WPT2

Report on the demand survey – recommendation for the development of Cob

Parc naturel régional des Marais du Cotentin et du Bessin

EBUKI

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1 – CONTEXT

Earthen construction is enjoying a revival in Europe (if not worldwide).
interest. The context of climate change and the problem of reducing embodied energy now seems to favour the development of alternative techniques that are deeper and more sustainable than those launched after the first oil crisis in the 1970s and the commitment of the first eco-construction pioneers. Many internationally renowned architects have taken up this material in recent years. Their projects are regularly published and featured in exhibitions such as "Ma Terre première" at the Cité des sciences et de l'industrie in Paris. l'industrie Paris 2010). Students at architecture schools are regularly confronted with these images, which gradually lead them to question the use of earth in their projects.
But on closer inspection, the range of techniques used is fairly limited. One technique stands out in recent projects: adobe. The materiality of rammed earth is very appealing to designers and their clients. A simple search on the internet for the terms rammed earth or pisé brings up images of contemporary architecture in the United States (Rick Joy, Dust, etc.), Europe (Herzog & de Meuron, Joly & Loiret, Nama, etc.), Asia (Wang Shu, etc.) and Australia.

The same research carried out on the terms cob, cob, leads to a few buildings designed by Anna Herringer in Bangladesh, Kevin Mc Cabe's "cob citadel", and then to a plethora of projects by self-builders who are adept at the organic forms that cob is capable of producing very easily. The apparent simplicity of this traditional technique, which requires few tools, has undoubtedly encouraged its appropriation by followers of alternative construction or architecture without an architect. It is also perhaps this peasant construction method, which, like pisé in the 18th century, did not benefit from popularisation and wider use in urban and public construction, that explains why it has been little studied in contemporary times, and why there have been few attempts to modernise its use.

Over and above this lack or absence of popularisation of this technique, the lack of experimentation. Beyond this lack or absence of popularisation of the technique, the lack of experimentation with its materiality and its use in contemporary architecture, we have to recognise that in the current context of building production, the technique presents a number of pitfalls that need to be overcome. Traditional use requires labour, and we know that, today the main cost of a construction process. What's more, the technique is physically demanding. Lastly, drying times are longer than for 'dry' techniques such as rammed earth, lengthening construction times and making them more complex to organise.

A project to redevelop, modernise and optimise this technique must therefore examine these various factors and obstacles, so as to be able to analyse, circumvent and deconstruct them and deconstruct them. The Cob project therefore set out to study the perception that the perception that the average resident, homeowner or future builder had of cob, the way in which professionals approached and promoted it. In other words, could this technique have a future, could there be a real demand for it, leading to the development of a market, training and investment?

2 - OBJECTIVE :

In order to provide a broad overview of the current perception of cob, three target audiences have been identified and addressed as part of the Cob project:

-The general public as a mass investor in single-family homes, at least in the French context,

-Social Landlords

-Professionals in the building sector.

The objective of these three target audiences is different. In the case of the general public, the aim was to assess the ability of novice investors to be seduced by timber construction, to accept its materiality and the economic and/or implementation constraints.

In the case of social landlords, the objective is quite similar, but in the context of construction and property investment professionals accustomed to conventional solutions. conventional solutions. As thermal regulations evolve to take better account of environmental issues, meetings with these players enable us to assess their receptiveness to new techniques and their ability to experiment in a system that is highly regulated, and to ensure the durability and longevity of the structures they build.

Finally, the professional context was considered from two angles: professionals already familiar with earth construction, and novice professionals. Those already familiar with the technique were asked about technical guidelines and the relevance of improvements to mixes and tools. The more novice professionals were questioned on the same points as the social landlords, with the addition of the sensory and aesthetic dimension.

The synthesis of these observations, remarks and perceptions of the technique, crossed with the laboratory tests and the scale 1 construction tests, should make it possible to draw up a roadmap of actions to be undertaken in the continuity of cob1 to ensure the development of the process and its wider use in the field of earth construction and in the more global field of materials and processes available to designers and builders.

3 - METHODOLOGY

Various tools were used to carry out the survey, mainly surveys and interviews.

On the English side, a questionnaire was drawn up by EBUKI and the Park, focusing on the appearance of the material, its materiality and how respondents perceived it. The questionnaire also addressed the question of confidence in the material and the technique, the level and qualification of the perception of climate issues in construction, as well as the level of acceptance of potential investors in the construction sector. potential investors' acceptance of higher construction costs in

the hope of reducing energy consumption and having less impact on the environment (see Appendix 1). The questionnaire was posted on the association's website and shared on social networks. Informal discussions were held with professionals at the Ecobuild exhibition in London, at a meeting of the Devon Earth Building association and at Clayfest.

At the same time, EBUKI set out to assess the renovation market, based on the premise that the thermal improvements brought about by university studies could be used to build new high-performance buildings, as well as to improve the performance of existing buildings in the context of renovation or extension. To achieve this, EBUKI has access to the databases of energy diagnostics drawn up at the time of sales, which include the building materials used.

In Normandy, the Park entrusted this survey work to the IUT de St Lo Cherbourg, Département Technique de Commercialisation, as part of a tutorial project. Seven students, Julie GUILLEMINE, Noémie ROUSSEAU, Damien DEHAY, Gabriel ELIE, Vincent FERRIEUX, Samuel GAUDIN and Nathan LEPESANT, supervised by two teachers, Valérie MONTRIEUL and Harold LEFEVRE, drew up a survey questionnaire based on the EBUKI questionnaire (see appendix 2). The questionnaire was based on an iconography highlighting the different materials used in the cob, different architectural expressions and two virtual projects designed by an architecture student, presented in the manner of conventional bungalows in order to "attract" and

serve as a basis for discussion. These projects were also used as the basis for a study into the impact on the cost of building detached houses of using timber.

However, the survey method was different. The Park chose to reach out to the general public and potential investors by questioning them at home shows, which are generally the places where property investment intentions are expressed. The Park and its students were present at three housing fairs: Caen (2 separate stands over 3 days), Cherbourg (4 days) and Avranches (2 days).
Each of the fairs was chosen to respond to different contexts: an urban environment relatively far from a traditional earth construction area and with fairly high land pressure (Caen), an urban environment close to a traditional earth construction sector, with relatively low land pressure (Cherbourg), and finally a rather rural context in a traditional earth construction sector (Avranches).
(Avranches).

Each of the stands was equipped with a roll-up displaying examples of construction in clapboard and examples of pavilions that could be built in clapboard (see appendix 3). Samples of walls and materials provided visual and tactile support for the questionnaire.

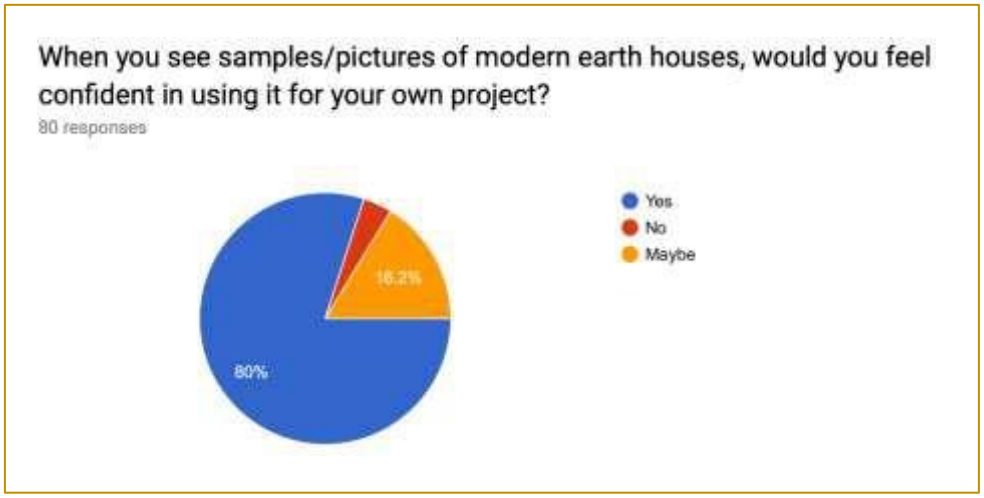
Discussions with professionals and social landlords were less formalised, based on individual interviews and discussion meetings. Three social landlords were interviewed (2 in Normandy and 1 in Brittany), and around thirty companies and forty architects/engineers were involved in informal discussions, most of which took the form of meetings, specific individual interviews, training courses on the use of timber, and a specific meeting in Brittany.

4 - RESULTS

4.1 - Surveys of professionals

The survey conducted in English was distributed mainly via professional networks (EBUKI, DEBA, etc.). As a result, the majority of responses came from the construction, design and training sectors. These responses should therefore be considered alongside those made in France by professionals in the sector during individual interviews and thematic meetings.
Eighty questionnaires were completed on the English online survey. The majority of the respondents were already familiar with cob construction (98%) and half of them were already familiar with the expectations of the cob project.

In France, almost 160 professionals were directly involved in the Cob study during the year (41 architects, 4 engineers, 48 builders, 4 social landlords, 26 teachers, 38 institutions/associations, etc.) through meetings, questionnaires or individual interviews. In addition to the partners, 3 French training organisations were directly involved in the project (AMACO, ENSA Normandie, GRETA des Estuaires) and three others from France and Austria (UNILASALLE, Lycée technique et professionnel LAPLACE de Caen, BASEHabitat/Universität Linz) were made aware of the objectives and work carried out by the project's supervisors and teachers with a view to future collaboration. This involved 26 teachers and almost 240 students.



Ill1 : confidence of English professionals in the use of cob as a construction technique

A summary of the responses or comments made about building with clinker shows a fairly homogeneous and shared perception of the technique, in terms of both its advantages and its constraints. The recurring elements in the responses on the potential of clapboard are :

- Thermal mass, which regulates interior heat
- low carbon emissions during construction and potential storage thanks to the fibres used in the mix
- Good indoor air quality
- Humidity regulation
- Tailor-made buildings, with formal freedom facilitated by the no-formwork technique
- Potential for different materials (a notion to be put into perspective in relation to the general public survey)

These professionals have also pointed out a number of points penalising the technique:

- Thermal problems: poor insulation, penalising new projects with regard to regulations that only take this property of the materials into account in regulatory calculations,
- Serious concerns about installation times and the drying out of structures
- Lack of skills, knowledge and training among professionals in the construction
- public and private customers
- Lack of certification to enable the right people to be found.
- Lack of case studies and exemplary projects to promote the technique.
- Not economically competitive or affordable
- Lack of recognised standards
- Perception as low-tech or a traditional, old, outdated technique, which can
- Penalising
- Maintenance
- Need to develop reliable construction details that meet current needs,
- Other trades, and today's essential equipment
- Difficult to use in an urban construction

Taken as a whole, these reactions are broadly equivalent to what emerged from the survey of the general public. The interest is there, there is little doubt about the quality and environmental benefits of the material, its potential in terms of comfort, its resistance over time and its ability to be maintained and repaired. Ability to be maintained and repaired. But the triad of construction costs, installation and drying times and regulations are still major obstacles for professionals.A number of strong requests were made with regard to the directions taken by cob:

- Need for tools to assess the performance of structures without having to use standardised earth. Professionals (particularly those already working in the field of earth construction) are keen to ensure that local soils can continue to be used. In other words, how can Cob develop a tool enabling professionals to anticipate and adapt their processes, or their design of structures according to the expected performance based on the properties of available local soils?

- More research into the performance of techniques and materials to make them easier to use. In France in particular, there are issues to be addressed in terms of environmental performance data sheets (FDES), which will help to comply with the future E+C- regulations, and structural calculation tools, in particular for earthquake resistance, which is of particular concern in the regions where the Group is active.

- seismic resistance, which concerns regions where cladding is traditionally used.

- A more commercial approach (turnkey products) to the sector, perhaps to compete a little more with other building materials and processes.

- Examples of collective/community construction to promote and publicise.

Some free words from the EBUKI survey:

- "Hoping that this research will bring more insight to the UK construction sector... to increase natural building opportunities."

- Positive remarks:
  Strong, resilient, comfortable, sculptural, beautiful, tactile, sophisticated, social, safe, accessible, warm, vibrant

- Negative comments:
  Hippy, naive, slow, difficult, messy, poor U-value, limited

4.1 - Survey of the general public:

    - The results are largely based on the tutorial work carried out by students from the Cherbourg IUT at three home shows. 340 questionnaires were completed, with almost equal numbers of men and women, and 71.8% based on an age category of person able to invest.
    - The interesting results of the survey include the following:
    - 19% of respondents were familiar with earthen construction, compared with 64% with cob. Most of these people were present at the Cherbourg show.
    - 20% of people who knew about clapboard associated it with an "ecological" or "natural" technique, compared with:
- "10% associated it with an old technique.72% of people who knew about clapboard and 42% who didn't considered it to be a reliable technique (score of 8 or more on a scale of 1 to 10) after seeing project presentations and seeing and touching clapboard wall samples presented at trade fairs.
- 79% found the material pleasant to the touch, 44% moderately liked the range of colours presented, compared with 37% who liked them a lot. 34% liked grey/white shades, 30% liked light/ecru shades and 36% liked stronger shades of yellow to red ochre.
- As for the obstacles to using the technique, 26% cited a lack of knowledge about the material and technique, 22% cited the price of such walls, 19.7% a lack of confidence in the material (11.5% reliability, 5.3% maintenance, 2.9% crumbling) and 14% the aesthetics of the material,
- When it comes to building costs, 85% of those questioned said they would be prepared to pay more for their home to save money in the long term, but only 55% said they would be prepared to pay 10-20% more.
- Insulation is mentioned by most as the most important quality that a modern building should have in terms of comfort, followed by energy savings, a regular temperature with little fluctuation, humidity regulation, unpolluted air, and finally, often by default and without conviction, good odour control.
- This is followed by energy savings, a regular temperature with little fluctuation, humidity regulation, unpolluted air, and finally, often by default and without conviction, good odour control.
- 80% of those surveyed had a positive perception of the various examples of contemporary construction shown on the roll-ups.
- 55.3% would not consider allowing very fibrous clapboard to appear on an exterior façade, and a fortiori 82% would not consider using the same finish indoors, judging it too rough and unattractive, sensitive to damp or dusty.

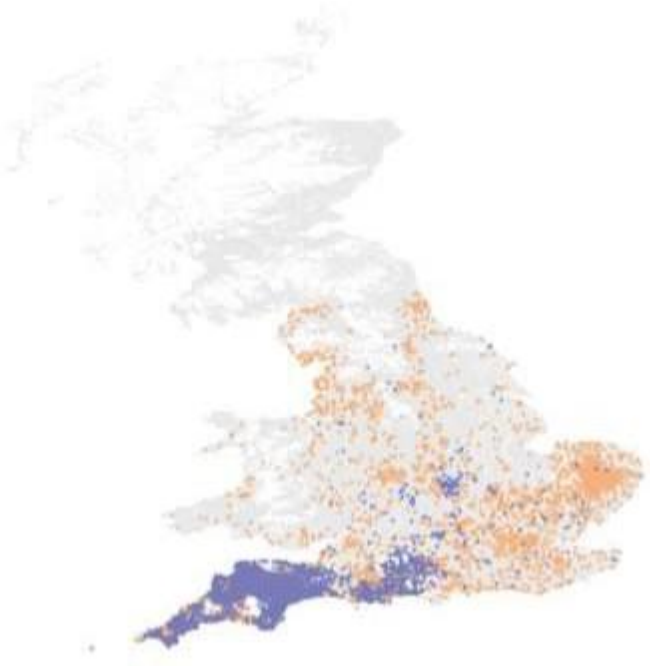
- 46.2% would not consider allowing a low-fibre clapboard finish to appear on the exterior, and 62% would consider using it indoors either.

- 6% of those questioned said they would certainly consider building with cob and 23% would seriously consider this solution, compared with 71% who would not consider using this technique at all. 270 buildings were surveyed between 1976 and 2016 as part of the "terres contemporaines" study by Elisabetta Carnevale and Anne-Lyse Antoine, students in the DSA "architecture de terre, CRATerre- ENSAG. According to the same study, pisé and BTC account for 31% and 38% respectively of new earthen buildings in France. Wattle and daub accounts for just 4%. If we compare this with the percentage of new earthen buildings in France (which we can estimate at just over 0.003%), the potential suggested by these figures for intention or interest in cladding is quite encouraging.

However, this highlights a number of bottlenecks that need to be addressed if the material and technique are to be developed. Information on the technique seems to be a key point. Aesthetics and cost are also two other key points that are quite closely linked. It seems that the raw materiality of clapboard is not particularly attractive to investors. This means that, in the majority of cases, plastering solutions will have to be considered to cover the walls. The financial impact on the total cost of the wall is therefore not negligible (see the cob report on the economic study).

4.1 Cob Renovation Market

One of the major discoveries of the first Cob Project was the existence of Energy Performance Certificate, EPC, data concerning cob. Cob is one of the recognised wall building systems in the UK EPC system, logging all house sales and rentals from its introduction in 2005 up to the most recent data available in 2016. Over that period cob buildings appeared in 12,000 sales or rentals across England and Wales, that's over a thousand a year, or 20 a week. Most of these houses are more than a hundred years old, many much more than that, so there is no doubt that cob is a long-lasting material which people find comfort from living in. But the Cob project is about improving thermal performance and building a market to do so.



12,000 cob homes plus 8,000 on the listed building register

New build cob is in some ways easier to improve, all the elements are assembled at site before the work begins and then the lighter Cob elements are assembled as the building is constructed. Existing buildings already have the roof overhang they were built with, the gutter details put in, the openings, windows and doors etc. And many have listed status. But none of this prevents home owners from repairing, maintaining, upgrading and extending their properties, a thriving market already exists. In

fact, most cob builders started not as cob new builders but as part of a workforce able to maintain and upgrade the existing housing stock which in parts of the country is quite plentiful.

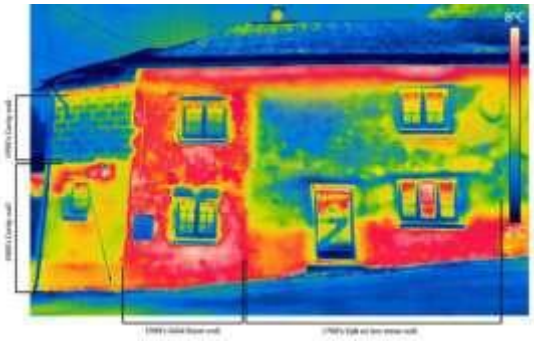
One thing that many cob houses have had applied in the past 50 years is a coat of cement render. This cure-all solution has been a disaster for buildings longevity and quality of life for the owners. It is not controlled by local authorities, mortgage companies or insurers despite the risks such an approach poses not just to their investments but to the very lives of the occupants. Clay bound structures, as the housing stock clearly shows, are long lasting structures. They work because of the materials used, the details and design of the buildings. Even rudimentary damp proof courses, stone or brick plinths are sufficient to keep the clay walls dry over decades and centuries. Roof overhangs from thatch, tile or slate similarly work at the top of the wall, with whatever maintenance a roof requires over its lifetime. These are the elements of the common phrase ‘a good hat and boots’ are what cob buildings require to work. But the last element of that old aphorism is ‘and a good coat’. This element is often overlooked as cob buildings can survive perfectly well without a render coat at all, but what it means is

Cement render and other inappropriate finishes can lead to disaster

Cement overcoats have two effects. In the short term they prevent walls from taking up and losing moisture as they do even when no protection is offered. The effect of this on homes is to trap moisture inside and reduce living conditions for occupants, particularly in cold damp conditions more heating is needed to achieve thermal comfort while humidity can lead to not just unhealthy levels of humidity in the air but also help spawn mildews and other fungal growths. In the longer term wet walls can lose strength, and aggravated by poor roof maintenance, poor maintenance of French drains or other disturbances to the original design walls that become too wet are at danger of collapse.

We can also see how cob buildings have been added to over time, mixes of wall building materials which have lower thermal mass and lower insulation levels that are masked behind the common use of renders. None of these later additions of render or other materials are controlled by local authorities, mortgage companies or insurers. In fact all of these agencies are currently blind to any potential

damage being done.



The same building with its built elements revealed through thermal imaging, cob is one of the better thermal elements while stone and concrete block could both benefit from an addition of Cob material

One of the outcomes of the Cob project has been to shine a light on this existing market for building and skills and see how Cob could help. Cob as an exterior treatment to cob is extremely sympathetic, it is made from the same materials, allows moisture to be taken up and released but also provides an extremely effective insulating layer from locally sourced materials and agricultural waste. It can be applied as well to concrete blocks as to cob, making it a compliment to more recent additions to older buildings too.
So Cob is both an opportunity to build to current and future thermal regulations in the UK and France but also to retrofit the existing stock of buildings using sympathetic materials locally sourced with a workforce trained to use these materials. This builds capacity, increases the value of the built housing stock and the quality of life for the inhabitants.
How to make this happen? One approach which we have been exploring through the Cob project is to become the technical advisors to the insurance industry, producing a guideline or best practice document for homeowners. Such a document would mean that going forward the existing housing stock is protected from poor care through applications of materials which harm the structures. Protection would be in the form of a loss of cover by the insurers where advice on care, maintenance, repair or additions has been ignored. This is an ongoing outcome of the Cob project, one which EBUKI are keen to pursue.

5 – CONCLUSIONS – PLAN OF ACTION

This study of demand shows real potential for the development of the technique. Awareness of the challenges of sustainable development and the need to limit CO2 emissions are present in people's thoughts and speeches, testifying to the receptiveness of these target audiences. Nevertheless, various bottlenecks have been identified that require the approach to be pursued in different directions.

The following proposals were drawn up following meetings with professionals and a summary of the responses to the various questionnaires. They constitute a list of actions to be taken in order to respond to the need for additional knowledge that emerged from the research carried out during cob1 and the results observed. They constitute a roadmap to ensure that the initial knowledge work continues and leads to the structuring of an innovative construction sector.

Setting an example

There seems to be a significant lack of tangible, visible references that can be visited. The survey undertaken provides a useful information base in this respect. It needs to be continued, completed and enhanced via the references/links to the online site.

However, the development of the Cob technique is hampered by a lack of practical experience. Finding and building pilot projects therefore seems essential to promote Cob. Such projects require strong support from the partners, to advise and reassure investors, designers and companies at every stage of the projects, from the first sketches to the commissioning of the building and its first years of life. This support is designed to identify sticking points, any gaps in knowledge, and any need for further study or fine-tuning of details. The complementary nature of Cob's partners is interesting in this respect, but it needs to be strengthened throughout the operational part of the design, to enable it to tackle the the question of architectural quality, the materiality of the clapboard, and its impact on other notions of comfort less addressed in the first phase of the study, such as the qualities of light, colour, auditory comfort, etc.
If we refer to the past experience of the PnrMCB in terms of the development of a sector for the renovation of the built heritage in cob, it was after having carried out 6 renovation operations between 1992 and 1994, with strong technical and economic support that the activity developed.

This is probably an objective we should set ourselves over the next 4 years: to initiate the construction of around 5 Cob projects in England and 5 projects in France on which a promotional campaign could be based to demonstrate the viability of the technique while fine-tuning its development and efficiency.

Technical knowledge

In order to achieve this target of 10 new constructions over the next few years, we need to acquire additional knowledge. The work carried out on mixes and the search for mechanical and thermal optimisation (see WPT1 report) has led us to devise a new installation process in which the load-bearing part and the insulating part are fitted together. The completion of the first scale 1 test walls seems to show that this principle is feasible.
But it does raise a number of questions about the long-term behaviour of this type of composite wall. Firstly, the drying of these two mixes can lead to differential shrinkage. How will the wall mounted on several successive courses behave during drying? What will be the quality of the bond between the two facings over this long drying period, and under load constraints (floor, roof)? How well will the protective plaster adhere to the different facings
We also realised that the installation time measured on experimental walls was not representative of the real scale of production of a building, experimental walls were not very representative of the real scale of production of a building. These initial experimental projects

enabled us to test the equipment and refine the installation principle, but not really to test and evaluate the economies of scale that a full-scale project could achieve. In this respect, the economic study highlights the risk of additional costs compared with conventional solutions, but also highlights other arguments that we need to complete or learn more about, particularly on the question of the overall carbon and environmental impact of the construction solutions being compared.

We therefore need to start building experimental test pavilions as soon as possible, so that we can measure the installation process, the time taken, and the performance achieved compared with traditional and conventional processes, measure the performance of the finished structure in use or in simulated use, assess the carbon impact of the worksite phase, and draw up EHSFs for this process. These observations will make it possible, on the one hand, to build the real argument on which to develop the process and, on the other hand, to develop the toolbox enabling professionals to design, assess the performance of the planned structures and construct these future Cob buildings according to the different project contexts (use of local soil or quarry soil, on-site construction or prefabrication, etc.).

Working on materials and architectural expression - fine-tuning construction details

The construction of test buildings should also be an opportunity to reflect on and experiment with the architectural potential of materials and techniques. The way in which they are used, the composition of the mixes and the nature of the materials are all sources of different expressions, different finishes and different materials.

to determine their full potential, which architects and interior designers could use to design their buildings. This reflection must combine the constructive aspects, the implementation and the fine-tuning of the constructive details (fixing, junction between materials, between structures). The results of these experiments in design and architecture will provide input for the designers of the pilot projects mentioned above, so that they can be extended and developed further. The aim of this work would be to complete the range of possible uses for raw earth in new construction by offering a reliable and interesting alternative to building with adobe or raw earth bricks.

Toolbox - technical guides

All the work carried out as part of cob 1 and the studies carried out for the design and construction of the test pavilions must be capitalised on and made available to professionals. and construction of the test pavilions must be capitalised on and made available to professionals. They will form the methodological and technical guide to cob construction. This guide should make it possible to assess the performance of mixes according to the composition of the earths used, depending on the fibres, to help professionals to develop the technical details of the buildings, and to give recommendations for the preparation and use of the mixes. The development of this guide will also be an important source of information for the development of training tools for professionals, as it will identify all the key points and skills that need to be mastered to achieve a quality result.

Formation

The successful development of the cob process will also depend on the ability of the partners to train skilled people from the design stage through to completion. This means that each of the players (architects, engineers, economists, craftsmen) will have to think about the skills and know-how they need to master. Then, on this basis, we will need to develop the specific

the specific teaching tools to be put in place, and the criteria for assessing skills. The work already carried out as part of the European PIRATE project could serve as a basis insofar as they have already been established for traditional cob at levels 3 and 4, i.e. for applicators. The work carried out as part of Cob, in particular for the

levels relating to specifiers, could conversely feed into the PIRATE reference system for earth construction.

These teaching and certification tools will make it possible to build training modules leading to qualifications, initially targeted at the professionals involved in the project (identified as part of WPT2) and subsequently developed by the partners to form part of their curricula. These include initial training courses at the University of Plymouth, ESITC Caen, the University of Caen, but also vocational and continuing training courses in which EBUKI is already involved as an assessor and contributor to the adaptation of vocational qualifications, or the PnrMCB in its participation in adult training courses at GRETA de la Manche. These initial experiences will make it possible to refine the various training and assessment evaluation tools before considering developing them more widely for other initial and continuing training training organisations.

Identifying skills

The work of identifying the professionals interested in the cob project should serve as a basis for privileged communication of cob results. It will make it possible to identify resource people who are already ready to get involved in the development of cob because they have expertise in the field of earth construction that will enable them to adapt and learn the principles developed quickly. It will also make it possible to identify requests for information and training. Ultimately, this database should make it possible to identify the various skills involved in cob, from the project planning phase (project management assistance, consultancy) through design, economics and engineering to construction. The partners will then have to think about how to monitor the quality of the players trained and involved, based on a charter of commitment, a brand, etc.

Information

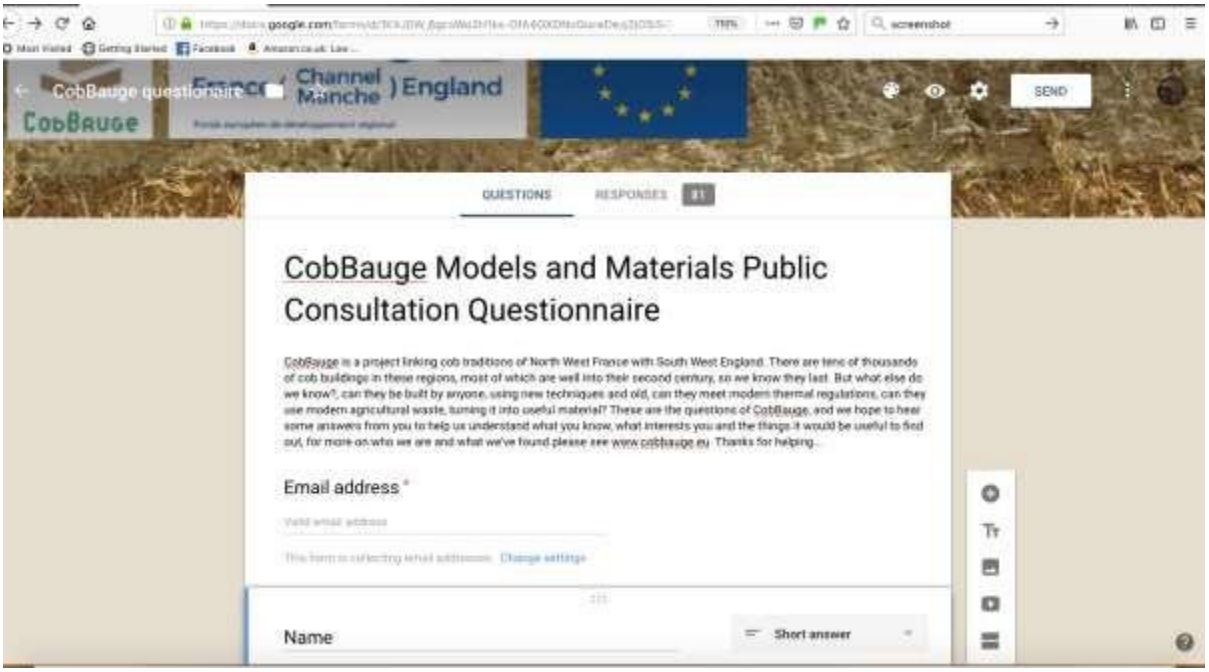
The work undertaken at trade fairs has shown that a regular presence and communication around the technique is very likely to reassure and develop its use. The growth in traffic on the FB page and other social networks also bears witness to this. For the time being, this work has been carried out by the project partners, but the professionals involved, who have been trained, will have to take up the baton and become involved in their own success. The structuring of these professionals, in particular via the above-mentioned action to identify and recognise skills, will therefore also be a corollary of the dissemination and awareness-raising actions at trade fairs. It will also be a question of extending this dissemination to trade shows, and not just among professionals or the general public who are already well-informed.

The results of this project will also need to be communicated beyond the network of players involved in the Flanders region involved in the FMA zone. The meetings in which the Cob partners have taken part have often led to exchanges with the European networks of those involved in earth construction and have often aroused their interest in the project. Social networks have also enabled connections to be made with other continents, suggesting that the results of Cob and the process developed could be disseminated well beyond the partners' 'historical' areas of intervention.

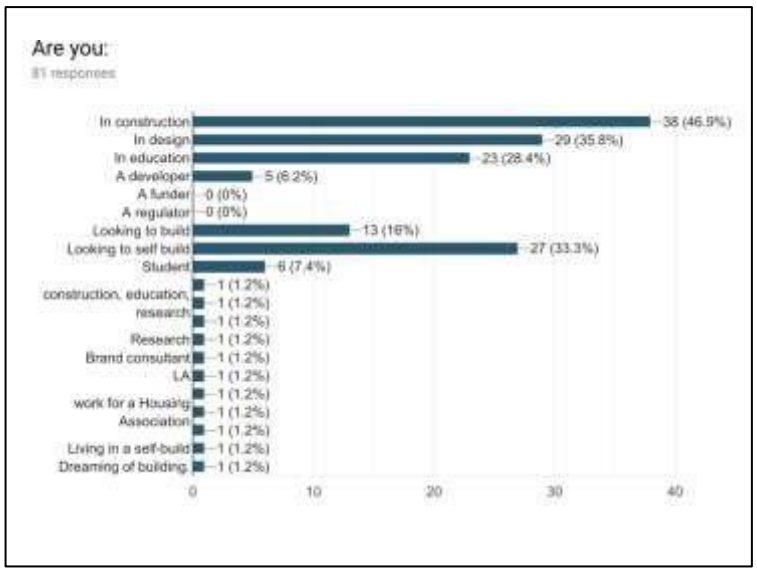
All of these actions are mutually supportive and need to be interlinked to enable the Cob project to develop as a whole and eventually achieve an ambitious objective of building in modern cob, contributing to the overall effort needed to meet the challenges of tomorrow.

ANNEXE 1 - EBUKI Social Media Questionnaire : Testing the market for Cob

In January 2018, EBUKI conducted an online questionnaire via facebook to gauge the interest, potential and barriers for the use of new Cob technologies, ie optimised ways of working with cob. The questionnaire was shared widely on social media with partners and other strategic websites, including Talking Natural Homes and the regional EBUKI groups.



The questionnaire received 7068 views and detailed responses from 81 people from a variety of backgrounds, largely connected with construction and education, including 26 self builders and 5 developers. It consisted of short yes/no answers as well as more open questions. Over 7000 words of text were submitted illustrating a significant level of engagement and a depth of knowledge and experience within the participant group (99% knew about cob and 50% were familiar with the Cob project). Views were sought on a range of technical, aesthetic, social and environmental issues regarding eco-construction and cob.



Some of the questions concerned subjective and emotional responses to cob. For example:

What words would you use to describe how you feel about cob?

" Strong, resilient, comfortable, sculptural, beautiful, tactile, sophisticated, social, safe, accessible, warm, alive"

"-Hippy, naive, slow, difficult, messy, arduous, poor U value, limited "

Other questions explored the relevant experience of the participants:

Please give a brief description of how cob is or might be used in your work?

This highlighted the range of active and potential users within the audience including architects and builders, new build and renovation projects, community groups, materials producers and professionals working in education and research. Many respondents recognised the need to raise awareness around the social, ecological and historic value of cob and it's many regional variations in the UK and beyond.

Further questions investigated the problems and opportunities for cob and Cob techniques which simulated a wide ranging and lengthy discussion primarily focussed on thermal issues (mentioned 29 times). The follow themes were the most common:

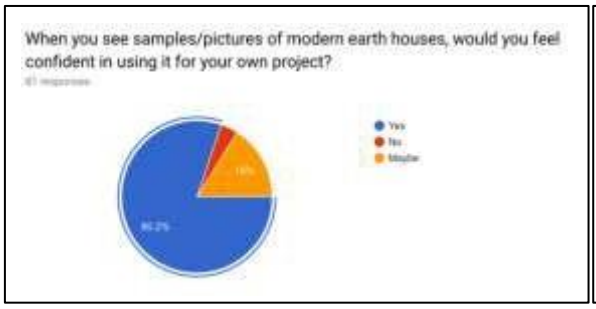
Opportunities for cob:

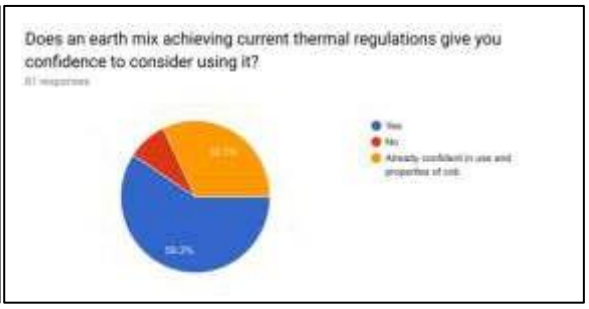
- Thermal mass regulating heat
- Training and education
- Low carbon emissions
- Good indoor air quality
- Moisture buffering
- Bespoke beautiful buildings
- Need for exemplar case studies
- Better research on performance
- Commercial products
- Community builds

Barriers to cob:

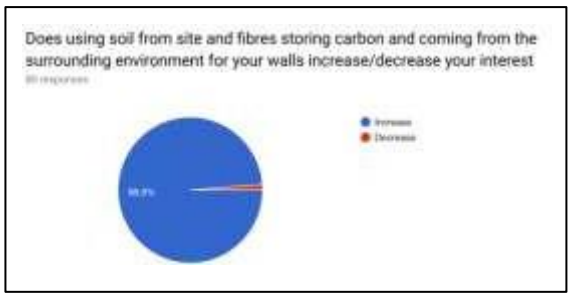
- Not competitive or affordable
- Thermal issues – poor insulation
- Lack of skills and knowledge
- Lack of agreed standards
- Perception as low tech
- Maintenance
- Building Reg compliance
- Lack of training and accreditation
- Need for robust detailing
- Difficult in urban areas

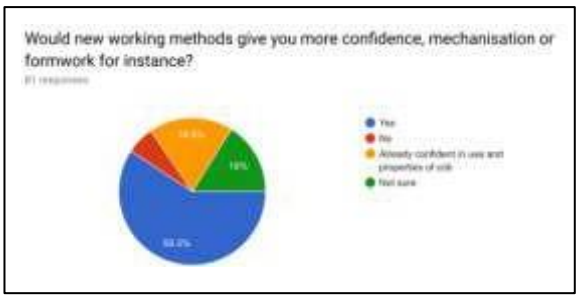
While almost everyone recognised the significant potential for optimised cob as a thermally efficient ecological technique, significant barriers are in place, both real and perceived, that need to be challenged if it is to become accepted and affordable in the wider construction industry. To this end a series of short yes/no responses further developed the case for changes that might increase the uptake of cob and Cob in new build and renovations.

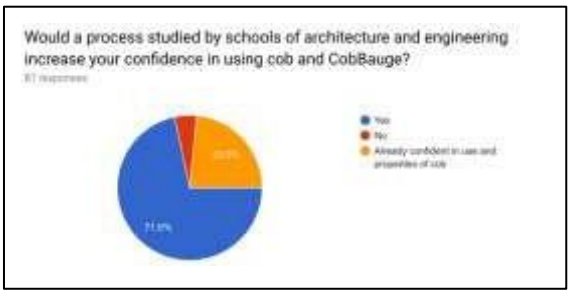


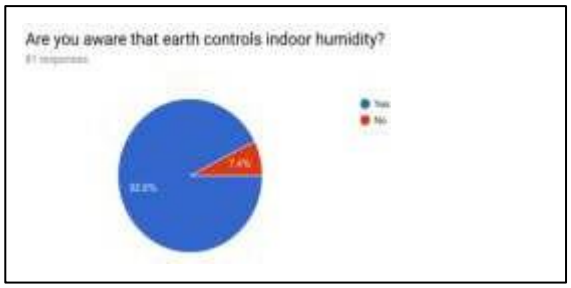


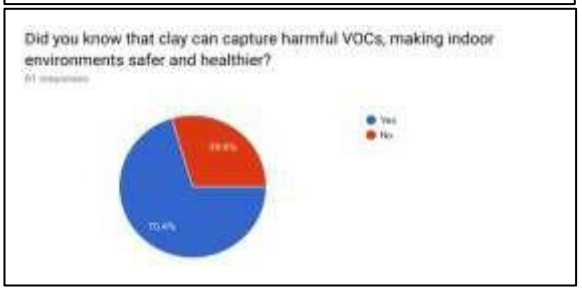
The responses to these yes/no questions have been recorded as visually accessible pie-charts and begin to build a picture of opening up the market for Cob with increased focus on improved thermal performance, humidity regulation, indoor air quality, locally sourced materials, mechanisation, training and education. These are the key areas that the Cob project can influence to encourage market and regulatory confidence and increase competence and motivation within the building industry.



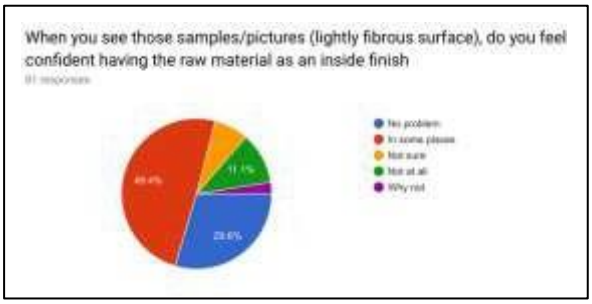


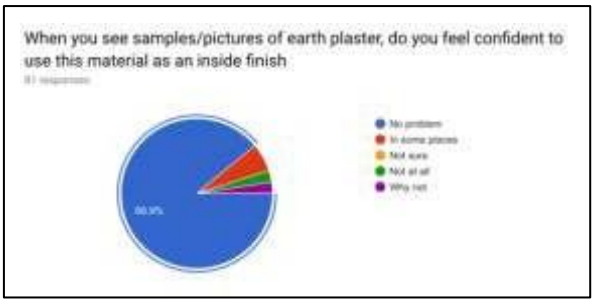






Finally, a series of short questions investigated the aesthetic barriers to the uptake of Cob. These challenges are more easily tackled but indicate the need to change perceptions of cob as a "*hippy, low-tech"* material especially regarding finishes. The use of clay or lime plasters internally and lime coatings outside have a long tradition in the UK so the skills are largely available and could be utilised to enhance and create a more modern and functional aesthetic for Cob if desired.





In summary the questionnaire has proved a useful tool in gauging the market perceptions of Cob amongst a well informed and experienced community. These are the people most likely to engage with the technology and take it to a wider audience with sufficient encouragement, motivation and support:

"Hope that this research brings more insight to the British building industry to be more accepting of natural building opportunities"

"I know much of the skills in these materials are being lost and given their potential benefits they

should not be. It should be developed as both a modern and traditional material method, to give designers and clients the best options and the confidence to use them".

"I think this is a great project and would like to wish you all the luck in your future endeavors :)"

<u>ANNEXE 2</u> - questionnaire PNRMCB

Bonjour madame, monsieur, nous sommes étudiants en Techniques de commercialisation à l'IUT de Cherbourg-Manche. Dans le cadre de notre formation, nous réalisions une étude sur un nouveau matériau de construction écologique.
Auriez-vous quelques minutes à nous accorder pour répondre à nos questions ?

I. Projet de construction

1 -Avez-vous déjà eu ou avez-vous un projet de construction ? (si non, renvoi à n°3)

Oui Non

Déjà eu un projet	A un projet

2 - Si oui, quel(s) type(s) de matériau(x) avez-vous privilégié ou privilégieriez-vous ?

Parpaings	Béton cellulaire	Bois	Brique	Terre	Pierre

II. Connaissance des matériaux écologiques

3 - Connaissez-vous les techniques traditionnelles de construction en terre utilisées (en terre crue)? Si non, renvoi à 5

Oui Non

1 / 5

4 - Si oui, lesquelles ?

.....

.....

5 - Parmi les méthodes suivantes, lesquelles connaissez-vous ne serait-ce que de nom ? Et comment les qualifieriez-vous ?

Techniques proposées	**Oui**	**Non**	**Qualificatif**
La bauge (si oui, renvoi à 6)			
Le pisé			
Le torchis			
L'adobe			
L'enduit de terre crue			

6 – Par quels moyens avez -vous entendu parler de la bauge ?

Internet		Revues		Bouche à oreille		Radio		Stand Salon	
Quel(s) site(s) ?		Quelle(s) revue(s) ?				Laquelle ?			

III. IMAGE

a. L'esthétisme :

7 – Après avoir vu ces images de maisons modernes en bauge, quelle est votre réaction ? (plaquette) **Et seriez-vous intéressé de construire une maison dans le même style ?** (à mettre dans intérêt)

Qualificatif	Positif	
	Négatif	
	Neutre	

Très intéressé Intéressé Peu intéressé Pas intéressé

Si intéressé / très intéressé, demander l'image préféré :

8 – Quand vous voyez cette image (surface brut et très fibreuse), utiliseriez-vous ce matériau comme finition ? (plaquette) Quel est l'image qui vous satisfait le plus ?

Extérieure	Oui		
	Non		Pourquoi ?
	Peut-être		À quelle condition ?

Intérieure	Oui		
	Non		Pourquoi ?
	Peut-être		À quelle condition ?

9 – Quand vous voyez cette image (surface légèrement fibreuse), pensez-vous pouvoir utiliser ce matériau comme finition extérieure de votre maison ? (plaquette)

Extérieure	Oui		
	Non		Pourquoi ?
	Peut-être		À quelle condition ?

Intérieure	Oui		
	Non		Pourquoi ?
	Peut-être		À quelle condition ?

b. <u>La fiabilité :</u>
10 - Sur une échelle de 1 à 10, comment évaluez-vous la fiabilité de la bauge ? (échantillon)

1 : peu fiable _____ fort fiable :10

c. <u>Le toucher :</u>
11 - Au toucher, comment qualifiez-vous la bauge ?

Très agréable Agréable Peu agréable Pas agréable

d. <u>La couleur</u>
12 - D'un point de vue décoratif, ces différentes couleurs vous plaisent-elles ? (plaquettes)

Beaucoup Moyennement Peu Pas du tout

Laquelle préférez-vous ?

13 - Quels sont pour vous les freins à la technique de la bauge ?

.....

IV. INTÉRÊT

14 - Dans cette liste de confort d'habitation que privilégieriez-vous ?

Classez-les de 1 à 7 selon votre ordre de priorité (1 étant le plus important)

Air non pollué par les COV*	
Une économie d'énergie	
La maîtrise des odeurs	
Une température régulière peu fluctuante	
Une humidité régulée	
Une bonne isolation	

COV : composé organique volatil

15 - Êtes-vous sensible à l'écologie ?

Très sensible Sensible Peu sensible Pas sensible

16 - Avez-vous déjà réfléchi à l'utilisation de matériaux de construction écologique ?

Oui Non

17 - Auriez-vous l'intention de construire une maison en bauge ?

Intensité \ Echéance	> 1ans	1-2 ans	< 2ans	TOTAL
Très certainement				
Certainement pas				
Peut-être				
Pas du tout				

V. ATTENTES

18 - Saviez-vous que la bauge :

	oui	non
Économise les ressources		
Est recyclable		
Apporte de l'inertie thermique		
Évite la climatisation		

19 - Il faut savoir qu'une maison en bauge coûte 10 à 20% plus cher qu'une maison conventionnelle. Cela est-il un frein pour vous ?

Oui Non

20 - Seriez-vous donc prêt de payer plus cher votre projet de construction afin d'économiser sur le long terme ?

Oui Non

VI. SIGNALÉTIQUE

21 - Sexe : Homme Femme

22 - Age : 18/25 25/35 35/60 +60

23 – Situation matrimoniale :
Marié Pacsé Divorcé Séparé Célibataire Veuf Concubinage

24 - Profession :

Profession de l'interviewé	Profession du conjoint

25 - Lieu d'habitation :

Rural Urbain

26 - Type d'habitation

Appartement Maison Maison avec jardin

27 - Êtes-vous ?

Locataire Propriétaire

28 - Nombre de personnes dans le foyer : 1 – 2 – 3 – 4 ou plus

29 - Commune (Code Postal) :

.....

Nom de l'enquêteur :
Jour d'enquête :
Heure d'enquête :
Lieu d'enquête :

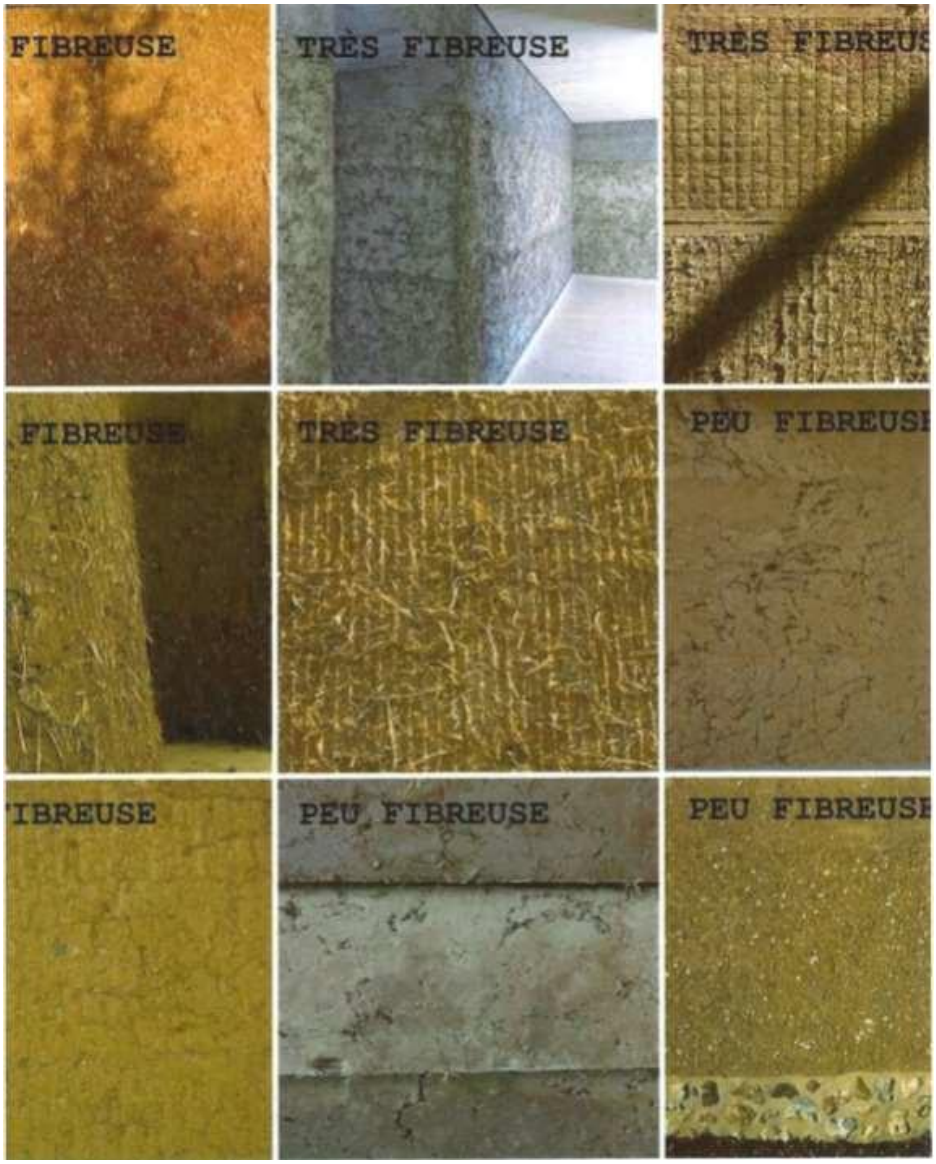
5 / 5








MAISONS MODERNES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PEU FIBREUSE
PEU FIBREUSE


ro 1
Numéro 2
ro 4
Numéro 3
Numé

<u>ANNEXE 3</u> - roll-up présentés sur les salons de l'habitat


CobBauge
ET POURQUOI PAS MA FUTURE MAISON EN BAUGE?
Exemple d'un T3 :
Surface habitable: 84 m²
1 grand séjour/cuisine
2 chambres
Des espaces évolutifs,
des transformations possibles.
Interreg
France (Channel Manche) England
ebuki


CobBauge
ET POURQUOI PAS MA FUTURE MAISON EN BAUGE?
Exemple d'un T5:
Surface habitable: 130 m²
1 grand séjour/cuisine
1 suite parentale
3 chambres
1 terrasse
Des espaces évolutifs, des transformations possibles
Un projet contemporain
Des matériaux traditionnels, naturels et sains
Interreg
France (Channel Manche) England
ebuki

APPENDIX 4:

Summary of the tutorial study report "Study on the receptivity of private investors to modern construction in logs".

Marketing Techniques Department Class of 2017-2019

SUMMARY DOSSIER

"Study on the receptiveness of private and public investors to modern construction in timber".

UNIVERSITÉ
CAEN NORMANDIE

Étudiants

DEHAY Damien
ELIE Gabriel
FERRIEUX Vincent
GAUDIN Samuel
GUILLEMINE Julie
LEPESANT Nathan
ROUSSEAU Noémie

Sponsor : M. STREIFF, architecte chargé de mission terre et éco-construction au Parc Naturel Régional des Marais du Cotentin et du Bessin

Enseignants tuteurs : M. LEFEVRE Harold - MME. MONTRIEUL Valérie

Acknowledgements

We would like to take this opportunity to express our sincere thanks to all those who contributed, directly or indirectly, to the preparation of this report.

First of all, we would like to express our sincere thanks to our tutor teachers, Mr Harold LEFEVRE and Ms Valérie MONTRIEUL, who followed us throughout our project and guided us in writing this report.
We would also like to thank our sponsor, the local authority of the Parc naturel régional des marais du Cotentin et du Bessin, represented by Mr François STREIFF, architect in charge of the earth and eco-construction project within the park. He supervised us throughout the project, answered our questions and gave us the keys to carrying out this market study.

Our sincere thanks also go to Pascal COLARD for his availability and speed in printing our various documents.

We would also like to thank Ms Imane Elouaryarhli for her help with the Sphinx questionnaire.

Finally, we would like to thank everyone who agreed to answer our questionnaires.

We would like to express our sincere appreciation to all those who have contributed to this project.

I. Presentation of the company

The Parc naturel régional des Marais du Cotentin et du Bessin is a French regional park located in Normandy, near Carentan in the Manche department. Created in 1991, the park now comprises 150 communes covering 146,700 hectares. These municipalities have signed a charter drawn up in collaboration with various players in local life (elected representatives, local authorities, associations, ...). The Park's charter is the territorial project that provides for and gives concrete expression to the preservation and enhancement of the natural and cultural heritage, while working on economic, social and cultural development in conjunction with its inhabitants.
The nature park is working on a project called Cob. The project is part of the European Union's drive to reduce greenhouse gas emissions by 20% by 2020. The energy consumed by the building sector currently represents 40% of the total energy produced (EU2010), 60% of which is used by occupants to heat buildings.
The Cob project aims to adapt a traditional raw earth construction technique that is widely used in Normandy and Brittany: Cob. Cob is a mixture of earth and agricultural fibres, such as straw, to which water is added. It is used to construct buildings.
Building with cob offers a number of advantages, such as saving resources, providing thermal inertia and, above all, being recyclable.
The problem is that houses made of cob do not meet current thermal regulations. The Cob project

therefore aims to create new materials and processes for cob that are both economical and compliant with building standards, while also meeting the need to preserve local historical heritage.
The Cob project was selected as part of the European cross-border cooperation programme INTERREG VA France (Channel)/England, co-financed by the ERDF, and brings together 5 French and British partners.

Illustration 1: Clapboard wall

Illustration 2: Interior of cob house

Illustration 3: Exteriro of cob house

I. Introduction

1. Definition of problem

Our client, Mr STREIFF, architect in charge of earth and eco-construction at the Parc naturel régional des Marais du Cotentin et du Bessin, entrusted us with the study, as did our two tutors, Ms MONTRIEUIL

Valérie and Mr LEFEVRE Harold.

Before carrying out our study, we established a problematic with the help of Mr STREIFF. Our problem was as follows:

The Cob project aims to adapt a traditional raw earth construction technique that is widely used in Normandy and Brittany: cob. Mr Streiff, an architect with the Syndicat Mixte du Parc naturel régional des Marais du Cotentin et du Bessin, asked us to carry out a study of the market's receptiveness to this material, namely private and public investors. The Parc naturel régional des Marais du Cotentin et du Bessin, represented by Mr Streiff, and its partners, as part of the adaptation of the construction sector, have asked us to carry out a study of the market's receptiveness to this material.

The Regional Nature Park of the Cotentin and Bessin Marshes, represented by Mr Streiff, and its partners, as part of their efforts to adapt the construction sector to the challenges of sustainable development, want to promote the Cob technique.
Once the issues had been defined, we set ourselves 5 main objectives for the study:
- Determine the role of raw earth in construction choices
- Identify what people know about the cob technique
- Determine the image of the Cob in the minds of individuals
- Measure the interest in properties such as the Cob in building projects
- Identify the receptiveness of individuals to the cob

2. Survey methodology

➢ Constitution du groupe :

For the tutored project, we had to put together a group of 7 people. Our group was made up of : Damien DEHAY, Gabriel ELIE, Vincent FERRIEUX. Samuel GAUDIN, Julie GUILLEMINE, Nathan LEPESANT and ROUSSEAUX Noëmie.

➢ Drawing up a retro-planning schedule

We have also introduced a retro-planning system to help us get organised.

➢ Drawing up specifications

We then drew up a set of specifications to guide our study. These specifications cover 3 phases of our study:

- Documentary phase
- Identifying experts phase
- Information gathering phase

➢ Drawing up the field questionnaire

We then drew up the questionnaire. Due to lack of time, we were unable to carry out the pilot questionnaire. We therefore proposed several questionnaires to our tutors, which they subsequently validated. We did, however, have to make a few changes to the questionnaire as a result of the trade fairs we attended. These changes had no impact on the results of the study.

➢ Questionnaire admission method

We administered the questionnaires face-to-face at the various trade fairs we proposed to our client. We were present at 3 different trade fairs that we organised for our client.

Carefully chosen in order to have the opinion of the whole population of Normandy, each show being in a very different area.

- The 1st show was in Caen, an urban area
- The 2nd show was in Cherbourg, an urban area in a large rural setting
- And the last show was in Avranches, a rural area.

At these shows we had a stand dedicated to us so that we had an area where we could freely administer our questionnaires, as we couldn't administer questions outside this area.

To support our questionnaire, we had flyers to hand out and a television to attract the attention of passers-by. We also had a sample of a log wall that we could use to raise people's awareness of construction methods and to animate our questionnaire. We also used photo-boards to illustrate the different colours that could be achieved with raw earth plaster and to show different mud houses.

➢ **Developing the sphinx questionnaire**

After administering our questionnaires, we entered them into a software programme called sphinx. This software enabled us to begin the next stage, which was to analyse the data.

➢ **Data analysis**

To carry out this analysis we carried out flat sorting as well as cross-sorting between the variables that we felt were relevant to our objectives. We then produced an analysis file containing all the data. To conclude the study, we produced a summary file. We also had to produce a file of appendices, with the various documents that helped us throughout this market study.

II. Information gathered

To carry out this study, we interviewed 340 people instead of the 200 initially planned. Of the 340 people, we interviewed 176 men (51.80%) and 164 women (48.20%).

	Male	Female
Number of people	176	164
Percentage	51,80 %	48,20 %

We also had an age variable, which is why we divided it into 4 parts:

18 à 25 ans	26 à 35 ans	36 à 60	61 ans et plus
3,80 %	20,90 %	50,90 %	24,40 %

We can therefore see a representation of people aged between 36 and 60 and an under-representation of people aged between 18 and 25.

For our study, we had a fairly broad field of enquiry, limited to the various trade fairs we attended (Avranches, Cherbourg and Caen). The figures are as follows.

Salon de Caen :

We interviewed 201 people at the show.

Location of interviews	Number of people	Percentages
Périphérie de Caen	91	45,30 %
20/30 km	58	28,90 %
> 30 km	52	25,90 %

Salon de Cherbourg :

We interviewed 108 people at the show.

Location of interview	Number of people	Percentages
Cherbourg et ses alentours	57	52,80 %
Nord Cotentin	33	30,60 %
Centre Manche	10	9,30 %
Supérieur centre Manche	8	7,40 %

Salon d'Avranches :

We interviewed 201 people at the show.

Location of interviews	Number of people	Percentages
Avranches et ses alentours	13	41,90 %
20/30 km	6	19,40 %
>30 km	12	38,70 %

The most representative show in this study was the Caen show. It accounted for 59.12% of the results.

In order to answer our question, we will first of all determine the place of raw earth in building choices. Secondly, to identify what individuals know about clay. Thirdly, to determine the image of clay in the minds of individuals. Secondly, to measure the interest in properties such as those of clay in the construction project, and finally to identify the receptivity of individuals to clay.

3. The role of raw earth in construction choices

Out of 100 people questioned, 40 had already had a building project. Earthen building materials came 6th (11), behind wood (25) and stone (24).

Then, out of 100 people questioned, 20 had a building project. Earthen building materials came 4th (11), behind wood with 55 people, then stone with 19.

We can see that people who currently have a building project favour natural material such as wood and earth.

Earth has moved up from 6th to 4th place, and 1 in 2 people with a building project prefer wood.

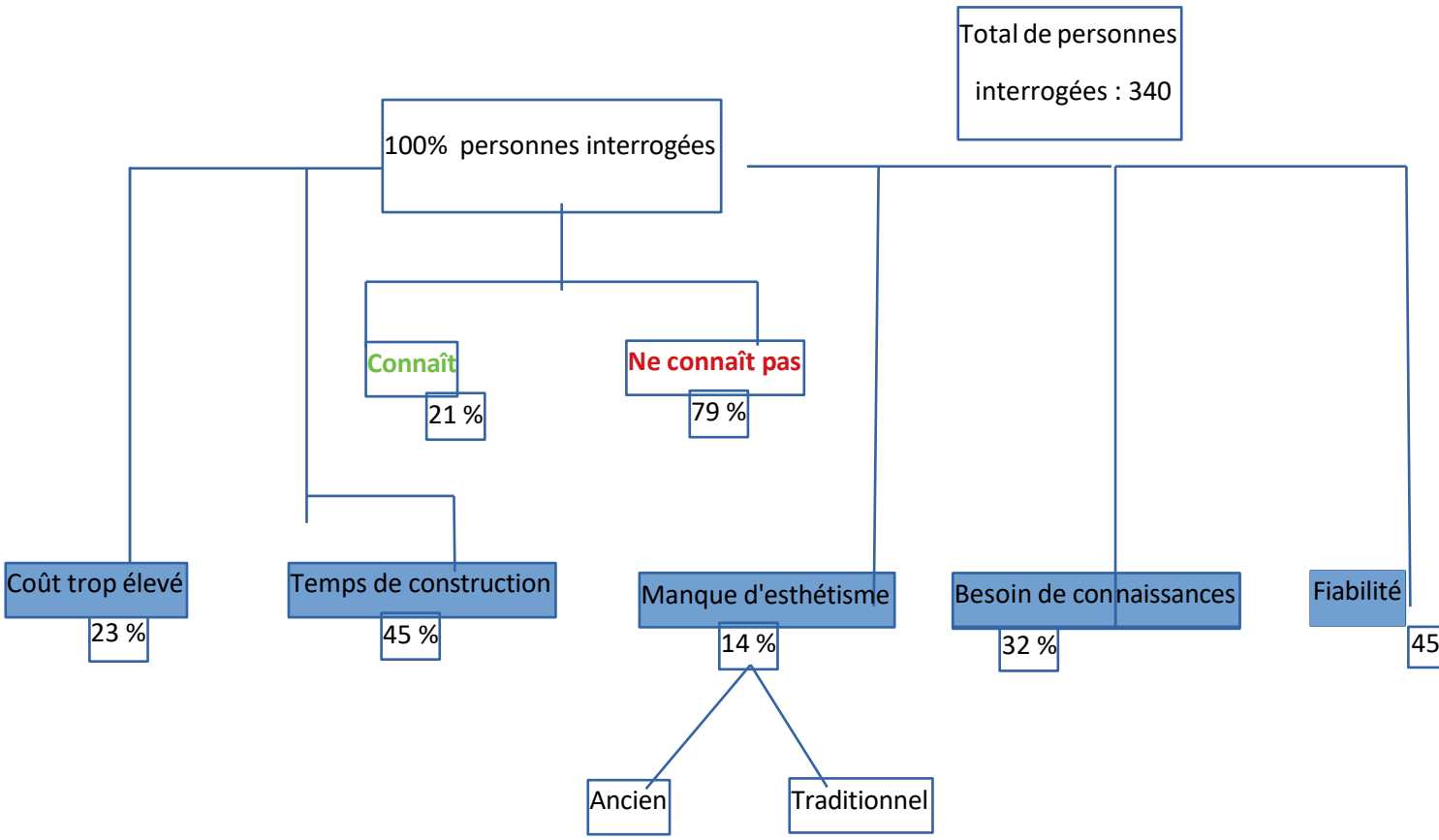
In terms of knowledge of earth materials, of the 340 people questioned, 317 were familiar with cob, which represents 93% of those questioned.

What's more, the second best known is raw earth rendering. Out of 100 people questioned, 33 were familiar with adobe.

Then we can see that pisé and cob are equally well known, with 24% for pisé and 22% for cob.

3. Individuals' knowledge of cob

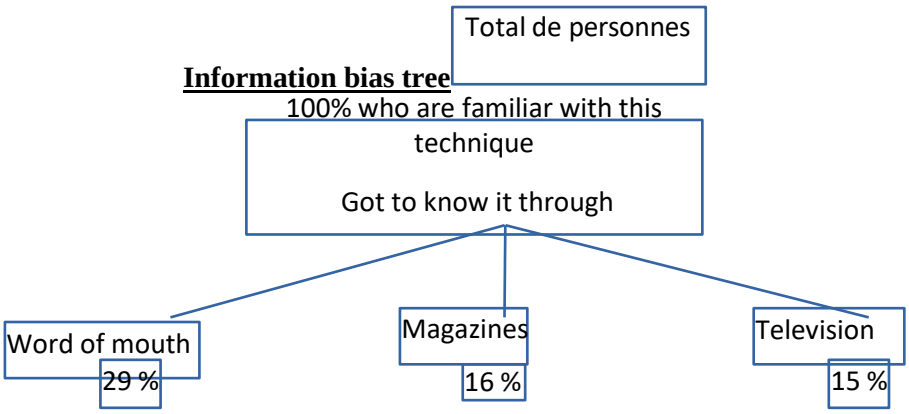
Tree structure of the cob brakes



Out of 100 people questioned, 45% felt that construction time was an obstacle to using this technique.

The respondents were given the choice of responding to several obstacles to construction, which is

why the figure exceeds 100%.



Out of 100 people who know about this technique, 29% found out about it by word of mouth.
word of mouth.

The people questioned were given the choice of answering how they heard about this technique, hence the fact that this exceeds 100%.

4. The image of Cob in the minds of individuals

In the minds of the majority of individuals, the cob is rather well perceived. Indeed, the average given to the reliability of cob is 7 out of 10.
What's more, people like the colours overall. Of the colours presented on the leaflets, the two most popular were ochre (31%) and grey (34%).
In addition, 79% of those questioned said that clapboard was pleasant to the touch.
When it comes to the different illustrations of houses in clapboard, 80% of those questioned have positive images of how a house in the same style could look. The adjectives most often used were modern (40%), bright (14%) and ecological (12%).

Table of positive images of modern homes

Qualifying	Percentages
Modern	40 %
Don’t know	39 %
Luminous	14 %
Ecology	12 %
Warm	8 %

As for the adjectives attributed to cob, the ones that come up most often are "mixture of earth, straw and water", "old construction" and "natural". All the other adjectives are not included, as they are not representative because there were too few responses.

Table of cob qualifiers

Qualifying	Percentage
All	47,9 %
Mixture of soil, straw and water	21,9 %
Old building	13,7 %
Naturel	12,3 %

Tableau des qualificatifs « autres » de la cob

All Qualifying	Percentages
Don’t know	15 %
Insulation	3 %
Quality	2 %

4. **Interest in properties such as logs in building projects**

From a general point of view, the people questioned are rather sensitive to ecology, in fact 88

out of 100 say they are.

When it comes to thinking about using environmentally-friendly materials for construction, 59 out of 100 people have already given it some thought.

Another important point is that 29 out of 340 people might be interested in building a house out of logs.

Response	1-2 ans	< 2 ans
Most certainly	33,00%	55,00%
Perhaps	10,00%	81,00%

4. The receptiveness of individuals to the cob

We are now going to respond to the objective of measuring the receptiveness of individuals to the cob. Approximately 64% are interested in building a modern log house like the one shown in the photo brochure.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Approximately 18% are for the very fibrous surface outdoors and 12% indoors.

In addition, 40% are for the slightly fibrous surface indoors and 24% indoors.

Out of 100 people questioned, 45 did not find it difficult to pay 10 to 20% more if they knew the characteristics of the wood.

III. Recommendations

One of the main recommendations we could put forward would be that in this construction

technique, the necessary steps should be taken through research to make the material both less expensive to produce and less expensive for potential customers in order to make this technique more attractive.

Less expensive to produce and less expensive for potential customers, in order to make this technique more attractive.

It would also be a good idea to offer new colours: both for the rammed earth rendering and for the colours proposed for the interior, to cover all the tastes of potential customers. As the renderings are optional, the choice of leaving a rough aspect that appeals to some people may still be an option.

If the project of building a house in cob is to attract more people, we can see that the material needs to be made more aesthetically pleasing, obviously while still respecting the natural and ecological aspects of the material, as the vast majority of those questioned shun the material's too rough appearance.

We believe that the Cob project needs to be better communicated if it is to develop its reputation. Better communication would enable the project to develop and reach more potential customers.

IV. Conclusion

To conclude this study, few people know about cob, in fact about 21% of those questioned know about cob. What's more, 32% of respondents said they had a lack of knowledge about the product. What's more, 31% of those questioned (45%) wondered how long it would take to build. So there is a problem of communication about the product.

As for those who have already had a project, 11% of people preferred earth. Around 16% of people with a project want to opt for land. So we can see that earth is now playing a more important role, even though the most commonly used natural materials are still wood and stone. Breeze block is still the most common material used in both past and future projects.

What's more, 88% of those surveyed said they were very environmentally aware. That's why around 59% have already thought about using eco-friendly materials, which is very interesting for a product like clapboard. In fact, 29% of people say they intend to build a log house in more than two years' time.

On the subject of price, 45% of those questioned said that paying 10-20% more for their building project, knowing the advantages of the material, in order to save money in the long

term, would not be a barrier.

What's more, 79% of those questioned said that clapboard was pleasant to the touch. What's more, the average reliability rating was 7 out of 10. Finally, half the people questioned would be interested in having a modern house like those shown on the brochures.