



Building with natural fibres

200 miles home: UK grown buildings from field to house

Decarbonising our built environment

The built environment generates 42% of annual global CO₂ emissions. Of those emissions, 27% comes from running those structures, while 15% comes from the materials and construction (typically referred to as embodied carbon footprint). Globally over the next 15 years, an area equal to the entire building stock of the Western Hemisphere will be redesigned, reshaped, and rebuilt. Our choices around design and the **materials** used will determine whether climate change is manageable or catastrophic. The UK is poised to make the transition to more sustainable infrastructure if it can take this opportunity to scale up existing supply chains and expertise in locally grown biobased building materials.

Meanwhile, in response to the climate crisis, the UK Government tightened the sustainability criteria in the industry **Construction Playbook** in 2020. Shortly after, they launched the **Net Zero Estate Playbook** for the public estate, driving the use of greener building materials and to decarbonise Britain's largest property portfolio.

Carbon capture via natural fibre buildings: The answer to low carbon construction

The increasing use of UK grown natural fibres, such as industrial hemp and miscanthus, is delivering a keystone solution for meeting net zero, and even net negative, targets in the built environment. Natural fibre crops provide viable alternative cropping options for farmers. The carbon capture within the materials themselves, displacement of fossil intensive materials, alongside the energy efficiency and soil carbon capture properties, gives them a leading edge across multiple parameters. In addition, this growing industry is creating UK green jobs and boosting local economies across the supply chain.

Expanding the UK's primary processing capability

Before natural fibres can be made into building materials, they must go through processing. This step takes the retted stems in the case of flax and hemp and breaks the fibres down. The image to the right shows a post-retting stage at the **Harrison Spinks** factory. The process for taking fibres from field to market is demonstrated in Figure 1.



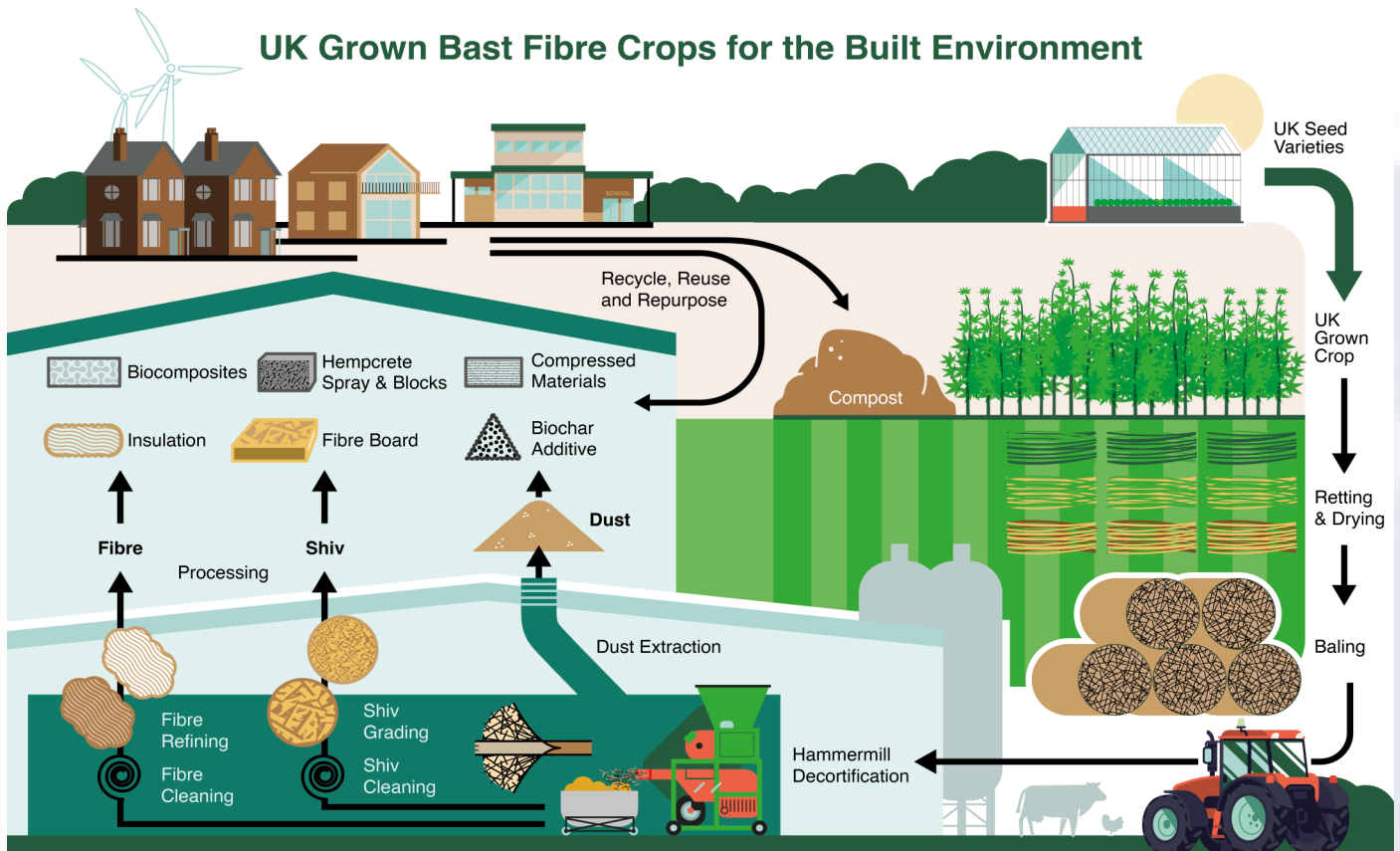


Figure 1. UK grown bast fibre crops (flax and industrial hemp) are grown, processed and supply chains.

Since 2002 the primary processing facility of **East Yorkshire Hemp** (EYH), has processed UK grown flax and hemp straw into fibres and woody shiv, to be used in various commercial products, including **IndiNature's** insulation and **Natural Building System's** building panels. The CHCx3 project is working closely with EYH.

More recently, **UK Hempcrete** and **Unyte Hemp** (CHCx3 partners) have joined forces and obtained licenses to manufacture commercial hemp products that are already available in other regions. They are setting up primary processing facilities around the UK to separate fibre and shiv from locally grown crops to go into their various production streams. Once fully operational their vertically integrated manufacturing facilities would sequester 220,000 tonnes of carbon per annum to produce:

- 5 million Hempcrete Blocks
- 10,600 houses worth of fibre insulation
- 4,000 tonnes of HempWood Flooring
- 6,000 tonnes of Bio Char

Nature's solution to built-in energy efficiency

Hempcrete is a mixture of woody hemp shiv and binder, such as lime, which is used as a wall material. It can be supplied as preformed bricks, such as **Isohemp™** hemp blocks from **UK Hempcrete**, and **Hemspan™** Bio Blocks. UK Hempcrete are also leading experts on hempcrete spray construction, applied on-site as a filler for structural panels or frames. The image to the right shows application of Hempcrete roof insulation on-site in the Scottish Highlands.



The UK has thousands of hemp buildings, including iconic structures such as the **M&S flagship sustainable store** at Cheshire Oaks, which received a BREEAM 'Excellent' rating, the RIBA Sustainability Award and BCSC Gold Award for Sustainability. The University of Bradford Sustainable Enterprise Centre is the tallest hemp building, cast on-site with hempcrete. This existing housing stock has demonstrated the outstanding thermal regulating properties of this natural material. Cool in summer and retaining heat in winter, a steady temperature of 16 to 18°C can be achieved all year without heating or carbon intensive air conditioning. It also demonstrated outstanding air quality regulation.

Breathing freely with superior indoor air quality

Indoor **air quality** has been linked to respiratory diseases, allergies and cognitive impairment. Manufacturers in the natural fibres' space are passionate about minimising, if not eliminating, synthetic materials and harmful chemicals, which are abundant in many building materials.

In terms of interiors, Bristol-based **Adaptavate** have developed a series of carbon negative plasterboard alternatives and plaster materials. Their Breathaboard's use of natural materials, enhanced thermal performance, reduced risk of mould forming, and compostable nature has attracted investors including Semin and OnePlanetCapital.

Flexible construction through clever modular design



Modular construction is an expanding area, worth £5.6 billion in the UK and growing strongly at 6% to reach £7.6 billion by **2029**. Prefabricated thermal envelopes from biobased fibres such as hemp, miscanthus, and willow, are being developed by UK companies, and are a perfect solution for rapid construction of low carbon housing stock. The systems of panels by **Natural Building Systems** (NBS) use standardised, repeated elements combined with optimal material efficiency to make a system that is affordable, scalable, and quick to build. The image to the left demonstrates the modular building design. NBS has also developed a traceability system enabling materials to be tracked back to the field they were grown in.

GreenCore Homes has developed hemp fibre based external wall panels that lock up over 30kg of CO₂e per square metre. **M&G** has invested a further £30m in the company to support their growth and development. The Biohaus® system designed by **Hemspan** is a whole-house panellised system for climate-positive living with an ambition of net negative carbon of -250kgCO₂e/m².

Wrapping up our housing stock

In September 2023 the UK Government launched a £1 billion Great British Insulation Scheme (GBIS), funding more than 300,000 homes to install insulation, and local councils have their own retrofit grants. Market research concludes that the **decarbonisation** push that is driving new-build targets and retrofit requirements will continue to deliver a steady 4% growth in the UK insulation market.

IndiNature manufacture biobased natural fibre insulation in Scotland with exceptional thermal, acoustic and moisture-buffering properties. The low-density heat storage in the materials means indoor temperatures stay warm in winter and cool in summer. From 2024, **IndiTherm** and now **IndiBreathe** insulation batts are the first UK grown and made insulation to be BBA certified, shown in the image to the right. Making bio-based insulations with a net negative embodied carbon eligible for use at scale on Trustmark projects and able to access the **Energy Company Obligation** / GBIS funding. **Recent investment** has enabled IndiNature to develop the local **industrial hemp supply chain**, enhance production in the IndiNature Mill, and expand their bio-based product range, launching Quiet Mark certified **IndiSilence** acoustic insulation in 2025. Other UK suppliers in this space include GRWN Group, with their GRWNwarm 85% natural fibre insulation slabs sold in B&Q. Kingspan is also joining the club with their new **HemKor** range of up to 95% biobased content.



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To find out more about fibre crops, read our [page](#) or watch the [Fibre processing webinar](#) with guest speakers from luxury bedmakers **Harrison Spinks** and bio-based insulation producers **IndiNature** where they give exclusive insight into their manufacturing process followed by a Q&A session.

References

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