

**Briefing note: Sustainable Bio&Waste Resources for Construction (SB&WRC) –  
Work package 3: rationale for choosing stuffed bedding products.**

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**Overview**

In order to identify the target textile for the development of insulation, a two stage scoping exercise was conducted. Stage 1 involved the project team using their existing knowledge, meeting with waste industry stakeholders, and reviewing waste management literature to identify the preferred waste stream. Stage 2 consisted of a top level review of existing products on the market, and academic literature, to ensure the project did not duplicate existing practice. This briefing note provides an overview of the process.

**Stage 1 Identification of textile feedstock**

Using their existing knowledge of problem textile waste streams, the project team developed a short list of potential materials for the production of insulation. The short list was made up of streams that were known to be hard to manage historically due to their properties, and that would also be in plentiful supply. The shortlist consisted of the following:

- **Stuffed bedding including duvets, pillows:** stuffed bedding is a problem material in both the household and commercial waste streams. Reuse options for stuffed bedding are limited due to health and safety concerns, and often the poor quality of used bedding.
- **Mattresses:** due to the bulky nature of mattresses and their multi-material composition, mattresses have historically been sent to landfill. Being bulky they are a problem for handling in Energy Recovery Facilities.
- **Carpets:** this has historically been a problem waste stream.
- **Unsold/soiled clothing and textiles from charities:** some clothing and textile products donated to charities are not resalable due to being damaged or soiled. Similarly they have products that they have failed to sell in their shops. These items have traditionally been sold to rag merchants who would pay a flat rate based on the weight of the textiles.
- **Specific waste streams from the commercial sector:** in the UK businesses under the Duty of Care regulations are required to ensure that their waste is collected and managed responsibly by a waste carrier registered with the Environment Agency. This could be from the private, public or third sector. The commercial and industrial waste stream is complex and these carriers handle textile products that might be hard to reuse or recycle.

This shortlist was presented to industry stakeholders who gave their feedback on each stream, and were also given the opportunity to identify other opportunities. Existing waste management literature was also considered for each stream. Following this engagement the following streams were discarded:

- **Mattresses:** this was due to the complex nature of mattresses, and the number of other initiatives already underway to address the management of this stream. Moreover mattresses are made up of a range of materials including metals, foams and textiles.

Based on research by Zero Waste Scotland (2012)<sup>1</sup> only 43% of mattress are textile therefore solutions would need to be found for over half of the waste stream.

- **Unsold/soiled clothing and textiles from charities:** whilst the price has dropped that rag merchants pay for textiles there is still a market for these items. Moreover the composition of rags is heterogeneous.
- **Carpet:** nationally and internationally a lot of work is being done on developing markets for the recovery of carpets. For example initiatives such as Carpet Recycling UK<sup>2</sup> and Carpet America Recovery Effort USA<sup>3</sup>. The UK project has increased the diversion of carpet from landfill from 2% in 2007 to 35% in 2016. It is noted that 76% of the carpet is being sent for energy recovery but other markets are developing including reuse, recycling into equestrian surfacing, felts and plastic<sup>4</sup>.

The decision was made to focus on stuffed bedding products, predominantly duvets and pillows. As well as households this would also encompass these wastes from the commercial sector. The rationale for choosing stuffed bedding is as follows:

- Waste management stakeholders identified that due to health and safety concerns this material was not suitable for reuse and mainly was being sent to either landfill or energy recovery;
- According to the Charity Shops Survey, 75 charities have 6,933 charity shops making up 2/3 of all charity shops in the UK<sup>5</sup>. A top level review was undertaken of the policy of accepting used stuffed bedding by these charities. For some it was unclear from their website if they would accept donations, and they recommended contacting the local store for guidance, though most stated that they would not accept damaged or spoiled items. Some charities clearly stated that they would not accept used stuffed bedding including the British Heart Foundation<sup>6</sup> which with 735 shops has the largest number of charity shops in the UK. Similarly the Salvation Army export approximately 34,000 tonnes of textiles for reuse and recycling each year, and between April 2009 and March 2014 the sale unwanted clothes and household items raised £39.5 million<sup>7</sup>. However they do not accept stuffed bedding<sup>8</sup>.
- Recent research undertaken at 11 Household Waste Recycling Sites showed that 3.6-10.7% of the residual waste stream was non-clothing textiles which includes stuffed bedding<sup>9</sup>.
- Based on the latest data from WRAP 30% of local authorities collect textiles through their kerbside service<sup>10</sup> including 12 out of the top 20 Waste Collection Authorities<sup>11</sup>.

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<sup>1</sup> Zero Waste Scotland (2012) A Business Case for Mattress Recycling in Scotland. Zero Waste Scotland, Stirling, UK.

<sup>2</sup> <http://www.carpetrecyclinguk.com/index.php>

<sup>3</sup> <https://carpetrecovery.org/>

<sup>4</sup> Carpet Recycling UK (2017) 2016 achievements. Carpet Recycling UK, Bramhall, UK.

<sup>5</sup> Ainsworth, D. (2016) Barnardo's opens 89 charity shops and aims to be 'biggest chain in the country' - See more at: <https://www.civilsociety.co.uk/news/barnardo-s-opens-89-charity-shops-and-aims-to-be-biggest-chain-in-the-country-.html#sthash.IVcAyrwj.dpuf>. Accessed 10/9/17.

<sup>6</sup> <https://www.bhf.org.uk/shop/donating-goods/items-we-can-not-sell>

<sup>7</sup> <https://www.salvationarmy.org.uk/recycling>

<sup>8</sup> <http://www.satradngco.org/donating/what-can-you-donate>

<sup>9</sup> Confidential report authored by project team member. Note due to the methodology adopted this could include rugs, blankets, pillows, sleeping bags, towels.

<sup>10</sup> WRAP (2017) WRAP La portal statistics. WRAP, Banbury, UK.

A desktop review was undertaken of these 20 authorities to understand their policy on collecting stuffed bedding. Whilst all 12 collect non-clothing textiles such as sheets, duvet covers and towels, none accept stuffed bedding. A similar exercise was undertaken for Waste Disposal Authorities that operate Household Waste Recycling Sites. Whilst all have banks for clothing and textiles, they clearly state that stuffed bedding is not allowed, and needs to be placed in the residual container with the material sent to landfill or energy recovery.

- Very limited research has been conducted looking at the levels of used stuffed bedding generated, and of potential markets. The main body of work was commissioned by WRAP in 2012/13 on their work evaluating markets for non-clothing textiles. Their work highlighted that an estimated 61,900 tonnes of duvets and pillows were entering the waste stream each year with the majority being sent to landfill or energy recovery. They concluded that a small (but not quantified) amount is co-collected with clothing and is exported for re-use and recycling abroad most commonly to India or Pakistan which have established industries for shoddy – a non-woven felt material. In addition less than 100 tonnes is thought to be re-used in the UK through charities and social enterprises in night shelters and animal homes<sup>12</sup>.

## Stage 2 Review of existing insulation materials

To ensure the project did not duplicate existing research or insulation products currently available commercially using stuffed bedding as feedstock, a review was undertaken. The review focused on non-conventional material used to manufacture insulation and consisted of:

- A web search of existing products;
- Reviewing insulation products listed on the following sustainable construction product directories/certification schemes: GreenSpec (UK), Green Book Live (UK), German Building Materials Association (Germany), Green Building Pages (USA), Eco Structure (USA), Environment Protection Agency Comprehensive Procurement Guidelines (USA), MDBC (USA), BuildingGreen.com (USA), California Integrated Waste Management Board Recycled Content Directory (USA), Ecologo (Canada), and Australia Green Procurement (Australia). Information on relevant products has been collated in the accompanying spreadsheet 'Insulation product directory' – 'Product directory sheet' with technical information available in the project Dropbox folder;
- Reviewing over 30 academic papers on insulation – again these are available in the project Dropbox folder;
- Searching the International Solid Waste Association and Chartered Institute of Wastes Management archives for waste materials being used as feedstock for insulation.

Some interesting reference materials for the project were identified:

- GreenSpec has a useful guide on [natural/organic insulation materials](#) comparing the properties of cork, wood, wet-formed wood fibre board, hemp, hempcrete, flax, wool. The site also has a comparison of the [thermal properties](#) of these materials.

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<sup>11</sup> Waste Collection Authorities are district and borough councils that are responsible for waste and recycling collection.

<sup>12</sup> WRAP (2013) Demonstrating the viability of collecting non-clothing textiles. WRAP, Banbury, UK.

- [Eco structure](#) also has some interesting articles on the use of alternative insulation materials.
- A number of academic papers were very useful especially Asdrubali et al (2015) which reviewed unconventional building insulation materials. The information on this paper has been consolidated and presented in the accompanying spreadsheet 'Insulation product directory' 'Materials and thermal conduct sheet'.

The review highlighted a wide range of materials are being used as feedstock with the most common being recycled glass, cellulose (this seems particularly common in North America), and wool. In terms of textiles a number of products were identified:

- Quiet-Tech Recycled Insulation - Insulation batts made from 90% recycled carpet, cotton and PET and manufactured by [Carpet Cycle](#).
- Soex Group – [Soex](#) collect clothing from charities in Europe and USA, and approximately 100,000 tonnes is annually sorted at their facility in Wolfen, Saxony-Anhalt where it is graded according to up to 420 criteria. The sorted products are then exported to over 90 countries. The goods that cannot be worn are processed into cleaning cloths and a further portion is processed into insulation material at an in-house recycling plant. The insulation is used in the automotive and construction industry. They accept non clothing textiles including towels, tablecloths, bed linen, curtains, featherbeds (no foam material) – and it is likely some of this would end up in the insulation product however nowhere does it state they handled stuffed bedding.
- Cotton Armour - [Applegate Insulation Systems'](#) Cotton Armor contains at least 85% recycled cotton content.
- Inno-therm - Insulation made from recycled cotton and denim manufactured in France by [Le Relais](#).
- Ultratouch - Batt or blown in insulation made from denim with 80% post-consumer recycled content in the USA by [Bonded Logic](#).
- Isonat - Roof insulation made from UK farmed hemp and recycled cotton. Manufactured in France by [Isonat](#).
- Some interesting work has been done on using textiles in insulation – for example see the work of Briga-Sá et al (2013) however this has not focused on stuffed bedding.
- Interesting Eden Renewable Innovations Ltd manufacture [Supaloft Insulation Recycled](#) manufactured from 95% recycled plastic bottles. Interestingly the website states that the product utilises pillow and duvet technology.

## Recommendation

Based on this scoping exercise stuffed bedding products have been identified as a problem material for the waste management industry. It is in plentiful supply with the majority of products generated from the household and commercial waste stream being disposed of through landfill and energy recovery. Whilst a number of commercial insulation products are made from recycled textiles, it appears that none utilise stuffed bedding products. This presents an interesting opportunity to research the viability of developing insulation to harness this problem waste stream which already has been engineered for insulation purposes.