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BUILDING THE NORTH SEA BIOBASED ECONOMY: INSIGHTS FROM REGIONAL INITIATIVES

Interreg North Sea

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INTRODUCTION

The transition to a sustainable, biobased economy in the North Sea Region (NSR) depends on the development of well-functioning local value chains. Understanding the status of biobased initiatives in each region is essential to identify opportunities, address challenges, and foster cross-border collaboration. By linking the strengths of one region with the gaps of another, the NSR biobased economy can scale more effectively, become more resilient, and support the broader green transition.

This report provides an overview of ongoing and past initiatives in the NSR, focusing on four key crops: flax, hemp, miscanthus, and cattail. For each initiative, we highlight the background of the initiators, partners, location, crops used, and objectives. We also examine key milestones, critical success factors, and insights that can inform further growth within the BBoBB framework.

In addition to showcasing best practices, the report includes some initiatives that faced challenges or did not fully achieve their ambitions. These cases provide valuable lessons on gaps in the value chain, regulatory and policy constraints, and the importance of aligning all stakeholders to ensure viable, circular biobased solutions.

By combining lessons from successes and challenges, this report aims to guide regional actors, designers, architects, and policy makers in strengthening biobased value chains, fostering innovation, and scaling circular solutions across the NSR.

LOWER SAXONY,

Best practice: Hanffaser Uckermark eG

Hanffaser Uckermark eG, based in Prenzlau, Brandenburg, is a leading example of how industrial hemp can support a regional, circular, and cooperative-based bioeconomy. Originally launched in 1996 as a private hemp factory by Rainer Nowotny, it became a cooperative in 2013, combining democratic governance with community-driven decision-making. The cooperative collaborates with universities and industries on harvesting and processing technologies, patents, and product innovations, and is a member of Fibershed DACH, promoting local fiber economies and knowledge exchange. Cultivation of 400–600 hectares of hemp occurs near the processing facility, ensuring efficiency and low environmental impact. Products include technical fibers, Hemp-Light-Clay panels, hemp-lime, and hemp wool insulation, all produced with a fully circular model that converts residual biomass into CO_2-neutral energy.

Key milestones include the 2013 cooperative transition, continuous R&D and patent development, academic collaboration, and membership in Fibershed DACH. Capacity limits prompted the planning of a second factory in Geiseltal, scheduled to start production at the end of 2025, demonstrating the scalability of both operations and cooperative governance.

Hanffaser Uckermark eG is considered a best practice because it combines regional production, sustainability, and technological innovation while supporting rural economic development. Lessons for BBoBB include the value of vertical integration for traceability and local value retention, circular design for ecological and financial performance, and research collaboration to accelerate product development. The model is replicable across the North Sea Region and can be adapted to other industrial crops such as flax or Miscanthus.

Best practice: Paludi & Bau

The INTERREG VI A project “Paludi & Bau” demonstrates how peat degradation and regional development can be addressed through biobased innovation. By integrating cattail and mycelium into construction materials, the project supports scalable biobased value chains aligned with the BBoBB vision and offers cooperation opportunities across the North Sea Region.

Running from September 2024 to September 2027, the project is led by Stichting TechnologieCentrum Noord-Nederland (TCNN) and involves universities, companies, and networks from the Netherlands and Germany. Activities focus on peatlands and wetland soils suitable for paludiculture, with cattail cultivation reducing CO_2 emissions and peat oxidation, and biobased construction materials reinforced with mycelium. The project aims to protect peatlands, develop regional production and supply chains, and create prototypes evaluated for life-cycle impact, cost efficiency, and usability.

“Paludi & Bau” is considered a best practice because it combines ecological and climate benefits, innovative material use, scalability, and local economic impact. Lessons for BBoBB include developing end-to-end value chains, structured scaling via TRL levels, stakeholder collaboration, and public visibility through demonstrations. Cross-border opportunities include knowledge exchange, value chain expansion, EU-wide standardization, regional innovation networks, and leveraging policy and funding platforms to advance the biobased economy.

GERMANY

Challenging initiative: Miscanthus

The region also worked on projects that did not fully achieve its goals. Led by 3N and the Landwirtschaftskammer Niedersachsen, the project explored the potential of miscanthus, assessing yields, site suitability, and applications such as horticultural substrate, building materials, animal bedding, and bioenergy.

The project faced several challenges. High establishment costs and low early yields limited economic viability, while soil and climate conditions affected performance. In practice, use focused mainly on energy, where results were below expectations due to lower heating value and regulatory constraints. As a result, the intended multi-sector impact was not achieved.

Research continued through seminars, demonstration plots, and yield trials, keeping knowledge exchange and visibility alive even as broader adoption stalled.

Key lessons for future biobased initiatives include planning for early economic challenges, careful site selection, early validation of potential applications, and proactive engagement with regulatory frameworks. Demonstration plots and seminars proved valuable for sustaining interest and sharing knowledge.

The Miscanthus pilots highlighted the difficulties of scaling perennial crops, the importance of matching crop, context, and use, and the need for regulatory foresight. They also demonstrated the ongoing value of research and community engagement. These insights can guide BBoBB pilots, supporting phased scaling, regulatory readiness, supply chain alignment, and demonstration support to strengthen regional biobased value chains.

HAUTS DE FRA

Best practice: Lignin

Several initiatives in Hauts-de-France and Nouvelle-Aquitaine showcase how biobased materials can be valorized in both construction and infrastructure applications. One key example focuses on the use of lignin, a by-product of the wood and paper industries. Close collaboration between IMT Nord Europe, CEREMA, and the bio-economy orchestrators Rev3 and Industry Innov ensures strong links between research, local authorities, and industry. Tartas Paper Mill supplies locally sourced lignin, which is used in cementitious matrices to improve plasticity, compressive strength, durability, and water resistance. Lignin can also partially replace bitumen in asphalt, increasing rigidity, improving aging resistance, and reducing thermal sensitivity. Pilot demonstrators, including a parking area with eight spaces made from bitumen, lignin, and vegetable oil mixtures, are being constructed to validate technical, economic, and environmental performance. This integrated approach establishes a local biobased value chain and provides a scalable model for lignin applications across the North Sea Region.

Best practice: Cooking oil

A second best practice involves the valorisation of waste cooking oil through the Geeco initiative, in partnership with IMT Nord Europe, CEREMA, Rev3, and Industry Innov. Collected from restaurants and the food industry, these oils are transformed into biobased wall coatings, lime mortars, and asphalt additives. In mortars, WCO acts as a water repellent, improving freeze-thaw durability and water resistance, while in asphalt it serves as a rejuvenator or plasticizer, enhancing flexibility, low-temperature crack resistance, and self-healing capacity. Pilot projects and collaboration with designers, as well as knowledge exchange with Belgian partners, support development and demonstrate the potential of local circular economy models.

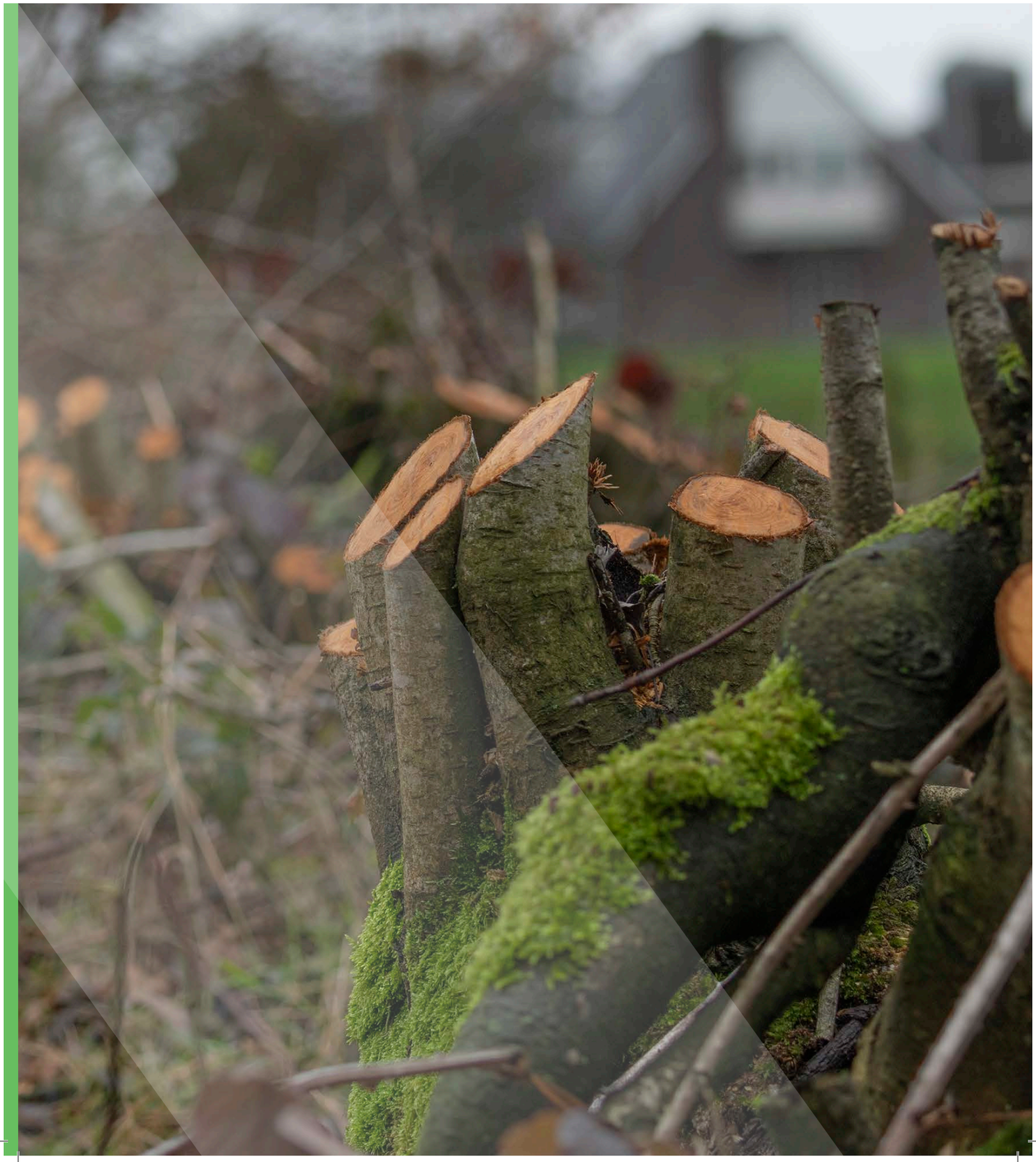
Together, these initiatives illustrate how research, industry, and local authorities can work collaboratively to create sustainable, biobased materials. By leveraging locally available resources such as lignin and waste cooking oils, these projects offer replicable models for scaling biobased value chains in the North Sea Region, contributing to both circular economy objectives and sustainable construction practices.

Challenging initiative: lignin valorisation

This project, led by IMT Nord Europe in collaboration with Cerema and supported by suppliers such as Sigma Aldrich, focuses on developing bio-based asphalt binders partially substituted with lignin, a by-product from the wood and paper industries. The aim is to provide sustainable alternatives to fossil-based materials while strengthening regional value chains.

The initiative is considered challenging because sourcing sufficient lignin locally remains a significant hurdle. The collection and availability of lignin waste in the region are limited, which slows progress and makes scaling the value chain difficult. This highlights a critical lesson: successful biobased initiatives require all parts of the value chain: feedstock sourcing, processing, and market demand to be coordinated. The project demonstrates the importance of building strong local stakeholder engagement and creating momentum for underutilized biobased resources, even when initial conditions are not fully favorable.

NCE, FRANCE



FLANDERS, BELGIUM

Best practice: C Hemp

C Hemp, part of Cordeel Group, develops industrial hemp solutions that combine carbon capture, soil remediation, and biobased construction materials in a circular, local value chain. Partners include C Wood (hemp panels), Wase Werkplaats (hemp-mycelium sandwich panels), Trafiroad (hemp-based traffic poles), and others supporting remote sensing, binders, phytoremediation, and carbon credit tracking.

Industrial hemp is grown locally, including on degraded soils, enabling soil restoration and crop diversification. The initiative aims to replace fossil-based or carbon-intensive materials, capture carbon, and generate measurable carbon credits through satellite and AI monitoring.

Key milestones include the development of hemp-mycelium sandwich panels and 80% grass / 20% hemp insulation mats for Europe-wide projects, and the production of traffic poles with 50% recycled plastic. The Earth+ platform will track CO_2 storage and carbon credits from May 2025.

C Hemp is a best practice for its holistic circular approach, strong multi-sector partnerships, measurable impact, and scalable local production. Lessons for BBoBB include replicating hybrid materials, using satellite-based monitoring, scaling circular hubs, and leveraging public procurement. Cross-border opportunities include joint demo zones, shared LCA tools, vocational training, and policy dialogue to expand biobased material acceptance.

More on www.c-biotech.eu

Best practice: Vlastic

Vlastic is a biobased innovation rooted in the rich flax tradition of Belgium, northern France, and the southern Netherlands. Developed by a consortium supported by Vlaanderen Circulair, it brings together Surplace design studio, local flax producers, and regional bioeconomy networks. Operating in the NSR flax belt, Vlastic leverages existing flax processing infrastructure and local partnerships.

The initiative valorizes flax shives, a residual stream of roughly 70,000 tonnes annually in Belgium, transforming this underutilized by-product into 100% circular, binder-free materials. These materials are lightweight, compostable, acoustically insulating, and suitable for packaging, acoustic panels, and construction applications.
Key milestones include the development of three material grades—soft-pressed for acoustic use, medium-pressed for packaging, and hard-pressed for construction—and the demonstration of binder-free processing of flax residuals into functional materials.

Vlastic's success stems from its circular feedstock, binder-free production, and versatile materials, enabling adoption across multiple sectors. The initiative exemplifies NSR biobased innovation by turning local agricultural residues into high-value, multifunctional products.

Lessons for BBoBB include replicating residual biomass valorization, promoting binder-free processing, and engaging multiple sectors to boost demand.

Opportunities for cross-border cooperation include expanding Vlastic-type hubs across NSR regions, joint R&D and pilot facilities for residual-to-material systems, and harmonizing public procurement policies to incentivize biodegradable, local biobased materials.

More on www.vlastic.be

Best practice: Exie

Exie NV, founded in 2019 by a former mixed farmer, bridges sustainable agriculture and construction through biobased materials. The company operates one of Belgium's few advanced hemp decortication lines and collaborates closely with local hemp farmers to source regional feedstocks.

Exie processes mainly hemp and straw into insulating materials, minimizing waste and using renewable resources. Their products, including CaNaDry (fast-drying hemp-lime mix) and EXIE Fibres (straw-based flake insulation), provide CO_2-negative, toxin-free, breathable, thermally efficient, reusable, and biodegradable solutions for walls, floors, roofs, and facades.

Key milestones include securing private equity investment from Taste Invest, deploying an advanced decortication line in 2023 to boost quality and throughput, and expanding exports to the Netherlands, Poland, Spain, Australia, and the USA.

Exie's success is driven by local crops and short supply chains, unique manufacturing capacity ensuring material quality, and adaptability across new-build and renovation sectors. The initiative exemplifies integration of farming heritage into green construction industries and supports replication across NSR regions. Lessons for BBoBB include fostering farmer–manufacturer collaboration, investing in processing infrastructure, and developing standardized yet adaptable material applications.

Opportunities for cross-border cooperation include demo projects across NSR renovation and construction zones, exchange of decortication expertise to increase regional capacity, and aligning procurement rules to promote breathable, sustainable insulation solutions.

More on www.exie.be

LOLLAND FALST

Best practice: Miscanthus

On Lolland-Falster, Miscanthus is the only BBoBB crop with a fully active value chain. Søren Vodder, a local thatcher, pioneered the use of Miscanthus for roofing around 2014, supported by the project "Na-turens eget tag" (Nature's Own Roof) with Aarhus University, SEGES, and the Danish Technological Institute. Vodder grows Miscanthus and applies it in his thatching company, resulting in 150–200 houses now featuring Miscanthus roofs on Lolland and Falster. His hands-on experience has been crucial for adapting cultivation and usage practices over the past two decades.

Vodder is also director of Miscanthus.dk A/S, a growers' association and sales company facilitating new growers' entry into the niche market, handling sales commissions and fees per finished bundle. Another key figure, Bjarne Hansen from BH-Tækkerør, developed Denmark's only Miscanthus harvesting machine and manages the majority of the country's harvest.

Although overall cultivation area has not expanded significantly, renewed interest is emerging due to climate considerations and suitability in water reserve areas. Currently, Miscanthus in Denmark is only used for thatching, but there is potential to explore additional applications, such as boards, by learning from BBoBB partners in other regions.

Best practice: Hemp

The Lolland-Falster hemp initiative started in January 2020 when Guldborgsund Municipality, Bioeconomy Hotspot, regional farmers, and university students explored the potential of establishing a local hemp value chain. Building on networks from the NSR Interreg project BIOCAS, the initiative became formalized under BBoBB, with active partners including Agrovi (farm advisory service), Business Lolland-Falster, CELF (vocational and higher education), and the municipality's Strategy & Development and Project & Developing teams. The goal is to contribute to the green transition, create green jobs, add local prosperity through new hemp processing activities, and build capacity in local education.

Key milestones include agreement to start a regional hemp value chain (2020), creation of Hampens Hus—a demonstration hemp house using up to ten hemp-based materials and locally grown hemp (2022), securing funding for value chain development and Hampens Hus (2023), and breaking ground on Hampens Hus after overcoming funding challenges.

Critical factors for success so far include securing sufficient local interest and funding, while upcoming factors include making hemp an attractive crop for farmers, attracting processing industry partners, and establishing viable cascade uses for leaves, flowers, and stems. Regulatory gaps remain, such as the lack of standardized certifications for hempcrete and cautious agricultural policies due to hemp's association with cannabis.

This initiative is a best practice because it establishes a versatile, regional hemp value chain that integrates cultivation, processing, and construction applications, supporting scalable biobased value chains in the NSR. Insights for BBoBB growth include learning from mature chains in other countries, promoting knowledge exchange along the value chain, and fostering cross-border collaborations, exemplified by Hampens Hus working with a Dutch company to produce hemp fiber and bio-resin roof tiles. Knowledge from Hampens Hus will be shared with building stakeholders through an open workshop within the BBoBB framework.

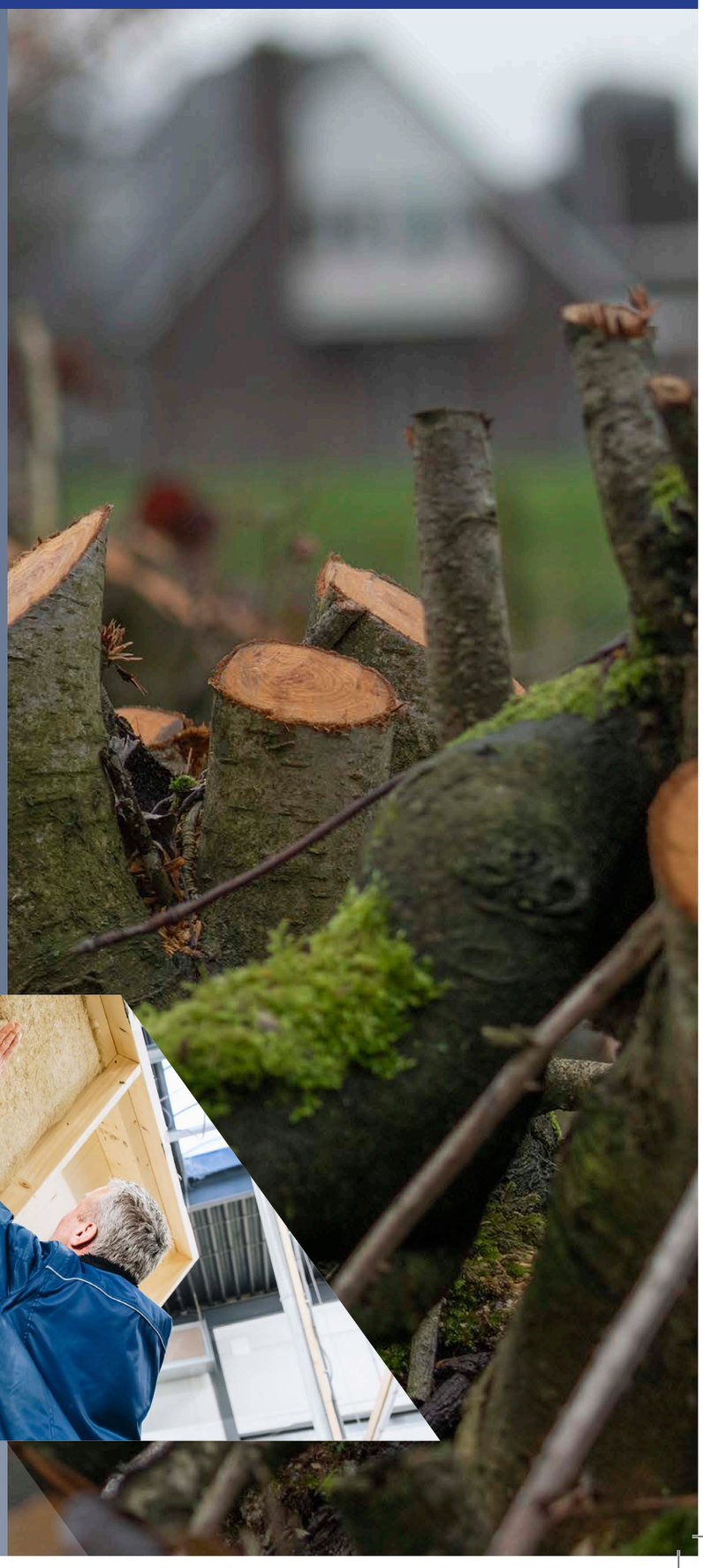
More information is available at Hampens Hus.

ER, DENMARK

Challenging initiative: Dansk Naturisolering Aps

Dansk Naturisolering Aps aimed to produce insulation mats from linen and hemp fibers, inspired by the use of bio-composites in the German automotive industry. However, the initiative faced critical obstacles: limited processing capacity, reliance on imported raw materials due to the absence of Danish hemp growers, and the expected ban on mineral wool insulation in 2004 never materialized. As a result, the company closed in 2003.

The key lesson from this initiative is the importance of developing all parts of a value chain in coherence, as a chain is only as strong as its weakest link. This insight remains relevant for emerging biobased value chains in Lolland-Falster and for BBoBB projects elsewhere, emphasizing the need to align production, processing, and market demand.



FRYSLÂN, THE

Best practice: Fryslân Builds Circular

Fryslân Builds Circular, a flagship program initiated by Vereniging Circulair Friesland, in collaboration with the Province of Fryslân, Frisian municipalities, and five housing corporations, aims to accelerate the transition to circular and biobased construction throughout Fryslân. The core of the initiative is the client approach, which empowers clients to clearly define and request circular building practices in tenders. By doing so, clients provide uniform demand signals to the market, helping circular construction shift from a niche practice to a regional standard.

The approach is applied in at least 40 concrete building and renovation projects across the province, serving as practical learning grounds where clients and market parties exchange experiences and best practices. In addition to procurement, the initiative includes a Knowledge and Peer Review trajectory that strengthens client expertise and embeds circularity within internal policies, such as the provincial housing and spatial visions.

A major pillar is the development of a comprehensive knowledge base with inspiring examples, tools, and standardized formats. This resource supports clients, contractors, and stakeholders in addressing circular construction challenges efficiently.

Critical success factors include the client-focused strategy, strong regional collaboration, integration with policy instruments, and learning through real-life projects. Within the BBoBB framework, Fryslân Builds Circular illustrates how client demand can drive market development for biobased materials and circular construction. Cross-border cooperation in the NSR can further enhance these efforts by sharing knowledge, aligning procurement standards, and fostering joint innovation projects.

Best practice: Biosintrum

Approximately 40% of the Netherlands' national peat meadow areas are located in Fryslân, facing ecological, economic, and social challenges such as soil subsidence, CO_2 emissions, and declining agricultural yields. Addressing these issues requires both technological and social innovation, including new forms of collaboration, community engagement, and alternative business models for farmers and residents.

Biosintrum, together with partners, has initiated the rewetting of at least 10 hectares of peat meadow and experiments with cattail (Typha) cultivation for sustainable building materials. The project addresses multiple stages, from cultivation and harvesting to drying and processing. The 2025 harvest produced sheet materials and insulation products suitable for housing applications. Students from various disciplines contribute research and ideas on landscape development, ecosystem services, and material innovation, training a new generation of professionals in sustainable land use and circular building practices.

Cross-border collaboration with German partners 3N and Jade Hochschule has strengthened knowledge exchange on peatland rewetting and wetland biomass applications. Project partners include Stichting Hegewarren, farmer Jongbloed, construction company Dijkstra Draisma, designer Tjeerd Veenhoven, and the Province of Fryslân. The project's success is largely due to the interdisciplinary expertise and commitment of the team, combining experience in agriculture, construction, design, and innovation to create a results-driven and forward-looking approach.

NETHERLANDS

Best practice: Wad van Waarde

Wad van Waarde, based in the Wadden Sea region of the Netherlands, aims to reduce microplastic pollution and promote sustainability by developing biobased, reusable alternatives to conventional plastic products. The initiative leverages locally grown flax and other renewable materials, fostering a circular economy that benefits both the environment and local communities.

The project focuses on fiber flax, reintroduced in Fryslân and Groningen, using all parts of the plant. Long fibers are processed into linen textiles as a sustainable alternative to synthetic fabrics, while short fibers and shives are used in product development, interior design, and biobased construction materials. Seeds are either retained for sowing the next crop or used in food and animal feed. The full value chain, from cultivation to processing, spinning, weaving, and final production, is organized within a one-day driving radius, ensuring efficiency and traceability. Initiated by House of Design, the project involves a broad network of stakeholders including farmers, producers, educators, policymakers, and partners such as Ecoras, TCNN, Vanhulley, Agrarisch Collectief Waadrâne, Biosintrum, and NHL Stenden Hogeschool. Flax cultivation benefits the region environmentally by sequestering CO_2, improving soils, and enhancing biodiversity, while also revitalizing local agricultural practices.

Key milestones of the project include its conceptualization in 2018, the first 2 ha harvest in 2021, scaling up to 65 ha in 2024 with a closed-loop regional value chain, and expansion to 81 ha in 2025, accompanied by the first purchase of harvesting machines and international visibility at the Salone del Mobile in Milan.

Critical success factors include integrated collaboration among a wide range of stakeholders, strong local focus using regional resources and skills, innovative and aesthetically appealing product design, and establishing a new standard for biobased, multi-use, and biodegradable materials in both consumer and institutional procurement.

Wad van Waarde is recognized as a best practice because it demonstrates how regional, bottom-up initiatives can successfully build resilient, multifunctional biobased value chains. It revitalizes agriculture, supports local manufacturing, provides educational opportunities, and raises public awareness of sustainable practices.

Cross-border cooperation opportunities include adapting the framework to other North Sea Region areas, sharing knowledge, resources, and best practices to accelerate the transition to sustainable materials, and fostering circular economies at a broader European scale.

Challenging initiative: straw

As part of the National Approach to Biobased Building (NABB), straw was identified as a promising crop for sustainable construction due to its availability, thermal insulation properties, and potential benefits for indoor air quality. The initiative aimed to develop regional biobased value chains in Fryslân, valorizing straw as a local agricultural byproduct and stimulating innovation in the building sector. The focus was on collaborating with local farmers, construction companies, and innovation hubs to establish a practical pathway for straw-based materials.

Despite this ambition, the initiative did not gain traction. In Fryslân, straw is already efficiently reused on-farm as bedding or for soil improvement, providing little incentive for farmers to divert it toward a new construction market. Additionally, health concerns arose because conventionally grown straw may contain residual pesticides, creating uncertainty about its suitability for indoor applications. Finally, the market pull was too low: without clear demand or financial incentives from the construction sector, investing in a dedicated straw value chain was not economically viable.

As a result, stakeholders decided to put further development on hold. While the initiative has not been fully discontinued, progress awaits stronger health validation, clearer market incentives, or shifts in regional agricultural priorities. The experience, however, provided important lessons: the potential of a biobased crop does not guarantee regional suitability, health and environmental claims must be backed by solid evidence, and circularity strategies should build on existing sustainable practices rather than replacing them.

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