Market Research Report

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By

Group 205

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Introduction

With the ambitious sustainability goals of the European Union for 2030 and 2050 fast approaching, the pressure to transition towards renewable and sustainable practices is growing across industries. By 2030, the EU aims to achieve a 55% reduction in greenhouse gas emissions, and by 2050, it envisions a fully climate-neutral economy [1]. Even through much of the focus has been placed on renewable energy, the biobased materials (organic substances derived from renewable sources) represent a critical area in achieving these objectives.

In the eastern Netherlands, the BEON Foundation supports companies in adopting sustainable practices, including the production of biobased materials. However, while the region has made strides in renewable energy, there remains limited insight into the adoption and potential of biobased materials. Understanding the current state of production, the roles of key players, and the challenges they face is essential for transitioning away from fossil-based materials and aligning with EU sustainability targets.

The objective of this research is to map the biobased material landscape in Overijssel and Gelderland, providing an inventory of companies involved, analyzing their supply chains, and identifying opportunities and barriers for sustainable growth. These insights will support BEON and its member companies in advancing their sustainability efforts and realizing the yet untapped potential of biobased materials.

Main Question

To ensure that the research provides BEON with the correct information and results, a main question was formulated to encompass everything described in the previous section:

“What is the current situation and the potential for development of the production of biobased materials in the Overijssel and Gelderland provinces in The Netherlands?”

The information in this report is partially based on information obtained during interviews with twelve biobased companies. For further information, see the following documents:

- *Supplementary document 1 Interview Transcripts of Biobased Companies in the East of the Netherlands.*
- *Supplementary document 2 Interview Analysis of Biobased Companies in the East of the Netherlands.*

Contents

1. Method

To conduct this research a structured approach was adopted, combining various tools and methodologies to gather and analyze data on the biobased materials sector in the Overijssel region. The project plan was developed using the "Bouwstenen" tool (see figure 1 in appendix) which provided a framework for setting clear objectives, identifying stakeholders, and outlining key tasks.

The initial phase involved literary research to establish a theoretical foundation. This step included reviewing existing materials, company data, and sector-specific studies to provide the necessary background for understanding the biobased material landscape. Building on this foundation, experts and industry professionals were consulted for practical insights into biobased products and their production chains creating a connection between theoretical knowledge and real-world applications.

The research further involved conducting interviews with 12 companies operating within the biobased materials sector. These interviews provided in-depth insights into the challenges, opportunities, and dynamics faced by the industry, offering a more comprehensive view of the current situation.

Following data collection, the results were presented in an exhibit format to stakeholders, requesting feedback for refinement. This step ensured the validity of the findings and allowed for additional input to improve the research outcomes. Finally, the data was analyzed through SWOT analysis to evaluate the strengths, weaknesses, opportunities, and threats within the sector and to identify areas for improvement.

2. Stakeholders

In the Overijssel region and beyond many companies and organizations are working towards a more sustainable and eco-friendly future. Initiatives such as BEON (Bio based raw materials and sustainable energy eastern Netherlands) and Building for Good bring together stakeholders focused on using natural and recycled materials in sectors like construction, textiles, packaging, and more. Below is an overview of companies and partners involved in these initiatives, highlighting their activities and the materials they work with.

2.1 Table of Stakeholders

An overview of all the (biobased) companies and partners found is added to the appendix in the form of a table. Information of 100+ companies is found in this table. This overview can be found as “Table 1” in the appendix.

2.2 Materials used

The listed organizations and companies demonstrate a wide range of innovations and expertise in bio based and sustainable materials. These materials, such as hemp, flax, and recycled textiles, not only reduce environmental impact but also offer unique properties like insulation, durability, and biodegradability. Below is an overview of the most commonly used and notable materials, contributing to a circular and sustainable economy [2].

Hemp

Figure 2 & 3. Examples of Hemp

Hemp is a versatile, sustainable material widely used in construction for its ecological benefits. It grows quickly, requires minimal water, and thrives without pesticides, making it an eco-friendly choice. Known for its excellent thermal and acoustic insulation properties, hemp is often used in energy efficient and soundproofing applications. Additionally, hemp can be combined with other natural materials, such as lime or straw, to create durable, eco-friendly construction solutions. This makes hemp a vital resource in promoting sustainable, circular building practices [2].

PLA (polylactic acid)

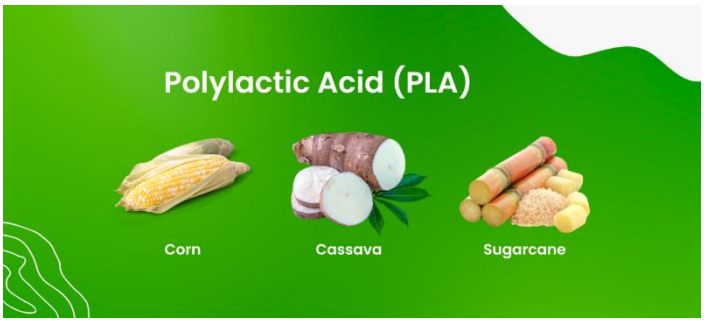


Figure 4. Examples of PLA products

PLA (polylactic acid) is a biobased plastic made from renewable resources such as corn starch or sugarcane. It has a low environmental impact, is biodegradable, and offers a sustainable alternative to traditional plastics. PLA is commonly used in packaging and construction due to its eco-friendly properties. It can be combined with other natural materials, like flax, to enhance its performance for various applications. PLA plays a crucial role in promoting a circular economy by reducing plastic waste and supporting sustainable industry practices. Its versatility makes it an essential material for a more sustainable future [3].

Straw

Figure 5 & 6. Examples of Straw

Straw is a biobased material gaining popularity in construction due to its excellent insulating properties and sustainability. It requires minimal resources to grow, is biodegradable, and contributes to a circular economy. Straw is used for insulation, wall construction, and as a base material in eco-friendly building projects [4].

As a sustainable option, straw plays a significant role in reducing the ecological footprint of the construction sector. It supports circular building practices by offering renewable, low-impact alternatives to traditional materials. Its unique properties make it an ideal choice for eco-friendly construction solutions, helping to drive the shift towards more sustainable building practices [5].

Miscanthus

Figure 7. Example of Miscanthus

Miscanthus, or elephant grass, is a fast-growing biobased material known for its excellent insulating properties. It requires minimal water and fertilizers, and is biodegradable, making it a sustainable alternative to traditional building materials. Miscanthus is used for insulation and as a base for circular building solutions, reducing the ecological footprint and promoting more sustainable construction practices [6].

2.3 General advantages of Biobased products

The case for biobased materials in the Netherlands aligns closely with its sustainability goals, particularly reducing carbon emissions and meeting climate targets by 2030. These materials, derived from renewable sources like plants, algae, and agricultural residues, offer a sustainable alternative to fossil-based materials by ensuring a replenishable supply and reducing dependency on finite resources [7] [8].

Biobased materials significantly lower carbon emissions, with studies showing they produce 37% to 52% less CO_2 than fossil-based products [9]. Plants absorb CO_2 during growth, storing carbon in a stable form and contributing to the natural carbon cycle. While not achieving net-

zero emissions, biobased products provide a critical step toward reducing fossil fuel reliance and mitigating climate change.

These materials can be sourced from waste streams or dedicated crop cultivation, repurposing agricultural residues and food waste into valuable products. This process captures and sequesters carbon, reducing emissions and promoting a circular economy [10]. Additionally, biobased products, particularly bioplastics, have better end of life options such as recycling, composting, and conversion into bioenergy, minimizing landfill waste and supporting sustainability [11].

The Dutch government's circular economy goals, including a transition to renewable products and reducing waste, create a favourable market for biobased materials. Initiatives like phasing out coal energy, promoting biobased energy generation, and redesigning products with circularity in mind further drive this momentum. Policies from the national Climate Agreement and sector-specific directives underscore the commitment to renewable alternatives [12].

Biobased materials advance a sustainable economy by reducing waste, supporting circular practices, and lowering carbon footprints. They repurpose waste into valuable resources, reduce reliance on fossil fuels, and offer improved recyclability, making them a key component of the Netherlands' sustainability efforts.

3. Sectors

In this chapter, the top 5 biobased sectors are highlighted in 4 distinct aspects. Each sector will show: The current situation, the struggles inherent to that situation, the goals and advantages and the improvements BEON could implement.

3.1 Textiles

1. Situation right now

When classifying textile fibres, the main distinction made is between natural and synthetic fibres. Natural fibres can be made from cellulose (e.g. cotton, flax, hemp, etc.) or protein (e.g. wool, cashmere, silk, etc.), but all fall into the category of biobased materials. Synthetic fibres can be made from natural polymers, such as rayon or lyocell, which thereby are also biobased materials. However, there are also synthetic fibres which are made from synthetic polymers (e.g. polyester, nylon, elastane, etc.) which are made from fossil feedstock [13] . As can be seen in Figure 8, synthetic fibres made up 67% of the global textile output in 2023. The most represented synthetic fibre was polyester, with 57% of the global output, followed by polyamide with 5%, leaving the other 5% to all other synthetic fibres. Cotton is the most represented natural fibre, and the second most represented overall, with 20% of the global output [14].

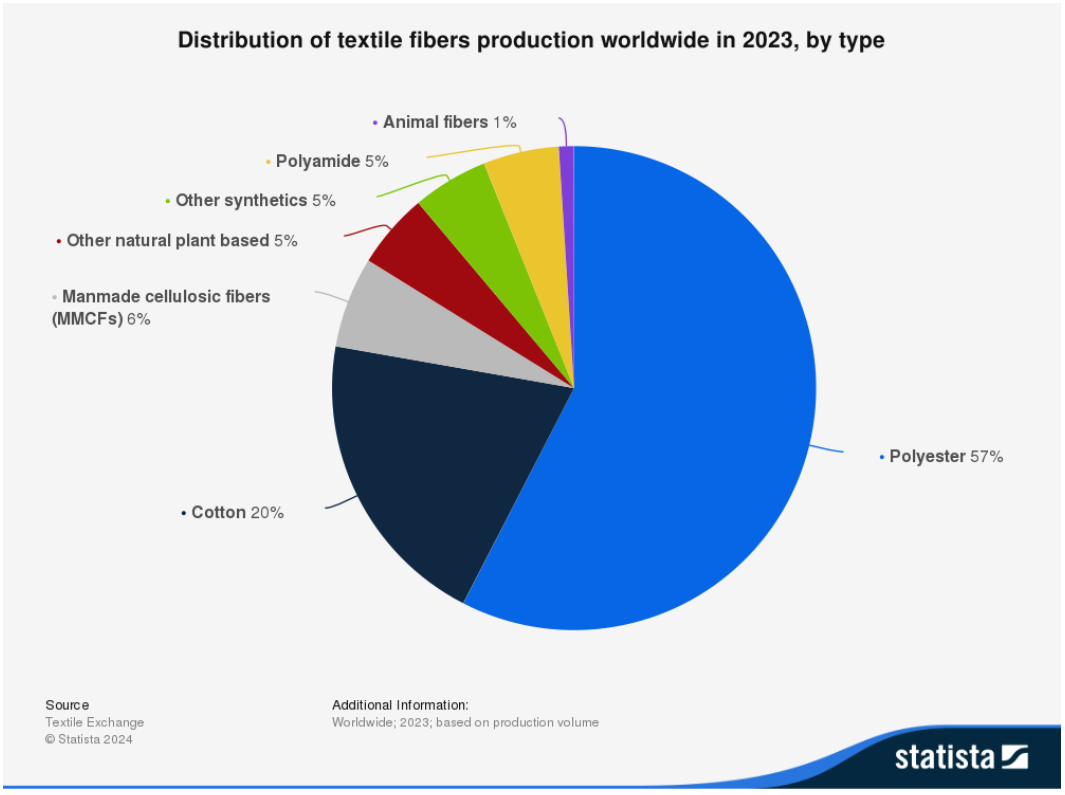


Figure 8. Distribution of textile fibers production worldwide in 2023, by type [14]

The impact of the fashion and textile industry on the environment is clear, as it is estimated that the manufacturing and retail of textile products will produce 1.24 billion metric tons of carbon dioxide equivalents in the year 2023, with the majority of these emissions happening during the manufacturing process [15].

In their article, Gonzalez et al [16] compare the environmental impact of natural and synthetic fibres using life cycle assessments (LCA). They compared polyester, cotton and other natural fibres in all product life stages and concluded that while cotton is more resource-intensive in the raw material phase, due to the large amounts of water, pesticides and land use, polyester is more energy intensive and has a higher global warming potential (GWP) due to the use of petrochemicals and synthetic processes. The article also considers the product end-of-life, mentioning that in The Netherlands, 67% of discarded clothes go into a municipal waste incinerator, which is an energy intensive and highly emitting process.

2. Struggles

Textiles are a group of fibres that are used in a wide variety of products like: clothing, curtains, carpets, and towels. Especially clothing is a large part of the textile industry. However, many textiles suffer from all kinds of environmental challenges. Used textiles tend to waste away in landfills, which cause a lot of local environmental damage. Because of this, introducing more sustainable textiles is an important part of a sustainable future. There are, however, some challenges that prevent rapid growth of sustainable textile industry; one of these challenges is a lack of knowledge about sustainable textiles among consumers and producers. Many producers are unaware of the true sustainability of their products which limits their ability to adapt their supply chain in more ecologically friendly ways. Consumers can often struggle to find eco-friendly textiles or are unaware that such options exist, putting a light on the production pathway of sustainable textiles. Spreading knowledge of sustainable textiles among consumers can help to mitigate these problems and increase demand for sustainable textiles [17].

3. Goals and advantages

Due to the high impact of the textile industry, the European Union introduced the “EU Strategy for Sustainable and Circular Textiles”, in which The Commission lays out a set of actions to help achieve a more sustainable textile industry by 2023. Some of the actions described include setting design requirements for textiles to improve longevity and recyclability, requirements for minimum recycled content, introducing the Digital Product Passport and setting mandatory Extended Producer Responsibilities (EPR) for all member states [18]. In the Netherlands, the EPR requirements set for textiles apply to both producers and retailers of textile products (second-hand textile retailers are not included). The EPR holds the producers responsible for their products during the whole product life cycle, requiring them to collect the products after the end-of-use, recycle the collected products for use in new textile products or process them with the most sustainable available technologies if reuse is not possible [19] . The EPR targets in The Netherlands for reuse and recycling are shown in Figure 9.

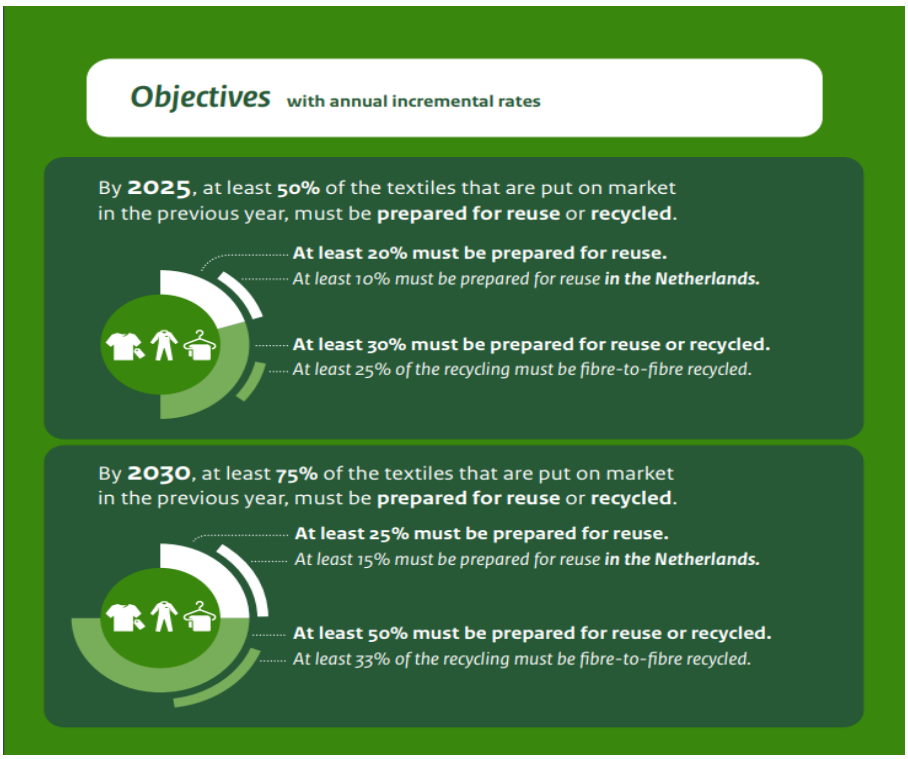


Figure 9. EPR targets for reuse and recycling in The Netherlands [20].

4. *Advice for the East of the Netherlands*

1. **Set up a pick-up system for old textiles to recycling companies:** Implementing a pick-up system that collects old textiles and delivers them to recycling companies can help reduce textile waste. This system makes it easier for consumers to recycle their clothes, contributing to a more circular textile economy and reducing landfill pressure.
2. **Reward giving textiles back to producers/recycling companies with discounts/gift cards:** Encouraging consumers to return textiles to producers or recycling companies can be incentivized with discounts or gift cards. This approach motivates people to recycle their old garments, helping to reduce waste and promote the use of recycled materials in new products.
3. **Allow fossil-made fibres only for high-performance fabrics:** Fossil-based fibres should be restricted to high-performance applications, such as in sports, medical, or fire-retardant fabrics. This ensures that sustainable fibres are used in everyday clothing, while fossil-based materials are reserved for specialized uses where performance is critical.
4. **Promote under-consumption:** Promoting under-consumption in the textile industry is key to reducing overproduction and waste. By encouraging consumers to buy fewer, higher-quality items and reduce fast fashion, we can minimize environmental impact and support more sustainable consumption patterns.

3.2 Construction

5. *Situation right now*

Build sight released a report for the government about the current market share of biobased materials within the housing construction sector from 2021-2023 [21].

Table 2: Material usage in housing construction [21]

	Biobased	Ceramic	Plastic	Metal	Mineral	Total
Main load-bearing structure	4,388	742	83	16	128,656	133,885
Inner load-bearing wall	1,101	232	6	4	27,149	28,492
Facade, inner cavity	995	219	-	6	46,604	47,824
Single-layer facade	951	263	77	6	5,508	6,805
Party wall	1,341	28	-	-	49,395	50,764
Insulation	83	0	50,254	0	58,682	109,019
Sloped roof insulation	59	-	1,089	-	15,776	16,924
Single-layer facade	15	-	3,816	-	1,672	5,548
Facade-closing elements	-	-	-	-	6,580	6,580
Cavity insulation	9	-	10,254	-	10,254	44,812
Flat roof insulation	-	-	35,050	-	105	35,155
Frames	23,049	0	13,281	36,873	0	73,203
Inner frames	849	-	-	22,834	-	23,683
Facade frames	22,200	-	13,281	14,039	-	49,520
Total	27,520	742	63,618	36,889	187,338	316,107

Figure 10 Shows the percentage of materials used in construction projects in Netherlands from 2021 till 2023. biobased materials are currently spotted in about 9% of the total materials used in houses on construction sights.

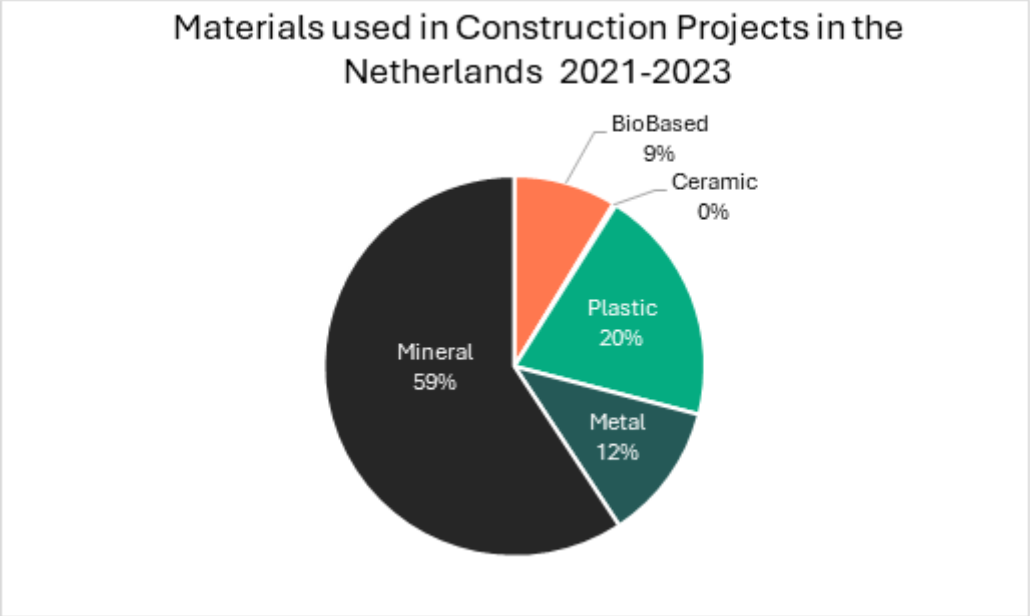


Figure 10. Materials used in construction projects in the Netherlands 2021-2023 [21]

Figure 11 shows how much of the categories is currently biobased percentagewise. The percentages are calculated using table 2. Despite their growing popularity, biobased materials are underrepresented in main load-bearing structures (3%) and insulation (<1%), Which means there is a potential for innovation and market growth.

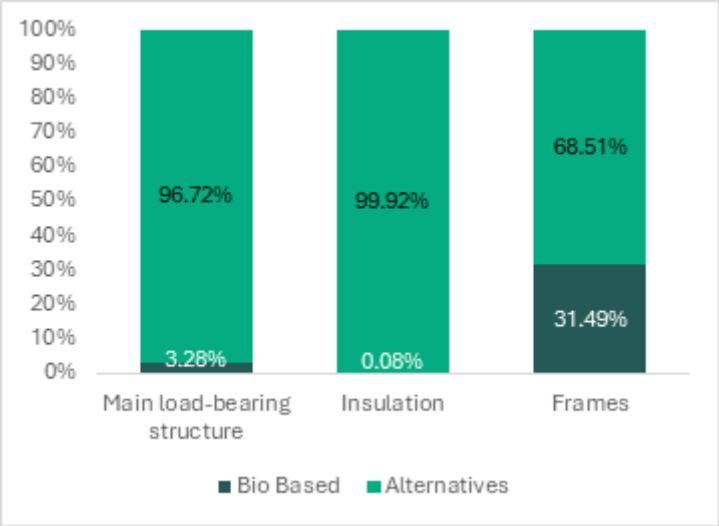


Figure 11. Percentages of biobased materials in different aspects [21]

Insights and observations

- The high usage of biobased materials in frames is not surprising, as wooden frames have been common in houses even before the push for more sustainable building practices.
- Despite the availability of good biobased alternatives for insulation, as observed during interviews and the BEON day, their usage in construction remains low. This means there is a gap between available technology and market adoption.

Company Interviews

4 companies were interviewed in the biobased construction sector: Van de Bunt Isolatietechniek, Hemp wood Nederland, Vakgroep Strobouw, and Dikat Prefab Biobouw (see supplementary document: Interview transcripts). These companies are small enterprises, each with fewer than 10 employees, and are based in the Netherlands. They are pioneering the use of locally sourced biobased materials such as straw, hemp, and wood.

- **Van de Bunt Isolatietechniek:** Sources straw from local farms and agricultural waste. The cellulose used in their insulation products is derived from recycled paper and other plant-based materials.
- **Vakgroep Strobouw:** Sources straw and hemp from local Dutch farms. The wood used in their construction projects is also locally sourced, often from sustainably managed forests.
- **Dikat Prefab Biobouw:** Sources wood from local forests that are managed sustainably to ensure a continuous supply of raw materials. The straw used in their prefabricated building elements is obtained from nearby agricultural operations, making use of agricultural by-products that might otherwise go to waste.
- **HempWood Nederland:** Sources hemp locally within the Netherlands. They produce wood substitutes from hemp, emphasizing local sourcing and sustainability. Their efforts to establish a production facility in the Netherlands aim to reduce reliance on imports and improve sustainability.

6. Struggles

Through the interviews it was shown that public perception around biobased materials is often not up to date with the recent innovations of this sector. According to Peter Davids from Prefab Strobouw the construction sector is still relatively traditional and seems less receptive to biobased innovations. The construction sector, according to Peter, needs more proof of the advantages and safety potential for straw housing. The consumer also needs to be convinced of these aspects before demand can rise. According to Dikat, product image is especially important. Dikat is performing tests to try and proof the fire safety of their products, which are straw foundations.

7. Goals and advantages

In 2030, 30% of the total housing construction sector should use biobased materials as established in the NABB (“Nationale Aanpak Biobased Bouwen. translated: National Approach

to Biobased Construction). This is to reduce and capture CO_2 emissions to achieve the goals set by the government [22].

According to Plantics and Van de Bunt isolatietechniek, many biobased products in construction are non-toxic. The materials are safer for both consumers, construction workers and the environment. For example, biobased resins and insulation materials can improve indoor air quality and reduce health risks associated with traditional materials.

8. Advice for the East of the Netherlands

1. **Validate that biobased materials are better:** reliable research is needed to actually support the claims that biobased materials are superior to fossil-based materials, especially regarding health benefits. According to insights from the straw construction research group, building with biobased materials creates healthier environments. This reinforces the importance of adopting these materials for both sustainability and well-being.
2. **Promote resting fields to biobased production:** Promote resting Fields for Biobased Production. Fields that are not used for food production can be repurposed for growing biobased materials like hemp or flax. Promoting this practice helps reduce waste, supports sustainable production, and eases pressure on agricultural land. Greater focus on this opportunity is key for a more sustainable future.
3. **Stimulate larger industry rather than smaller.** Supporting larger industries makes more sense than focusing on small businesses, as they have a greater impact on the zoumarket. Larger companies can scale solutions more effectively, drive wider adoption of sustainable practices, and influence industry-wide changes, making them more valuable for driving significant progress.

3.3 Bioplastics

9. *Situation right now*

Due to the rapid growth of the plastics market (shown in Figure 12) and the environmental concerns that come with it, the bioplastics market has grown as well, as a sustainable alternative [23]. Bioplastics are often regarded as a more conscious option than their fossil feedstock counterparts, as they reduce the dependency on fossil resources and to reduce greenhouse gas emissions [24].

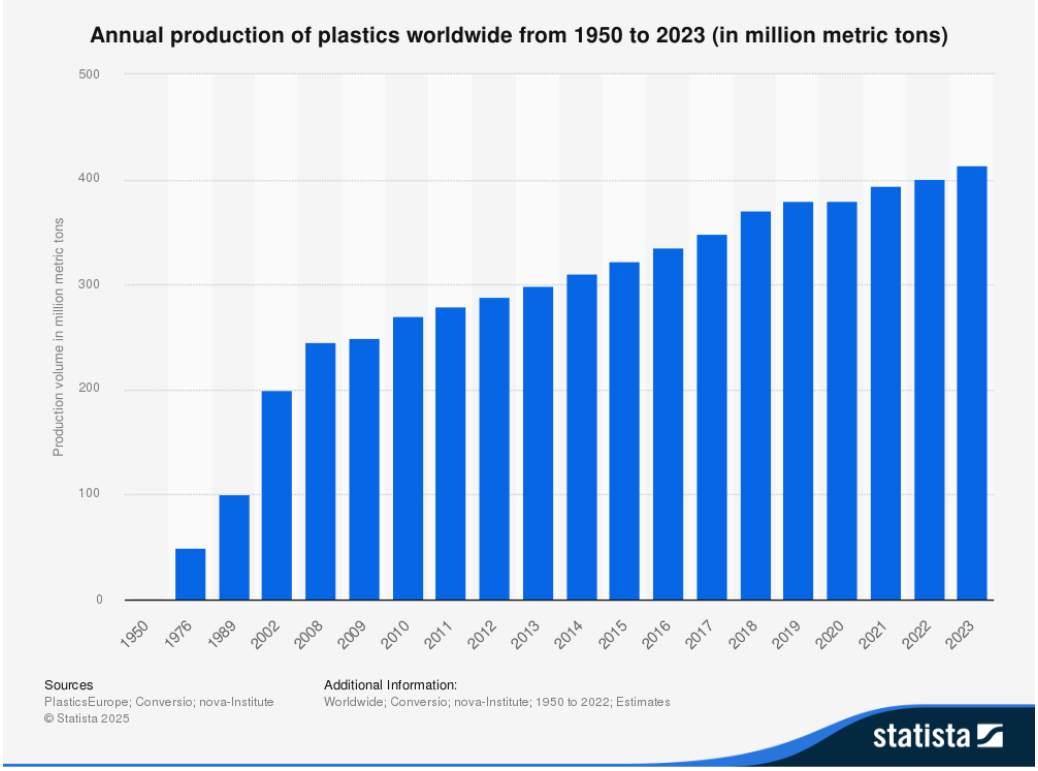


Figure 12. The growth of the plastics market since 1950 [25].

However, bioplastics still only make up approximately 1% of the plastics market . Figure 13 highlights the different market segments within the bioplastics industry and their production capacity in 2023. Flexible packaging accounted for the highest number of bioplastics produced, with 591,000 metric tons, followed by rigid packaging accounting for 337,000 metric tons in 2023. In 2022 the two leading bioplastic materials were polylactic acid bioplastic (PLA) and bioplastic starch blends which accounted for 20.7% and 17.9% respectively of the global bioplastics production capacity [23].

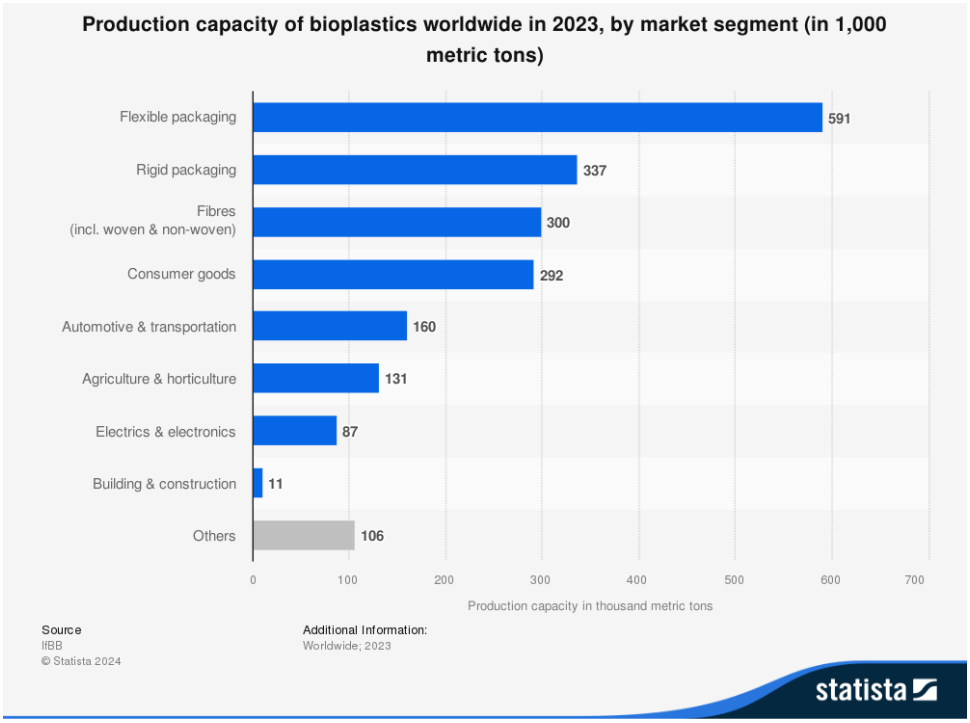


Figure 13. Production capacity of bioplastics worldwide in 2023, by market segment [26].

10. Struggles

Although many, but not all, bioplastic materials are biodegradable; the biodegradation often only occurs in specific environments not accessible to many communities. Some bioplastics also leech harmful chemicals causing biodegradation to release them [23]. It also contributes to deforestation, as can be seen in Figure 14, the area of land used to grow feedstock for bioplastics is expected to increase.

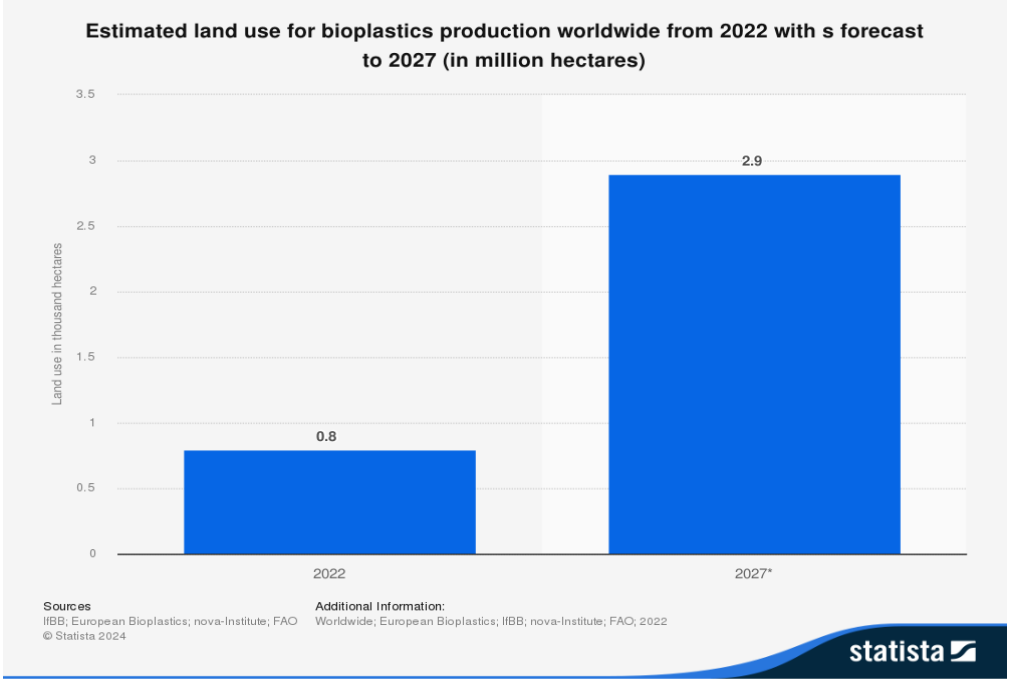


Figure 14. Estimated land use for bioplastics production worldwide from 2022 with a forecast to 2027 [26].

11. Goals and advantages

Although there are currently no legally binding regulations regarding bioplastics in the EU, there are some relevant laws in place [27]; the directive on single-use plastics ensures that single-use plastic products for which affordable and available alternatives are available cannot be placed on the market and the directive on plastic bags, which was put in place to reduce the consumption of lightweight plastic bags [28] [29]. Additionally, the European Commission put a policy framework for the sourcing, labelling and use of biobased plastics, the goal of which is to improve knowledge about these materials to ensure that their impact on the environment is indeed positive [30].

12. Advice for the East of the Netherlands

1. **More products with a "statiegeld" system:** Expanding the use of a deposit return system ("statiegeld") for more products can significantly reduce plastic waste and encourage recycling. By implementing this system for more types of packaging, we can increase the reuse of materials, reduce littering, and promote a circular economy.
2. **Ban single-use plastic in the EU if it is not biobased:** Banning single-use plastic in the EU that is not biobased is essential for reducing plastic waste and replacing oil-based plastics. Shifting to biobased plastics would lower dependence on fossil fuels and help

transition to a more sustainable future by encouraging the use of renewable, environmentally friendly materials.

3.4 Green waste management

13. Situation right now

The waste processing industry in the Netherlands plays a crucial role in managing the country's waste and contributing to environmental sustainability. In 2020, the industry saw significant developments, with increases in composting and incineration, and a decrease in landfill use. The processing of vegetable, fruit, and garden (GFT) waste increased by 9%, with a total of 1.9 million tonnes processed. This includes 1.7 million tonnes of GFT waste and other organic waste such as green waste and swill. Approximately 0.7 million tonnes of compost were produced and 0.5 million tonnes of GFT waste were processed in digestion installations to produce biogas for energy generation. The total amount of waste incinerated in Dutch facilities was 7.6 million tonnes, a 3% increase from 2019. Of this, 6.5 million tonnes were from domestic sources, marking an 11% increase while 1.1 million tonnes were imported; a 30% decrease. The energy produced from incineration is used for industrial heating, greenhouse heating, and district heating. The amount of waste sent to landfills decreased by 14% to 2.0 million tonnes. Additionally, 0.4 million tonnes were used as construction material. The reduction in landfilled waste was primarily due to decreases in industrial waste, construction and demolition waste, shredder waste, asbestos, and waste from municipal wastewater treatment plants. In 2020, 2.7 million tonnes of contaminated soil were processed through cleaning, immobilization, or landfilling. Additionally, 1.8 million tonnes of dredge material were processed, with 6.3 million tonnes directly applied to the (water) soil [31].

An interview was conducted with Twence and Reterra (see Suplementary document: Interview transcripts). They are important players in the green waste management market.

Twence

Twence is a prominent player in the waste processing and biomass sector in the Netherlands. The company operates primarily between Borne and Almelo, with additional facilities for manure treatment and solar parks. With approximately 250 employees, Twence processes around one million tonnes of waste and biomass annually, including 600,000 kilotonnes in waste-to-energy facilities.

Twence produces: Biogas, compost, biomethane, organic fertilizers, and ammonium water.They also have a Biomass power plant using construction and demolition waste as fuel.

Biomass and waste come mainly from the Netherlands and nearby regions in Germany with some imports from England and Italy for the energy facility.

Biowaste mainly comes from the Twente region and Achterhoek region. And waste wood from various parts of the Netherlands and Germany.

And Twence has a CO_2 capture plant capable of capturing 100,000 tonnes of CO_2.

Reterra

Reterra specializes in the waste processing of organic waste (GFT) and ABC wood into various soil and raw materials, with a primary focus on compost production. The company operates

from four locations in the Netherlands: Goor (head office), Zwolle, Geldermalsen, and Neerijnen, and employs approximately 30 people.

Reterra produces: Compost/potting soil, which is entirely biobased, made from organic waste, though it may contain up to 5% plastic. Organic waste is sourced from sawmills, residential areas, and fields and Materials that are brought in by individuals or transported by trucks.

Recycled potting soil as an alternative to peat, helping to save CO_2 emissions. (see supplementary document: Interview questions analysis, section on sustainability, subsection CO_2 reduction, discussion following figure 9).

14. Struggles

Green waste management is the method by which organic waste gets disposed or recycled. Green waste management is important otherwise the organic waste will be landfilled. Landfills are known for their environmentally damaging properties. This is why many governments are looking into stimulating green waste management in their countries [32]. There are however some barriers to the development of green waste management. We will discuss these barriers based on literature research. the barrier found is resource availability. Many companies that produce upcycled products suffer from a suddenly unavailable feedstock when the demand for their products remains the same [33].

15. Goals and advantages

Green waste processing plays a crucial role in the Netherlands' efforts to achieve its environmental and economic sustainability goals. As part of its broader circular economy strategy, the Dutch government aims to transition to a fully circular economy by 2050. This ambitious plan emphasizes sustainable resource use and waste reduction, with an intermediate goal to reduce the consumption of primary raw materials, such as minerals, fossils, and metals, by 50% by 2030. To achieve these targets, the Netherlands is enhancing waste management practices, particularly for organic waste, to improve recycling rates and further reduce landfill use [34].

The benefits of these efforts are clear. The transition to a circular economy is expected to contribute around €7.3 billion to the Dutch GDP and create around 54,000 additional jobs, demonstrating the economic potential of sustainable waste management practices [35]. Effective waste processing systems have already minimised the use of landfill to just 2-3% of total waste, significantly reducing the environmental impact and setting a global example for efficient waste management [36].

Green waste processing also advances circular economy principles by converting organic waste into valuable products such as compost and biogas [37].

Through its focus on innovation and efficiency in green waste processing, the Netherlands continues to set benchmarks for integrating sustainability with economic and environmental

resilience. These efforts highlight the country's leadership in realizing a sustainable, circular economy.

16. Advice for the East of the Netherlands

1. **Better distribution of nitrogen pollution in composting:** Spreading out production locations prevents high concentrations of nitrogen pollution centred in one area. By spreading the production locations companies can adhere to the legislation while still having the opportunity to grow.
2. **Encourage more people to separate waste:** Encouraging more people to separate their green waste is important for effective waste management. Proper separation enables better recycling and composting, reducing landfill waste and promoting sustainable practices.
3. **Innovate in new waste management technology:** Innovation in green waste management, such as enzymatic plastic digestion, can help process waste more efficiently. Recent technologies make it possible to break down waste better and convert it into useful products, reducing the ecological impact of green waste.
4. **Develop specialized machines for separating composites**: Developing specialized machines for separating composites in green waste contributes to better waste management. These machines increase the efficiency of sorting dissimilar materials, ensuring more effective and sustainable processing of green waste.

3.5 Packaging

17. Situation right now

The packaging market is not a well-documented market in the Netherlands. There are no clear estimations on how large the biobased packaging market is.

There are a lot of packaging subgroups. The market is expected to grow due to policy changes. One such change happened 2024 with the ban of disposable plastic cups and meal packaging for catering establishment, festivals, and offices [38]. Reusable plates and cups will then be the norm to prevent environmental pollution and plastic soup. Many catering establishments switched to paper and wood alternatives for example, paper straws.

On bioplastics some information was available. From there it is possible to make some estimations about how large the biobased plastic market is. In 2017 less than 1% of plastics were biobased [39]. And even less are biodegradable. 40% of the plastic market is packaging [40]. This Estimation shows how big the packaging market is and how relatively insignificant the biobased market in comparison. It can be concluded that currently the focus in the packaging market lays more on recycling and less on biobased products to advance sustainability.

Bio4Pack

An interview was conducted with Bio4Pack (see supplementary document: Interview transcripts). It is a small to medium-sized enterprise based in the Netherlands. With approximately 10-50 employees, Bio4Pack sources renewable resources like cellulose and bioplastics to produce their compostable packaging materials. Bio4Pack is at the forefront of innovation in the biobased packaging sector. They are dedicated to creating sustainable packaging solutions that reduce environmental impact.

18. Struggles

Biobased packaging is the packaging made from biological resources instead of fossil materials like petroleum. Biobased packaging is known for its sustainable feedstock and low CO_2 emissions. It is no wonder that many companies and governments are looking into expanding biobased packaging, as a means to address climate change. There are however some barriers that limit the expansion of biobased packaging. some of these barriers will be discussed here. The first barrier for biobased packaging is the higher permeability of many packages for water. Letting water in reduces the shelf life of many products and facilitates the growth of harmful microbes. Another barrier found is the biodegradability of the packaging. Although biodegradable packaging is often portrayed as an advantage, the reality is that this biodegradation sets in too early leading to food spoilage [41].

19. Goals and advantages

The Netherlands and the European Union are advancing efforts to promote biobased and fossil-free packaging as part of their sustainability and circular economy goals. In the Netherlands, the National Circular Plastics Standard (NCPN) mandates that, by 2027, all plastics produced in the country must contain at least 15% recycled or biobased materials. This standard applies to plastic polymers used in packaging and other products, aiming to reduce fossil resource dependence, minimize plastic waste, and increase the use of sustainable materials [42].

At the EU level, the Packaging and Packaging Waste Regulation (PPWR) adopted in 2024 emphasizes the role of biobased and compostable plastics in achieving circular economy and climate neutrality objectives. Biobased plastics help reduce greenhouse gas emissions by utilizing carbon absorbed during plant growth while compostable packaging, certified under standards such as EN 13432, improve organic waste management by reducing contamination in recycling streams and facilitating biowaste processing, especially in food packaging applications. Member States are required to establish bio-waste collection systems and composting infrastructure to support these efforts helping address existing gaps in waste management [43].

The benefits of this transition are significant; biobased packaging reduces environmental impact by lowering greenhouse gas emissions and reliance on fossil resources [44]. These materials integrate well into recycling systems and support the EU's goals for a circular economy through recycling, reuse, and waste reduction. Compostable solutions further enhance waste management by streamlining the processing of organic waste [43]. Economically, the shift to sustainable packaging fosters innovation and investment; creating jobs and new markets within the bioeconomy. It also helps businesses meet regulatory requirements while appealing to the growing consumer demand for environmentally friendly products [44].

Through initiatives like the NCPN in the Netherlands and the PPWR across the EU, biobased and fossil-free packaging is becoming a key strategy for reducing environmental impact, supporting sustainable growth, and advancing the circular economy [43].

20. Advice for the East of the Netherlands

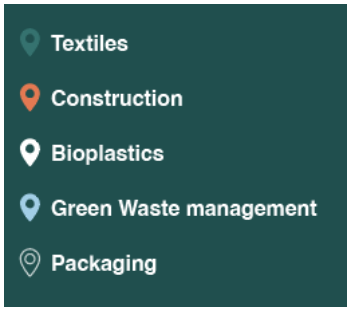
1. **Allow biodegradable food packaging in biowaste trash, allow advertising of this:** Biodegradable packaging should be allowed in biowaste trash, reducing waste and promoting sustainable solutions. In an interview with Bio4Pack, it was revealed that they were not allowed to label their products as suitable for biowaste disposal. Advertising this practice would raise awareness and encourage wider adoption of eco-friendly packaging.
2. **Packaging that is not biobased should be reusable**: Non-biobased packaging should be designed for reuse to cut down on waste. Reusable packaging promotes sustainability, saves resources, and supports a circular economy.

3. **Improved Regulations in the Food Industry:** Strict regulations in the food industry limit the use of sustainable materials. Relaxing these rules would allow for more ecofriendly packaging, reduce plastic waste, and speed up the shift to sustainable alternatives.

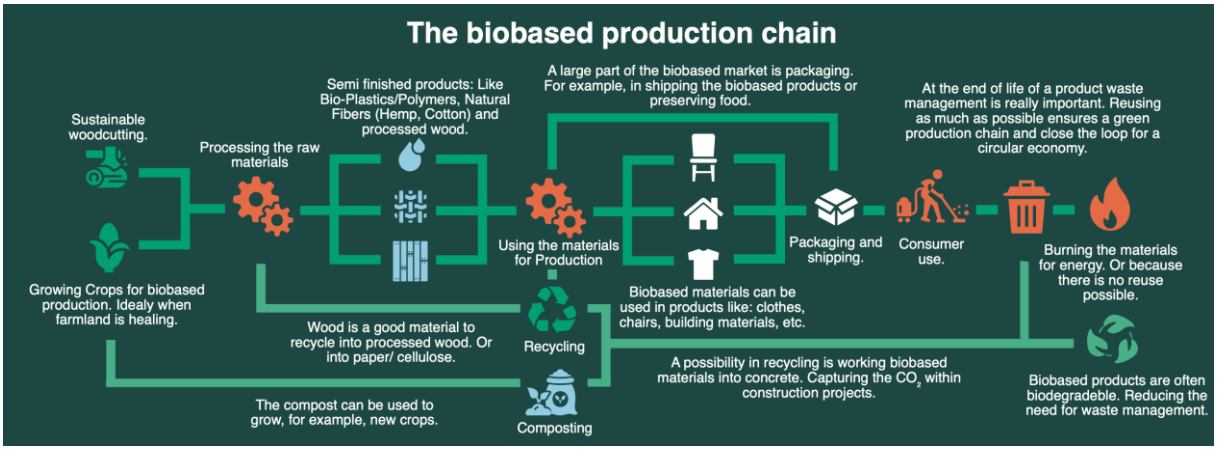
4. Analysis

In this chapter, we will investigate the Infographic of the interactive map and the SWOT Analysis.

4.1 Infograpic interactive map



This map shows the location of the twelve interviewed, biobased companies in the East of the Netherlands. They are colour categorised according to sector, as is shown in the legend above.



Here, the complete production chain for the biobased industry in the East of the Netherlands is shown. From feedstock to processing of the materials, to intermediate products which can be further used in the production process, to consumer use and the end-of-life stage. Waste management steps are also taken into account, and connected to the other parts of the production chain.

4.2 SWOT analysis

Strengths:

- **Collaborative Network:** BEON's partnership with diverse companies and institutions fosters innovation and resource sharing in sustainable energy.
- **Regional Focus:** Concentrating on Eastern Netherlands allows BEON to address local energy and climate goals effectively.
- **Events for people of interest:** BEON makes use of events that attracts people that are interested in a brighter future.
- **Green energy is the USP:** BEON needs to highlight that they want to promote the market of green or more products.

Weaknesses:

- **Dependence on Regional Collaboration:** Relying heavily on local partners might limit opportunities for broader collaborations and innovations.
- **The market price of biobased materials:** The price of these materials are substantially higher than the price for fossil products. This might be a problem when you look at the demand of these materials.
- **Downcycling of products:** Most of the products that are biobased are used for downcycling instead of recycling or upcycling.
- **Demand of biobased products is low:** The interviews we have taken with professionals show that the demand of biobased products is still too low to invest into new measures.

Opportunities:

- **Growing Demand for Sustainable Energy:** The increasing emphasis on renewable energy sources presents opportunities for BEON to expand its initiatives and influence.
- **Policy Support:** Alignment with national and EU sustainability goals can attract funding and policy support for BEON's initiatives**.**
- **Authorities have sustainability goals:** These goals might be an opportunity to get more people behind the idea of transitioning to biobased materials.
- **Adding companies to BEON:** If BEON has more companies added to their founding then they have a bigger platform that can result into tipping the scales for better subsidies or help in any other form to make the transitioning happen.

Threats:

- **Regulatory Changes:** Shifts in environmental policies or energy regulations could impact BEON's operations and project viability.
- **Competition for Funding:** With many organizations vying for limited sustainability funds, securing financial support may become challenging.
- **Companies are not willing to make a change:** Most of the companies which we have interviewed were not ready yet to take the leap into biobased materials. The most heard reason was the difference in price compared to the fossil products, and the demand for biobased materials was not high enough now.
- **Slow growth of the market:** The biobased market is growing currently, but it is not growing at a fast rate. The slow growth of the market is a threat for BEON because when the market changes to being in favour of biobased materials then the transitioning will go a lot faster.

Swot-analysis biobased materials

In the supplementary documents is a summary available of the strengths and weaknesses of biobased materials. A lot of effort is put into the processing of the interviews, and the information is very valuable for BEON. So if interested, check the following documents:

- *Supplementary document 1 Interview Transcripts of Biobased Companies in the East of the Netherlands.*
- *Supplementary document 2 Interview Analysis of Biobased Companies in the East of the Netherlands.*

5. Limitations of the research

While this research offers valuable insights in the biobased materials sector in the province Overijssel, several limitations have been faced in the research process and methodology, which must be acknowledged.

Starting with one of the main limitations, which lies in the selection of participating companies. Due to the constrains of being a student group, the companies that participated in the interviews were primarily those who were willing to engage with such a project. During the contacting phase, many companies declined their participation. Furthermore, due to the timeframe in which interviews were conducted, despite adjustments of the frame, some companies were not able to schedule a meeting, caused by busy calendars on their behalf. The response rate from contacted companies was lower than anticipated. Such limitation reduces the diversity of perspectives or insights from companies that may have different experiences or challenges.

Another limitation arises from the reliance on self-reported data during interviews with company representatives. Although these interviews provided valuable qualitative insights, the claims made were not independently verified which introduces the potential for bias. For example, statements regarding sustainability practices, production processes, or future plans were accepted at face value and could not be cross-referenced with external sources due to time constraints, this reduces the diversity of perspectives or insights from companies that may have different experiences or challenges.

Additionally, many of the companies interviewed were relatively small or new to the biobased materials field, reflecting the early-stage development of the sector in the region. While their focus provided insights into emerging practices also highlights that much of the production in these companies is not economically mature. As such, the findings may not represent the capabilities or challenges of more established players in the biobased materials industry.

Due to geographic data gaps further limitations were faced. While the primary focus was on the eastern Netherlands, much of the available literature and statistical data pertain to the Netherlands as a whole. This limited the ability to draw highly region-specific conclusions as broader national trends may not fully align with the dynamics of Overijssel. The research relied heavily on secondary sources for the literature review. While these sources provided a strong foundation for understanding the biobased materials sector, they may not fully capture the most recent developments or region-specific details; this reliance on existing data further underlines the need for future research to build on these findings and address gaps in knowledge.

6. Conclusion

The transition to bio-based materials in Overijssel and Gelderland plays a pivotal role in aligning with EU sustainability goals and advancing a circular economy. Bio-based materials offer a sustainable alternative to fossil-based resources, reducing carbon emissions and dependence on non-renewable materials. Despite promising developments across various sectors, challenges such as limited market demand, high production costs, scalability issues, and public misconceptions continue to hinder widespread adoption. Addressing these challenges through targeted policies, increased consumer awareness, and industry collaboration is critical to realizing the full potential of bio-based materials.

Textiles

The textile sector is a significant contributor to environmental challenges, with the fast fashion industry driving unsustainable levels of clothing production and waste. Although bio-based materials, such as natural fibers and recycled textiles, offer an eco-friendly alternative, the demand for clothing currently outpaces the bio-based market's ability to sustainably scale production. Limited consumer knowledge and producer awareness exacerbate these challenges. EU initiatives like the "Strategy for Sustainable and Circular Textiles" aim to address these issues, but fostering slow fashion practices, improving material durability, and incentivizing sustainable production are essential for progress.

Construction

In the construction sector, bio-based materials like hemp, straw, and wood demonstrate considerable potential. However, their adoption in load-bearing structures and insulation remains limited due to misconceptions about safety, durability, and cost-effectiveness. The "National Approach to Biobased Construction" sets ambitious goals for 30% bio-based material usage by 2030, offering a roadmap for progress. Public awareness campaigns, enhanced performance testing, and targeted subsidies can help overcome market resistance and accelerate the integration of bio-based solutions into mainstream construction practices.

Bio-Plastics

Bio-plastics offer a sustainable alternative to traditional plastics, reducing dependency on fossil fuels and lowering greenhouse gas emissions. Despite their potential, they account for only about 1% of the plastics market. Challenges include limited biodegradability in standard environments, competition with food-based feedstocks, and higher production costs. EU regulations, such as those on single-use plastics, provide a supportive framework for growth. However, expanding public knowledge of bio-plastics' benefits and investing in production innovation are crucial to increasing their market share and impact.

Green Waste Management

Green waste management is central to the Netherlands' circular economy strategy, transforming organic waste into valuable products such as compost and biogas. Leaders like Twence and Reterra demonstrate the sector's potential, yet challenges like inconsistent feedstock availability and limited public participation in waste separation remain. Innovations in waste processing technology and better distribution of nitrogen pollution can enhance sustainability. Public engagement campaigns and broader industry collaboration are essential to realizing the economic and environmental benefits of efficient green waste management.

Packaging

The packaging sector is transitioning toward sustainability, driven by regulatory changes and growing consumer demand for eco-friendly solutions. Bio-based packaging presents a promising alternative, but issues like water permeability, premature biodegradation, and limited scalability hinder its adoption. Policies such as the EU Packaging and Packaging Waste Regulation (PPWR) and the Dutch National Circular Plastics Standard (NCPN) encourage innovation and market growth. Allowing biodegradable packaging in biowaste streams, improving regulations for eco-friendly materials, and incentivizing reusable packaging are necessary steps to advance this sector.

Final Thoughts

While progress has been made in the adoption of bio-based materials across sectors, the region's transition to a sustainable, circular economy requires a coordinated effort. Stakeholders must address barriers such as public perception, market resistance, and infrastructure limitations. Strengthening collaboration, fostering innovation, and leveraging supportive policies will enable Overijssel and Gelderland to position themselves as leaders in the bio-based economy, setting a benchmark for sustainability in the Netherlands and beyond.

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Appendix

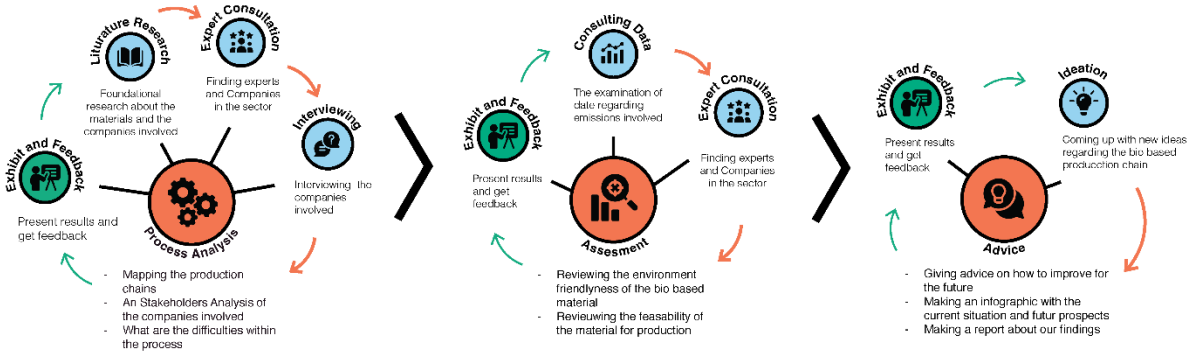

Figure 1: Bouwstenen

Table 1: overview of stakeholders in the biobased industry in the East of the Netherlands

1	EcoBouwSalland	Ecological building with natural materials.	Lime hemp, hemp wood, wheat and spelt or rye straw.
2	Dijkhuis	Construction biology contractor.	Wood, plasterboard, clay, timber frames.
3	Tala	Biobased houses.	100% bio-based (wood and others) or reused materials.
4	Enschede Textielstad	Weaving natural fabrics.	Recycled denim, recycled cotton (both post-industrial waste and post-consumer material), recycled PET, Tencel, hemp and flax.
5	Stichting TexPlus	Partnership between 6 Overijssel leaders in the field of circular textiles.	Reuse of textile.
6	SaXcell	Viscose/cellulose from textile waste (TexPlus).	Recycle of paper and cotton into new high-quality fibers.
7	Frankenhuis	Recycling of fibers for various industries (TexPlus).	Recycling of textile waste.
8	HempFlax	Industrial hemp production.	Hemp.
9	HAN Hogeschool	Has, among other things, a professorship in biobased innovations and a biocentre.	-
10	Plantics	Biobased thermoset resins and materials.	Hemp and recycled paper.
11	Paperfoam	Biobased packaging solutions.	Starch and fiber from paper pulp.
12	DunAgro Hemp Group	Industrial hemp production for insulation.	Hemp.
13	Duurzaam gebouwd	Sustainable construction knowledge platform.	-
14	Cato Composites	Production of composites (e.g. flax/PLA).	Flax in combination with PLA.
15	EcoBouwen	Professional finishing and plastering company for sustainable and ecological construction.	woodfiber, lime, marble, quartz, cement, resin, color pigments, and loam for plastering materials. As well as Cotton, sheepwool, hemp, and hemplime.
16	Hempwood Netherlands	Production of wood-like material from hemp.	Hemp.

17	Prefab Strobouw	biobased bouw met stro.	Straw and leam.
18	Van de Bunt isolatietechniek	Insulate in an environmentally friendly way.	Hemp, flax, sheeps wool, cork, and cellulose (recycled paper).
19	Vakgroep Strobouw	Association for professionals and private individuals with a passion for building with straw.	Straw and wood.
20	Price-CE	Circular Economy Practice & Innovation Center.	wood, hennep, flax, straw and the wild giant hogweed.
21	Dutch Green Building Council	National social organization that is committed to making the built environment future-proof at a rapid pace.	-
22	Starblock	Sustainable prefabricated houses.	CLT wooden construction, where 80% of the materials used can be reused infinitely in the chain.
23	Cirkelstad	Cirkelstad is the platform for leaders in the circular and inclusive construction sector who want to do things together, learn and meet each other.	-
24	Senbis	Senbis is Europe's leading innovator in fibres from bioplastics.	Biobased PLA.
25	Sustainable polymer innovation cluster (SPIC)	R&D facilities sustainable polymers (including bioplastics), financed by the government and Senbis.	-
26	Bio4Pack	Compostable packaging.	Starch, PLA and waste from rice paddies.
27	The Compound Company	Production biobased plastics.	Supply all kinds of semi or fully biobased plastics.
28	Windesheim Hogeschool	Plastics technology.	-
29	Green PAC	Partnership between knowledge institutions, companies and other organizations in the field of biobased and circular polymers. (Windesheim).	Biobased polymeren.
30	BKC	Green maintenance.	Miscanthus.
31	Foodvalley	In the Foodvalley region, entrepreneurs, educational and knowledge institutions and governments work together to create a healthy and sustainable region.	-
32	Achterhoeks Centrum voor Technologie (ACT)	Network organization for and by entrepreneurs in the manufacturing industry.	-
33	Versfabriek	Oyster mushrooms on coffee grounds.	Coffee grounds and oyster mushrooms.
34	Smurfit Kappa	Packaging.	Recyclable paper types.
35	Omlab	Biocircular material design studio Omlab.	Cellulose, kaumera and calcite.
36	Heijemans	Real estate, construction & technology and infrastructure.	Fiber hemp.
37	Circulus	Waste management overijssel gelderland.	-
38	Save Plastics	Upcycling plastic waste and wood products (replacing plastic).	Recyclen van plastics.
39	Dirk Jan van Dalfsen	Sheep wool as fuel.	second-grade sheep wool.
40	Wageningen	Research in the field of biobased fashion and fiber crops.	-
41	NoPalm Ingredients	Palm olie in voeding en cosmetica vervanen met reststromen industrie.	microbial oils produced through fermentation.
42	Dikat	Natural prefab & circular bowing with straw and wood.	Straw and wood.

43	GreenInclusive	GreenInclusive develops and makes products from natural and local raw materials, including hemp.	Hempwool.
44	Weever-sloop	Weever-Sloop is a Dutch demolition company that focuses on circular demolition and reuse of materials.	-
45	Rouwmaat groep	Rouwmaat Groep is a Dutch company active in the construction and sloop sector with a focus on sustainability and the circular economy.	-
46	Greenpaints	Green Paints is a Dutch company that develops paint with a focus on sustainability and the use of environmentally friendly ingredients.	linseed oil, hemp, soybean oil, sunflower oil and rice flour.
47	Circulair-Groningen	Circulair Groningen is an initiative that focuses on the fairness of the circular economy through reuse and the use of sustainable, biobased materials.	Wood, hemp, sheep's wool, bamboo and bioplastics.
48	Hekstra	Hekstra is a company that focuses on sustainable and circular building materials, with a focus on biobased raw materials.	Hemp, flax and wood.
49	Bouwakkoord staal	Bouwakkoord Staal is a Dutch company that focuses on the production process and application of sustainable steel.	-
50	Weever-circulair	Wever Constructie is a Dutch construction company that specializes in various construction projects, from residential construction to complex infrastructure, with a focus on quality.	Wood.
51	KEIM	KEIM is a German company specializing in the development and production of high-quality mineral paint and coating solutions for both indoor and outdoor applications.	Silicates and lime.
52	Makersfabriek	Makerfabriek is a Dutch company that produces sustainable, custom-made products using digital technologies such as 3D printing.	-
53	Kranendonk	Kranendonkvgo is a Dutch real estate company that focuses on the development and sustainability of commercial real estate.	-
54	Ijzerleeuw	IJzerleeuw is a Dutch company specialized in the development and production of high-quality steel constructions and installations for various industries.	Steel (not biobased).
55	Isolectra	Isolectra is a Dutch company that produces electrical installations and systems for industry and utilities.	Bioplastics.
56	Dunacro	Dunacro Hemp Group is a Dutch company that produces hemp for sustainable applications in various industries.	Hemp.
57	Deltion college	Deltion is a Dutch vocational education institute that offers practice-oriented training courses.	-
58	Breman	Breman is a Dutch company that specializes in technology, installation and maintenance for industry, utilities and residential construction.	-
59	Kingspan	Kingspan is a global company providing innovative insulation and building solutions	Hemp, Cellulose.

		with a focus on energy efficiency and sustainability.	
60	DuSpot	DuSpot is a Dutch company that offers digital solutions to efficiently match circular materials in the construction and infrastructure sector.	-
61	Calduran	Calduran is a company that produces sustainable concrete products for the construction sector.	Lime sand brick.
62	Mammoetgrasnoord	Mammoetgras Noord is a Dutch company that sells and distributes grass seed and greenery.	Mammoth grass.
63	Greenlabel	Green Label is a Dutch company that supplies sustainable products for the construction and interior design sectors.	Wood, hemp and cork.
64	Dynova	Dynova is a Dutch company focused on energy management and sustainability.	-
65	VBI Consolis	VBI Consolis is a Dutch company that produces prefabricated concrete structures for construction.	Concrete.
66	VVU Energie	VVU Energie is a Dutch company that offers sustainable energy solutions and solar energy.	-
67	Stichting-OPEN	Stichting Open is a Dutch company that focuses on promoting open and accessible data and knowledge sharing.	Recycle electrical appliances.
68	eeculair	Eeculair is a Dutch company that develops circular solutions, with a focus on the reuse of steel.	Sustainable steel.
69	HS Agri	HS Agri B.V. is an agricultural contracting company specialized in manure distribution, crop protection and earthmoving.	-
70	Carlisle SynTec Systems	A leading manufacturer of roofing and waterproofing systems, offering EPDM, TPO, and liquid solutions.	EPDM (Ethylene Propylene Diene Terpolymer), thermoplastic polyolefin (TPO) and ARBOFLEX PU.
71	Tala	A Dutch construction company specializing in designing and building circular houses using wood and other biobased materials.	Cross-laminated timber (CLT), Wood fiber insulation, Hemp insulation, Flax and Bamboo.
72	19 Het Atelier	19 Het Atelier is an architectural firm in Zwolle that focuses on realizing special, high-quality and sustainable architectural projects.	-
73	Weever-bouw	A construction company specializing in residential, commercial, and renovation projects with a focus on sustainability.	Biobased building products
74	Eurorail	A company specializing in the design, construction, and maintenance of railway infrastructure and rolling stock.	-
75	Petershout	A family-owned business in Bolsward specializing in timber trade, custom carpentry, and construction materials.	Wood
76	SOPREMA	Soprema is an international family-owned company specializing in innovative waterproofing and insulation products.	Bitumen, wood fibers, and polyurethane.
77	Sonkrag	A company specializing in solar panels, charging stations, and energy storage solutions.	-

78	LJ Solutions	LJ Solutions specializes in circular facade systems.	-
79	Concordia bouwcenter	A construction company offering a wide range of building materials, including wood, panel materials, insulation, concrete, and prefabricated products.	Cellulose, hemp, sheep's wool, flax, wood fibre boards, pressed wood fibre boards and timber frame construction materials (wooden beams and boards).
80	Zehnder	Zehnder is a company that offers solutions for an optimal indoor climate, with products such as ventilation systems and designer radiators.	Polyurethane membrane, wood fibre based insulation panels and polyphenolic extraction treatments.
81	IsoHemp	IsoHemp is an industrial manufacturer of sustainable products for the construction and renovation sector, specialized in hemp blocks for insulating, healthy and natural exterior walls, partition walls and curtain walls.	Hemp, air lime and hydraulic lime.
82	ABN AMRO	ABN AMRO is a Dutch bank offering a wide range of financial services, including banking, mortgages, and investment solutions.	-
83	Rabobank	Rabobank is a Dutch bank offering financial services in banking, mortgages, insurance, and investments.	-
84	Bouw bedrijf speelman	A construction company in Stadskanaal specializing in new builds, renovations, and refurbishments for both individuals and businesses.	Wood material, Profiled hardwood, Natural stone, Hemp and Sheep wool.
85	Vazet	Vazet is a construction company in Zwolle focused on the development and realization of homes, with an emphasis on sustainability and energy efficiency.	-
86	SW Vastgoedverbetering	SW Vastgoedverbetering focuses on the long-term preservation and sustainability of real estate.	-
87	Trivium	Trivium eSolutions is a software development company specializing in enterprise and industrial applications.	-
88	Skellet	Skellet is a Belgian company that develops a circular steel construction system, focusing on sustainable and reusable structures.	Steel.
89	COR	Adviesbureau COR supports businesses and governments in achieving a circular economy through sustainability services.	-
90	Aliaxis	Aliaxis Netherlands develops and supplies innovative plastic piping systems for water and energy distribution.	PVC (Polyvinylchloride), PE (Polyethylene), PP (Polypropylene), PEX (Crosslinked Polyethylene).
91	Claddingpoints	Cladding Point supplies high-quality insulated sandwich panels for facades, walls, and roofs.	PIR (Polyisocyanurate), EPS (Expanded Polystyrene), Mineral wool, Metal (for the outer layer) and Plastic (for the outer layer).
92	Adamas	Adamas is a supplier of high-quality diamond tools and machines for the construction sector.	-

93	Talen	Talen is one of the largest property maintenance companies in the Netherlands, specializing in maintaining, upgrading, and densifying homes and buildings.	Recycled material.
94	Alumet	Alumet specializes in anodizing aluminum, providing durable and aesthetically pleasing finishes for architectural applications.	Aluminum.
95	COFAC	Specialized in designing and producing aluminum composite facade elements for various applications.	Aluminum.
96	Insus	InSus is a company specialized in the production of insulation boards for floors, walls and roofs, with a focus on sustainability and efficiency.	PIR (Polyisocyanurate).
97	Groothuisbouwhuis	A family-owned company specializing in real estate development, construction, and management, with a strong focus on sustainability and circularity.	Reuse building materials.
98	Stadsmijn Achterhoek	Stadsmijn Achterhoek is an initiative that focuses on the reuse of building materials from demolition projects, with the aim of promoting the circular economy in the region.	Wood, metals, rock wool and bricks.
99	Hans van der Meijs	Hans van der Meijs B.V. specializes in the construction of cold stores, freezers and panels, with a strong focus on circular construction and the reuse of materials.	Metal, Rock wool, Polystyrene and Polyurethane (PUR) / Polyisocyanurate (PIR).
100	Bouw Novum	A company that focuses on realizing circular and flexible housing while preserving nature.	Cross Laminated Timber (CLT), Timber frame facades, Natural insulation and Biobased facade cladding.
101	Cyclin	Cyclin offers acoustic insulation panels that are completely circular and biobased.	Paper cellulose fibers.
102	Oost NL	Oost NL is a regional development company that supports companies in innovation and sustainability.	-
103	Gemeente Eemnes	Eemnes is a green municipality in the province of Utrecht, focused on sustainability and liveability.	-
104	Gemeente Steenwijker	Steenwijkerland is a municipality in Overijssel, with lots of nature and a rich history.	-
105	LTO	LTO Nederland is the business organisation for Dutch farmers and horticulturists, which represents the interests of 35,000 members.	-
106	Rietkracht Biomassa	Reed Power Biomass conducts research into the possibilities of using reed in various ways as a biobased product.	Reed
107	Deailin Green	Dealin Green connects farmers and builders to supply sustainable materials and carbon credits for the construction industry.	Paulownia (Kiri) wood and Miscanthus (Elephant grass).
108	WaardeRing	WaardeRing is a circular craft network that connects companies, educational institutions and organizations to promote circularity.	Recycled materials.

109	H&W	H&W Totaalbouw is a construction company from Friesland, specialized in new construction and renovation.	Hemp, flax, wood with the FSC or PEFC quality mark.
110	NIVO	NIVO Isolatiezorg specializes in eco-friendly insulation services, including cavity wall, roof, and floor insulation.	Wood wool, cellulose and EPS (expanded polystyrene).
111	Ansova	Specialized in powder coating steel constructions with a focus on quality and efficiency.	Steel.
112	Wijk Isolatie	Wijk Isolatie is a specialist in home insulation, including cavity wall insulation, floor insulation, ground insulation and roof insulation.	EPS (expanded polystyrene).
113	OOG Vastgoedadvies	OOG Vastgoedadvies biedt vastgoedadvies, -management en organiseert workshops.	-
114	Twence	Twence is a waste management company in Hengelo that converts waste and biomass into sustainable energy and raw materials, with a strong focus on the circular economy and energy transition.	Biogas, compost, biometane, organic fertilizr and ammonium water.
115	Reterra	RETERRA B.V., based in Goor, Netherlands, produces and supplies secondary biofuels and raw materials from biomass, such as waste wood and green waste, playing a leading role in the green chain under the motto "Energetic in nature and environment."	Organic waste and ABC wood.