent habitats of specimens of a species. Many areas with economic restrictions form buffer zones around strictly protected areas to provide a smooth transition between the commercial forest and the strictly protected area. In these areas, felling is carried out following the protection rules applicable to each area.

Our forest portfolio is fully certified.



The most common protected bird species in the Group's forests: the lesser spotted eagle, the western capercaillie, the Ural owl, the northern goshawk, the golden eagle and the white-tailed eagle.



Protected animal species in our forests: the Siberian flying squirrel, Daubenton's bat, the northern bat, and hibernating brown bears.



Protected plant species in our forests: the European white elm, the Arctic bramble, the felwort, various Orchidaceae, the heath spotted-orchid, the common spotted orchid, the marsh angelica.

Maintenance work in national parks

In 2020, Graanul Mets Group conducted forest management works (planting, management of cultures, thicket tending, thinning, sanitation cutting, regeneration cutting) in different limited management zones following the restrictions of each zone. These restrictions are introduced by the Estonian Environmental Board and experts, taking into account the particularities of each area and the species living there. Working in these areas require following restrictions on time, size of the cutting area, the number of old crop trees, and leaving buffer strips in the transition zones.



We carry out maintenance, planting and reforestation work on areas many times larger than we fell. It is worth remembering that these harvests do not take place in special protection zones but in limited management zones, and only in situations where this is necessary and helps to improve the conservation value and health of the forest.



Carbon footprint in forestry

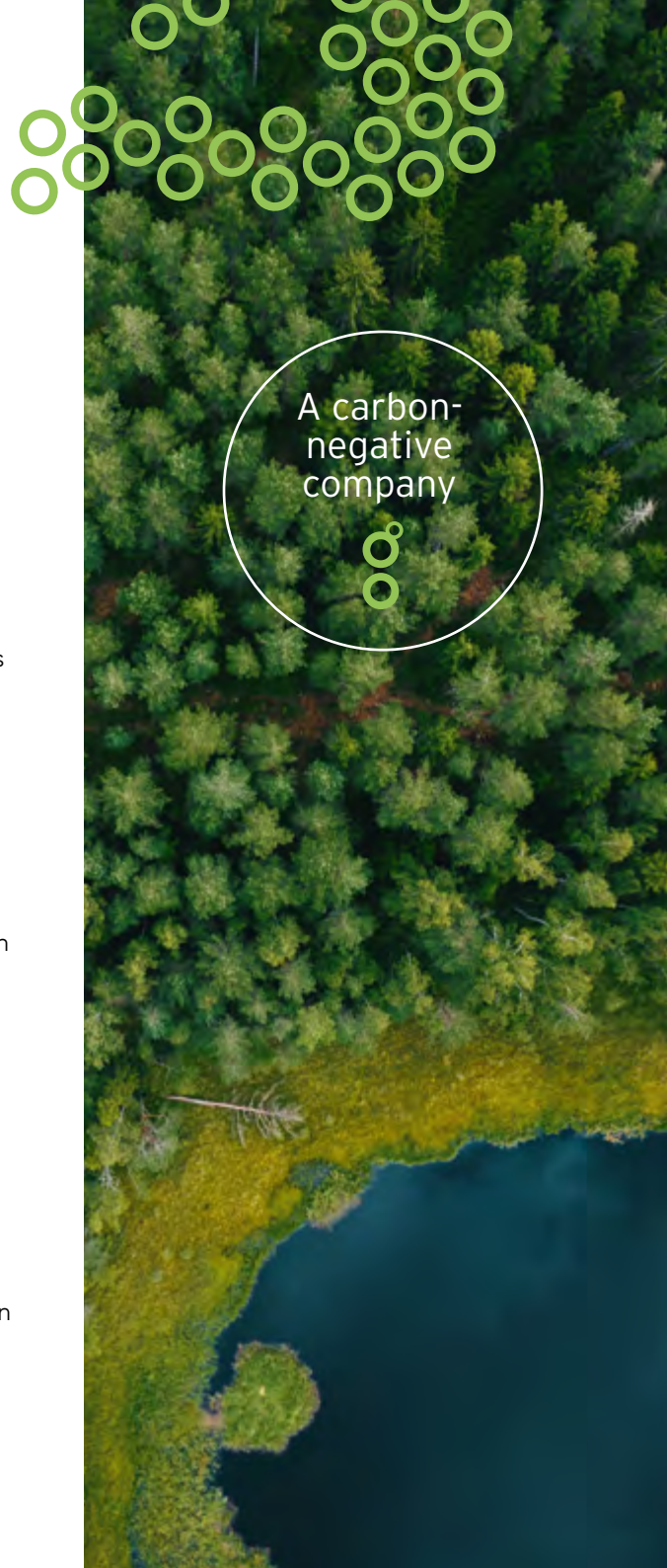
Forests in general, and the Graanul Mets portfolio in particular, play an important role in achieving climate goals and rebalancing the carbon cycle disrupted by fossil emissions. Estonia, as one of the forest-rich countries of the European Union, has a greater responsibility to increase the carbon sequestration capacity of its forests, as this is currently one of the most reliable methods available to Europe and the world in mitigating climate problems.

The LULUCF Regulation is an essential tool in ensuring that emissions are sequestered quickly within the sector, rather than relying on other industries and external assistance. This means that forestry outputs, emissions from forest operations, and temporary reductions in sequestration capacity should be lower than the emissions sequestered in the near future through reforestation and better management. Managing a forest unit helps to maintain or increase its long-term production capacity.

Graanul Mets manages its portfolio to increase growing volumes, applying all local and international best practices relevant to the forests in our climate zone. The fastest regeneration method is selected and implemented for each management unit, with the objective of obtaining the healthiest and most biodiverse forest possible, but at the same time taking into account the specificities and species of the area. We enhance the portfolio's climate positivity through the forestation of overgrown or disused farmland, ensuring that these areas also have above-ground vegetation that sequesters carbon and increases biodiversity. This is the only way our forest portfolio can achieve the kind of carbon sequestration needed for the future.

We follow the methodologies used in Europe and cooperate with the state in managing our portfolio. In addition, we are subject to international rules – the GHG profile, road to net zero, science-based targets.

The carbon footprint of Graanul Mets consists of energy consumption related to forest management and the shipping and transport of forest material to end users. This activity is carbon-emitting and is likely to grow with the expansion of our forestry operations. It is important to monitor the specific consumption per unit of wood managed and set ambitious targets to reduce specific consumption. Last year, this indicator increased significantly, though not due to the expansion of activities but as a result of dividing the Graanul Invest Group. As Graanul Mets now operates as a separate company, its carbon balance also includes the energy costs of sourcing the forest biomass that goes to the pellet plants. As a joint venture, these were allocated to the pellet production footprint. The energy costs are still also recorded under pellet production, but this double counting will remain until there are clear conditions and contractual means for allocating emissions between separate collaborating companies. The effect of this on the carbon balance is approximately 700 tCO₂-eq per year.



The real factor in the overall carbon footprint of forestry is, of course, the forest. Its short-term and long-term carbon balance must be negative, and, at the same time, its growing stock must increase. Although the sequestration capacity of our forest portfolio has made a big leap due to the expansion of our portfolio, its annual sequestration capacity per hectare has decreased and is now 10.28 tCO₂-eq. The main reason for this is a 6% increase in the share of coniferous forests compared with deciduous forests. Deciduous trees have a faster sequestration capacity than conifers in the short term, but conifers achieve a higher carbon stock within their life cycle, as well as being higher quality as raw material for the bioeconomy. One of the main goals of Graanul Mets is to increase the share and growing volume of conifers.

○ Forest management	2,534.69 tCO ₂ -eq
○ Forest portfolio	- 647,671.5 tCO ₂ -eq
○ Footprint	- 645,136.81 tCO ₂ -eq

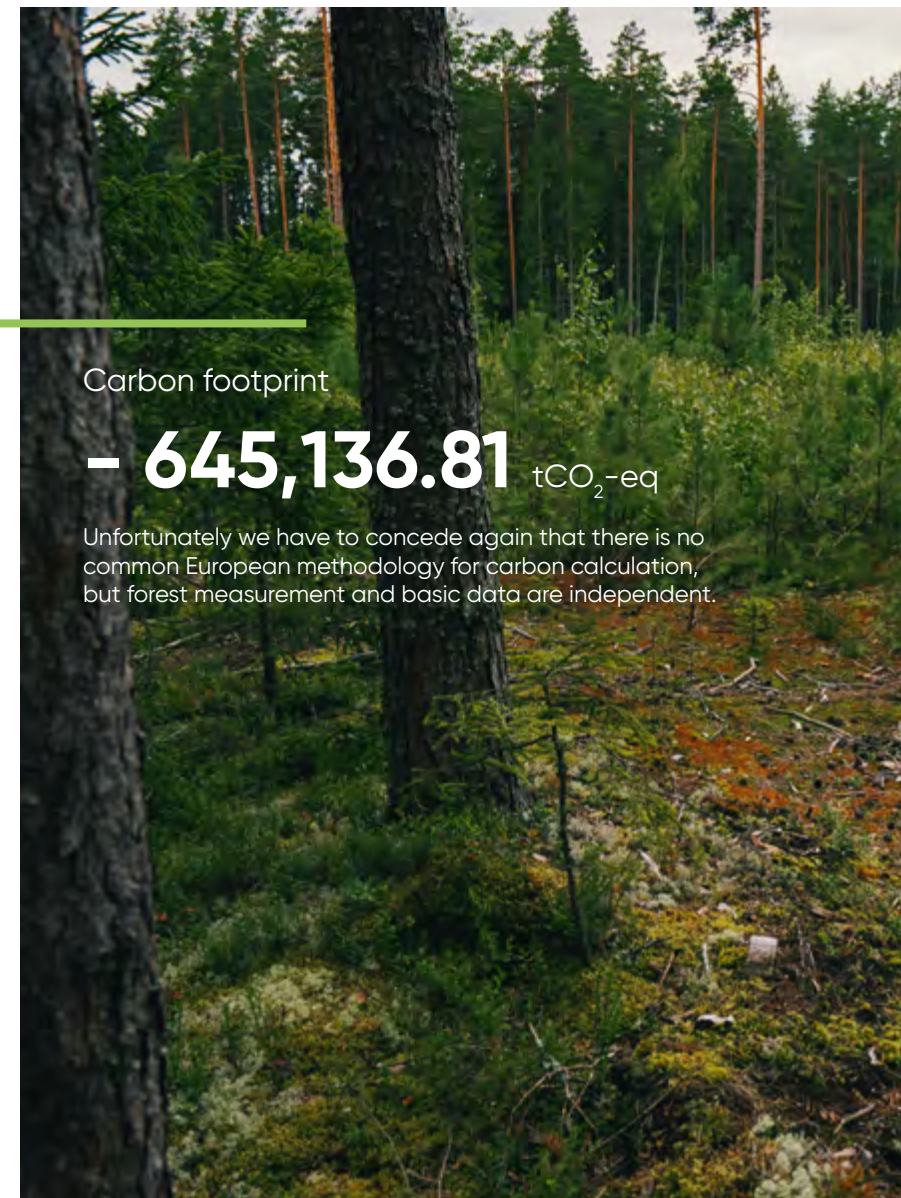
The standards for auditing forestry footprints are slow to develop, and we hope for a globally recognized standard to fill this gap by 2022. It will then be possible to obtain third-party verification and a transparent methodology for the footprint of Graanul Mets. The most important conditions of the Renewable Energy Directive and the Taxonomy Regulation are taken into account when modelling the carbon dioxide equivalent balance of the Graanul Mets forest portfolio. The additional principles are as follows:

- The balances of all dominating tree species are calculated separately, and the annual figures contribute based on their percentage in the entire portfolio.
- The calculations of the above-ground biomass are based on the current average growing stock per hectare. This way, the low sequestration capacity of treeless fields and young forests are taken into account, and the impact of felled forests is also immediately reflected in the model.
- The average growth curve of a mixed stand is used based on the nature of our forests.
- The carbon balance also includes periodical thinning before regeneration felling.
- The maximum growing volumes of most species are based on the Estonia average, not theoretical maximums.

Carbon footprint

– **645,136.81** tCO₂-eq

Unfortunately we have to concede again that there is no common European methodology for carbon calculation, but forest measurement and basic data are independent.





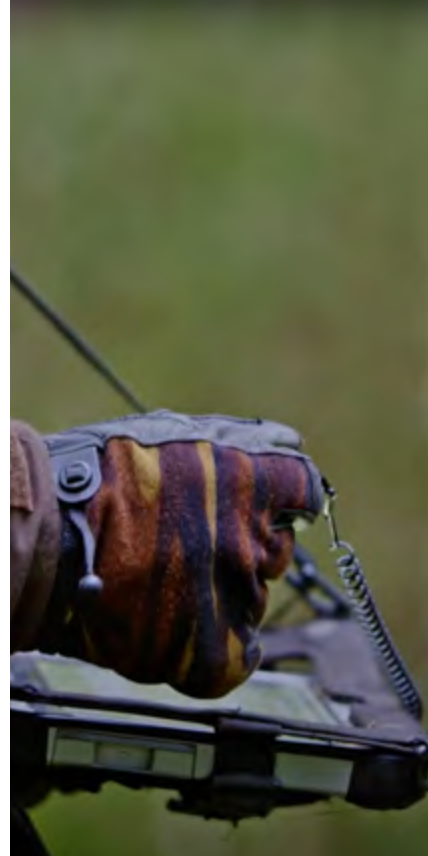
Innovation

Smart forest management

Due to the spread of COVID-19, we found opportunities to minimize the need for human contact in our work. The digital and automated systems used by forest companies helped carry out the work without causing any spread of the virus and with people being able to keep a sufficient distance from each other and not be in the same place. IT solutions and digitization also support the work of smaller teams. This makes it possible to react faster and more quickly to sudden changes, and the adjustment process is easier.

As a new solution, we have developed a forest inspection software in co-operation with Valga Puu. It can be used during and after the forest management activity, where the person performing the inspection registers the inspection results in a mobile application, and the information is automatically transmitted to the person performing the forestry work. The goal is to provide prompt feedback to our employees and partners. So far, the testing of the application has been successful, and in the future, we plan to expand its use to other companies in our Group.

In addition to the above, in 2020, we made improvements to the forest regeneration module of our forest management software and created our own map server to keep the map layers required for forest management (e.g., nature conservation restrictions) updated. The forest management software was also deployed in our Latvian forest management company, and now the entire Group's forest-related information is in one system.



Socio-economic impact



Jörgen Viilup,
Valga Puu harvester
operator:

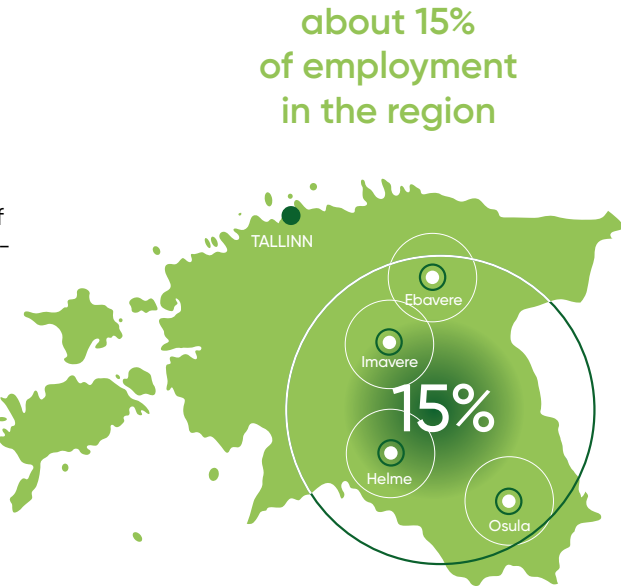
"When I was 15, my father gave me a chainsaw. I started doing smaller jobs for people I knew, and that's probably where my interest in forestry started. I worked in Russian forests, in a shipyard in Finland, as a lifeguard in Crete, and as a builder of modular houses in Norway. At one point, my desire to travel waned off, and my heart called me back to Estonia. When I heard from a friend while working in Norway that there was an opportunity to get a job with Valga Puu, I grabbed it immediately. Valga Puu sent me to the Luua vocational school to qualify as a harvester operator, and while studying, my wish to finally get a secondary diploma grew as well. By now, I have been working as a harvester operator with Valga Puu for almost ten years, and I am very happy to be able to do the work I like, knowing that people are satisfied with my work. I mostly do improvement cutting and like to work in nature, witnessing its constant changes, with every day being different."



Important employers in rural areas

The analysis of the socio-economic impact of the Estonian forest and wood sector in 2020 carried out by Ernst & Young Baltic showed that the contribution of the forest and wood sector to the livelihood of rural areas is significant. The value-added created by the sector makes up a quarter, and a fifth of the total value-added created in central Estonia and southern Estonia. The forest and wood sector employs just over 28,000 people and, taking into account the indirect and spill-over effects, creates almost 60,000 jobs. According to the study, the sector is also an important contributor to employment in central Estonia and southern Estonia, accounting for about 15% of employment in the region.

Our forest companies are important employers in rural areas, offering families the opportunity to find good professional work outside the local commuting centres. For example, the average gross salary at Valga Puu OÜ, which belongs to our Group, is twice as high as the average of Valga County, and our other forest companies are also valued employers in the sector.



Local businesses came to the rescue of the community



In 2020, Valga Puu, a forest company belonging to the Graanul Invest Group, supported Põlva, Võru and Valga County Food Banks to help families living in rural areas during the difficult COVID-19 crisis. The food products to be distributed through the aid project were collected in co-operation with local food producers.

Valga Puu supported the project with 60,000 euros, which will enable the Food Bank to offer local food products to large families, people with disabilities, and other people in need for a period of four months.

According to Kairit Numa, the leader of the Põlva Food Bank, an agreement was signed with Valga Puu, stating that the food going to the aid packages would be bought only from local producers in order to provide people with quality food while supporting small businesses.

According to Andres Olesk, the head of Valga Puu, one of the initiative's goals was to provide support to each other during the crisis caused by the COVID-19 virus. According to him, life in rural areas is based on two main lines of business – forestry and agriculture, which now jointly began to support those in need. “Supporting the local community and small producers is important to us, and we have always done so whenever possible,” Olesk said.

From the producers’ side, Nopri Talumeierei, Karni Lihatooted, Jaagumäe centre, Sangaste Linnas, Aakre Moos, Muna Liisa, and several others participated in the initiative.

We support hobbies for children and young people in the region

Our forest companies Valga Puu and Karo Mets base their support activities on the needs and wishes of the local region and community, paying particular attention to the hobbies of children and young people. Through our sponsorship activities, we help shape the sports habits of thousands of local youth each year by supporting a number of sports schools and clubs. Valga Puu has supported youth football development in FC Elva and FC Helios Võru clubs for more than seven years. We have also offered long-term support to youth basketball in Valga and Parksepa and the Võru volleyball girls. Karo Mets is a long-standing sponsor and fan of Pärnu Sports Society Kalev. Since 2020, Karo Mets has also been the main sponsor of the Tallinn Selver Volleyball Club. In addition to the good co-operation with various local sports clubs, we have been supporting the activities of the Estonian Forestry Students’ Association and promising local athletes for more than ten years. Since 2019, Karo Mets has also been a sponsor of the Kaisma hiking trail. In 2020, our forest companies sponsored hobby activities worth a total of 39,000 euros.

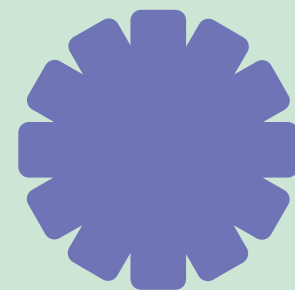


Kalev Palo,
Parksepa Sports Club Basketball coach:

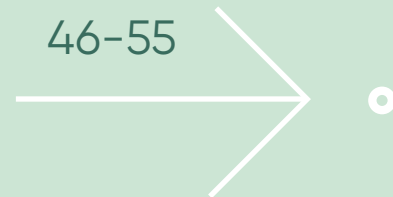
“Our co-operation with Valga Puu started in 2015, when we met during the anniversary of Parksepa School. This led to them supporting us. Many people at Valga Puu are former students of Parksepa school, and now our boys have come to the rescue at the right time. We would not survive with only the money from the municipality and need such help very much. I am glad that even when the winters were not so good, and I know that forest companies had more difficult times, Valga Puu did not given up their support. If there were no supporters, there would be no sports.”

Graanul Biotech

Since 2017, Graanul Biotech has been engaged in an innovative bioprocessing field aiming to develop and produce high-quality biomaterials from lower-quality wood.

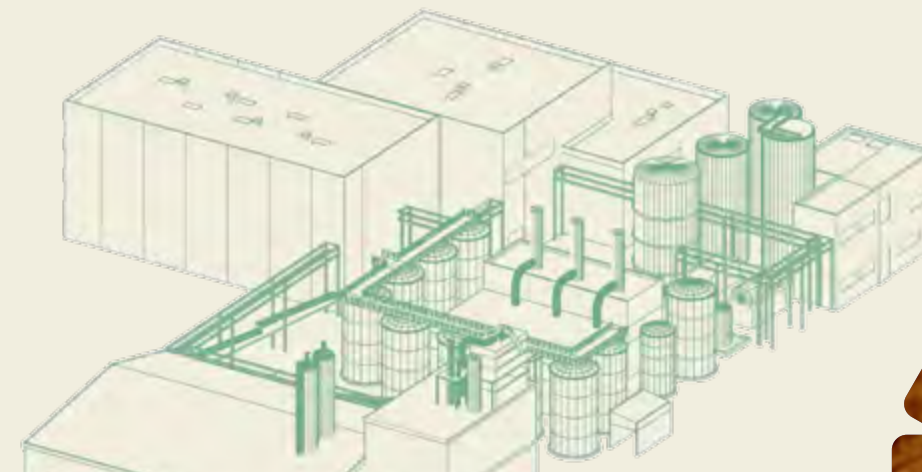


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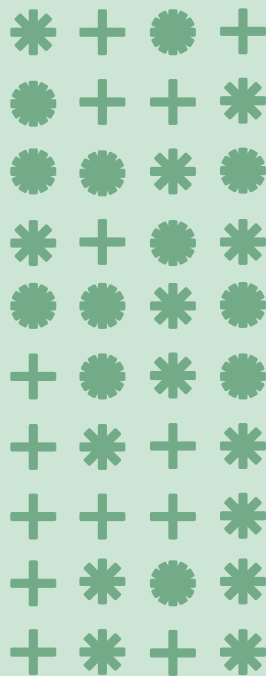
Novel flagship

Since 2017, Graanul Biotech has been engaged in an innovative bioprocessing field aiming to develop and produce high-quality biomaterials from lower-quality wood. The new fractionation technology being implemented makes it possible to separate high-purity lignin and wood sugars from biomass while maintaining a minimal environmental footprint. The new generation of lignin and sugars can be used in a wide range of industries as a sustainable alternative to fossil materials, enabling environmentally friendly products to be brought to market.



Graanul Biotech is establishing a demo plant in Imavere based on a novel approach to chemical wood valorisation, aiming to apply it to more than 90% of the chemical compounds found in wood.





In 2020, the flagship of Graanul Biotech reached its first milestone with industrially representative samples of high purity lignin and wood sugars available at the ton scale for testing at novel value chains. The Bio-Based Industries Joint Undertaking (BBI JU) funded the SWEETWOODS wood valorisation flagship; it is now ready to ship out industrially representative samples of high purity near-native lignin and wood sugars at the ton scale.

The first phase of construction works of the flagship was finished in 2020, and the construction of the second phase, where hydrolysis, separation processes, and lignin drying will be established, has started. We estimate that an industrial supply of novel lignin and sugars will be available in the last quarter of 2022.

“The whole fractionation process still needs to be challenged within 24/7 operation at scale, but preliminary performance tests have had very promising results yielding expected high purity lignin and sugars” said Graanul Biotech’s R&D Manager Dr Peep Pitk.

“This means that we have created a strong basis for near term realisation of supply of sustainable feedstocks for different biomaterials and biochemicals production to create industry-changing new value chains, where wood as sustainable raw material plays a vital role.”

High purity lignin and wood sugars in evaluation

One of the goals of the SWEETWOODS project is to establish markets for lignin and sugar-based platform chemicals. The consortium partner Tecnaro, which develops and produces thermoplastic compounds, composites and blends, confirms that high-purity lignin from the SWEETWOODS project can be used as a substitute for conventional lignin in biocomposite production, offering improved product quality without any odour.

“These first tests show positive results that novel high purity lignin will allow Tecnaro to enter higher value markets and gain competitive advantage through both sustainability and performance,” said Dr Michael Schweizer from Tecnaro. The Tecnaro product family includes ARBOFORM®, made from 100% renewable raw materials and biodegradable.

SWEETWOODS consortium member Recticel is currently evaluating on a lab scale which (depolymerised) lignin types are most suitable for incorporating rigid foam for insulation boards. The most suitable candidates will be further upscaled and screened on a semi-industrial scale.

Another consortium partner, Global Bioenergies, has successfully scaled up the production of bio-isobutene from residual wood derived sugars at the ton scale. The company is also progressing very well towards commercialising renewable cosmetics with the first EU registration of a key cosmetic-grade ingredient derived from fermentative isobutene.

An important part of the SWEETWOODS project is evaluating the environmental and socio-economic performance of the SWEETWOODS plant, feedstock, and developed products. Consortium member, 2B, has been working on the Life Cycle Assessment (LCA) of the whole wood fractionation process to calculate the environmental impact of the outputs of this process, which are sugar concentrates and lignin. The LCA has allowed the identification of the environmental hotspots of the fractionation process, which are useful from an eco-design perspective. The LCA results are currently being compared with other biorefining processes and products to get a numeric estimate of the environmental benefits of the SWEETWOODS flagship technology.

The SWEETWOODS consortium, led by Graanul Biotech, brings together innovation-oriented partners: Global Bioenergies, Tecnaro, Armacell, Recticel, MetGen, 2B Srl and Spinverse. The SWEETWOODS project has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement No. 792061.



One of the goals of the SWEETWOODS project is to establish markets for lignin and sugar-based platform chemicals.



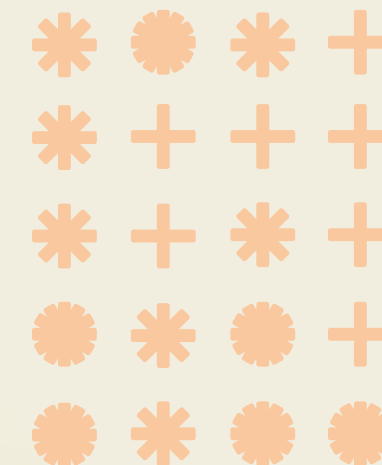
Our bio-based materials potential



Nicolas Barraud,
Global Bioenergies:

“The sugar hydrolysates we have received from Graanul Biotech have the right properties. We have performed a series of tests in the lab and pilot-scale fermenters to produce our key platform molecule isobutene and obtained excellent performances. The isobutene can then be converted to final ingredients to make top quality cosmetic products and jet fuel blends, all from bio-sourced materials. Global Bioenergies is now preparing to scale up its demonstration production from wood-derived sugars to several tons in our Demo plant.”

In parallel with the construction and commissioning of the Imavere flagship plant, Graanul Biotech has been actively expanding the network of innovation-oriented companies looking to utilise sustainable sources for their production processes. Some of the key learnings have been that although there has been a lot of work on cellulosic sugars and lignin done in the past, there is still a significant lack of them on the market. Many process developments never get out of the lab/pilot scale, which has increased scepticism towards lignocellulosic biorefineries. We hope the quality and progress of our materials on the scale-up will soon change this. Another common misconception about lignin and cellulosic sugars is them being low-quality waste products of the forestry industry. With the feedback from many end-users, we can confidently say that our lignin and cellulosic sugars have proven to be valuable components in a wide variety of applications while offering a lower environmental footprint compared to the currently used fossil-derived alternatives.



Lignin applications

Biocomposites

Biocomposites are a mixture of different natural components moulded or bonded together by a natural resin. These materials can be used in building materials, consumer products, automotive and many other sectors. Using lignin as one of the components in biocomposites or 3D printing formulations enables reduced environmental footprint and often also improved properties of the materials. Our lignin has the benefit of a natural wood-like smell compared to some other lignin types, limiting their use so far.

Resins

Conventional resins used are made of fossil origin components phenol and formaldehyde. Lignin has proven to be a very good biomaterial to replace a significant part of the formulation of these resins. They are resulting in safer, environmentally friendlier resins and end-products. Lignin is chemically very similar to phenol, and therefore research to use lignin in this area was started already a long time ago. The first commercial products are on the market by now, showing no quality reduction of end products.

PU foams

Lignin use in general as a drop-in in PU foams production is quite challenging. Still, our crude lignin, due to its native form, has an excellent prospect to be converted into lignopolyols, allowing easier incorporation into PU foams formulations.



Sugars applications

Due to the swift and efficient fractionation process, the wood sugars produced by GBT have proven to be of very high quality. This means there is a very low amount of non-wanted byproducts that could hinder the use of these wood sugars instead of conventional industrial sugars from sugarcane, beet or other sources.



Isobutene

Isobutene is an important industrial intermediate used in many industries, including aviation fuels, rubbers and cosmetics. Instead of making it from fossil fuels, there are developments to produce isobutene by fermentation using microorganisms that eat sugars.

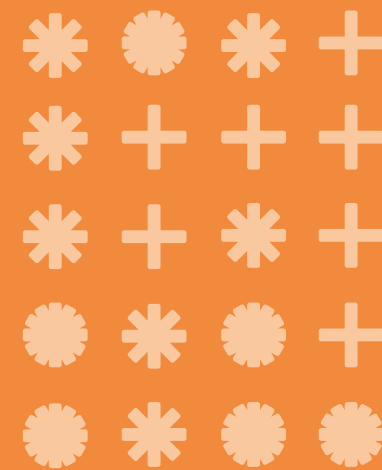
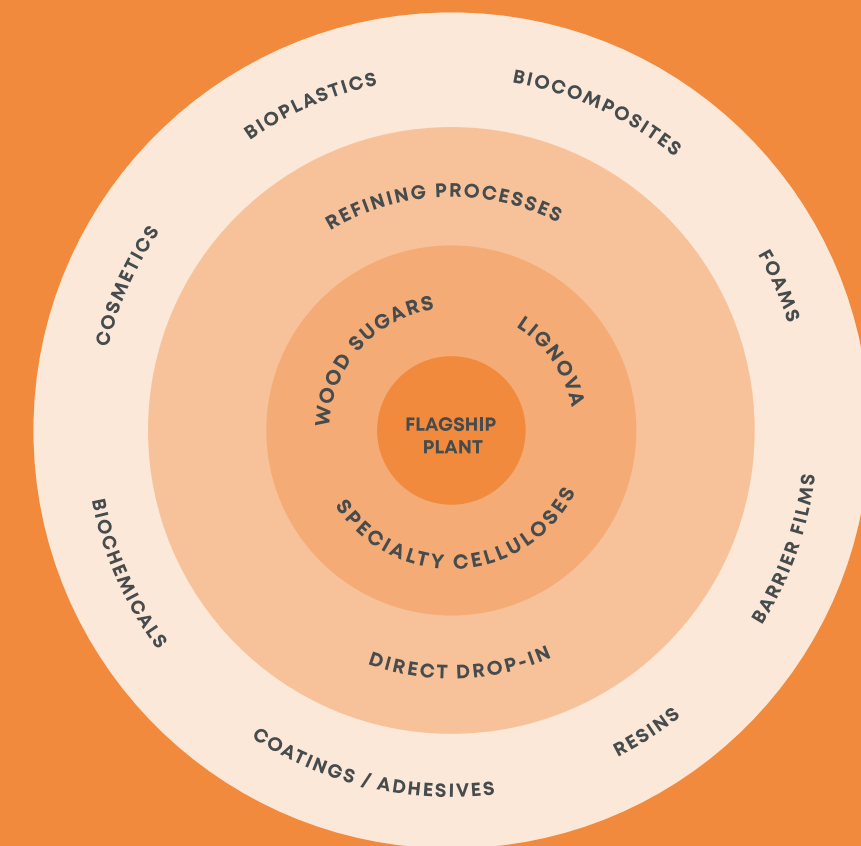
Butanediol

This includes industrial intermediates that can be converted into bioplastics, athletic apparel, shoes, and automotive uses. Conventionally produced from oil and gas refining, but more recently, industrial processes utilising microorganisms have been developed. As wood sugars have a lower environmental footprint than conventional sugars, they offer the potential to further reduce the environmental impact of production for this bulk chemical.

Process and R&D developments

Going beyond the well-known lignin and cellulosic sugars applications, Graanul Biotech has successfully taken the water-insoluble lignin and turned it into a water-soluble, pumpable concentrated liquid, which makes it more suitable for several industries not so much used to the powder format of crude lignin. The water-soluble lignin for us is the first step in many options to use the chemical potential of lignin further. Similarly to crude oil that is processed, fractionated and purified into numerous important molecules surrounding us everywhere, lignin can be upgraded with nearly unlimited potential.

The unique wood fractionation process breaks down the wood structure into its basic units. It turns out that cellulose gets broken down into microscale crystalline cellulose during the wood pre-treatment. Compared to standard fibrous cellulose used in the paper industry, this material has completely different properties and is used in a variety of applications. A few examples include: making food packaging more water/air resistant, improving cosmetics creams quality, food texture modification, etc. Currently, a limited amount of such material is produced worldwide due to complex and intensive processing requirements. Our fractionated wood-derived whole slurry allows an efficient route to separate and purify such crystalline speciality cellulose. This unique process shows there is significant potential in increasing the supply in a cost-efficient manner.



Socio-economic impact

Wood is one of Estonia's few natural resources, so the chemical valorisation of wood is a priority that has been often discussed in society. Looking at the forest, wood and materials industries, Graanul Biotech has been involved in the research and development of these fields for many years, integrating state-of-the-art biological, chemical and materials technologies to create an innovative wood valorisation industry. We work with various research institutes and universities and have already launched a number of pan-European cross-sectoral R&D projects to develop innovative applications based on wood sugars and lignin. The development of fractionation at Graanul Biotech will permit to extend the wood-based value chain in Estonia and enable the creation of jobs for highly educated chemical and materials specialists.

Innovation and research development is a time-consuming and costly process. As of the end of 2020, Graanul Biotech has invested 20 million euros to develop new biomaterials. Still ahead is the construction of the second phase of the demo plant, with the total investment in the pilot plant estimated at 60 million euros, of which BBI JU's international project grants will cover about a quarter.

Mart Loog,
The Wood Chemistry and Bioprocessing
Core Laboratory, University of Tartu:

"The collaborative projects between Graanul Biotech and the University of Tartu's Wood Chemistry and Bioprocessing Core Laboratory continued with several exciting developments in 2020. The core laboratory itself has been operating for over three years and got its start when Graanul Biotech's R&D manager Peep Pitk expressed some justified criticism at a seminar on wood chemistry at the Academy of Sciences. Peep spoke to the Academy's president Tarmo Soomere, asking why there is no wood chemistry research in Estonia to support industry and develop new technologies. The University of Tartu's molecular biologists and chemists overheard this conversation and were inspired by the idea. A consortium of laboratories was created, which later formed the basis for establishing the core laboratory that conducts independent research to develop radically innovative high-tech solutions for wood valorisation. The core laboratory also offers opportunities for collaborative projects and analytical services for the wood industry. By now, research in the Tartu laboratory has taken off in several directions. One of the best examples is the collaboration with Graanul Biotech. The main goal of the core laboratory is to help promote wood chemistry in Estonia to achieve sustainability and increase our competitiveness in the novel biomaterial market.

The main focus of the collaboration in 2020 was to study the properties and possible applications of wood sugars and lignin produced at the Graanul Biotech demo plant. The training of top specialists was also developed further. The training of specialists that have work experience both in a research laboratory and in an industrial environment is crucial for the joint activities of universities and industry companies. Within the framework of a new program by the Estonian Research Council, Dr Rait Kivi, a researcher at the University of Tartu, started a two-year work project at the Graanul Biotech demo plant.

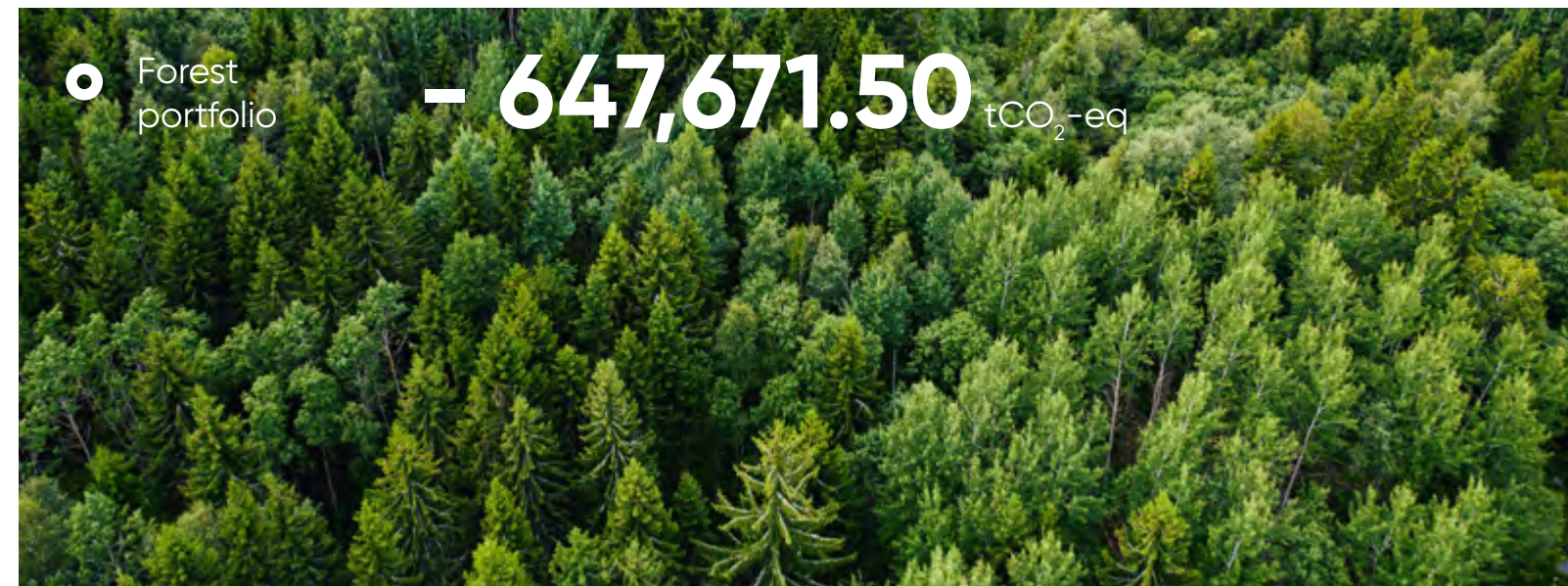
In 2020, the demo plant produced the first larger batches of wood sugars, and in connection with this, the core laboratory in Tartu also began to study their properties on a larger scale as a medium for cell factories in bioreactors. The ongoing doctoral project on the chemical valorisation of lignin also continued, with PhD student Kait Kaarel Puss focusing on studying the novel hydrolysis lignin.

The collaboration between the University of Tartu and Graanul Biotech also sets an important example for other universities and companies. The initiative has a huge socio-economic impact, terms of industrial competitiveness as well as training and employment. For example, the University of Tartu's core laboratory is also starting to teach wood chemistry at the master's level. It is clear that this field is gaining a lot of popularity among young people."



All groups combined

Total footprint
– 311,832.42 tCO₂-eq



Graanul Invest Group remains carbon negative at the property level.

Although we have already achieved the ultimate carbon objective, this does not mean that we can rest on our laurels for the next two decades. As the three main activities of the Group were separated at the end of 2020, each of the new companies must now achieve its environmental goals independently.

As Graanul Biotech has reached a point where production has created its own value chain, we will aim to introduce a clear calculation methodology for reporting our production carbon balance in the future.

Occupational safety

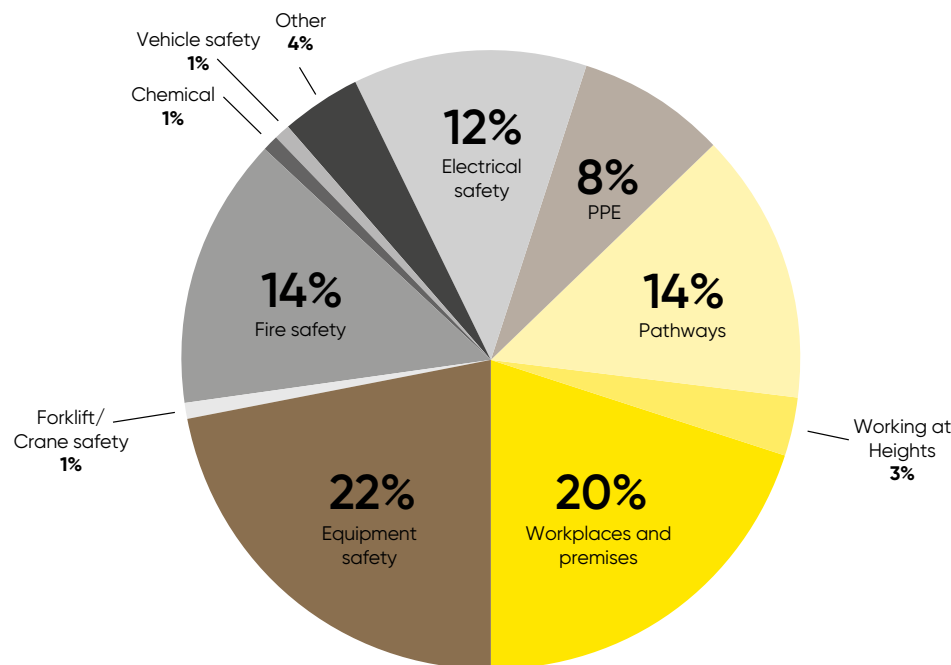
Graanul Invest has developed an application that aims to improve occupational safety monitoring. This interactive software makes it easy to detect irregularities or anomalies in plants, thereby reducing accidents, increasing occupational safety, and significantly improving awareness.

During quarterly internal audits, a total of 252 occupational safety findings were recorded across the Group. Due in no small part to the application, the occupational safety indicator has improved by 8% compared with 2019. This is an encouraging step forward, brought about by consistency, transparency and the widest possible areas of occupational safety monitoring. These include pathways, lifting work, chemical safety and more.

According to the occupational safety measurement system, which takes into account workplace accidents, internal audit findings and the number of employees, the Group had an average rating of 0.75 (compared with 0.81 in 2019). The best results were at 0.51.

In 2020, the Group had 0.85 workplace accidents per 100 employees (6 occupational accidents per 700 people). In 2019, this figure was 1.18. The number of workplace accidents has slightly decreased (by 2 compared with 2019), as has their severity (all accidents were minor in 2020). Plants based in Estonia had good results, having had no workplace accidents in 2020.

Risks and dangers



COVID-19 prevention

Well-functioning systems and shifts made it possible to keep plants running without high infection rates. While COVID-19 does affect Graanul Invest's operations, we do our best to limit the number of infections and keep the plants running smoothly. The COVID-19 prevention measures we have in place are similar to all other companies that actively follow the instructions of the Estonian Health Board. Reduced and dispersed teams and protective equipment were an effective tool, but in the end, what made a real difference was the carefulness and responsible behaviour of the employees themselves.

Business ethics

Our business principles have brought us our current team and mapped the most important partners who share similar views and enable us to apply them ever more widely. Our goal is to create a safe working environment and an ecofriendly and efficient production process that allows us to create the best quality, environmentally friendly products. Graanul Invest and all its direct and indirect subsidiaries are committed to ethical business practices regardless of location. We comply with all applicable anti-bribery and anti-corruption legislation in all the jurisdictions in which we operate. We also monitor our suppliers to make sure they do the same.

ENVIRONMENTAL FOOTPRINT

Our goal is to reduce emissions. The collection and destruction of pollutants are very important, but any process or technological solution must first and foremost create as little pollution as possible. We closely monitor compliance with the applicable environmental regulations in companies, and we constantly measure pollution and resource use indicators. When making decisions and investments, we always assess their potential impact on the environment.

A COMPETENT TEAM

The people who work at Graanul Invest Group are one of our most valued pillars. Our team consists of employees with the required qualifications. We actively train our people to raise awareness of proper conduct related to quality, the environment, energy efficiency, occupational health and emergency response.

RELIABLE PARTNERS

We cooperate only with partners that operate according to the same quality, environment, energy efficiency and occupational safety principles as we do. We only use suppliers who comply with sustainable forestry standards and offer products that meet the requirements. We expect our partners to conduct regular third-party inspections and encourage mutual checks.

QUALITY

We find quality to be essential in both products and the company itself. We manufacture our products in accordance with the requirements of the market and our clients, and we always ensure consistent and timely deliveries. We always welcome criticism and suggestions from clients and stakeholders and improve our systems accordingly.

CONTINUOUS DEVELOPMENT

We set our short-term and long-term goals according to the company's core values and performance indicators. We constantly monitor our performance and regularly review our goals to ensure continuous development. We encourage the involvement of experts and third parties in our company to identify bottlenecks and assess the impact and relevance of objectives or improvements.

TRANSPARENCY

Increasing transparency and reducing the risk of corruption are an integral part of our operations. We are constantly raising awareness, entering into contractual relations, enabling electronic payments and conducting frequent audits. In doing so, we have created a system that does not allow any unethical behaviour in our value chain.

