



SB&WRC project

Survey report: Perception of French and English stakeholders on bio- and waste-based materials

June 2019

Abstract of the project

The SB&WRC (*Sustainable Bio&Waste Resources for Construction*) project, an undertaking of more than two years, aims to conceive, produce and test three innovative, low-carbon, thermal insulation materials from agricultural co-products and recycled waste. The project is supported by the development program Interreg VA France (Channel) England and its budget, estimated to be 1.8M€, is co-financed by the ERDF (European Regional Development Fund) for 69% (1.26M€ contribution).

This project, led by Nomadéis, is carried out by a cross-channel partnership which gathers academic research laboratories, private research and consulting companies, manufacturers and professional non-profit organisation of the building sector:

- Nomadéis;
- Veolia Propreté Nord Normandie;
- University of Bath;
- Ecole Supérieure d'Ingénieurs des Travaux de la Construction de Caen (ESITC Caen);
- Construction21;
- UniLaSalle;
- University of Brighton;
- Alliance for Sustainable Building Products.





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Acronyms

MB&D : bio-based and waste-based materials

SB&WRC : Sustainable Bio&Waste Resources for Constuction

1. Stakes and objectives

In parallel to the technical work undertaken by the project partners to conceive, produce and test insulation material which are innovative, low-carbon and made from bioresources and waste products at once, a part of the project was dedicated to stakeholder communication and building professional awareness of the stakes of sustainable construction. In this context, the survey “Expectations and perceptions of construction professionals towards bio- and waste-based materials and SB&WRC prototypes” was meant to fulfil a number of objectives:

- Gather the practices and the perceptions of professionals with regards to bio- and waste-based materials;
- Understand which factors would to the adoption, by building professionals, of the materials developed within the SB&WRC project;
- Help the academic partners designing prototypes that were as close as possible to economical and technical actors’ expectations;
- Allow the partners to appreciate *a priori* the commercial potential of the prototypes and what the constraints or levers would be to enable a successful commercialisation.

As such, the survey undertaken first had to allow Nomadéis to better comprehend current practices and perceptions of the industry’s professionals particularly with regards to bio- and waste-based material. Secondly, using specific feedback (both qualitative and quantitative) on the developed prototypes, the survey was meant to feed into the partners’ ongoing reflexion on the prototypes they are developing.

With respect to its past experience, and the observed average rates of responses for e-mail and internet diffusion, Nomadéis aimed to gather 200 surveys that would be divided as evenly as possible between both countries (France and England).

2. Survey methodology

2.1 *Creating the questionnaire*

2.1.1 Building the questionnaire

Relying on its past experience, Nomadéis created a first version of the questionnaire in both languages (French and English). Nomadéis was particularly attentive to the relevance of the personal information questions, of the wording and terminology of the questions related to practices and perceptions of bio- and waste-based materials.

In order to configure, save data in a secured manner then administer the survey professionally, Nomadéis subscribed a membership to Qualtrics, an online survey platform.

2.1.2 Testing phase and upload

Following the its creation, various approaches were taken to test the questionnaire. Firstly, the questionnaire was review internally by Nomadéis' consultants. Then, Nomadéis called upon members of its network (architectes, consultants, etc.) in order to provide feedback to the project team on language elements, formulation of response items, choices proposed, order of the questions, etc. After this test phase, Nomadéis undertook minor modifications ; most notably by adding response items or by adding more free text entries.

The questionnaire presented in Annex 1 is an abridged version of the one which was available online.

2.2 *Diffusion of the survey*

The initial diffusion of the questionnaire was done by the project's communication partners (ASBP and Construction21) via their website, newsletters and messages on social media. According to these partners' estimates, their respective platforms regrouped more than 6'000 companies excluding SME, nearly 17'000 SMEs and more than 4'000 research actors over France and the United Kingdom. Thus, by regrouping their respective platforms, the potential respondent base was beyond 25'000 industry players.

The other partners were also solicited and were aske to share the link to the survey to their respective networks. This mode of diffusion which was spread over time and through multiple diffusion canals was chosen to increase the number of people who would get in contact with the project's communication material and survey; the latter also served as an awareness-raising tool in itself as much of bio- and waste-based (MB&D) as of the prototypes developed by the project partners.

A second diffusion strategu was employed. Bilingual flyers (part of the dissemination activities) encouraged participation to the survey. These flyers were printed in 1'000 copies in total and were distributed to the conferences attended by the project partners. This incitement to participate included a linked towards the survey's web address. A code QR (a type of barcode that may be read using a smartphone) was also included and allowed the reader to reach directly the online survey. Amongst events during which yhre flyers were distributed, one may count:

- Fibra Innovation (October 2018, France) ;
- Timber Expo/UK Construction Week (October 2018, England) ;

- London Build (October 2018, England) ;
- ISOBIO Final Conference (January 2019, Belgium) ;
- Delivering Healthy Buildings (February 2019, England) ;
- Future Build (March 2019, England) ;
- Passi’Bat (April 2019, France).

2.3 Structure of the survey report

The present report takes a look at the key results from questionnaire and proposes a reading of the quantitative data from the items as well as the qualitative feedback collected in the text entries of the survey and by the project team during the various events it participated to. In order to be exhaustive, all the data from the survey including from questions not treated in this report is presented in its totality in the Annex 2. The Annex 3 presents a short observation and analysis reports of the results and the public feedback from the “Waste Zone” in the Future Build (London) congress.

3. Results of the survey

The results presented hereafter give an overview of the profile of the respondents and the categories that may be pertinent to the analysis.

3.1 Response rates to the two surveys

The objectives for both surveys were reached for a total of more than 210 respondents cumulated over the two versions of the survey:

- 110 people responded to the French survey;
- 101 people responded to the British survey.

Nomadéis and its partners noticed a particularly low response rate from the building industry stakeholders despite the partners' repeated calls to participation (via social media, ASBP and Construction21 newsletters and to the respective networks of each partner).

Both surveys were uploaded in their final version in September 2018 and were maintained opened until May 2019, at which point the minimum number of respondents was reached.

3.2 Personal data questions

3.2.1 Country of origin

Respondents are more or less equally divided between France (50% of respondents) and England (42% of respondents).

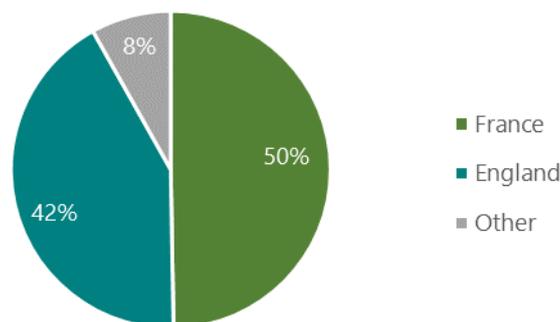


Figure 1: Country of origin of the respondents to the French and British surveys (n = 185 respondents).

3.2.2 Profile of the respondents

75% of respondents represented companies and were equally split between both surveys.

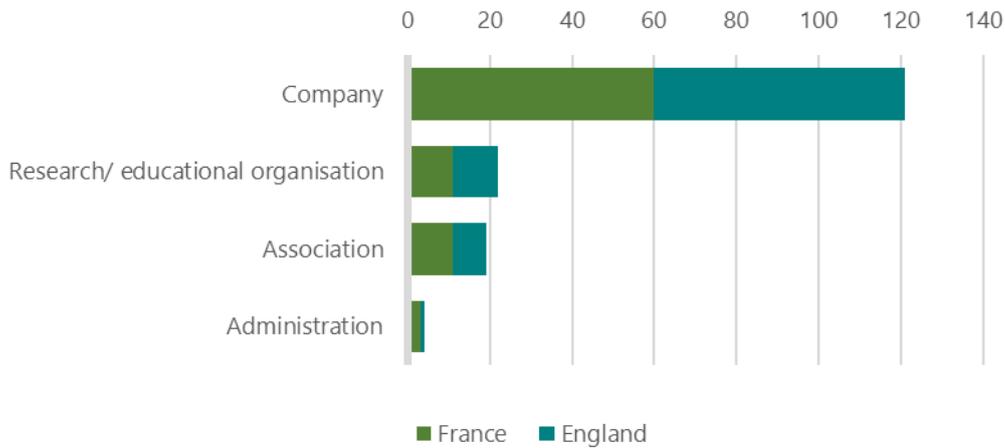


Figure 2 : Distribution of respondents' profiles (n = 166 respondents).

3.2.3 Main activity of the respondents

The main activity practiced by the respondents is within the "general contractor and architecture" category (40% of the sample) equally split between both questionnaire. The second main category is "Training, education, research" with 16% of votes. The category "Other" (14,5%) was mostly comprised of engineering and consultancy firms as well companies specialised in sustainable development communication and ecological material.



Figure 3 : Distribution of the main activity categories of the respondents to the French and English survey (n = 166 respondents).

3.3 Practices with regards to MB&D

3.3.1 Implementation of bio- and waste-based materials

The majority of people (81%) who responded to the surveys implement or **work in one way or another with MB&D**. From the onset, this result indicates that this survey may have reached people that were already somewhat aware of these practices and materials. It is also worth noting that, proportionally, there are more French players which work with MB&D than English ones. .

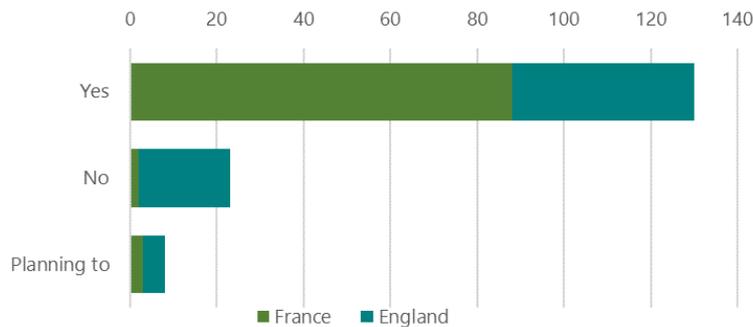


Figure 4 : Distribution of responses to the question "Do you implement bio- and waste-based materials?" (n = 161 respondents).

3.3.2 Materials implemented or intending to be

Among the people who currently implement or work with MB&D, the most popular materials are: **wood fibre derivatives with 19% of votes, hemp and its derivatives** with 17% of votes and **recycled paper** with 15% of votes. One may notice that out of the most used products, two are bio-based and one is waste-based. Similarly, if all responses are regrouped in these two categories, 31% of responses are related to waste-based materials and 69% to bio-based ones.

The results are generally equilibrated between both countries with the exception of sheep wool which three times more mentioned by English respondents and linen follows the inverse tendency.

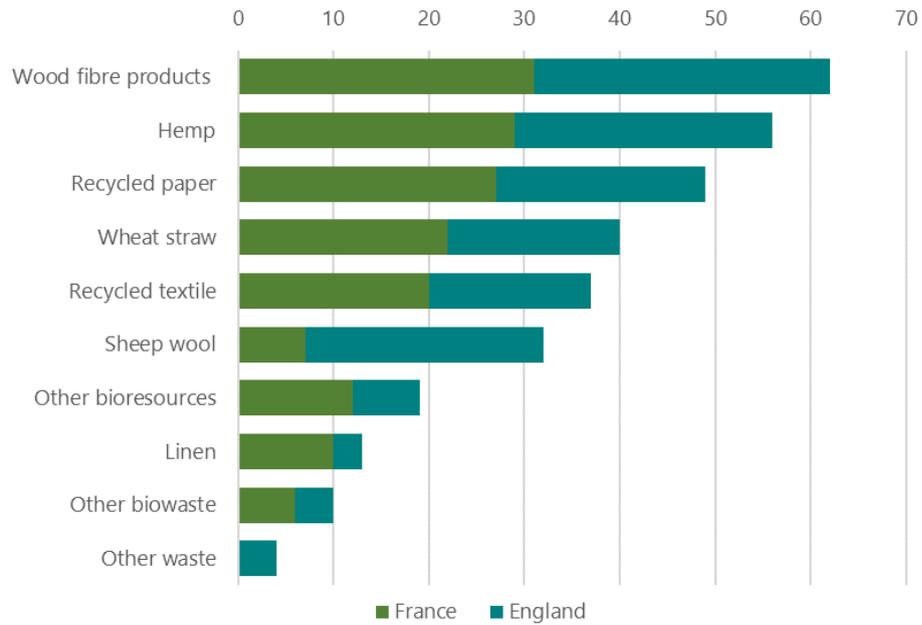


Figure 5 : Distribution of MB&D used, responses from people who answered Yes to their implementation (n = 322 responses).

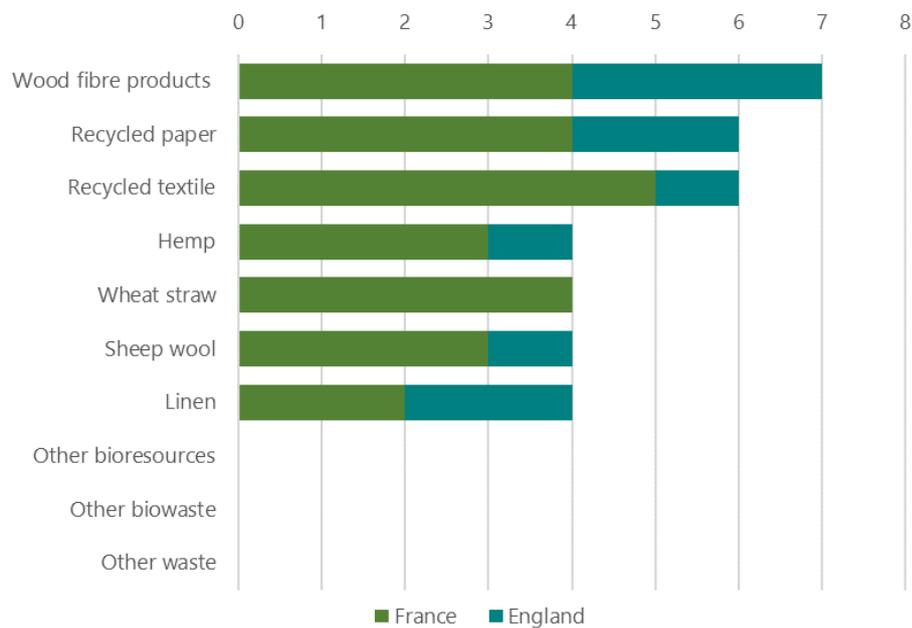


Figure 6 : Distribution of answers by people who are "planning to" implement MB&D (n = 35 responses).

Among the respondents (8 persons) who are planning to use MB&D, the most envisaged resources are wood fibre derivatives, recycled paper and recycled textile. In their responses, bio-based materials gathered 66% of votes and waste-based materials 34%.

3.3.3 Current and estimated evolution of the activity related to MB&D

This question probed the share of the activity that represented the implementation of MB&D; Nomadéis made the decision to exclude players whose activity was linked to education and research and those who answered "Other" activities as this question may not be appropriate for their particular line of work.

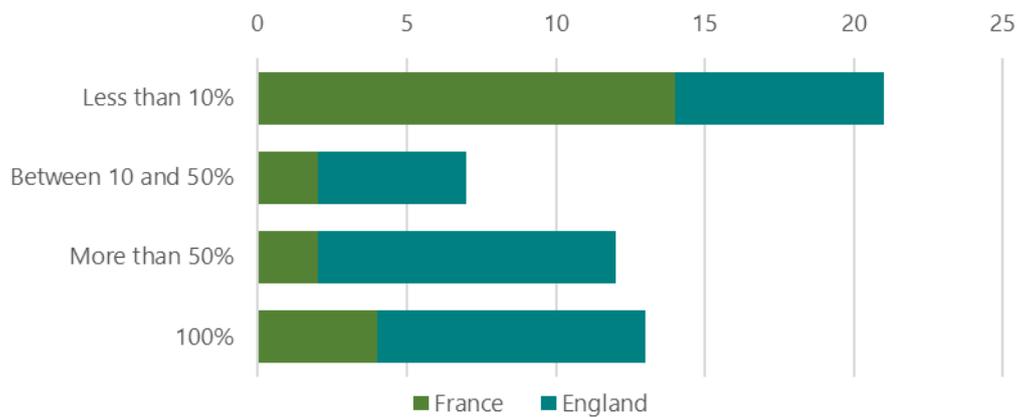


Figure 7 : Distribution of the portion that MB&D implementation represent within the respondents' activity (excluding actors who are within "Training, education and research" and "Other") (n =53 respondents).

40% of respondents indicated that the implementation of MB&D represented less than 10% of their activity and 24.5% indicated that these materials represented 100% of their activity.

In addition, it may be noted that for the two highest categories ("More than 50%" and "100%") the proportion of British respondents may suggest that actors whose activity is more specialised towards these types of construction materials are more present in England than in France.

The following question asked for an estimate of the general evolution of the implementation of MB&D within the industry.

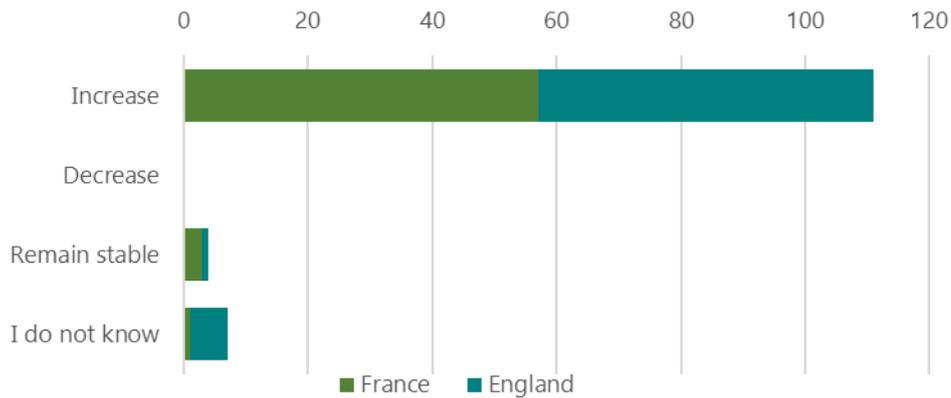


Figure 8 : Estimate of the evolution of the implementation of the MB&D within the industry (excluding actors who are within "Training, education and research" and "Other") (n =56 respondents).

Thus, 91% of respondents believe that, as a whole, the global portion of MB&D implementation will increase in the next five years. However, when asked about their personal activity (for those who do work with MB&D), only 55,4% believed that it will increase. Generally within the industry, only 3.3% believe the recourse to MB&D will remain stable but concerning their own activity 28,5% believe it will remain at today's level. Thus, there seems to be a stark difference between the perception of the MB&D market as a whole and the recourse to MB&D within their own practice.

3.3.4 Rationale for the use of MB&D in their activity

Among the respondents who implement MB&D, **30,8% of them evoked personal environmental principles, 22.7% evoked good technical performances** and **15.4% evoked a desire to contribute to the local economy** or use a locally sourced materials.

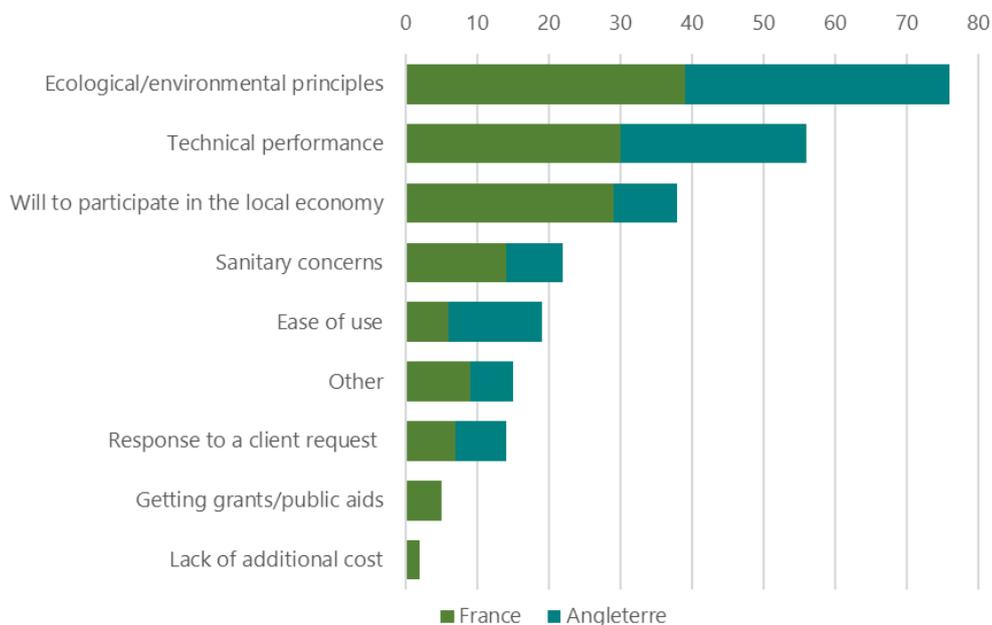


Figure 9: motivations of the people implementing MB&D (n = 247 responses).

Respondents who are **planning to implement MB&D**, on the other hand, evoke **ecological principles (30,8%)**, good **technical performance (19,2%)** and a **client request (15,4%)**.

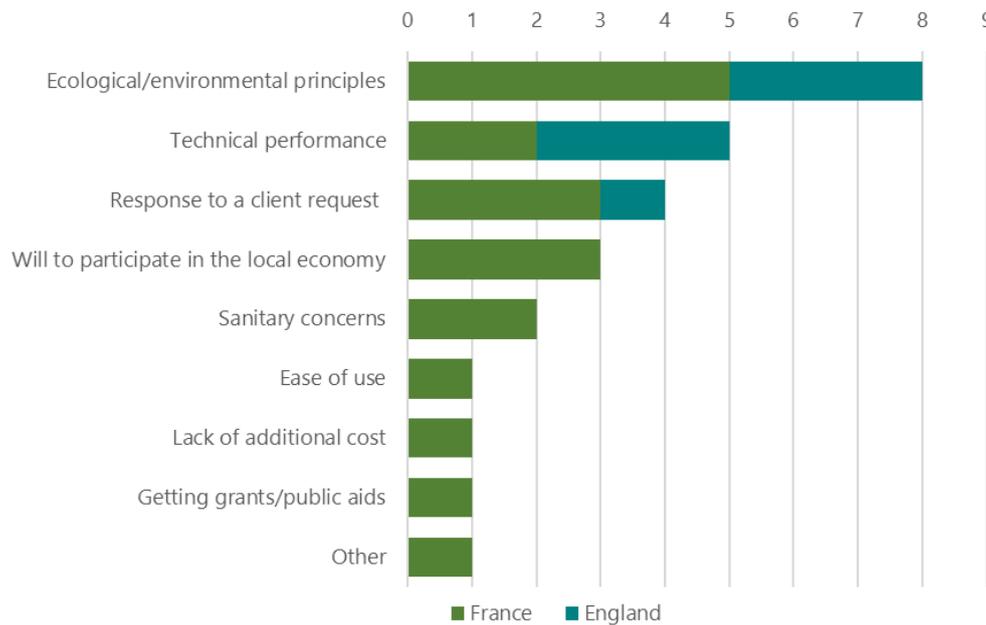


Figure 10 : Motivation of the people who are projecting to implement MB&D (n = 26 responses).

3.3.5 Motives for excluding MB&D

The two following questions targeted people who had indicated not implementing or working with MB&D.

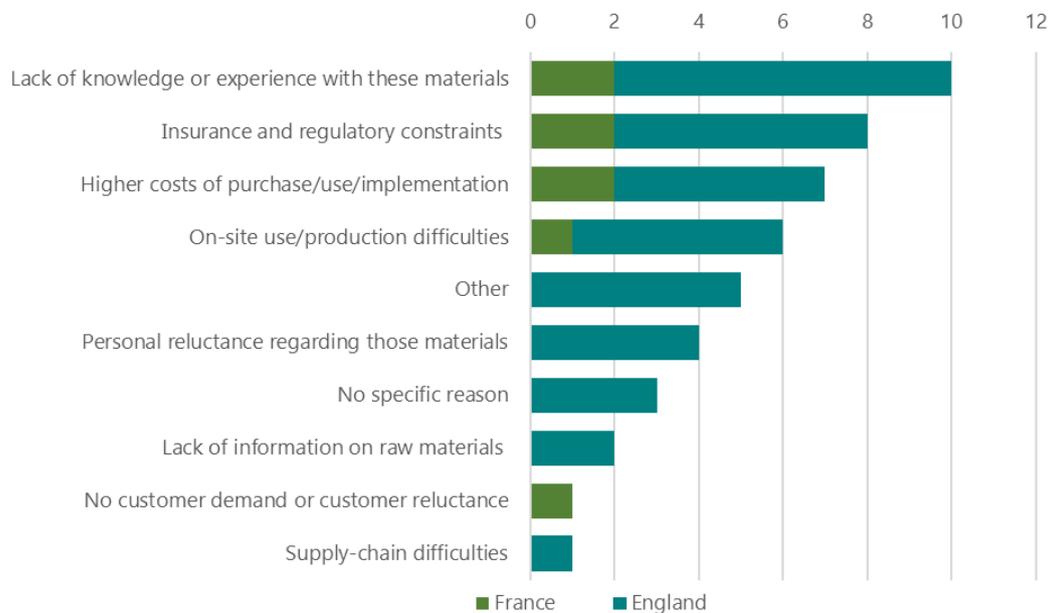


Figure 11 : Reasons evoked for the exclusion of MB&D within the respondents' activities (Stakeholders who answered "No" to the implementation of MB&D) (n = 47 responses).

According to the sample, the main three reasons for **not implementing MB&D** are a **lack of knowledge of the materials (21.2%)**, **constraints linked to the regulatory or insurance frameworks (17.0%)** and a **higher costs of purchase or implement (14.9%)**.

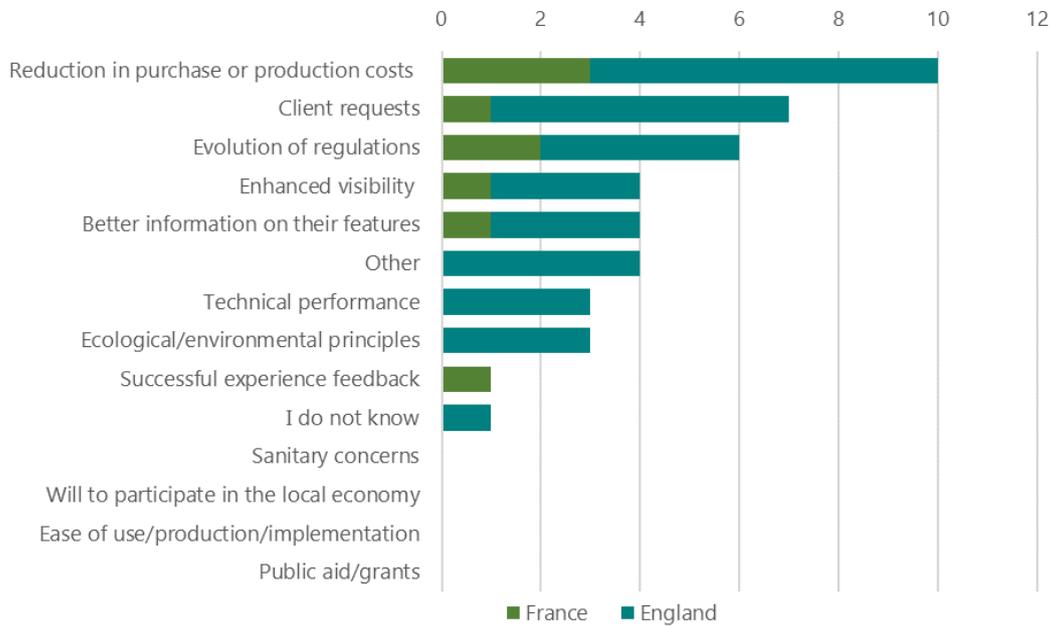


Figure 12 : Reasons that would make respondents who do not implement MB&D do it in the future (n = 43 responses).

When asked what **factors would lead them to include MB&D in their activities**, respondents evoked a **reduction of the purchase/production costs (23.2%)**, a **client's request (16.2%)** and the **evolution of current regulations (14.0%)** on these materials.

3.4 Perceptions of the bio- and waste-based materials market

All questions thereafter were posed to all respondents whether they had indicated implementing MB&D or not.

3.4.1 Perception of the evolution of recourse to MB&D

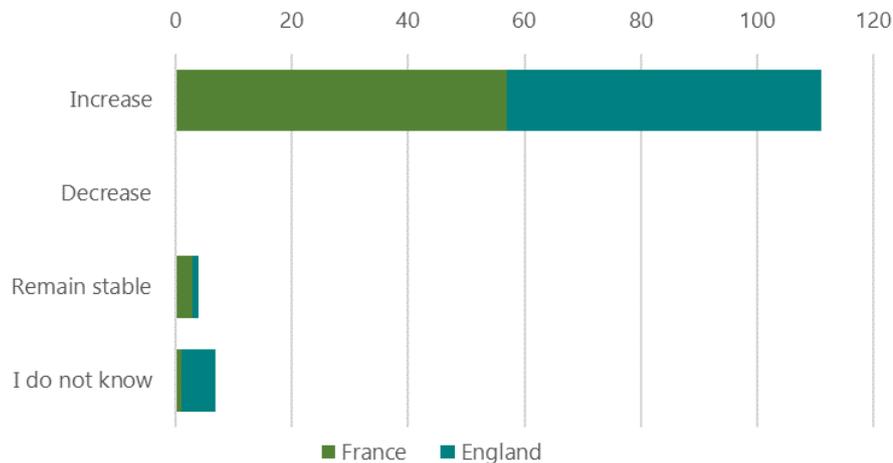


Figure 13 : Perception of the evolution of recourse to MB&D (n = 122 respondents).

The majority of respondents (**91.0%**) agree on the fact that the MB&D market is going to expand within **the next five years**, both French and English responded equivalently to this question.

3.4.2 Perceived impediments to the development of MB&D

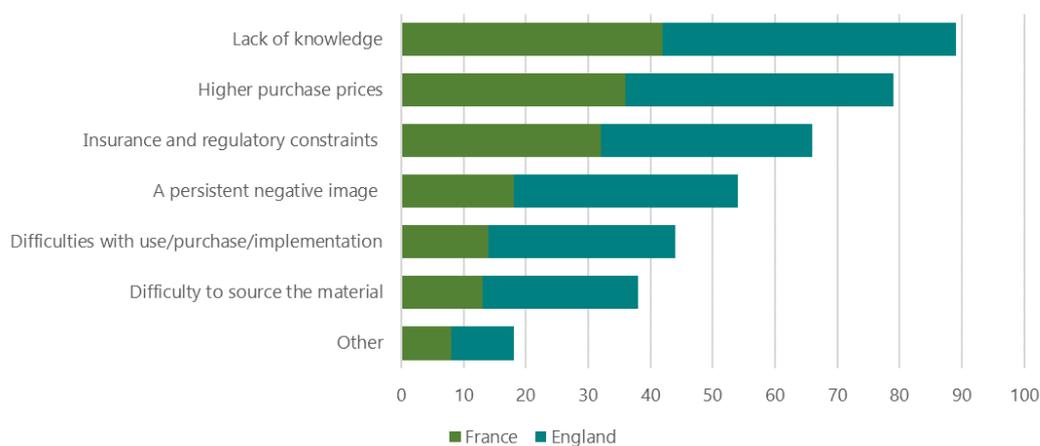


Figure 14 : Distribution of perceived impediments to the recourse to MB&D (n = 388 responses).

Respondents identified three major breaks to the generalisation of MB&D which are : **a lack of knowledge of these materials (22.9%), higher purchase costs (20.4%) and constraints linked to the regulatory framework (17.0%)**..

It is worth noting that the whole panel puts forward the same three main development impediments as the respondents who do not currently implement MB&D within their activities.

3.5 Perception of the SB&WRC prototypes

3.5.1 Methodologies choices made in this section

The following questions targeted the panel's perception of the material developed or envisaged within the SB&WRC project. Inert construction waste and rapeseed were included in the resources upon which the panel could comment despite the fact that the academic partners had already started work on the wheat, maize and polyester. They were included nonetheless as these two resources constituted serious contenders for prototypes and gathering opinions on them interested the project partners as well.

3.5.2 Perceptions regarding the type of construction project appropriate for the SB&WRC prototypes

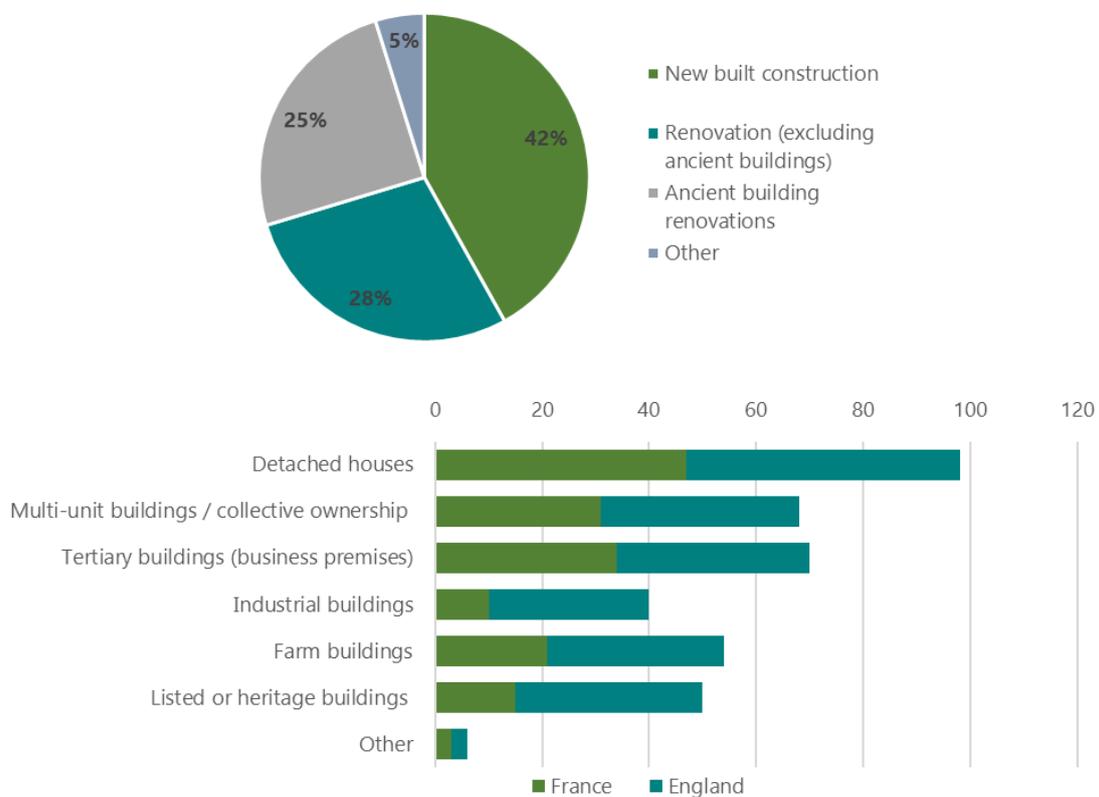


Figure 15 : Types of constructions and projects that respondents envisage for the SB&WRC prototypes (n = 229 et 386 responses respectively).

Respondents believed that the prototypes developed within the SB&WRC project would be most appropriate for **new built construction (42%)** and for **individual detached houses (25.4%)**.

3.5.3 Inclusion criteria for the SB&WRC prototypes

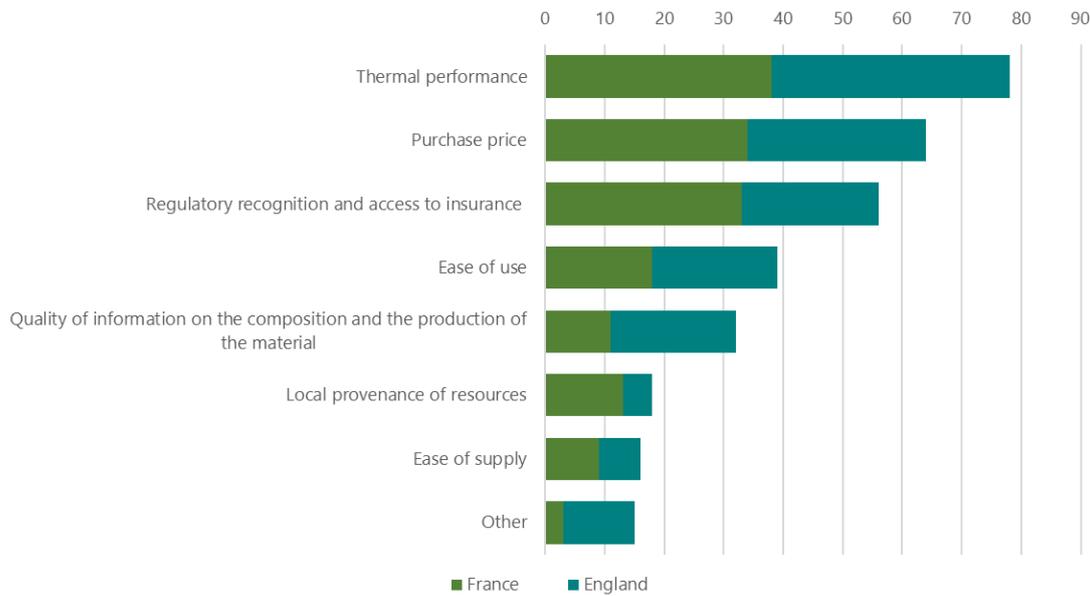


Figure 16 : Inclusion criteria of the SB&WRC prototypes within the respondents' activities (n = 318 responses).

If the prototypes developed by the academic partners of the project were to be commercialised, the factors that would convince people to buy and implement them would be their **technical performance (24.5% of votes)** primarily. The two other main factors are a **competitive buying price (20.1%)** and the **insurability of the construction project (17.6%)**. No major differences were observed between French and English respondents which indicates that similar dynamics may be at play in both territories and, potentially, similar marketing and sales strategy could be implemented.

3.5.4 Reluctance towards the prototypes

A first question exploring the existence of any reluctance towards the resources and prototypes presented indicated that **64.1% of respondents had no particular concerns**. The English sample seemed, proportionally, more critical towards the presented prototypes. Indeed, English responses are equivalent between both answers (26 Yes and 33 No) whereas the French sample seemed less critical (16 Yes and 42 No). In the end, only a third of respondents expressed concerns towards SB&WRC prototypes.

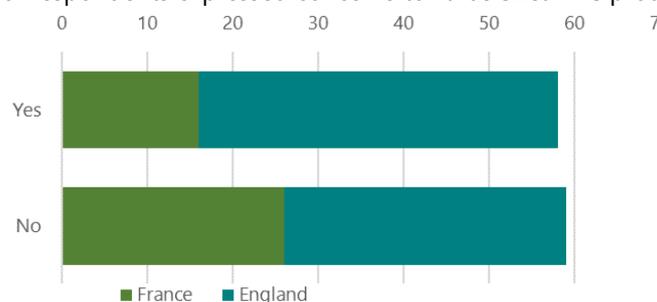


Figure 17: Distribution of responses to the questions Do you have any concerns regarding the SB&WRC prototypes (n=117 respondents)

People who indicated having concerns towards the resources considered for developing the SB&WRC prototypes, were mostly concerned about the **recycled polyester (31.7%)**, **maize (18.3%)** and **rapeseed (15.8%)**.

Respondents who had some reluctance towards the prototypes developed by the academic partners had the possibility to freely express themselves via a dedicated text box. 37 respondents thus explicated their concerns with the material. The 3 most recurring themes were, by order of importance, the **lack of information regarding the flammability of the materials**, the **perception of a negative impact on indoor air quality**, or at least a lack of information on this dimension, and lastly a **lack of information on the hygrometric behaviour** of the prototypes. In these three cases, respondents expressed a **need in having access to test results**, and potentially to proof of certification of the prototypes, of these three aforementioned dimensions before they could envisage implementing them on construction site.

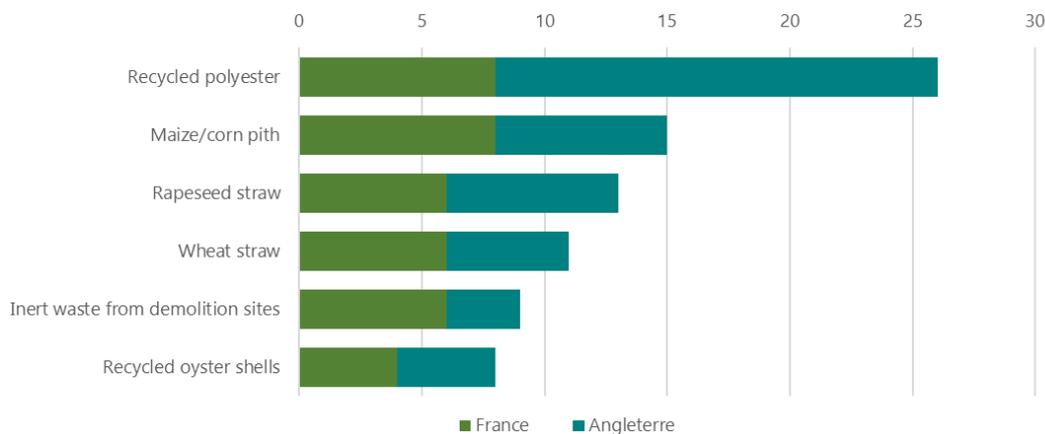


Figure 18 : Reluctance towards the resources chosen for the SB&WRC prototypes (n = 82 responses).

3.5.5 Interest in the purchase of the prototypes

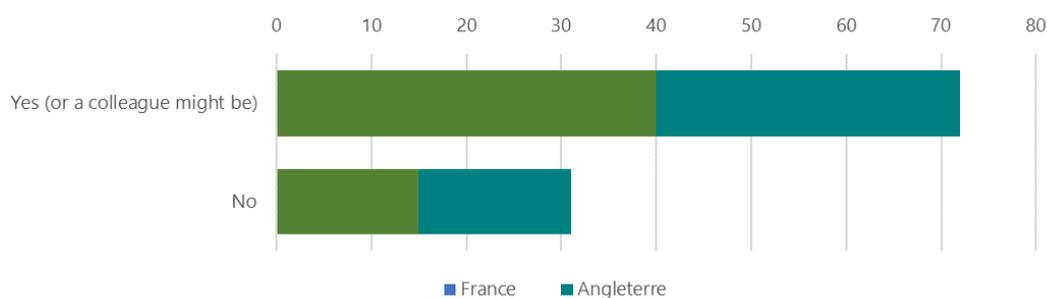


Figure 19 : Distribution of the interest in purchasing the SB&WRC prototypes (n = 103 respondents).

69.9% of the people surveyed expressed an interest in the purchase or the use of the SB&WRC prototypes if they were commercialised. This proportion is similar to that of respondents who declared having no reluctance towards the materials used. This interest for the prototypes may prefigure a successful commercialisation of the materials developed within this project.

4. Analysis

4.1 A promising yet currently braked market

According to the results of the present survey, it seems that MB&D are being implemented by the majority of respondents even though they do not constitute a major part of their activity. However, these results may not be generalised to the entire construction industry since the respondents to this questionnaire, limited in numbers, were potentially already attuned to MB&D and may have self-selected to answer this questionnaire and therefore skew the sample. In this manner, a person already sensitive to the environmental or sustainable aspect of the material they implement may monitor more diffusion platforms such as those of partners ASBP and Construction21 or track such topics as sustainable construction and, thus, would have more chance of hearing about the question and be inclined to respond to it. In the contrary, a person not engaged with these topics might not be a member of these professional networks and not undertake any monitoring on these topics as well as not interested by a survey on MB&D implementation if it doesn't concern their activity. In conclusion, the results presented here must be put in perspective with regards to this respondents' bias and this possibility of self-selection.

The main motivations for implementing MB&D, as indicated by the participants to this survey, were:

- Ecological and environmental principles;
- Good thermal performance;
- Will to participate in the local economy.

In addition, it must be noted that respondents that intend to implement these materials also cite the same two first reasons but the third motivation becomes "a client's request". It may therefore be observed that this sample's will is to act in favour of the environment and the local economy while supplying to their clients MB&D which have equivalent performance to conventional products.

The three dimensions that are cited as brakes to the generalisation of MB&D and that are perceived as current barriers to the implementation of MB&D are exactly same (although their proportion may vary according to the questions). The three main factors that hamper the adoption of MB&D are:

- Lack of knowledge of the materials or resources;
- Regulatory or insurability constraints;
- Perceived higher buying or implementation cost.

It must be noted, however, that taken separately the French sample identifies these brakes in this order but the English sample leans more towards the "negative image of these materials" as a third major obstacle (difference of 2 votes between higher cost and negative image). Despite these brakes identified, a very large majority of respondents believe the market will expand in the coming years.

Hence, it emerges from this consultation that MB&D (excluding timber wood) are relatively well-known products even though they only form a limited percentage of the activity of construction professionals. Despite an informational issue, as pointed out by respondents who felt the main issue was a lack of reliable information on MB&D, people who implement these products do it mostly due to personal ecological beliefs.

4.2 Accounting for the evolution of mentalities and the market

The project team did qualitative consultations with contractor (architects, engineering firms, etc.), industry representatives as well as manufacturers during the various events (fairs, conferences, congresses, etc.) it

participated to. Furthermore, partners from the University of Brighton carried out an experiment during the Future Build conference (5th to 7th March 2019). During this event, prototypes of different materials, including those produced within the SB&WRC project, were exposed to the public. Partners from University of Brighton collected, thanks to an interactive exhibition the visitors' perceptions with regards to the value, the inherent meaning, the applicability and sustainability of the materials (a complete report written by partner University of Brighton is available in Annex 3 of the present report).

These consultations aimed at informally collecting opinions and stances notably on inclusion and exclusion criteria of MB&D and actors' perception of the future of the bio- and waste-based insulants market. The interrelated issue tackled by these consultations was to know if the SB&WRC prototypes were favourably considered or, in the contrary, their commercialisation would not interest purchasers and developers.

The majority of professional indicated to the project team that the implementation of new regulations (RE 2020 in France for example) and a growing interest from clients towards the environmental quality of the built environment, new biobased materials needed to comply with a number of criteria, summarised in Figure 20 below. According to the people consulted, currently available insulation material will become obsolete as they generally optimise one or two dimensions out of the 7 that these professionals identified as having an emerging importance. These 7 criteria are the following :

1. Purchasing cost;
2. Thermal characteristics;
3. Carbon footprint;
4. Flammability and fire reaction;
5. Indoor air quality;
6. Origin or source of the products;
7. Hygrothermal properties.

Indeed, a number of professionals have indicated that the optimisation of a material solely on the cost and thermal performance criteria will become obsolete. These two criteria should conserve their importance, but they will loose their decisive value in favour of a **collegiality of factors** mentioned above which might have an equal importance in the choice of an insulation material.

In England, due to constraining regulations (which may not necessary be applied or enforced) as well as recent event such as the Grenfell tower fire, two factors in particular have gained importance. Firstly, **flammability and behaviour of the material in fire** (emission of toxic compounds, smoke, etc.) has become a most critical criteria due to a growing demand from the clientele who needs to be reassured with respect to fire risks.

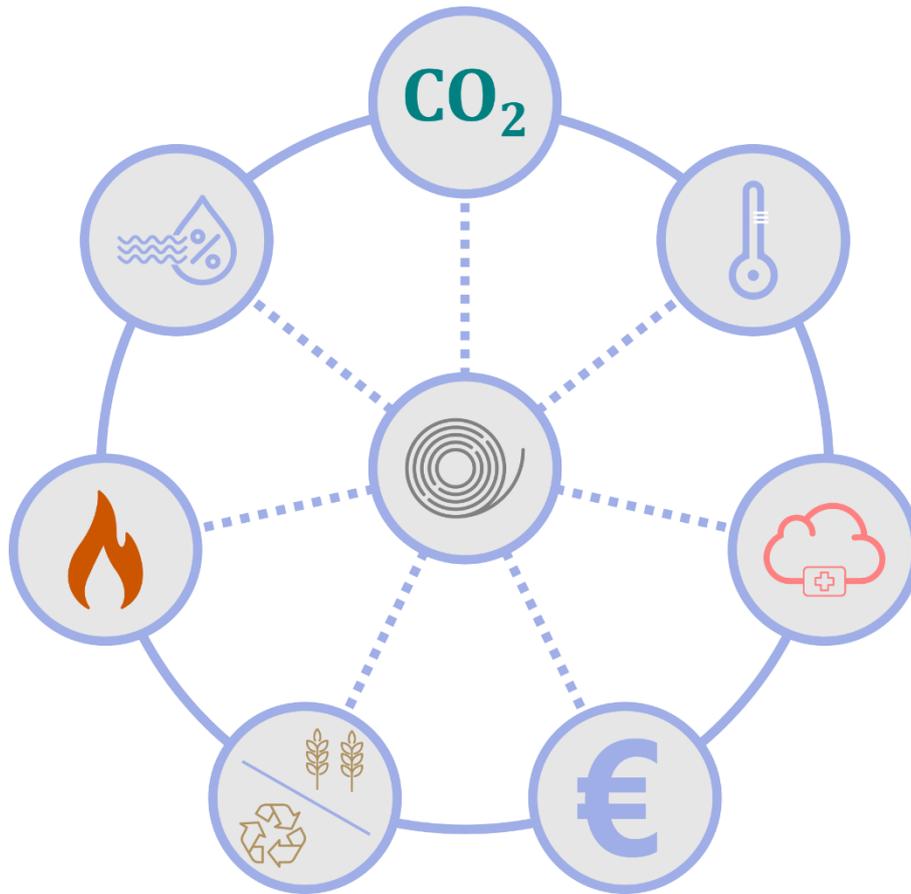


Figure 20 : The 7 dimensions that come in play when choosing an insulation material (concept which emerged from discussions with construction stakeholders). From top to bottom, clockwise: carbon footprint, thermal characteristic, air quality, price, origin of the material, flammability and reaction to fire and hygrometric property.

Moreover, the free text entries in the survey questionnaire confirms a tendency observed during this consultation. English stakeholders are also particularly concerned about the **hygrometric properties** of the newly developed materials. Stakeholders are conscious of the high pluviometry and relative humidity that some regions of the country may experience and have highlighted the importance of carrying out the adequate test to ensure hygrometric behaviours that are compatible with their climatic conditions. Thus, out of the 7 aforementioned dimensions the reaction to fire and the hygrometric properties are of prime importance.

In the contrary, the data from the Future Build interactive exhibit (presented in Annex 3) made air quality and health impact matters of concerns for stakeholders, particularly with regards to materials previously in use by humans (such as the reused¹ polyester) or which plant origin may foretell a capacity to host an ecosystem (microfauna and microbes). Vistors had notably shared their worries concerning the presence and proliferation of acarids and other such health risk factors (fungus for example).

¹ Reuse designates a practice by which used products or waste are used again for an identical or different purpose than their original one. This practice differs from recycling in that it keeps the value of the original state of the matter or the material and implies only steps to recondition or treat slightly the waste. Using a wood beam coming from a deconstruction site within a new structure would count as reuse whereas its transformation in chips or shavings to make OSB panels would count as recycling.

The discussion that were conducted with **French construction professionals lead to the emergence of the same 7 decision factors** (as presented in Figure 21). However, the most recurrent issue was that of sustainable provisioning above any other. In this manner, numerous persons underlined the necessity to have products which had reduced carbon footprint available but not at the cost of disrupting the food supply chain. Thus, in relation with the issue of carbon footprint of a material, bio-based materials posed the question of **its origin and potential issue of competition of the use of agricultural land for both food and construction material production**. Indeed, these stakeholders feared the emergence of a competition between land usages which may lead to a situation where prices would augment for both types of resources.

However, when **stakeholders were informed** of the real provisioning possibility as expressed in supplementary available volume, which designates the quantity of matter available once the common usage (return to the soil, cattle feed, etc.) were subtracted of the total amount of available matter available each year (cf. deliverable "Evaluation of sources and flows of resources with the Interreg France (Channel) England Program area"), **then they did not perceived any more usage conflict**. In the same vein, the use of agricultural co-products which do not currently have a use, such as the maize pith, did not raise the issue of use conflict in our consultation. Waste coming from other sectors such as stuffed and bedding material created a tension between the approbation of the valorisation of matter otherwise lost and the fear to see the rise of a market calling for increasing quantities of used polyester, for which new polyester may have to be made. This, in the minds of French stakeholders, would contradict the initial to decarbonise the economy and preserve natural resources. Therefore, **towards polyester, stakeholder expressed reservations** to its use if the latter was not strictly regulated and confined to the perimeter of reuse.

Moreover, it is interesting to note a major difference between this qualitative consultation and the survey. In the latter, the carbon footprint of a material was seldom mentioned in the responses or free texts. It may be the case however that this dimension was interpreted as already present within the conception of "environmental principles" (first source of motivation for the implementation of MB&D) and therefore considered implied by respondents when they developed their thoughts in writing.

In summary, stakeholders in both countries agreed on the fact that choosing an insulation material based on its price, and perhaps its thermal performance, was not sufficient and that, more and more, this choice was based on 7 dimensions. These dimensions not include price and thermal performance but also carbon footprint, resistance to fire, origin, hygrometric properties and air quality. Both countries differed in their evaluation, since English respondents favoured fire resistance and hygrometric properties whereas the French respondents were mostly concentrated on the carbon footprint and the source of the material and its related issues.

4.3 SB&WRC prototypes: a positive prefiguration under conditions

About two-thirds of respondents indicated that they had **no reluctance towards the SB&WRC prototypes** and the same proportion of people indicated that **they were interested in buying or using them if they were to be commercially available**. This is confirmed by the numerous interactions that the project team had with the professional and private audiences encountered during the various events; generally, the people to whom the prototypes are presented are enthusiastic about having a larger choice of MB&D available. However, several conditions have to be fulfilled in order for construction stakeholders to actually consider implementing these new materials.

These *sine qua none* conditions for the the adoption of SB&WRC materials are:

1. A need in complete **technical information on the product** mentioned by 67 % of respondents;
2. **Reassure professionals on the absence of conflicts of interests on the sourcing of M&D**, mentioned by 22% of respondents.

The primary condition for the adoption of the prototypes, mentioned by 67% of respondents to the questionnaire and reflected in the questions asked to the project team during the various events, is to have access to reliable technical information on all properties of the insulation materials. More than the price of the future products, building professionals reported wanting data from long-term deployment (both in laboratory and in testing facilities). Communicating these data would confirm the technical suitability of the materials and stakeholders would then be more inclined to implement them.

Finally, as previously mentioned, building professionals question the potential issues related to the supply of material (bio-based or waste-based) and generally do not wish to create a competition on land use or to create perverse effects (increase polyester demand for example. Thus, the other essential condition for the adoption of the SB&WRC prototypes is the insurance with supporting evidence (such as the deliverable: "*Evaluation of sources and flows of resources with the Interreg France (Channel) England Program area*") that the chosen materials do not lead to harmful side effects. Live interactions with some building stakeholders revealed that it was more of a need to be reassured and thus indicated a need for manufacturers to communicate on this dimensions.

Thus, the adoption of SB&WRC prototypes follows a similar trend to that of other MB&D. Indeed, in a similar fashion to the obstacles identified to the implementation of the MB&D where stakeholders initially deplored a lack of knowledge of their properties, the adoption of the SB&WRC prototypes will be done only when the professionals will have access to the different technical information. In addition, ensuring the truly sustainable nature of the source and supply chain of these prototypes is equally essential for the adoption of these materials. Subject to the provision of this information by the manufacturers and distributors of the future SB&WRC products, the professionals would be able to make their choice according to the collegiality of the aforementioned factors and would consider the purchase or the implementation of these materials.

4.4 Limits of the survey

Several limitations to this survey have been identified and are detailed below:

1. The sample is only constituted of 100 people per country which may not be representative of the diversity of stakeholders. This low responses rate are unfortunately common in online consultations even when they are targeted towards a specific group (here construction stakeholders via professional platforms).
2. As mentioned above, one must exercise caution with regards to the bias introduced by the choice of dissemination platforms and the potential self-selection of people to answer the questionnaire. As explained previously, it seems more likely that people already aware of these issues were more likely to answer the questionnaire.
3. The main profile of respondent to this survey was "company", and, more specifically, from architectural firms. All the other profiles were a minority and due to their diversity, it would not be possible to create an adequate comparison group with this majority profile. Thus, the diversity of stakeholders in the construction and building sector is not adequately represented in this survey;
4. The majority of respondents to the survey used or implemented MB&D, which reinforces the validity of the responses probing the motivations behind MB&D implementation, but caution should be exercised when considering the reasons why the other respondents did not implement MB&D since the latter are few in the final sample. However, it should be noted that the obstacles to implementations observed in the survey were mirrored in the feedback gathered by the project teams of partners Nomadéis, Construction21, ASBP and the University of Brighton during the various events they had participated in.

5. Annex 1 : perception questionnaire

SB&WRC project



Survey of construction professionals' practices and expectations for bio- and waste-based insulating material and the SB&WRC prototypes.

The *Sustainable Bio&Waste Resources for Construction (SB&WRC)* project is a French-British R&D project supported and co-financed by ERDF (*the European Regional Development Fund*). It aims to develop **three innovative, low carbon, bio- and waste based prototypes of thermal insulants**.

In order to develop prototypes that correspond to building professionals' and stakeholders' expectations, we launched the present consultation which aims to:

- Understand your perceptions and expectations regarding bio- and waste-based construction materials;
- Gather your opinion on the thermal insulant prototypes developed within the SB&WRC project and improve or adapt them to fit your needs;
- Identify the leverages or hurdles to diffusing these materials on the construction market.

If not otherwise requested, this survey is totally anonymous.

It takes about 8 minutes to complete.



Your activity

In which country is your company's headquarters located?

- France
- England
- Other (specify) _____

If your activity is located in France / in England, specify the department / the county

Which stakeholder category do you belong to?

Company	Association	Administration	Research/ educational organisation
---------	-------------	----------------	------------------------------------

What is your main activity?

Training, education, research

- Fundamental research
- Applied research and development
- Training
- Education
- Evaluation / certification
- Other (specify) _____

Conception and production of building materials

- Research / development
- Industrial production of construction materials
- Craft production of construction materials
- Other (specify) _____

Materials trade or supplier

- Trading for professionals
- Trading for individuals
- Other (specify) _____

Construction project ownership/client

Public contracting authority (ex.: local authority)

Private contracting authority (ex.: real estate developer)

Other (specify)

Architecture/planning and construction

Architecture, urban planning

Engineering, consulting, expertise

Construction works

Other (specify)

Other (specify)

(If answer is "company")

How many employees work in your company?

0-9	10-49	50-249	250-5000	5000+
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Practices and perceptions regarding bio- and waste-based construction and insulating materials

Do you deal with bio-based or waste-based insulating materials?

Yes	No	Planning to
-----	----	-------------

(If "Yes" or "Planning to" use of bio- and waste-based material)

(If "No", see next page)

How many years have you been using bio-based or waste-based insulating materials?

--

Which materials do you (or intend to) design/produce/sell? (You can tick more than one box)

- Wood fibre products (wood wools, particle boards as OSB, etc.)
- Hemp (hemp wool, hemp mortars and concretes, prefabricated elements, etc.)
- Straw (straw bales, strawboard panels, straw-based concrete, etc.)
- Sheep wool (sheep wool rolls, sheep wool hanks, etc.)
- Linen (linen yarn, chipboards, etc.)
- Recycled paper (cellulose wadding): loose insulation products, insulation panels, etc.
- Recycled textile (loose insulation products, insulation panels, etc.)
- Other bioresources (specify) _____
- Other biowaste (specify) _____
- Other waste (specify) _____

What proportion of your activity does the conception / sale or production of bio-based or waste-based insulating materials represent?

Less than 10%	Between 10 and 50%	More than 50%	100%
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Over the next 5 years, do you think your use or activities related to bio- and waste-based material will:

Increase	Decrease	Remain stable	I do not know
----------	----------	---------------	---------------

What convinced you to develop these types of materials? (You can tick more than one box)

- Response to a client request
- Ecological/environmental principles
- Sanitary concerns

- Technical performances
 - Will to participate in the local economy
 - Ease of use
 - Competitiveness against conventional insulating materials
 - Getting grants/public aids
 - Other (specify)
-

(If "No" to use of bio- and waste-based material)

Are there specific reasons why you haven't developed activities related to bio-based or waste-based materials? (You can tick more than one box)

- Lack of knowledge or experience with these materials
 - No customer demand or customer reluctance
 - Personal reluctance regarding those materials (specify)
 - Supply-chain difficulties
 - Higher costs of production / use and/or of raw materials purchase
 - Lack of information on raw materials
 - Manufacturing process difficulties
 - On-site use difficulties
 - Insurance and regulatory constraints
 - No specific reason
 - Other (specify)
-

What could encourage you to design and/or produce these types materials in the future? (You can tick more than one box)

- Ecological/environmental principles
 - Client requests
 - Sanitary concerns
 - Public aid/grants
 - Reduction in purchase or production costs
 - Better information on their features
 - Evolution of regulations
 - Successful experience feedback
 - Enhanced visibility
 - I do not know
 - Ecological/environmental principles
 - Client requests
 - Other (specify)
-

Perceptions of the market's future

Over the next five years, do you think the use of bio-based and wasted-based insulating materials will globally:

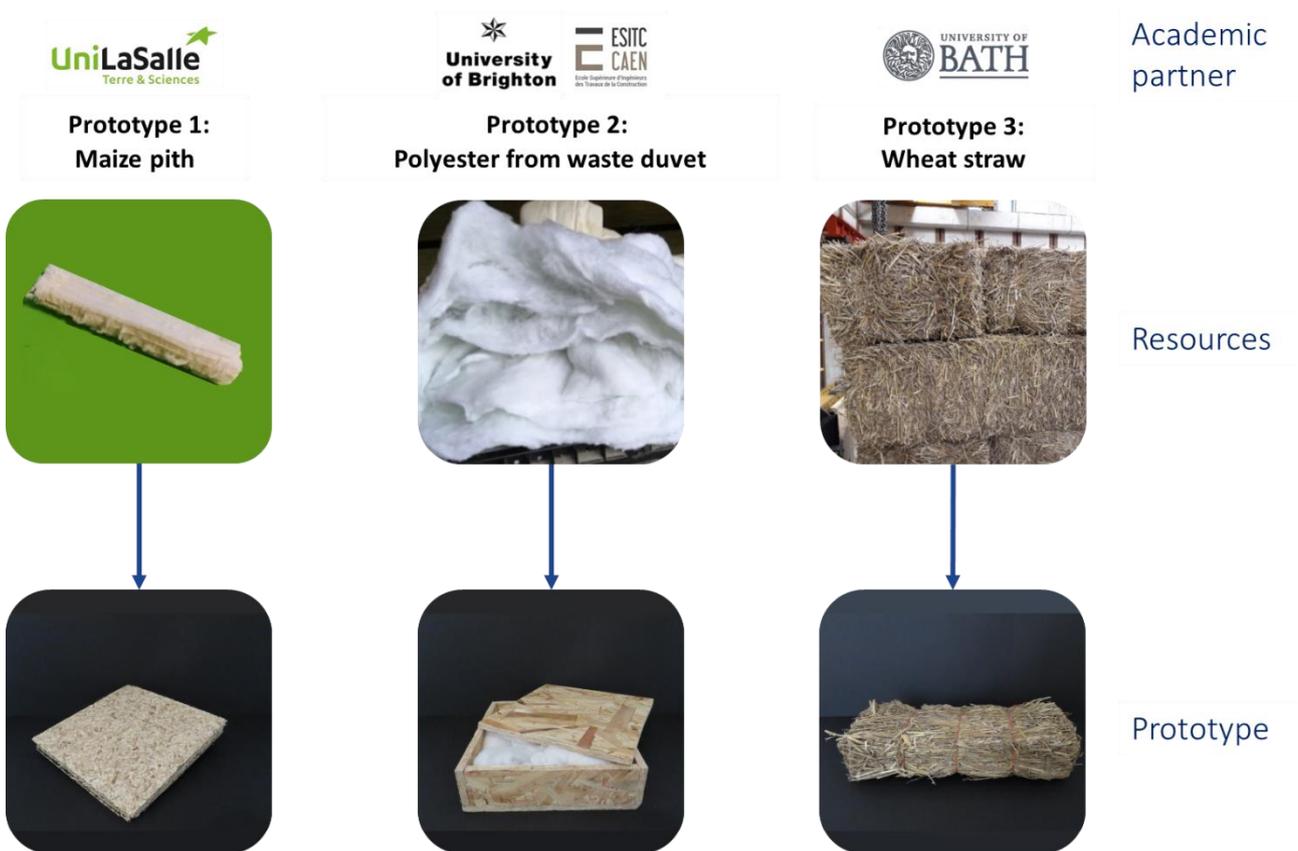
Increase	Decrease	Remain stable	I do not know
----------	----------	---------------	---------------

According to you, what could restrain the development of bio-based and waste-based insulating materials? (You can tick more than one box)

- Lack of knowledge
- Higher purchase prices
- Fear of on-site use difficulties
- Insurance and regulatory constraints
- Difficulty to source the material
- A persistent negative image (not resistant to fire, insects or rodents resistant, etc.)
- Other (specify) _____

Prototypes of insulating materials developed in the SB&WRC project

The SB&WRC project aims at designing, producing and testing three prototypes of innovative, low-carbon and bio-based or waste-based thermal insulants.



The following questions aim at providing feedback to the teams working on the conception of the SB&WRC project prototypes.

If you had to decide whether to integrate these types of materials or not in your activities, what would be your main criteria? (You can tick up to 3 boxes)

- Purchase price
- Ease of use
- Thermal performances
- Ease of supply
- Regulatory recognition and access to insurance
- Quality of information on the composition and the production of the material
- Local resources
- Other (specify) _____

Which type(s) of construction work do you think would be most suitable for using bio-based or waste-based wall insulators? (You may tick multiple boxes)

- New built construction
- Renovation (excluding ancient buildings)
- Ancient building renovations
- Other (specify) _____

According to you, what type(s) of buildings would be most suitable for using bio-based or waste-based wall insulators? (You may tick multiple boxes)

- Detached houses
- Multi-unit buildings / collective ownership
- Tertiary buildings (business premises)
- Industrial buildings
- Farm buildings
- Listed or heritage buildings
- Other (specify)

Are you reluctant to use some of the materials used in the design of those prototypes?

- Yes (if so, which one(s)?)
- Maize/corn pith
 - Rapeseed straw
 - Polyester from used bedding
 - Recycled oyster shells
 - Wheat straw
 - Inert waste from demolition sites
- No

(If “yes” to reluctance of use of SB&WRC material)

Why are you reluctant to those materials, and what could change your opinion? (Free text)

Might you be interested in the production, sale or use of the SB&WRC prototypes and would be happy for us to contact you with further information?

Yes	No, but a contact / colleague might	No
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Do you have any remark/comment on this survey?

If you wish to receive the survey's results directly, please indicate your email address below

Thank you for taking time to participate to this survey.



6. Annex 2: Raw results to the French and English surveys

6.1 Information questions

In which country is your company's headquarters located?

French survey	
France	88
England	2
Other	3
TOTAL	93

English survey	
France	4
England	76
Other	12
TOTAL	92

In which county is your company located (if the headquarter is in "England")?

Counties	French survey	English survey	Combined results
Bedfordshire	0	0	0
Buckinghamshire	0	4	4
Cambridgeshire	0	6	6
Cheshire	0	0	0
Cleveland	0	0	0
Cornwall	0	0	0
Cumbria	0	1	1
Derbyshire	0	1	1
Devon	0	1	1
Dorset	0	1	1
Durham	0	1	1
East Sussex	0	1	1
Essex	1	0	1
Gloucestershire	0	1	1
Greater London	0	33	33
Greater Manchester	0	0	0
Hampshire	0	0	0
Hertfordshire	0	1	1
Kent	0	0	0
Lancashire	0	0	0
Leicestershire	0	0	0
Lincolnshire	0	1	1
Merseyside	0	1	1
Norfolk	0	0	0
North Yorkshire	0	3	3
Northamptonshire	0	0	0
Northumberland	0	0	0
Nottinghamshire	0	0	0

Oxfordshire	0	0	0
Shropshire	0	0	0
Somerset	0	3	3
South Yorkshire	0	3	3
Staffordshire	0	0	0
Suffolk	0	0	0
Surrey	0	1	1
Tyne and Wear	0	0	0
Warwickshire	0	3	3
West Berkshire	0	0	0
West Midlands	0	2	2
West Sussex	0	1	1
West Yorkshire	0	2	2
Wiltshire	0	2	2
Worcestershire	0	0	0
TOTAL	1	73	74

In which Département is located your company (if headquarter in "France")?

Département	French survey	English survey	Combined results
01 : Ain	1	0	1
02 : Aisne	0	0	0
03 : Allier	0	0	0
04 : Alpes-de-Haute-Provence	0	0	0
05 : Hautes-Alpes	1	0	1
06 : Alpes-Maritimes	0	0	0
07 : Ardèche	0	0	0
08 : Ardennes	0	0	0
09 : Ariège	0	0	0
10 : Aube	0	0	0
11 : Aude	0	0	0
12 : Aveyron	0	0	0
13 : Bouches-du-Rhône	2	0	2
14 : Calvados	4	0	4
15 : Cantal	0	0	0
16 : Charente	1	0	1
17 : Charente-Maritime	0	0	0
18 : Cher	0	0	0
19 : Corrèze	0	0	0
2A : Corse-du-Sud	0	0	0
2B : Haute-Corse	0	0	0
21 : Côte-d'Or	1	0	1
22 : Côtes-d'Armor	0	0	0
23 : Creuse	0	0	0
24 : Dordogne	0	0	0
25 : Doubs	0	0	0
26 : Drôme	3	0	3
27 : Eure	0	0	0
28 : Eure-et-Loir	0	0	0
29 : Finistère	0	0	0
30 : Gard	0	0	0
31 : Haute-Garonne	5	0	5

32 : Gers	0	0	0
33 : Gironde	1	0	1
34 : Hérault	4	0	4
35 : Ille-et-Vilaine	4	0	4
36 : Indre	0	0	0
37 : Indre-et-Loire	0	0	0
38 : Isère	4	0	4
39 : Jura	0	0	0
40 : Landes	0	0	0
41 : Loir-et-Cher	0	0	0
42 : Loire	1	0	1
43 : Haute-Loire	0	0	0
44 : Loire-Atlantique	5	0	5
45 : Loiret	1	0	1
46 : Lot	0	0	0
47 : Lot-et-Garonne	0	0	0
48 : Lozère	0	0	0
49 : Maine-et-Loire	0	0	0
50 : Manche	0	0	0
51 : Marne	0	0	0
52 : Haute-Marne	0	0	0
53 : Mayenne	0	0	0
54 : Meurthe-et-Moselle	0	0	0
55 : Meuse	0	0	0
56 : Morbihan	2	0	2
57 : Moselle	0	0	0
58 : Nièvre	0	0	0
59 : Nord	0	0	0
60 : Oise	1	0	1
61 : Orne	0	0	0
62 : Pas-de-Calais	1	0	1
63 : Puy-de-Dôme	1	0	1
64 : Pyrénées-Atlantiques	0	0	0
65 : Hautes-Pyrénées	0	0	0
66 : Pyrénées-Orientales	0	0	0
67 : Bas-Rhin	0	0	0
68 : Haut-Rhin	0	0	0
69D : Rhône	0	0	0
69M : Métropole de Lyon	4	0	4
70 : Haute-Saône	0	0	0
71 : Saône-et-Loire	0	0	0
72 : Sarthe	0	0	0
73 : Savoie	4	0	4
74 : Haute-Savoie	1	0	1
75 : Paris	17	1	18
76 : Seine-Maritime	1	1	2
77 : Seine-et-Marne	2	0	2
78 : Yvelines	1	0	1
79 : Deux-Sèvres	0	0	0
80 : Somme	2	0	2
81 : Tarn	0	0	0
82 : Tarn-et-Garonne	0	0	0
83 : Var	0	0	0
84 : Vaucluse	0	0	0
85 : Vendée	1	0	1

86 : Vienne	0	0	0
87 : Haute-Vienne	2	0	2
88 : Vosges	3	0	3
89 : Yonne	0	0	0
90 : Territoire de Belfort	0	0	0
91 : Essonne	1	0	1
92 : Hauts-de-Seine	4	0	4
93 : Seine-Saint-Denis	0	0	0
94 : Val-de-Marne	0	0	0
95 : Val-d'Oise	0	0	0
971 : Guadeloupe	0	0	0
972 : Martinique	0	0	0
973 : Guyane	0	0	0
974 : La Réunion	0	0	0
975 : Saint-Pierre-et-Miquelon	0	0	0
976 : Mayotte	0	0	0
977 : Saint-Barthélemy	0	0	0
978 : Saint-Martin	0	0	0
984 : Terres australes et antarctiques françaises	0	0	0
986 : Wallis-et-Futuna	0	0	0
987 : Polynésie française	0	0	0
988 : Nouvelle-Calédonie	0	0	0
989 : Île de Clipperton	0	0	0
TOTAL	86	2	88

Which stakeholder category do you belong to?

French survey	
Company	60
Association	11
Administration	3
Research/ educational organisation	11
TOTAL	85

English survey	
Company	61
Association	8
Administration	1
Research/ educational organisation	11
TOTAL	81

What is your main activity ?

French survey	
Training, education, research	13
Conception and production of construction materials	13
Materials' sales or supplier	4
Construction project ownership/client	7
Architecture/planning and construction	31
Other	17
TOTAL	85

English survey	
Training, education, research	14
Conception and production of construction materials	10
Materials' sales or supplier	4
Construction project ownership/client	10

Architecture/planning and construction	36
Other	7
TOTAL	81

How many employees work in your company (if category is "Company")?

French survey	
From 0 to 9	20
From 0 to 49	16
From 50 to 49	10
From 250 to 5000	6
More than 5000	1
TOTAL	53

English survey	
From 0 to 9	38
From 0 to 49	4
From 50 to 49	6
From 250 to 5000	3
More than 5000	0
TOTAL	51

Does your company possess an environmental certification or qualification?

French survey	
Yes	16
No	37
TOTAL	53

English survey	
Yes	19
No	31
TOTAL	50

6.2 Implementation of bio- and waste-based materials

Do you implement bio- and waste-based materials in your activity?

French survey	
Yes	88
No	2
Planning to	3
TOTAL	93

English survey	
Yes	42
No	21
Planning to	5
TOTAL	68

6.3 If “yes” to the implementation of bio- and waste-based materials

Which materials do you use? (multiple responses allowed)

French survey	
Wood fibre products (wood wools, particle boards as OSB, etc.)	31
Hemp (hemp wool, hemp mortars and concretes, prefabricated elements, etc.)	29
Straw (straw bales, strawboard panels, straw-based concrete, etc.)	22
Sheep wool (sheep wool rolls, sheep wool hanks, etc.)	7
Linen (linen yarn, chipboards, etc.)	10
Recycled paper (cellulose wadding): loose insulation products, insulation panels, etc.	27
Recycled textile (loose insulation products, insulation panels, etc.)	20
Other bioresources (specify)	12
Other biowaste (specify)	6
Other waste (specify)	0
TOTAL	164
Number of respondents	47

English survey	
Wood fibre products (wood wools, particle boards as OSB, etc.)	31
Hemp (hemp wool, hemp mortars and concretes, prefabricated elements, etc.)	27
Straw (straw bales, strawboard panels, straw-based concrete, etc.)	18
Sheep wool (sheep wool rolls, sheep wool hanks, etc.)	25
Linen (linen yarn, chipboards, etc.)	3
Recycled paper (cellulose wadding): loose insulation products, insulation panels, etc.	22
Recycled textile (loose insulation products, insulation panels, etc.)	17
Other bioresources (specify)	7
Other biowaste (specify)	4
Other waste (specify)	4
TOTAL	158
Number of respondents	39

What proportion of your activity do these material represent ? (Excluding research/education actors and “others”)

French survey	
Less than 10%	14
Between 10 and 50%	2
More than 50%	2
100%	4
TOTAL	24

English survey	
Less than 10%	7
Between 10 and 50%	5
More than 50%	10
100%	9
TOTAL	31

In the next five years, you believe this proportion will: *(Excluding research/education actors and "others")*

French survey	
Increase	18
Decrease	1
Remain stable	5
I do not know	0
TOTAL	24

English survey	
Increase	13
Decrease	1
Remain stable	11
I do not know	7
TOTAL	32

What convinced you to implement these materials? *(multiple responses possible)*

French survey	
Response to a client request	7
Ecological/environmental principles	39
Sanitary concerns	14
Technical performances	30
Will to participate in the local economy	29
Ease of use	6
Competitiveness against conventional insulating materials	2
Getting grants/public aids	5
Other (specify)	9
TOTAL	141
Number of respondents	47

English survey	
Response to a client request	7
Ecological/environmental principles	37
Sanitary concerns	8
Technical performances	26
Will to participate in the local economy	9
Ease of use	13
Competitiveness against conventional insulating materials	0
Getting grants/public aids	0
Other (specify)	6
TOTAL	106
Number of respondents	39

6.4 If “planning to” implement bio- and waste-based material

What material do you intend to implement? (multiple responses possible)

French survey	
Wood fibre products (wood wools, particle boards as OSB, etc.)	4
Hemp (hemp wool, hemp mortars and concretes, prefabricated elements, etc.)	3
Straw (straw bales, strawboard panels, straw-based concrete, etc.)	4
Sheep wool (sheep wool rolls, sheep wool hanks, etc.)	3
Linen (linen yarn, chipboards, etc.)	2
Recycled paper (cellulose wadding): loose insulation products, insulation panels, etc.	4
Recycled textile (loose insulation products, insulation panels, etc.)	5
Other bioresources (specify)	0
Other biowaste (specify)	0
Other waste (specify)	0
TOTAL	25
Number of respondents	8

English survey	
Wood fibre products (wood wools, particle boards as OSB, etc.)	3
Hemp (hemp wool, hemp mortars and concretes, prefabricated elements, etc.)	1
Straw (straw bales, strawboard panels, straw-based concrete, etc.)	0
Sheep wool (sheep wool rolls, sheep wool hanks, etc.)	1
Linen (linen yarn, chipboards, etc.)	2
Recycled paper (cellulose wadding): loose insulation products, insulation panels, etc.	2
Recycled textile (loose insulation products, insulation panels, etc.)	1
Other bioresources (specify)	0
Other biowaste (specify)	0
Other waste (specify)	0
TOTAL	10
Number of respondents	4

What convinced to implement these materials? (multiple responses possible)

French survey	
Response to a client request	3
Ecological/environmental principles	5
Sanitary concerns	2
Technical performances	2
Will to participate in the local economy	3
Ease of use	1
Competitiveness against conventional insulating materials	1
Getting grants/public aids	1
Other (specify)	1
TOTAL	19
Number of respondents	9

English survey	
Response to a client request	1
Ecological/environmental principles	3
Sanitary concerns	0
Technical performances	3
Will to participate in the local economy	0
Ease of use	0
Competitiveness against conventional insulating materials	0

Getting grants/public aids	0
Other (specify)	0
TOTAL	7
Number of respondents	4

6.5 If “No” to the implementation of bio- and waste-based materials

Why do you never implement these materials? (multiple responses possible)

French survey	
Lack of knowledge or experience with these materials	2
No customer demand or customer reluctance	1
Personal reluctance regarding those materials (specify)	0
Supply-chain difficulties	0
Higher costs of production / use and/or of raw materials purchase	2
Lack of information on raw materials	0
Manufacturing process difficulties	1
On-site use difficulties	2
Insurance and regulatory constraints	0
Other (specify)	0
TOTAL	8
Number of respondents	5

English survey	
Lack of knowledge or experience with these materials	8
No customer demand or customer reluctance	0
Personal reluctance regarding those materials (specify)	4
Supply-chain difficulties	1
Higher costs of production / use and/or of raw materials purchase	5
Lack of information on raw materials	2
Manufacturing process difficulties	5
On-site use difficulties	6
Insurance and regulatory constraints	3
Other (specify)	5
TOTAL	39
Number of respondents	16

What could encourage you to design and/or produce these types materials in the future? (multiple responses possible)

French survey	
Ecological/environmental principles	0
Client's request	1
Sanitary concerns	0
Technical performance	0
Will to contribute to the local economy	0
Ease of implementation	0
Reduction in purchase or production costs	3
Evolutions of regulations	2
Successful experience feedback	1
Enhanced visibility	1
Better information on their features	1
Obligation to get public aid/grant	0
I do not know	0
Other (specify)	0
TOTAL	9
Number of respondents	5

English survey	
Ecological/environmental principles	3
Client's request	6
Sanitary concerns	0
Technical performance	3

Will to contribute to the local economy	0
Ease of implementation	0
Reduction in purchase or production costs	7
Evolutions of regulations	4
Successful experience feedback	0
Enhanced visibility	3
Better information on their features	3
Obligation to get public aid/grant	0
I do not know	1
Other (specify)	4
TOTAL	34
Number of respondents	16

6.6 Perception de l'avenir du marché

Over the next five years, do you think the use of bio-based and wasted-based insulating materials will globally:

French survey	
Increase	57
Decrease	0
Remain stable	3
I do not know	1
TOTAL	61

English survey	
Increase	54
Decrease	0
Remain stable	1
I do not know	6
TOTAL	61

According to you, what could restrain the development of bio-based and waste-based insulating materials? (*multiple responses possible*)

French survey	
Lack of knowledge	42
Higher purchase prices	36
Fear of on-site use difficulties	14
Insurance and regulatory constraints	32
Difficulty to source the material	13
A persistent negative image (not resistant to fire, insects or rodents resistant, etc.)	18
Other (specify)	8
TOTAL	163
Number of respondents	60

English survey	
Lack of knowledge	47
Higher purchase prices	43
Fear of on-site use difficulties	30
Insurance and regulatory constraints	34
Difficulty to source the material	25
A persistent negative image (not resistant to fire, insects or rodents resistant, etc.)	36
Other (specify)	10
TOTAL	225
Number of respondents	61

6.7 Perception of the SB&WRC prototypes

If you had to decide whether to integrate these types of materials or not in your activities, what would be your main criteria? *(multiple responses possible)*

French survey	
Purchase price	34
Ease of use	18
Thermal performances	38
Ease of supply	9
Regulatory recognition and access to insurance	33
Quality of information on the composition and the production of the material	11
Local resources	13
Other (specify)	3
TOTAL	159
Number of respondents	58

English survey	
Purchase price	30
Ease of use	21
Thermal performances	40
Ease of supply	7
Regulatory recognition and access to insurance	23
Quality of information on the composition and the production of the material	21
Local resources	5
Other (specify)	12
TOTAL	159
Number of respondents	60

Which type(s) of construction work do you think would be most suitable for using bio-based or waste-based wall insulators? *(multiple responses possible)*

French survey	
New built construction	43
Renovation (excluding ancient buildings)	25
Ancient building renovations	31
Other (specify)	6
TOTAL	105
Number of respondents	56

English survey	
New built construction	53
Renovation (excluding ancient buildings)	40
Ancient building renovations	26
Other (specify)	5
TOTAL	124
Number of respondents	60

According to you, what type(s) of buildings would be most suitable for using bio-based or waste-based wall insulators? (multiple responses possible)

French survey	
Detached houses	47
Multi-unit buildings / collective ownership	31
Tertiary buildings (business premises)	34
Industrial buildings	10
Farm buildings	21
Listed or heritage buildings	15
Other (specify)	3
TOTAL	159
Number of respondents	56

English survey	
Detached houses	51
Multi-unit buildings / collective ownership	37
Tertiary buildings (business premises)	36
Industrial buildings	30
Farm buildings	33
Listed or heritage buildings	35
Other (specify)	3
TOTAL	225
Number of respondents	60

Are you reluctant to use some of the materials used in the design of those prototypes?

French survey	
Yes	16
No	42
Total	58

English survey	
Yes	26
No	33
Total	59

If yes, which one(s)? (multiple responses possible)

French survey	
Maize/corn pith	8
Rapeseed straw	6
Recycled polyester	8
Recycled oyster shells	4
Inert waste from demolition sites	6
Wheat straw	6
TOTAL	38
Number of respondents	14

English survey	
Maize/corn pith	7
Rapeseed straw	7
Recycled polyester	18
Recycled oyster shells	4
Inert waste from demolition sites	3
Wheat straw	5
TOTAL	44
Number of respondents	23

Why are you reluctant to those materials, and what could change your opinion? *(Free text)*

Might you be interested in the production, sale or use of the SB&WRC prototypes and would you like to get more detailed information on them?

French survey	
Yes	36
No but a contact/colleague might	4
No	15
Total	55

English survey	
Yes	30
No but a contact/colleague might	2
No	16
Total	48

Do you have any remark/comment on this survey?

None recorded

7. Annex 3: 'Cities as Material Stores and Material Stories' Waste Zone, Futurebuild, March 5th-7th 2019 London.

Written by Nick Gant Principal Lecturer / Founder Community21 School of Architecture and Design, University of Brighton

7.1 Introduction

The exhibition sought to provide an innovative output and data gathering opportunity for the SWB&RC project, whilst providing an engaging and attractive exhibit for FutureBuild as an internationally significant building industry trade fair. The exhibition was presented as a giant map of a city and on it we mapped material propositions from on going waste material and valorisation research including the SBW&RC prototype insulate propositions alongside other initial material tests and related material proposals. It promoted the innovative nature of the prototypes as potential products and 'local' solutions that contribute to waste management of currently identified waste issues / opportunities as well as providing carbon emissions reduction potential but also contributing to the 'social' fabric of the city. It facilitated engagement and feedback on the potential 'values' accrued through the mapping of localised waste-streams and their role in increasing the sustainability of social housing whilst simultaneously fostering 'meaningful', local, material cultures and new vernacular designs.

The exhibition was very well received and organisers commented on its popularity and leading contribution to the show. A daily flow of visitors engaged with the objects, presented as accessible samples to touch. It was featured by social media based materials promoters and influencers (Including Material Stories and Materially Driven) and provided an excellent and key visual backdrop for the wider WasteZone feature.

The exhibition definitively engaged with both quantitative (material) and qualitative (immaterial) aspects of the urban environment. It reveals how waste-from-a-place can form the basis for design methodologies that are both technical and ethnographic and where design research manifests within both the physical and social 'fabric' of the city.

7.2 Mapping Waste Materials in the circular city

The interactive exhibition of material research presented the notion of waste materials gathered from across 'the city' and how the research has sought to valorise waste through two key approaches:

1. To exploit the material capabilities of the waste streams in terms of their technical, physical attributes and material, performance potential
2. To reveal and exploit their meanings as re-appropriated materials within the context of a city's built environment and material culture

This recognizes that the process of the valorisation and elevation of the 'value' of waste in relation to the built environment is about both the technical processes of the material into a usable state but also that the reuse and recycling of these materials may also have meaning in material and consumer culture. Culturally the materials and processes we use reveal their meaning in relation to aspects and contexts of use over time (Karana, 2010) but we also acknowledge their value as part of the process of facilitating, catalyzing but also embodying, communicating and mediating change (Gant, 2016) as *vernacular materials* of their place (geographically and within the politic and process of waste, reuse and recycling). Through this consciousness

of the material being significant beyond simply *recycled matter* and potentially socially and culturally significant in their 'becoming something else' (Ingold, 2011) we critically engage with metrics that recognize the social value of the material (Appelgren, 2019) - A feature of the waste landscape that is now gaining traction in academic research.

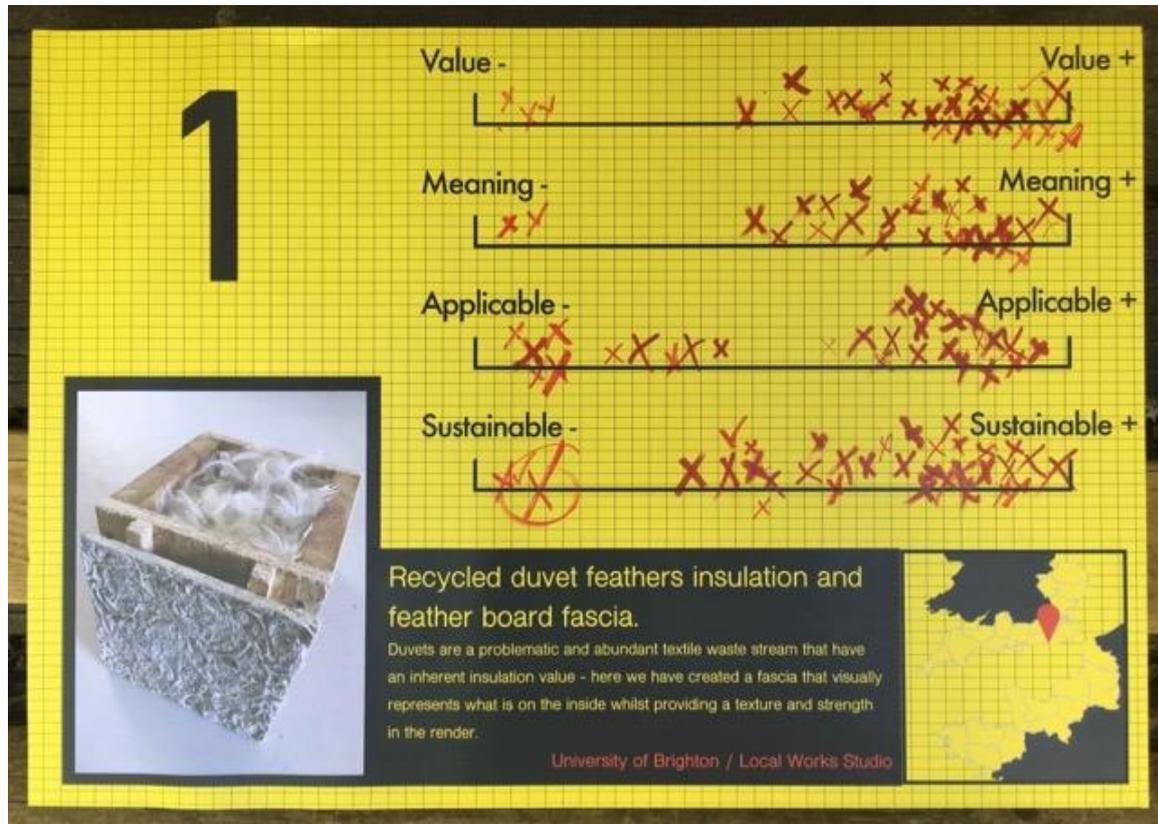
We adopt a *making-research* approach, where knowledge is generated *through and about* making as a constructive (Koskinen, et al, 2007) process of investigation and thinking (Adamson, 2011) and therefore the 'products' created and presented have been design through research and are propositional (Walker,2013). Through making we enact a form of enquiry that reveals both unpredictable outcomes as well as testing expectations built on established knowledge *and* hypothesis and our products form user solutions but also facilitate and embody the research.

We asked the industry to help in indicating on the boards provided whether individuals think that the materials presented offer:

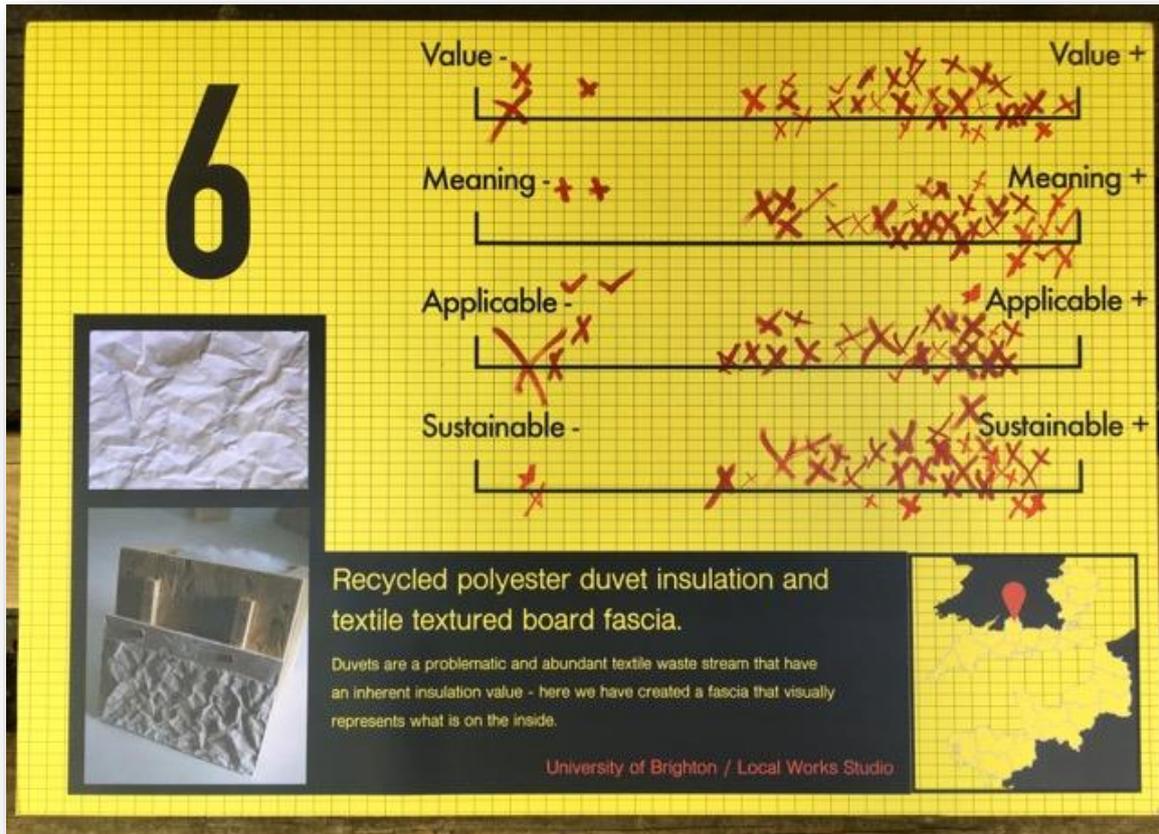
- **Value** : However you define 'value' – does the reuse and processing of the waste materials add or create value or not?
- **Meaning**: Do the material samples present meaningful propositions materially, socially, culturally etc or not?
- **Applicable**: Are the materials applicable to the built environment and / or to your business or industry or not?
- **Sustainable**: In your opinion are these material proposals sustainable or not?

Whilst this is not *secure data*, participants were not categorised and the process could not be policed as process but it did offer some immediate responsive feedback – as well as raising the profile of the project in an industrial setting.

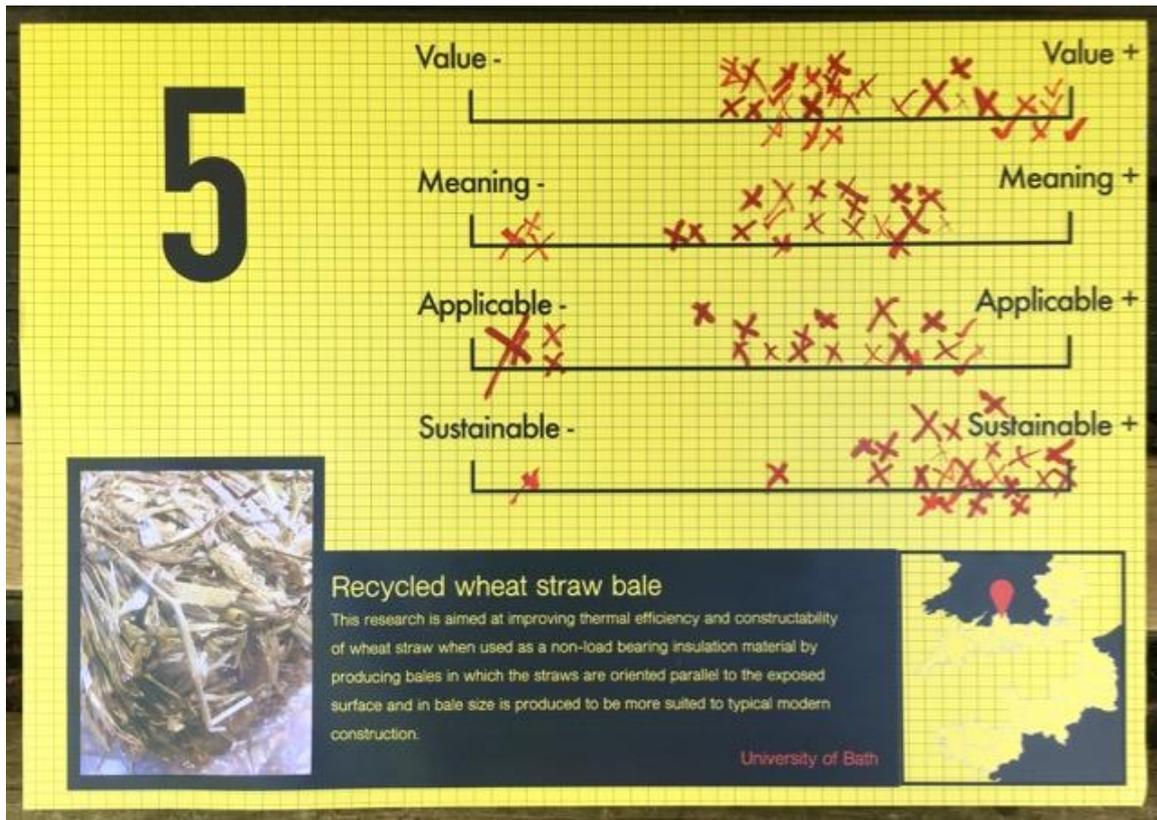
7.3 Feedback (qualitative data and verbal)



The use of feathers regardless of their origins as diverted land-fill etc is a contentious issue and some feedback conflates the projects use with the farming and use of animal derived materials and methods in some incidents which is reflected in negative data. More generally mixed opinions also viewed the use of material that had come into contact with humans as problematic – reflected in the range of feedback against the metrics. A recurrent aspect in all the insulate products shown was that their meaning is difficult to justify in some instances as they are in effect covered (inside a cavity and not visible) – but participants acknowledged the value of telling this story on the exterior of the building (as per tile details).



As above similar issues are associated with the use of products having had contact with humans, and the nature of a material that is not necessarily 'valued' if it is 'simply dumped inside walls'. But again this was to some degree polarised and others really valued the notion of such a problematic waste issue finding a sensible use, congruent with its intended purpose and the investment made to create an insulating material – that is otherwise wasted. Applicability feedback in each case varied based on whether the participant was even in the building trade (as some were marketeers, journalists etc) – generally less positive issues were expressed with concerns over stability of the materials (as fibres of plastic referencing recent concerns relating to plastics pollution micro-fibres) and feathers being messy. This relates to summary discussions relating to 'next step' possibilities.



Feedback here clearly identified with straw as an insulate solution already in the culture and use of materials for 'eco-insulation' – it is noted that the novel aspects of the research do need explaining and emphasising in this instance so that the innovation is acknowledged. Applicability issues again related to the 'mess' of potentially using straw (some from experience of adopters) and again the value is restricted by it being in effect a 'hidden solution'.



Feedback concurred with the above (re relationship to ‘unsustainable’ farming practices) and hidden nature of a product not supporting notions of valorisation – but as with the others this too was seen as an intelligent and sustainable use of a by-product and possible agribusiness / diversification. The textual and ‘organic’ aspect of the material did draw positive comments and it was handled to the point of destruction. It is no doubt seen as representative as a material of innovation.

Generally verbal feedback and engagement was very positive - discussions with visitors appreciated the aesthetic nature and contextualised, concept of the exhibit and the innovative approach to the prototypes. Individual comments were varied but common themes emerged:

The value in **representing ‘the inside out’** and how the insulates that are hidden are evidently less ‘meaningful’ as building products if they are out of sight (as the data also suggested). This was obviously promoted by our presentation of the duvet proposal with an effective rain screen tile that sought to promote the insulate – and visitors commented on how this could be carried forward to each prototype.

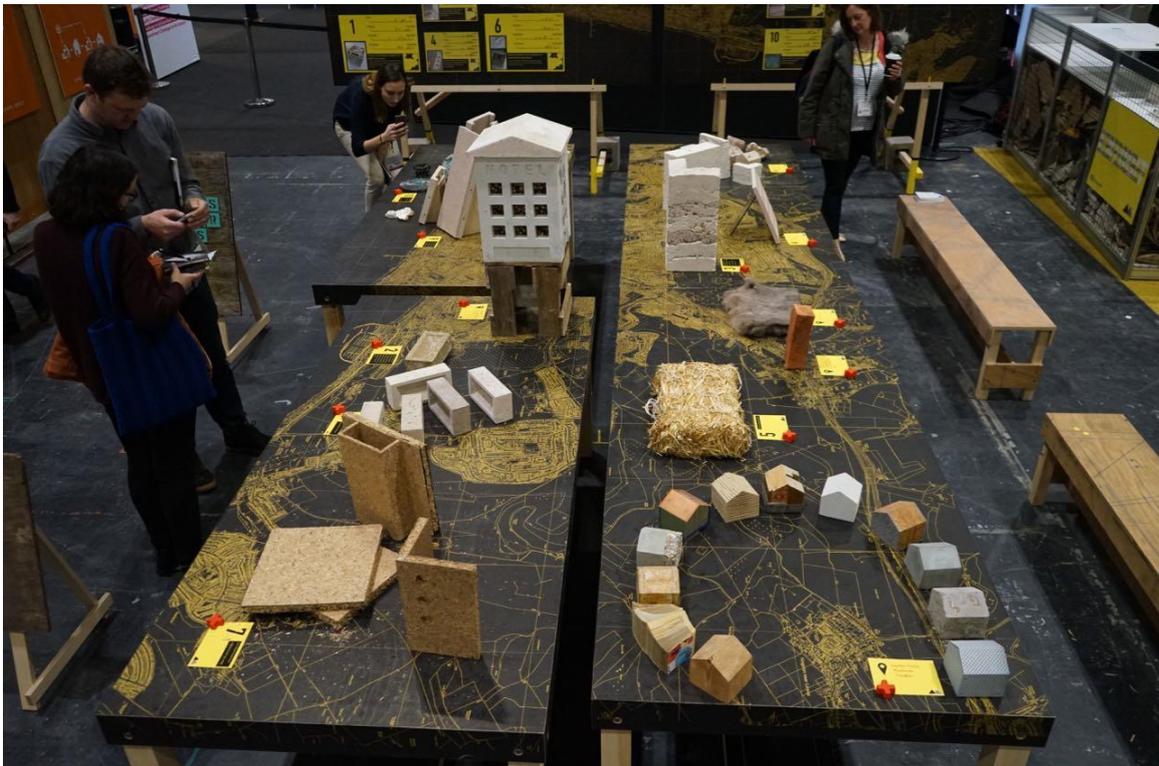
Other commonly discussed themes included the **next phase of development** and the recognition that ‘local’ opportunities would be further enhanced by systems that would support agri-business diversity and / or manufacturing systems to support the production of the prototypes as local business adaptations / opportunities. This does suggest potential for **follow-on project feasibility** study relating to the potential to

provide local SME business propositions for agri-business-diversification, machine adaptation and building implementation to really support and optimise the carbon reduction opportunities offered by distributed (ref Baurley, Tooze etc) or diffuse (rather than centralised) manufacture systems (Manzini, 2016).

Example images from the exhibition (Nick Gant):

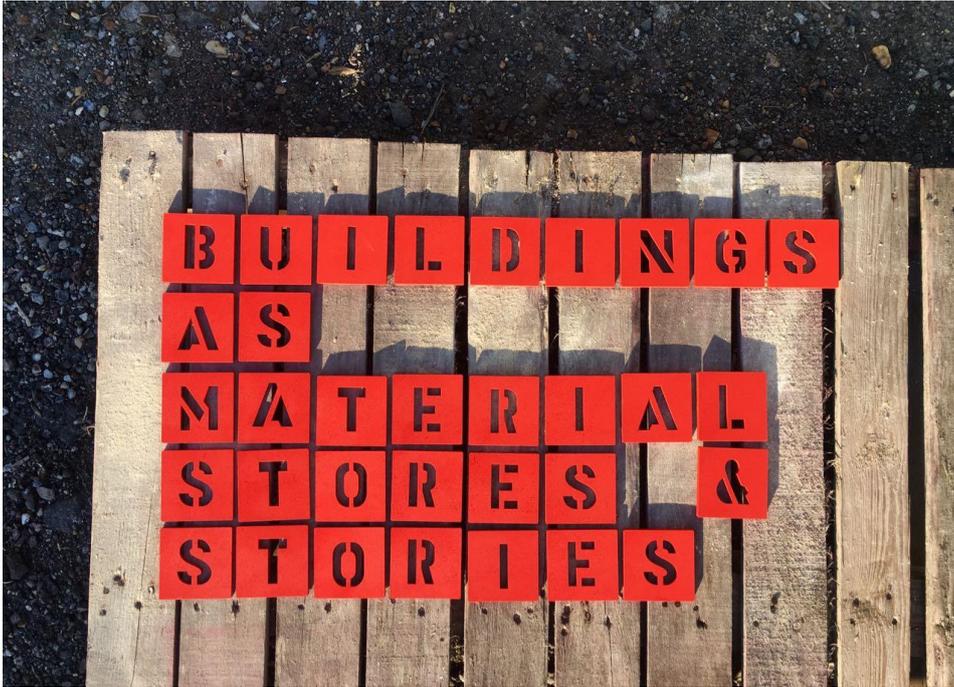














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