



Building materials and well-being in indoor environments

A focus group study

Byggematerialer og velvære i innendørs miljø

By: Kristian Bysheim, Anders Nyrud, Kristen Strobel



RAPPORT

Wood2New



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Date: March 2016

Summary

Focus groups were carried out in Austria, Finland, France, Norway, and Sweden to understand building professional's and laypeople's perceptions of building materials and wellbeing in indoor environments. Focus groups asked participants to share their opinions and experiences related to seven main topics: choosing interior materials, naturalness, naturalness for building materials, wellbeing in the indoor environment, wood materials, cleanability, and ethics and environment. This report presents a summary of responses and a preliminary analysis of common themes and priorities among participants. Participants from each of the countries generally held similar views. The appropriateness of interior materials was seen as dependent on building type and context, with a greater preference for natural materials, particularly wood, in residential construction. Different stakeholders had different priorities relating to cleanability and environmental aspects which were often assessed as being in opposition to cost and general aesthetics.

Keywords: Focus groups, building materials, indoor environment, experience of wood

Sammendrag

I Østerrike, Finland, Frankrike, Norge og Sverige ble det gjennomført fokusgrupper for å oppnå en forståelse av fag- og lekfolks oppfatninger av byggematerialer og velvære i innendørs miljø. I fokusgruppene ble deltakerne bedt om å dele meninger og erfaringer relatert til sju hovedtema: valg av innendørs materiale, naturlighet, naturlighet for byggematerialer, velvære i innendørs miljø, trematerialer, vaskbarhet, etikk og miljø. Både lekfolk og fagfolk i byggebransjen deltok i fokusgruppene.

Denne rapporten presenterer en oppsummering av svarene og en foreløpig analyse av vanlige tema og prioriteringer blant deltakerne.

Deltakerne i fokusgruppene i de ulike landene uttrykte stort sett like synspunkt i diskusjonene om de ulike temaene. Bygningstype og kontekst ble sett på som viktig for hvor passende det var å bruke ulike typer byggemateriale. Det var generelt større preferanser for naturlige byggematerialer, for eksempel tre, i boligbygg. De ulike interessegruppene hadde forskjellige prioriteringer relatert til tema som vaskbarhet, og miljømessige aspekter ble ofte sett på som motsetninger til kostnader og estetikk.

Stikkord: Fokusgrupper, byggematerialer, innendørsmiljø, opplevelse av tre

Competitive wood-based interior materials and systems for modern wood construction

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WoodWisdom-Net

This report presents results from qualitative research on how people perceive the connection between use of building materials and the experience of indoor environments. The project carried out focus groups in Sweden, Austria, Finland, Norway and France. Scientists at Holzforschung Austria, Linköping University, Aalto University and The Norwegian Institute of Wood Technology (Treteknisk) and Building Research Establishment moderated the focus groups.

The work was part of the Wood2New research project, initiated in 2014. WoodWisdom-Net funded the project.

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Introduction

We spend 90% of our lives inside buildings and this affects our physical and psychological wellbeing and comfort. However, the significance of human wellbeing in construction is poorly understood. The importance of the indoor environment is enhanced in care and living spaces: the growing demand for healthy buildings could open new opportunities for wood. Sustainable development is also increasing in importance. Hence, materials and products with environmentally, socially and economically sound values should have an advantage if they can deliver competitive performance.

The aim is to identify possibilities of promoting human wellbeing in interior spaces, by gaining insight into how people view the correlation between building materials and the perception of the environment.

Research questions:

- What is associated with a natural building material?
- Which building materials are associated with a good indoor environment?
- How does the use of building materials in the indoor environment affect the users?

Methods

Qualitative research

Focus groups

Focus groups are carefully planned group discussions designed to gather participants' views and opinions on specific topics. Each focus group usually consists of five to ten people and a moderator who, using an interview guide, moderates the group discussions. The interview guide is used to ensure that all relevant topics for discussion are covered during the focus groups.

The purpose of a focus group is to listen and gather information to better understand participants' perceptions and views. The groups are conducted several times to enable identification of patterns and trends. The analysis of data from the focus groups can provide clues and insights to how products, services and opportunities are perceived (Krueger and Casey 2000).

The focus group differs from traditional interviews with a predetermined questionnaire and closed-ended responses. With the moderator taking on a less directive and dominating role in the interview, using open ended questions, the attention is shifted to allowing "individuals to respond without setting boundaries or providing clues for potential response categories" (Krueger and Casey 2000, 6).

The focus groups were carried out in Sweden, Austria, Finland, France and Norway. Scientists at Holzforschung Austria, Linköping University, Aalto University, BRE and Treteknisk moderated the focus groups.

Interview guide

Two different interview guides were used during the focus groups. One guide covered topics for building professionals and other people with a background from the construction industry, and another guide covered topics for groups with lay participants with various non-related backgrounds. The interview guide was based on a focus group guide developed in 2010 by Treteknisk in collaboration with Statistics Norway (Nyrud et al. 2010). Building Research Establishment (BRE) in the United Kingdom developed an interview guide for building professionals based on the topics in the interview guide developed by Treteknisk and Statistics Norway.

Table 1 shows the topics included in the interview guides. Six topics were included in both guides, the guide for building professionals additionally included choice of interior materials. The interview guide for laypeople was structured so that the participants first would discuss building materials in general before discussing the other topics listed in Table 1.

Table 1. Interview guide topics

<i>Topic</i>	<i>Background and comments</i>
<i>Choosing interior materials</i>	Design and building professionals only
<i>Naturalness</i>	Environmental psychology
<i>Naturalness for specific building materials</i>	Focus on wood products
<i>Feeling of wellbeing in indoor environment</i>	How choice of materials influence user experience
<i>Wood materials</i>	Material use: preferences and expectations
<i>Cleanability</i>	Often considered as a barrier for choosing wood
<i>Ethics, environment</i>	Green marketing

Transcripts and analysis

Transcriptions of focus groups from Norway, Austria and Sweden and summaries of the focus groups in Finland (Finnish and Mozambican participants) and France were analysed.

The analysis in this report is based recurring trends and patterns among the focus groups. Trends were identified using the methodology described by Krueger (1999). Findings, based on transcripts and summaries of focus groups, are reported in the results section. Results primarily focus on recurring opinions and themes expressed by multiple participants and focus groups, grouping together similar opinions that may have been expressed differently. While the primary focus is on recurring themes, opinions expressed by a single participant are also noted to give a sense of the range and diversity of perceptions and experiences.

Results

Background

Table 2 shows an overview of focus group participants contributing to this study. Two groups had participants who were students (Norway, Sweden), three groups had people with building industry background (architects, engineers, contractors), and two groups had people with a mixed background. A group from Mozambique, visiting the Aalto University in Finland, was also included in the study.

Table 2. Focus group composition, number of groups and participants in each group

Country	Focus group composition	Number of groups	Number of participants
Norway, Sweden	Students	2	16
Finland	Mixed Group, students and architects	1	8
Norway, Austria, France	Building professionals	3	17
Mozambique	Students and engineers, forest products and agriculture professionals	1	7
Austria, France	Mixed	2	12
Total		9	60

Naturalness

Participants in all groups, with few exceptions, had the same definition for a natural product: a product based on a raw material that was created by nature. The material must be unique and can be shaped, but not created, by humans.

#00:06:21-4# Male, Sweden: *I think the questions run into each other a lot. What I thought of, first and foremost, is that it is untreated. It is something that is found in nature that we don't modify. You can modify it but not create it.* #00:07:00-8#

Authenticity is important, a natural material cannot be reproduced and should not pretend to be anything other than it is.

#01:28:01-8# Male, Austria: *Natural materials are unique; none of them are the same. You cannot reproduce them. Particle board is at the borderline to natural materials. Just look at the wood imitations; they even manage to imitate the haptics of wood, but after some metres the structure repeats. That's the difference!* #01:29:17-7#

Laypeople felt that natural materials were those that had not undergone significant transformation. A material should not be chemically treated or undergo significant mechanical processing if it is to be considered natural.

#00:31:43-3# Female, Austria: *To me the size of the particles makes the difference; in the OSB panel one can still recognise the structure of wood, a wooden surface. The MDF [could be anything], there is no wooden texture. No fibre direction, etc.* #00:32:09-5#

Participants identified their emotional experience of a product as important to their assessment of whether or not a product was natural, "You may have a personal connection to wood from a forest". This also plays into the issue of transformation. If the product has not undergone substantial transformation, you can connect the product to something that is familiar to you, e.g. a forest, but if the product has undergone substantial transformation, you do not know where it originates and therefore do not have an emotional experience when it is used.

#01:30:56-1# Male, Norway: *I see naturalness as a personal connection to the material, for example wood out of a forest I have been to or from which I have some good memories. The same might account for stone. You [do not] have these feelings with OSB or particle board.* #01:31:36-0#

The Norwegian building professionals discussed this issue:

#00:37:13-3# MODERATOR: *When people talk about natural materials, what do you think they mean?* #00:38:01-7#

#00:38:01-7# Male, architect: *Unprocessed materials: wood, stone, where it is easy to see where the material comes from* #00:38:33-6#

#00:38:33-6# MODERATOR: Assistant: *What is the opposite of natural materials?* #00:38:33-6#

#00:38:33-6# Female, architect: *Artificial or synthetic materials* #00:38:40-3#

#00:39:33-3# Female, architect: *I think it is also culturally conditioned.*
#00:39:43-4#

Products should fit surroundings and aesthetics. This also includes sourcing of materials: materials from the region where the product is used, can be considered more natural than materials that are not of local origin.

Participants also mentioned that a natural material is degradable and recyclable.

During the discussion, the participants tended to converge on the conclusion that all materials are natural, cf. comment from Finland: "In the end everything comes from nature".

The following section contains a summary of the key attributes of natural materials for each of the focus groups.

Sweden

- Exists in nature, cannot be created by man, is not modified to any extent
- Gives you a strong feeling for the raw material
- Chemical and mechanical processing diminish perceived naturalness
- Recyclable, degradable, able to be returned to nature

Finland

- The amount of processing is important for the perceived naturalness of building materials.
- The material has to be non-synthetic, and have a connection to nature. It cannot be man-made.
- The material has to be recyclable to be a natural material.
- “In the end everything comes from nature”.

Norway

Students

- It is possible to tell the source of the material. A material from nature, which gives a feeling of nature.
- A natural material can also be a material that fits in with the surroundings aesthetically.
- A natural material must be environmentally friendly and pose no danger to peoples' health.

Building professionals

- A natural building material is a material where you can tell the source of the material.
- A natural material it is not processed. Tiles were mentioned as an example of a natural material, even though they are processed.
- An authentic material.

Austria

Building Professionals

- Naturalness is connected to optics and haptics: the origin of the material is visible.
- A natural material is something grown in and provided by nature, only slightly processed.
- Natural is not the same as sustainable.

- A natural material is something unique; that cannot be reproduced. It is something that no one else can have, since every piece is unique.
- It is authentic. That you only get from wood and stone. Naturalness is something emotional. You may have a personal connection to wood from a forest, and you can also get the same feeling from stone.

Mixed group

- A natural building material has a natural origin, which makes it more valuable.
- It is renewable, has not undergone any special (chemical) modifications.
- It is degradable and recyclable, and not harmful to the environment.
- Naturalness can also be about feelings. A natural material has a certain complexity, it smells and it feels warm.

France

Building professionals

- No transformation of materials
 - An architect said there is a lot of advertisement for materials claiming to be natural, where the materials are actually transformed, such as wood fibre products.
- The appearance of the raw material should remain even after processing.
- No chemical transformation. A natural material has a natural aspect, and gives a tactile sensation.
- Natural materials are not necessarily healthy or safe for materials, e.g. Asbestos

Mixed group

- A natural material was seen as having gone through no transformation of the material
- The appearance of the raw material remains after processing.
- No chemical transformation of the material. The opposite of natural materials were chemical materials, shapes that do not exist in nature, recreated materials and composite materials.

Mozambique

- Natural materials are things that come from nature without any transformation

Naturalness for specific materials

Wood samples used in the task given to the focus group participants can be seen in Figure 1 and in the Appendix.



Figure 1. Material samples used in focus groups. From left to right: painted pine, knot-free pine tongue and groove decking, oriented strand board (OSB), and medium density fibreboard (MDF)

The majority of focus group participants had the same ranking for the materials: from most to least natural knot-free pine decking, painted pine, OSB, then MDF (See Figure 2). While there were differences in responses between participants, the most common ranking was the same in all countries. An important factor for perceived naturalness was the level of transformation of wood. Materials with visible fibre were seen as natural. Materials that were laminated or painted were seen as industrial or chemical.

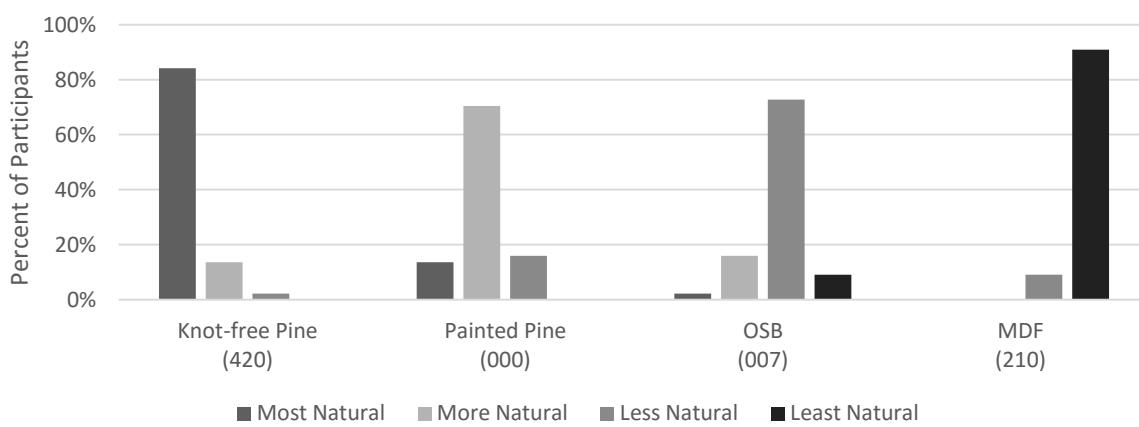


Figure 2. Material sample rankings (based on responses from 44 participants)

Reasons given for ranking the knot-free pine decking as the most natural material: you can tell the origin of the material, the wooden structure is visible, it is the least processed sample, the sample still smelled like wood.

A few people found the chemical treatment of the painted pine more natural than the mechanical processing of the knot-free pine decking. A respondent also felt that the look and feel of the white sample was something he would have been able to do at home by himself, making it more natural.

Most participants ranked the medium density fibreboard (MDF), as the least natural material sample. Perceived lack of durability, lack of resemblance to wood and no warmth were mentioned as characteristics for choosing MDF as the least natural. Participants felt that the material was dead and had lost the qualities of wood. One respondent commented:

The size of the particles makes all the difference; [...] The MDF [sample] could be anything, there is no wooden texture. No fibre direction.

The rankings of the material samples tend to coincide with how the focus group participants defined naturalness. The ranking of the materials depends on the level of processing. The mechanically processed pine sample was viewed as more natural than the treated pine sample or the MDF and OSB samples. Those who view the painted pine sample as more natural, view the chemical treatment of the material as more invasive. Some participants said this is the reason why they ranked the MDF sample as more natural than the OSB sample.

Natural and non-natural building materials

Materials such as wood, stone, bricks and sand were mentioned as natural building materials. Examples of non-natural materials were plastic, glass and asbestos. Materials such as gypsum, concrete and metal were mentioned as both natural and non-natural materials. Table 3 shows materials mentioned by most focus groups and Table 4 shows examples of natural building materials.

Table 3. Naturalness of materials

Natural materials	Uncertain	Non-natural materials
Wood	Gypsum	Plastic
Stone	Concrete	Glass
Bricks	Metal	
Tiles		
Asbestos		

Table 4. Examples of natural building materials

Natural building materials	Non-natural building materials
Wood	Plastic
Cork	Steel
Wood-based insulation	Aluminium

Bricks	Gypsum board
Clay	Concrete
Stone	Glass
Mineral Wool	
Gypsum board	
Concrete	
Tiles	
Sand	
Wood-based products	
Straw	
Hemp	
Wool	
Flax	
Cotton	
Asbestos	
Water	
Clay	

Applications for material samples

The solid wood material samples were seen as versatile materials suitable for a wide range of applications. The knot-free pine decking carried associations to old wood cabins and saunas for many of the respondents, but was also seen as suitable for floors, ceilings, and wall panels. One of the focus group participants had built a bar at home using the same material. One respondent with a non-European background thought the material was not suitable for visible surface areas, but that massive wood was a universal material.

The painted pine was deemed suitable for use both indoors and outdoors. Participants thought it was suitable for flooring or other visible surface areas. Suggested applications for the OSB and MDF samples, which were seen as functional and monotonous materials, were furniture and construction. A few respondents did not want to use materials like the OSB and MDF samples for any visible surfaces. Some respondents would use MDF for furniture, and the surface structure appealed to one respondent. With some sort of surface treatment participants felt MDF could be used indoors. Even though it was seen as a material mostly used at construction sites, OSB could also be used for kitchen furniture.

Wellbeing

Participants mentioned many aspects of buildings that help to promote occupant wellbeing. Factors mentioned as being important to wellbeing include: light, materials, scent, sound, cleanliness, and indoor air quality. Open, bright spaces with lots of (day) light were seen as instrumental in how interior environments affect human wellbeing. Quality materials that bring warmth and an appropriate atmosphere to a space were also seen as important.

Respondents with no professional experience of building materials had different expectations for public and private buildings regarding wellbeing in indoor environments. Public buildings are expected to have a minimalist modern design, but homes are expected to be cosy and warm.

Both laypeople and building professionals perceived factors affecting wellbeing as something subconscious.

#00:58:08-1# MODERATOR: *Do you see a connection between the naturalness of the materials and wellbeing indoors?* #00:58:23-7#

#00:58:45-8# Male, architect, Norway: *Well, there is an unconscious comfort in seeing what things are made of.* #00:59:05-9#

#00:59:05-9# Male, architect, Norway: *It is comforting to see recognisable materials.* #00:59:24-2#

#00:59:39-8# Male, architect, Norway: *I actually think that most people find it comforting and that natural materials, or materials that are perceived to be natural, are beneficial. It's not anything dismal; they recognise it from before.* #00:59:58-1#

Building professionals focused on the functionality of the building materials. They should provide warmth, contrast (inhomogeneity) and flow to the room.

#00:32:21-2# Female, architect, Norway: *I think there are many other factors that play a role. Materials that provide sound and reverberations in a room, rhythm and contrasts and aesthetics are hugely important. Rhythm in materials, textures, transitions between what is smooth and what has more relief.* #00:33:17-7#

When considering wood in particular, participants noted a number of properties that promote wellbeing. Wood can give an exclusive (fashionable, stylish) impression (experience, sensation); lack of wood can give an institutional feeling to an indoor environment. Wood is a soft material that insulates and provides warmth. The scent of wood was also mentioned as promoting wellbeing. One respondent claimed wood could improve the indoor air quality.

Visible wear and ageing of wood can be seen as a positive attribute for wood products.

#00:34:01-1# Female, Norway: *Wellbeing also has to do with the relationship you have with something. Something that you are happy with over time; and you can see how it develops in such a way that there is almost a positive form of wear and tear, or signs of use.* #00:34:25-9#

The size of the room and what the space is being used for dictates which surfaces are most important for wellbeing. Wellbeing in buildings is affected by many diverse issues that are dependent on the type and use of the building.

#00:56:16-2# Female, Austria: For me, my own expectations of the building and its function are decisive. An office has to be bright and clean but I also like to have some human elements included, like plants. Bright might be nice but dark churches with old wood can create a cosy atmosphere as well. Air conditioning is important for me, but the smell of an old wooden building is also nice. The worst thing is carpeted floors; they become dirty over time. #00:58:08-2#

Wellbeing is also related to the cleanliness of the interior.

#00:51:11-7# Male, Austria: Wellbeing in public buildings is dependent on their cleanliness and only indirectly from the type of material used. Many natural materials are hard to clean and thus might have a negative impact on wellbeing #00:51:53-4#

Sweden

- Open, bright spaces with lots of (day) light were seen as instrumental in how interior environments affect human wellbeing.
- Warm materials, such as wood were also seen as important for wellbeing, as well as soft materials that insulate and provide warmth.
- The smell of wood was mentioned by several respondents.
- The interior has to be made of quality materials.
- The size of the room and what the space is being used for dictates which surface areas are most important for wellbeing.

Finland

- Light is perceived as important for the feeling of wellbeing, especially natural light.
- Plants in the indoor environment may also provide a connection to nature.
- Indoor air quality is important, wood is by one respondent perceived as improving the indoor air.
- Moisture can be a problem for wellbeing indoors, as it may cause the growth of mould.

Norway

Professionals

- Sound (noise), rhythm, contrast and aesthetics were mentioned as ways the indoor environment can promote wellbeing.

- Lower decibel levels can reduce stress levels.
- Natural materials can be perceived as pleasant, giving a subconscious feeling of wellbeing.
- Wellbeing should not be confused with comfort.

Students

- Open, airy and bright environments provide a feeling of wellbeing. Many respondents think high ceilings provide a feeling of wellbeing. The exception was a respondent who had grown up on a farm with low ceiling.
- Light colours, making the room/space seem bigger.
- Acoustics influence the feeling of a room.
- To build a room for wellbeing, some respondents would start with the floor. Wooden floors feel warm.
- Many building materials used in modern buildings feel cheap
- Public buildings should not have distracting elements. There should be cold surfaces, almost a sterile environment.

One of the respondents remarked that the newly built student housing at the university campus gave her the feeling of a public building – cold and sterile. Therefore, she would decorate the room with carpets and a wooden table to get a warmer feeling while being in the room.

France

Professionals

The professionals mentioned multiple factors influencing the wellbeing in indoor environments:

- Absence of smell.
- Suitable acoustics.
- The internal climate (relationship between temperature and humidity).
- Tactile aspects.
- The nature of materials can contribute to wellbeing.
- The use of warm materials.
- Colour and shape of the architecture, e.g. use of curves instead of angular shapes, could also be a factor for wellbeing.

The professionals mentioned flooring as an important surface for wellbeing. Floors have a tactile sensation since we walk on them, while walls only have a [visual] impact on the atmosphere.

While wood is seen as a material that has a positive influence on wellbeing, its use should be moderate. A varied use of materials is preferred, to avoid constriction.

The role of furniture is firstly functional, but can still improve the perception of the room and the wellbeing of the occupant. Furniture can bring life to a space. For owners the construction itself is most important, while for tenants personalisation is

made through furniture. One participant mentioned the ability to open to the outside environment and view (being able to see things on the far away horizon) as important.

Mixed group

The participants mentioned several factors influencing wellbeing:

- Lighting, luminosity
- Use of plants indoors
- Heat (temperature)
- View, beauty
- Flooring (mentioned before the moderator asked about surfaces specifically)

Flooring was considered the most important surface for wellbeing in interiors because of the physical contact with the material. Walls were important for the atmosphere and the feeling of space in a room.

Austria

Professionals (mixed)

The Austrian professional mentioned these factors as important for wellbeing:

- Light and ambience
- Noise
- Air circulation
- Insulation and moisture levels
- Cleanability

Architects in the group mentioned inhomogeneity and combinations of materials as important, both functionally and optically. Simple indoor environments provide more freedom when choosing interiors. Wood, being a warm material with radiant heat, was also perceived as promoting wellbeing. Emotions decide wellbeing according to the sales engineer participating in the group. One architect claimed it was important to get to know the customer in order to be able to promote wellbeing, taking habits, material palette and even hobbies into account when it comes to indoor environments and wellbeing.

Mixed group

The Austrian group with mixed backgrounds had a divided view on how indoor environments could support wellbeing.

- Some participants mentioned bright and clean spaces as important, with material use as one of the factors influencing wellbeing. One respondent mentioned meeting places as good indicator of wellbeing; People meet at places they feel comfortable.

- Combinations of materials were considered as having a positive impact on wellbeing, with concrete and glass suitable for a clean and sterile office environment, and wood being the preferred material for homes.
- Several respondents saw wellbeing as something subconscious.

Almost half the group mentioned other factors than specific building materials as important for the feeling of wellbeing in interior environments:

- Cleanliness, with natural materials being hard to clean;
- functionality being more important, and
- Wellbeing not perceived as a problem in a new building.

Mozambique

- Being close to biological matter can give a feeling of wellbeing.
- Big windows and air circulation perceived as important for wellbeing in indoor environments.

Wood materials

Ordinary people focus on feelings when talking about the expectations they have of wood materials – wood is supposed to be warm, give a feeling of nature and be a breathing material.

#00:45:32-1# *Male, Norway: When I enter a room and smell wood, I am happier than when I enter a room of steel and concrete that doesn't smell of anything.* #00:45:49-5#

The use of wood should not be exaggerated. Preferably, indoor environments should mix different types of wood and combine wood with other materials.

#01:08:40-0# *Female, Austria: I like to try out contrasts and do not need to have only one wood species. Too much wood almost makes me feel claustrophobic. We have white walls and ceilings that enable me to use wood for the rest of the interior materials. I don't want surfaces that are modified too much; one has to see that one is dealing with wood here. It has to fit with my needs, easy to handle and maintain and keep its shape, more or less at least. Also the taste, especially when I invest in wooden furniture, is decisive. I like to experience the taste of wood. What I also like about wood is that there is a possibility to restore it, for example, 50 year-old furniture. Nowadays it is better to simply throw away MDF furniture. It is much nicer if future generations can make use of it.* #01:10:48-7#

#01:04:21-4# *Male, Austria: I love MDF, especially for furniture. When wood is used in a room, it has to become one unit with the other materials. Also use of too many different wood species appears as though it doesn't fit to me, this is perhaps also the reason why I like MDF that much. Cleanability is a key issue for material in general and specifically with wooden materials. The material should not change over time, dimensional stability is important. And it has to be easy to replace.* #01:07:09-8#

Wood should not require too much maintenance, knots should not be visible, nor should shrinkage and swelling be a problem.

Many respondents have a love-hate relationship to wood. Wood used the way they are familiar with from the 1980s and -90s is not popular. Old wooden farm buildings and worn wooden floors make people nostalgic.

Building professionals focus on the technical characteristics of wood. How using wood can improve the indoor environment, the weight-strength ratio of wood and how wood adapts to different indoor climates (e.g. levels of air moisture).

#00:47:58-8# *Female, Norway: I think of it as a living material. Specially-treated wood breathes, if you can say this. It reacts to humidity in the air and so forth. And then you can see that it ages.* #00:48:21-7#

#01:07:09-8# Female, Austria: Wood in the interior is primarily flooring; I wouldn't use it for the walls or the ceiling. I would not feel comfortable with that. A further issue is design, colour. It has to fit with the rest of the room. Cleanability and maintenance is important for the floors. And surface is important for me. There are surfaces that are very rough and still keep a nice look over time and use. #01:08:40-0#

Sweden

Topic was not discussed by the group.

Finland

- Using wood (spruce) can give a traditional look.
- Using surface treatments (e.g. white wax) can cause surfaces to lose the appearance of wood.
- The use of oil can change the natural feeling of wood.
- Using OSB materials in interiors can give a rough industrial feeling, e.g. when used in public places such as cafes.
- Wooden parquet is perceived as noisy by one respondent, and another would not like to have a wooden table top in the kitchen – that would require too much maintenance.

One respondent wanted more use of wood in public places, mentioning a visit to a shopping mall in Norway where a combination of wood and copper had been used.

Norway

Professionals

Topic was not discussed by the group.

Students

- Wood is a warm, breathing, durable material that can last for generations. It is supposed to be used, and can look good after years of wear. Use of wood gives a feeling of home.
- No use of wood in indoor environments can give an institutional feel to the environment.
- The use of wood should not be overshadowed by other materials, and it has to have bright colours and look nice. You should not get the feeling of being in an old wooden cabin.
- Wood should smell good, with no chemical odours. When you have installed wooden surfaces they have to smell nice.

- Ownership of wooden products, that you assembled or maintained, can give a feeling of achievement.

France

Building professionals

The participants mentioned two main factors influencing preferences for wood:

- Aesthetical (light vs dark wood) and local sourcing.
- Technical characteristics are important to ensure that the wood is suitable for the purpose (e.g. hard woods for stairs, soft wood for cladding).

One respondent mentioned exposed wood as a new trend. Earlier, people would paint or add plasterboard to hide the timber. People want to add timber to projects with no wood use.

Mixed group

- The preferred wood materials were oak and chestnut. Wood could come in wide variety of colours and textures: raw wood, matte, smooth, soft.
- Preferences for dark and pale (light) wood would depend on the volume of wood used and the style of the housing.
- One participant mentioned that the wood should tell the story of the tree.
- Varnished panelling was not a preferred material.
- Combinations of materials, e.g. wood and metal or wood and slate, would give nice associations.

People would like to have all the perceived advantages of wood (natural, raw), but not the drawbacks associated with wood (e.g. splinters). Wood should be enjoyable and its everyday use should be easy.

Austria

Professionals

Topic was not discussed by the group.

Mixed group

Wood use in interiors should be as natural as possible, and it has to [producers of wood products] keep its positive aspects while at the same time reducing the maintenance requirements of wood products.

- Wood in interiors should be used for flooring, not the wall or ceiling. An important issue is cleanability and maintenance of wooden surfaces.
- Old wooden floors can require a lot of maintenance, while new floors with sealed surfaces require almost no maintenance compared to old wooden flooring.

"I have to decide which surfaces I want to spend time on. I can use wood on those surfaces".

- When a lot of wood is used in interior surfaces, the colour of the wood material is important. When less wood is used, it has to be adapted to the other materials used in the room.

One respondent with a different cultural background thought cleanability was an issue when using wood. Wood materials should be easy to replace and should not change over time.

Mozambique

Topic was not discussed by the group.



Figure 3. Material surfaces are not perceived as hard to keep clean.
Photo: Arbyhether @ Flickr.com

Cleanability

For most of the lay respondents, material surfaces in general are not a problem to keep clean, and they expect them to be relatively easy to maintain. The laypeople made a distinction between cleaning and maintenance, noting that while there was effort involved in maintaining wood surfaces, well maintained surfaces were easy to clean on a day-to-day basis. However, for professionals cleanability can be an issue when specifying materials in indoor environments. Especially maintenance departments can have strong opinions on the materials used for indoor surfaces, e.g. flooring.

#01:06:03-6# Female, architect, Norway: Maintenance is something everyone is concerned about. It should be robust and maintenance-free. That is a classic. #01:06:35-4#

The kitchen and bathroom are seen as most laborious to keep clean. The structure of the material is seen as the most important factor for ease of cleanability.

Wood is perceived as requiring a lot of maintenance to be able to keep clean; especially in areas like the kitchen, where you have a lot of spilling of water and food.

Some maintenance can provide a feeling of doing something yourself. It can be a nice activity, giving a positive feeling of accomplishment once you have finished the

work. It looks almost like new again. But the cleanability of material is not a big issue when choosing material surfaces indoors.

#01:22:59-7# Female, Norway: [...] we have a solid wood table and a solid wood bench and it is nice to be able to oil it now and again. Then it is almost new again and you have the feeling of having done something yourself. It's just a nice thing to do it. But it is just a very small project.

For building professionals, cleanability can be a big issue. The reason for this is attitudes in the maintenance departments responsible for cleaning and maintenance of large areas in public buildings. Wood is perceived as a lot of work. Surfaces should be monotonous and consistent for cleanability and ease of maintenance.

#01:06:43-6# Male, architect, Norway: Wood is very difficult to keep clean. In relation to cleaning staff, wood is extremely difficult, it is heavy [...] and doesn't look clean. So we work hard [...]. #01:07:23-6#

#01:07:23-6# Male, architect, Norway: I see this in the cleaning department's culture. They want efficient cleaning, so they want vinyl and would prefer to use exactly the same machine in all rooms anyway. It is a company that does everything. And there is something in all of us that finds different characteristics or moods to differentiate the rooms appealing. So if we are honest, not everything has to do with cleaning. #01:08:02-5#

Sweden

The Swedish students were not concerned about cleanability in general, as this was thought to be more of a problem for families with small children.

- Kitchen and bathrooms are perceived as the areas that are most important to keep clean
- Issues like the looks of interior surfaces and how easy it would be to resell were deemed more important than the cleanability of a material surface.

Finland

- Maintenance of wood is a lot of work

Norway

Professionals

Cleanability is perceived as something everyone is concerned with. One respondent said that cleanliness is culturally determined, and is different for consumers and the cleaning department of a large public building.

- While consumers may not be concerned that cleanability is an issue when choosing building materials,

- Professional cleaning agencies put great emphasis on cleanability when it comes to surface materials. Uniform surfaces are easier to clean, since that means you can use the same tools for all surfaces.
- Consumers are perceived as being concerned with dust, but somewhat ignorant about more harmful emissions from materials.

Students

Overall, the issues of cleanability were not perceived as a problem. It is not something that comes to mind when choosing building materials.

- The smoothness of the surface was perceived as most important for the cleanability of a material surface. Smooth surfaces are easy to keep clean, while rough surfaces (e.g. carpets, rough massive wood floors) are perceived as more difficult to keep clean.
- Maintenance of surface materials is not something that should be too demanding.
- Some light maintenance work can give a feeling of having accomplished something.
- The participants mentioned wear and ageing of the surface of natural materials like wood and leather as advantageous (beneficial) properties of natural materials.

The exception was a young woman who had grown up on a farm with rough wooden flooring. She said that with the right tools it was no problem to clean rough wooden floors.

France

Building professionals

The importance of cleanability depends on the use of the area.

- Kitchen and bathroom were perceived as most important relative to other rooms.
- Frequency of use is another factor influencing the importance of cleanability.
- For wood it is important to protect the surface, e.g. by using lacquer.

Mixed group

Cleanability can be decisive in the choice of products to use in interiors. Most people are interested in surfaces that are easy to clean. One participant remarked that difficulty with keeping a surface clean was not necessarily a bad thing, as some people are looking for such products and like the patina they develop over time.

- Wood should be easy to keep clean,

- With time, it can acquire a certain patina with marks from everyday use over the years.
- The importance of cleanability depended on use and the general situation (e.g. family with children or not, crowded place or not).
- Some areas such as kitchen (countertop) should be easy to keep clean.
- Furniture should be easy to keep clean.



Figure 4. Wood is a trendy material. Photo: Kevin Spencer @ Flickr.com.

Trends

Most lay focus group participants cited magazines, friends and neighbours and IKEA as the main trend setters for the indoor environment. Wood is currently seen as both a traditional and trendy material in the Nordic countries. Many respondents considered wood as a trendy material, in particular those without a building industry background. One reason was that wood is environmentally beneficial, and this goes well with the overall trends in western societies:

#01:29:07-8# Female, Norway: *I feel that wood is super cool. In the building sector. That it is used everywhere. It supposedly is green, environmentally friendly. Wood is – at any rate in Scandinavia – Norway, Sweden, Finland, Denmark.* #01:29:37-0#

Building professionals see their customers as having no or very limited knowledge about building materials, and they have to be shown and informed about possibilities to consider other alternatives than what they see in popular media.

Laymen are influenced by trade shows, magazines, professionals and friends, and typically marketing publications such as the IKEA catalogue.

Wood is a modern building material, but should not be used as it was in interiors in the 1990s since that can give associations to old pine cabins.

Furthermore, the trendiness of wood was also considered to be a result of political goals:

#01:30:16-2# Male, Norway: I feel that it is an anchored political policy. That there is a political desire to build sustainably and use natural materials. We see now that the Norwegian Public Roads Administration has begun to build large bridge structures of wood, and... You see it a bit everywhere. #01:30:43-0#

Wood is seen as a timeless material that can be combined with trendy materials. Some products are perceived as timeless

*#01:04:41-1# Male, Norway: I consider oak flooring as very timeless.
#01:04:41-1#*

#01:04:41-1# Female, Norway: Yes. #01:04:43-4#

#01:04:43-4# Male, Norway: It isn't a trend or anything like that. If you get it, you are satisfied with it. That is my feeling. #01:04:52-9#

What people are used to doing is also an influence – this can reinforce trends for material use.

Sweden

Wood is a common material in indoor environments in Sweden:

- A typical Swedish home is a wooden house.
- The main source of inspiration mentioned was the IKEA catalogue.
- Oak floors were perceived as a timeless material.

It is nice to have elements of timeless materials in one's home, as they are easier to combine with trendy materials. You do not have the same relationship to building materials the way you do with other personal objects, e.g. clothes.

Finland

- Wood is a trendy material.
- I would use materials that are old.

Norway

Professionals

Topic was not discussed by the group.

Students

- A typical Norwegian building tradition was said to be wood, especially wooden houses.
- What you have grown up with is perceived as nice, cosy and comfortable (e.g. small traditional wooden buildings in Norwegian cities)
- Wood was perceived to be trendy by many of the participants in the focus group, being used everywhere these days.
- Wood is a modern building material, but should not be used like it was in interiors in the 1990s (associations to old pine cabins).
- The use of wood in buildings has been anchored in political policy, according to one of the respondents. The background for this being sustainability and environmental concerns.
- Interior exhibitions, TV shows, interior magazines and friends were listed as the main sources of inspiration/influence for interiors.

Things were not trendy any more when everyone has it.

France

Building professionals

Professionals are the main drivers for trends, and are able to predict the trends. Currently, salvage and ecology aspects are trendy. All the professionals admitted that trends influence their choice of building materials:

- Certain tastes remain more constant.
- Taste change more for colours than wood species.
- Some (authentic) elements come back regularly, e.g. seventies furniture style.

Mixed group

By introducing new building materials or standards for use of building materials, trends can be created or influenced:

- Technological progress, such as introducing double glazing in windows, have had a tremendous influence by enabling more open buildings with larger glass surfaces.
- Sustainability has become trendy, and has made durability and non-polluting materials a trendy topic.
- Professionals in the construction industry define trends.
- When a material becomes too common, or when a new technology overtakes an old one, a trend may stop. There can be differences based on income or wealth. When everyone can afford it, the trend may stop.
- Living situation may have a big influence on your taste, more so than trends. Lifestyle, family, career and age may have a bigger influence than trends.

Old materials (e.g. floor-tiles, old stones, and old buildings) are timeless materials. You may get bored of modern materials. The criteria for a timeless material are that it is:

- A classical material of very good quality,
- Functional
- Not dateable and not classified within a particular style.

The availability of a product over time, especially if it is a quality product, may increase its desirability. This means you can buy it when you can afford it.

Mozambique

- There are big regional differences in building traditions, e.g. rural vs urban and based on availability of building materials.
- People with a high social status, e.g. doctors, influence the choice of building materials.

Ethics and environment

Besides the Swan, CE and Fair Trade eco labels not many labels were recognised by the focus group participants. They expressed a certain distrust towards the labels they did recognise.

Building professionals wanted more and reliable information about environmental impacts for different building products.

Women and building professionals seem more interested in the environmental aspects of material use, and generally seek more and more detailed information when buying products.

Men also tend to say they are concerned with environmental aspects when choosing products, but generally do not have or want to spend time on these issues. Price and design are more important.

Several participants in the laypersons' focus groups expressed a time preference for making environmentally conscious choices. It is not something they do now, but they will do it in the future when their personal finances have improved.

Not many certificates were recognised besides Swan, CE and Fair Trade. Generally, both laypeople and experts expressed a sceptical attitude towards ECO labels. The labels are perceived as having little practical meaning.

Environmental and ethical issues are considered important, but few layperson focus group participants say they spend much time and energy researching this when buying building materials.

Professionals, particularly architects, claim environmental issues are important factors for choosing building materials. But they would like more information and transparency about the origin of information.

For salespeople connected to the building industry, lack of customer demand for wood products is mentioned as the most important reason for not offering more wooden surfaces in interiors in residential buildings.

Transportation is important in addition to production process. This relates well to the initial discussion about the naturalness of products.

#01:10:58-9# Male, architect, Norway: But they don't always know. Stone is also a natural material but it might come from China, so it isn't particularly sustainable. Natural products are not necessarily sustainable. And you can also use natural products in the wrong place, which makes it everything but sustainable. #01:11:46-5#

Durability and recycling are also important factors related to the environmental properties of products.

#01:39:59-2# Female, Norway: I think that everything that is bought via Finn.no [a Norwegian sharing economy] is environmentally friendly. Things that are used. It can't not be environmentally friendly because it is already, it exists. #01:40:12-4#

#01:41:07-9# Male, Norway: I think about durability, but that, but I look mostly at price and appearance before necessarily the material. As far as I'm concerned, it doesn't have to be solid wood as long as I have a feeling that it is. #01:41:30-7#

*#01:43:16-2# Female, Norway: I think, like you said, that one uses things again, That this is the most important thing, that it is durable and can be reused. Even if the trends change, we can save on this and reuse it.
#01:43:43-5#*

Even though participants thought that environmental properties are important, they were not always interested in spending much time and resources on this issue:

*#01:43:16-2# Female, Norway: I think, like you said, that one uses things again, That this is the most important thing, that it is durable and can be reused. Even if the trends change, we can save on this and reuse it.
#01:43:43-5#*

Austria

Professionals

Several respondents remarked that sustainability had become a trendy topic in recent years, but that most people did not care.

- Price was more or less the only thing they really cared about when choosing building materials.
- One respondent said that his company tried to force the use of natural and sustainable materials on clients.
- Regional differences in material choice, city vs countryside.

Mixed group

Trends were not only related to materials but also to how the interior spaces were divided, e.g. integrated kitchen and living room. A man remarked that good architecture combined modern and traditional elements.

One respondent defined traditional as pinewood cabins, warm, cosy, dark, not very open. Modern was energy, light, open.

- Combinations of trends and traditions are good, use traditional materials (e.g. wood) in modern settings.
- We now have larger and brighter rooms because it makes us feel better.

We want to include more nature. We know what is good for us.

Another respondent remarked that higher living standards have resulted in faster changes to trends, because more people can afford interior changes.

- The aim of a building staying modern (i.e. through refurbishment) is a recent concept.
- Trends are about combinations of materials. No contrast in material use makes people feel saturated with time.

Sweden

Recognised Eco labels:

- Swan
- CE
- Fair Trade

Finland

Recognised Eco labels:

- Swan and CE, which were trusted labels.
- Also recognised FSC, PEFC, Fairtrade, but these had little meaning for the participants in the focus group.

One participant wanted more information than just the eco label (e.g. QR codes or links to websites with additional product information).

Several respondents mentioned that supporting local producers gave a good feeling. They would look for the Swan or the Finnish flag when buying products.

Norway

Professionals

Naturalness and sustainability

- Natural materials are less processed, which means less energy is used in the production process.
- Transportation is important in addition to production process.

Students

Most of the focus group participants said ethical and environmental issues were important for them when deciding which product to buy – but with a few exceptions:

- that it was not important for them right now
- they did not want to pay extra money for environmentally friendly products
- paying for this was something they would consider doing when they were no longer students.

One of the participants considered buying second hand most environmentally friendly.

France

Building professionals

Topic was not discussed by the group.

Mixed group

Topic was not discussed by the group.

Austria

Professionals

Some building professionals complained about a lack of transparency in deciding which building material is sustainable or not. They did not understand the process of designating whether or not a material was sustainable or who was making these decisions.

Mixed group

Topic was not discussed by the group.

Mozambique

The main impression was that most people in Mozambique are not aware of environmental issues.

Factors influencing material choice

The professional background of the building professionals seemed to play an important role in which factors were considered important when choosing building

materials. Architects expressed most interest for environmental attributes of building materials when choosing materials to use in the design of buildings. Many architects lamented the level of knowledge about building materials and solutions among most (private) clients. The choice of building materials is influenced by several factors:

#00:23:48-5# *Female, architect, Norway: I have a different viewpoint. The environment has come more into focus, but one wants a place or a room to have an aesthetical aspect or feel. How are materials put together? And how are they connected with the place, more and more that local materials are used to provide an anchor or be part of an environment or a tradition, for example, but be used in a new way. So it is not just the environment that counts. There are very many decisions in choosing materials. Look at recent years where it was very much about how things look.* #00:24:53-7#

#00:32:21-2# *Female, architect, Norway: I think there are many other factors that play a role. Materials that provide sound and reverberations in a room, rhythm and contrasts and aesthetics are hugely important. Rhythm in materials, textures, transitions between what is smooth and what has more relief.* #00:33:17-7#

The architects expressed, as a general impression, that when given the opportunity to explain why clients should use durable and environmentally friendly materials most clients followed their advice.

Building contractors mentioned price and location as the most important factor, since in their experience, environmentally-friendly building materials used were not in demand by their customers.

#00:07:25-3# *Male, Austria: We get at first the requirements of the architects; then it is mainly about costs. From this point we try to create a best possible living environment in terms of climate, humidity. Here we often see wood as most appropriate material. Problematic here is the lack of research about a lot of characteristics and effects of this material, like humidity regulation in rooms. We see relation of mechanical properties and weight as the main advantage of wood. Often we have to compensate false choice of materials then with technical solutions, like heat regulation.*

#00:08:45-3#

Clients with an interest for environmentally-friendly building materials were seen as a niche category of clients (i.e. people using an architect when building a house), not something customers in the mass market were concerned with.

#00:21:21-7# *Female, Austria: In the low-budget segment is decisive. But we also see the kind of customer who is very conscious about the choice of material and more frequently is using wood. When we look at the segment of prefabricated housing, clients normally do not have any knowledge at all about used materials. I see the most conscious clients as those who also*

scrutinise the functional properties. I know that these aspects are some kind of luxury and many simply have to decide only according to the price.
 #00:23:14-4#

Several barriers for using wood in buildings were mentioned, such as cleanability, public building regulations, flammability and use of wood as floor material:

#00:19:09-5# Male, sales agent, Austria: For my clients technical properties are generally mainly decisive, but the level of knowledge differs a lot. Often customers have quite strong opinions about materials, some of them are right, some aren't. But normally rather the function than emotions decide for my customers. For walls we are mainly talking about flammability, for floors the level of usage. #00:21:21-7#

Norway

The group was divided on the importance of environmental issues with respect to choosing building materials and customers choosing environmentally-friendly products.

For the architects in the group, using environmentally-friendly products was always a priority in new building projects. The CO2 footprint of the building was an important factor for the choice of building materials. One of the architects also mentioned aesthetics, locally-sourced materials and [local] building traditions as important factors when choosing building materials. Their customers would also choose environmentally-friendly solutions once they had a chance to discuss choice of building materials with them, especially when building detached houses.

A building contractor had a different position regarding the importance of environmentally-friendly building materials when it came to choice of building materials. He agreed on the importance of choosing environmentally-friendly building solutions, but according to the sales department in his company there was no demand for such solutions (for apartments in urban areas). Location and price were seen as the most important factors for customers choosing a place to live, and few would demand more environmentally-friendly products when looking for a place to live. The contractor remarked that customers who got architects to design their detached house probably were not typical customers [selection bias].

Austria

Function, homogeneity, context and regionality, guidelines and customer expectations were mentioned as important for choice of building materials by architects. A participant with a background in sales mentioned flammability when it came to walls and use for flooring, but price and turnover were the most important factors according to the salesperson. Public building regulations were mentioned as a

barrier to the use of wood by the sales person. Designers avoid using wood due to the lack of code approved systems and assemblies.

The demand for natural construction materials was perceived as steadily increasing, with the conscious consumer choosing wood products. One participant did note that material selection was less important for clients of low-cost construction, but as budgets increased clients became more interested in wood solutions. Wood is used in prestigious building projects. In regions with wood industry, wood is more competitive. It was also used more in public buildings in the same regions. One architect thought political policy should encourage the use of wood.

Finland, France, Sweden, Mozambique

Participants in these focus groups did not discuss this topic.

Interpretation of the results and discussion

The goal for this research was to answer the following research questions:

- What do people associate with natural building materials?
- What do people associate with a good indoor environment?
- How does the use of building materials influence people in indoor environments?

The data material consists of summaries and transcripts of the focus group discussions conducted in this project. The views expressed on the topics in the different focus groups had a lot in common. The interpretation of the data is structured by the research question. The differences among the focus groups are also discussed in the background section.

Background

Based on the data, there does not seem to be any great differences among the groups in different countries. This may to a large extent be due to the fact that, with the exception of participants in Mozambique and France, most of the participants in focus groups were from cultures where there is extensive use of timber in buildings. In Scandinavia and some regions in Austria, especially for single-family residential and townhouse construction, wood is frequently used for interior and exterior surfaces as well as for the structural system.

Subjects such as aesthetics and the environment were the area in which the greatest differences were found among participants and between the different groups. Here participants, especially professional women in the Norwegian focus groups, expressed a greater commitment with respect to origin and production of materials, and the consequences this had for the environment.

Men among the lay participants also expressed that it was important to consider aesthetics and the environment when choosing materials, but that to a greater extent this was not something that in practice time was spent on in a purchasing situation. Several of the participants in the Norwegian student group, among them both women and men, expressed that the environment was something they would take more into consideration, or in other words be able to afford, after their studies when they expected to have a better financial situation than they were in while they were students.

Professionals in Norway and Austria asked to a larger extent than lay participants for environmental information about the products they wished to use, and said this was important criteria for the selection of materials. Especially in the Norwegian group, more information than was easily available today was requested, and there was also an expressed interest in that this should be more detailed, preferably linked to technical solutions and examples of construction projects.

Participants with a professional background could, to a larger degree than lay participants, use their own experience in discussing the various subjects addressed, and this meant that the discussions were often more concrete and detailed than among the lay participants who did not have any particular experience with practical materials use.

An example of this was the Norwegian student group, in which one of the participants had experience as a workman/craftsman. Professionals often expressed somewhat more realistic expectations of what the materials might be used for, as well as what limitations various materials and solutions have.

Natural building materials

The aim of asking questions related to *naturalness* is to understand which building products people associate with nature, as natural elements have been shown to potentially have positive psychological effects on building occupants. This question was open to misinterpretation, as *naturalness* could also be understood as usual or common materials to be used in a building. Most participants interpreted the question as exclusively meaning *close to nature*, but a few focus group participants also used the interpretation of a natural material as something that is common to use in their surrounding built environment.

Focus group participants in Norway and Austria mentioned that wood is connected to forests. They see wood products as an extension of nature. Several people mentioned the story and history of natural products as important.

A discussion about what should be considered a natural material or non-natural material occurred in all focus groups. During the discussion, some participants in a few of the groups expanded their understanding of what a natural material was. Some groups would start by mentioning wood, stone and brick as examples of natural materials, but would after some discussion come to the conclusion that many materials could be seen as natural materials, as the raw material had its origin in nature.

The disagreement about what should be considered a natural material is mostly related to the degree of chemical or mechanical processing that can be applied to a material before it stops being perceived as a natural material. Most respondents rated the knot-free pine decking as most natural, but those who disagree thought the painted pine sample is more natural. Figure 5 shows a graphical representation of the two dimensions the focus group participants used to rank materials for naturalness. The most natural materials would be in an unprocessed natural state with no additives; and industrial processed materials with chemical additives figured in the opposite corner.

Another interpretation of a *natural* material was a known, familiar material. Recyclability was also mentioned, as an important factor for whether the material is perceived as natural or not.

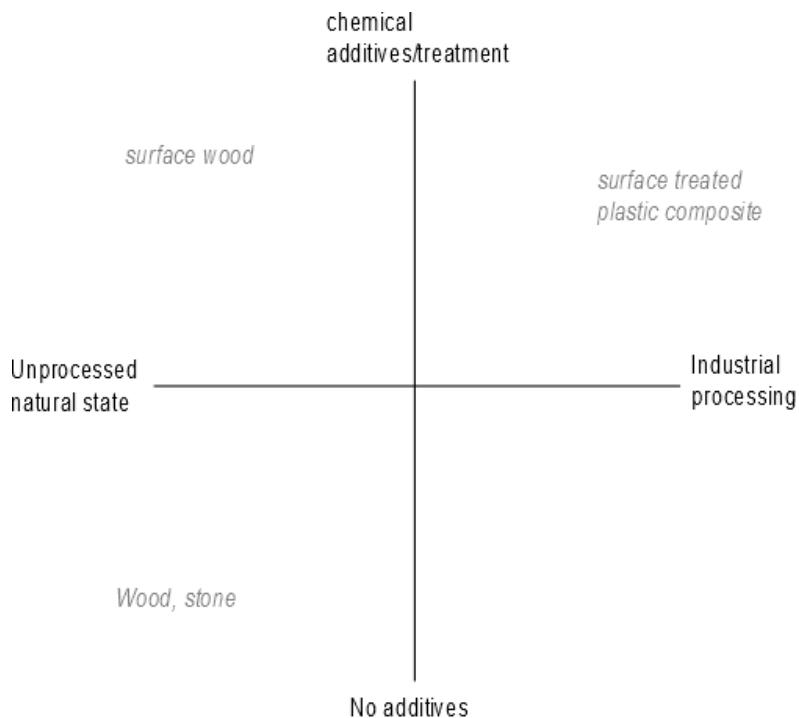


Figure 5. Perceived naturalness of materials.

The rankings of the material samples tend to coincide with how the focus group participants defined naturalness. The ranking of the materials depends on the level of processing. The knot-free pine decking was viewed as more natural than the treated pine sample or the MDF and OSB samples. Those who view the painted pine sample as more natural, thought the mechanical processing of the knot-free pine decking was more invasive. Some say this is the reason they rank the MDF sample as more natural than the OSB sample.

The level of processing seems to influence what is perceived as natural or non-natural materials. The participants would categorise gypsum, concrete and metal as both natural and non-natural materials. All groups discussing the topic mentioned materials such as wood, tiling and stone as natural. All groups mentioned plastic, metal (aluminium) and gypsum as examples of non-natural materials.

Whole wood samples are seen as versatile and visually pleasing materials suitable for surfaces that people walk on or touch, e.g. floors, walls. Many participants associated the knot-free pine decking sample with old wood cabins. The more processed material samples (MDF, OSB) were seen as construction materials or materials suited for use in furniture.

Based on the discussion from the first questions in the focus groups, we can conclude that the concept of *naturalness* has at least two interpretations among the focus group

participants: A physical meaning concerning the origin of the material, the degree of processing and the use of additives. It can also have a cultural meaning, as in a material that is commonly used or is part of traditions in an area.

Wellbeing

Wellbeing in interior environments is a complex issue involving multiple factors such as lighting conditions, sound (acoustics), smell, material choice and combinations of materials, physical space, expectations, traditions and the purpose of the building.

Both layperson focus group participants and building professionals mentioned lighting conditions, combinations of materials, and acoustics as important for wellbeing. Lay participants mention different expectations for interiors in public buildings and homes; people can experience interiors in public buildings as comfortable even though they are perceived as cold (i.e. minimalistic, glass and metal interior); for home interiors they want warm surfaces (i.e. natural surface materials such as wood) to get a feeling of wellbeing.

Cleanability was mentioned as important for wellbeing in both Austrian groups. No other groups mentioned this topic when discussing wellbeing.

Wood materials

The laypeople had mixed feelings and expectations with respect to wood in indoor settings. Wood has connotations of home, they like the feeling and look of wood especially when used for flooring. They like the natural features of wood, e.g. the smell and look. But some participants do not want to deal with other aspects of using wood in interiors such as maintenance and cleaning. Several focus group participants stated that using wood on all or many surfaces could give a claustrophobic feeling. Wood should be combined with other materials; otherwise people get connotations of old wood cabins. However, it was also mentioned in one group that the lack of wood in an indoor environment can give an institutional feel to a building.

Cleanability

Most laypeople did not see cleanability as a problem in general provided surfaces were well maintained. However, many see rough surfaces (e.g. old wooden floors or tiling) as harder to clean than smooth surfaces.

Building professionals experience problems when specifying wood for large indoor surfaces. Especially the cleaning departments doing the cleaning and maintenance for large public buildings prefer homogenous materials with surfaces that are easy to clean.

Trends

Most focus group lay participants cited magazines, friends and neighbours and IKEA as the main trendsetters for indoor environment. Wood is currently seen as both a traditional and trendy material in the Nordic countries.

Building professionals see their customers as having no or very limited knowledge about building materials, and they have to be shown and informed about possibilities to consider other alternatives than what they see in popular media.

Wood is seen as a timeless material that can be combined with trendy materials.

Ethics and the environment

Many labels were not recognised by the focus group participants with the exceptions of the Swan, CE and Fair Trade eco labels. The participants expressed some distrust towards the eco labels they did recognise.

Building professionals wanted more and more reliable information about environmental impacts for different building products.

Women and building professionals seem more interested in the environmental aspects of material use, and generally seek more and more detailed information when buying products. Men also tend to say they are concerned with the environmental aspects of choosing products, but generally do not have or want to spend time on these issues. Price and design are more important.

Several participants in the laypersons' focus groups expressed a time preference for making environmentally conscious choices. It is not something they do now, but they will do it in the future when their personal finances have improved.

Factors influencing material choice

Architects and other building professionals have very different opinions regarding the importance of the environmental impact of building materials when specifying materials in building projects. Architects want to specify environmentally friendly solutions and materials, and see using natural materials as a solution.

Building contractors and sales department staff specify materials based on market demand. They perceive location, price and turnover along with technical properties such as flammability as more important when specifying building materials.

Sample and data

The main purpose of this study was to gather information about different points of view regarding use of building materials in indoor environments, from both laypeople and building professionals.

The recruitment to and conducting of the focus groups were carried out by the research institutions involved in this project. This may have made the focus groups aware of the interests of the institutions and the research project, and may have caused the focus group participants to discuss the positive and negative aspects of the use of wood to a greater extent than they normally would have.

The sample may also have been affected by the sampling method, as most of the participants were recruited either through personal or professional relationships with either other focus group participants or the scientists involved in the study. Several of the participants in the Austrian groups were directly related to the Austrian project partner, though they were not working on the project. However, none of these participants had former knowledge on the content or aim of the focus group discussions.

Summary

The focus group participants see natural building materials as materials that have gone through minimal processing, both chemically and mechanically. Several building professionals stressed the importance of not confusing the concept of natural with ecological or healthy.

Several factors influence wellbeing in interior environments. Lighting conditions, acoustics, material choice, the shape of the physical space, expectations and the purpose of the building influence the wellbeing in interior environments.

Focus group participants without a professional background (laypeople) had different expectations for material used in public and private interior environments. Wood is something that reminds many people of home, and this influences how suitable they see wood for use in a public building and how it should otherwise be used.

An inhomogeneous indoor environment is preferred. Material combinations are the easiest way to achieve this. Indoor environments with a dominating material or colour can bring negative connotations; all wood interiors remind people of old wood cabins.

Wood can be a good material to use in indoor settings, since it is a living, warm and breathing material that influences the indoor air in a good way. Many participants preferred wood, especially as a flooring material for its honest and natural look. The fact that they can tell the origin of the material is important.

In general, most laypeople do not see cleanability as a big issue for indoor surfaces, provided they are well maintained. A common perception is that wood requires a bit more maintenance and can be harder to clean than other materials, and this can influence where wood is perceived as a suitable material, especially for building professionals. Some people find that natural materials such as wood, stone and leather can acquire a patina with some wear and aging, given proper maintenance. The participants regarded this as a positive attribute for natural materials.

Wood is both traditional and currently trendy, especially in the Nordic countries. Wood is a timeless material, which can be combined with other trendy materials. Friends, neighbours, professionals and publications such as the IKEA-catalogue are the main trendsetters.

Building professionals and women express a greater interest in environmental and ethical issues when buying building materials. Though environmental and ethical issues are important for the lay focus group participants, price and design were most important for many when choosing products.

Eco labelling is not a familiar topic for the participants. Few labels were recognised, and the respondents mentioned a distrust of some of the labels.

While architects focused on environmental and technical issues when specifying indoor materials, sales people and building contractors said demand and other factors not related to material choice (e.g. location, price) were most important for choice of indoor materials.

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Appendix

Interview guide laypeople

Competitive wood based interior materials and systems for modern wood construction (Wood2New)

Work package 4, Task 4.1 User Perceptions: Focus group analysis

About the guide

Guide for describing and understanding the relationship between building materials and people's perception of an interior environment

Each focus group session is divided into four main phases:

- Phase 1 consists of an informal introduction where participants present themselves over a light snack (cup of coffee or tea) before the main part begins.
- Phase 2 is a formal introduction by the facilitator. She will go over the framework for the focus group and say something about how it will be implemented.
- Phase 3, the main part of the focus group, consists of six subtopics where participants will discuss various themes linked to building materials.
- Phase 4, the facilitator will summarise the discussion and provide participants with the opportunity to give feedback to the summary.

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Symbols used in the document

\**Italics*\* = explanatory text

\*\***Bold**\*\* = tasks for the facilitator

Number sign # = indicates the structural level of the survey guide. # = title, ## = first level heading, ### = second level heading etc.

[Brackets] = a part of the text where the survey guide must be adapted for different countries

<! – Comments --> = comments to the survey guide

\*\*\* = page change

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Method: focus group discussion

Purpose: The focus groups will provide insight into how ordinary people view the relationship between internal building materials and people's experience of the indoor environment.

***Research questions**

- * Which building materials are associated with a good indoor environment?
- * How does the use of materials in indoor environments affect users positively and negatively?
- * What are people's views about using 'natural' building materials?

*** Participants:***

The objective is to survey four different groups comprising members of the public. The groups must all have participants resident in the [Oslo area], between 20 and 40 years old and both genders must be represented. Among the participants must be people with and without experience in do-it-yourself construction/refurbishing. [In addition, there should be a group of people who do not have a Scandinavian background.] See the selection and recruitment plan for further details. The four focus groups should comprise:

- * A group without experience of DIY construction/refurbishment, but with plans to do this (mixed gender?)
 - * A group with experience of DIY construction/refurbishment, women
 - * A group with experience of DIY construction/refurbishment, men
 - * A group of people without a [Scandinavian] background (Group 1) are these with or without DDIY and are they mixed gender?
- * Recruitment:* The selection will be made via different channels depending on the group concerned. See the selection and recruitment plan for details.

Topic guide

Section 1:
Welcome, (5 minutes)

Greet participants, offer them coffee etc., and give them name tags. Ask them to sit down.

* Presentation of the facilitator and participants.*

How long have you lived in [Norway]?

**Hand out ready-made name tags. **

Refreshments: Ask the participants to help themselves to snacks and refreshments.

Formal introduction, (5-10 minutes)

Speak calmly, distinctly

Hello and welcome. My name is [...] and I am here to guide you through this focus group discussion.

I thought we'd start with a short presentation round, where you introduce yourself by name and tell us a little about where you are from, where you live and what you do for a living etc.

We want to examine how people's experience of an internal environment is affected by the building materials used. [Ordinarily, I and the other people involved in this project work with assessments of various building materials.] We are interested in examining what people in [Norway], who do not work with this on a daily basis, think of this topic.

I will lead the group discussion, and to assist me I have with me [...] who will assist us. He/she is a colleague of mine, who is also involved in this project. He/she will make notes analyse all the reports to determine what people generally think about the topic.

The point of the focus groups is that the participants talk. It appreciate that that you are willing to share your thoughts with us. My task is primarily to guide the conversation and listen, but I may ask you to elaborate on certain topics or proceed to the next topic if time is running out.

The group conversation will last about 2 hours and afterwards you will be given a gift certificate worth [NOK 500] in appreciation for your efforts.

[The meeting will be transmitted via these cameras to the room next door where there are [.N.] observers. This is because there are other project workers and we do not want anyone in this room but the participants, the moderator and the reporter. They will all come out to meet you afterwards, and you will have an opportunity to greet them face-to-face.]

[The video transmission will be stored [on a PC in the other room]. We also want to [record the meeting as an audio file because the sound quality on the video is not that good]. We are recording this because we want to make the reports as thorough as possible; so we will need to be able to refer back to the tapes to hear what was said and what went on. There are too many people at a time for us to manage to catch everything.]

It will never be known outside the project group who has participated in the meetings. Nor will any names be included in the report. The recordings of the discussion and all lists of names will be destroyed within two months. All those who work with this project are under a duty of confidentiality. In addition, it would be good if we can agree to keep what is said in this group among ourselves. This should make everyone feel a bit freer to express their opinions.

Participation in the Focus Group is voluntary. Should anyone wish to withdraw from the group, they should do so now.

****Ask the others to start [the video recording] – moderator starts [name of equipment]****

Phase 2: Introduction

Introductory questions (10 minutes)

So let's start the discussion with a short introductory question. I would like you to tell us a little about what type of housing you live in and if you have any plans to, or experience with, refurbishment?

****Ask everyone around the table to answer the question.****

Phase 3: Focussing

Key questions (60-70 minutes)

Part 1 - The naturalness of building material

We have a small task for you to do. In front of you is a piece of notepaper. Would you write down on it what you consider to be a natural building material? What does it mean when we say that a building material is natural? Just let the notes stay there when you are finished; we will collect them afterwards.

****Go to the blackboard when everyone is almost finished, ask the participants to read the proposals and group the words mentioned.**

****If words are repeated, ask if there is someone who has something new to add. Name the groups of words if possible. Ask the group what they think about the various words. Is it possible to sort the words?****

What do you mean by that?

****The moderator sits down at the table****

What, in your opinion, is the opposite of natural? Can you give examples of materials that you do not consider to be natural?

Ask each of the participants directly, but let them think about it first.

Part 2 - Mapping naturalness/unnaturalness for specific materials

Here's another task. We will show you some samples of different building materials. I'll place them here and you can send them around and examine them one by one.

Present the material samples.

The first thing I'll ask you to do is to rank the samples from the one you feel is the most natural to the one you feel is least natural. Each of you should use a few minutes to consider this and then we'll write it up on the board.

Participants should perform this task in silence, that is, they should not have the opportunity to discuss and come to a common solution. Write up rankings from different participants if there are several different rankings. Remember to ask the participants to give their reasons for the ranking of materials.

So now we have one/two/several good ranking lists. Now, I'd like to ask you something else. Can you think of other materials that also are natural? Why?

Which applications are these material samples suitable for?

Mention the bullet points below as needed.

Flooring
Walls
Ceiling
Furniture

Can you give examples of where you have seen these materials in use? Do you think they were suitable for that particular application?

End the task

Part 3 - Mapping the 'feeling of wellbeing' in interior environments

What makes a public building good or not so good to be in?

*Explanation: For example, there may be special feelings linked to a building if you have memories of it from when you were a child, or if you met your first love there.

Or the opposite: if you have experienced something sad or difficult in a building, this may affect you negatively.*

What conditions affects this?

What do you think of first when you look at a room for the first time, or when you are about to refurbish, with respect to a feeling of wellbeing?

Can you elaborate on this?

If we look at the surfaces of individual rooms in the apartment/house, which parts of the room (I'm thinking of surfaces such as flooring, walls and ceilings) are the most important to you with respect to feeling comfortable in a room?

Now let's discuss the use of indoor building materials. Are there any building materials that you would especially like to have in your living room?

What are the reasons for this?

Now we have talked about housing and interior rooms. Does the use of materials that are used in the production of furniture and other things in the room have any influence?

Do you have any other expectations of building materials?

Part 4 - Wood materials

If we restrict ourselves to the use of wood - are there any types of wood that you would particularly like to have in your house or apartment/your living room?

Let's discuss what expectations you have of wood materials; how you think wood should perform and what you are interested in with respect to wood.

I wonder what expectations you have of different wood materials that you can use indoors at home with respect to:

Mention the bullet points below as needed.

- * Appearance
- * Physical characteristics
- * Quality
- * Practical user-friendliness

Part 5 – Cleanability

To what extent is cleanability an issue that you consider when looking at material surfaces? Does cleanability influence your choice of building materials, e.g. when you are refurbishing a wall or a floor?

Mention the bullet points below as needed.

- Surface treatment
- Maintenance
- Grease, spilled food, water, etc.
- Maintenance zones
- Areas with low and high traffic

How interested do you think other people are in these subjects? Can you give examples of other materials that are easy or hard to clean?

Part 6 - The significance of culture and society on the experience of the materials

The traditions we have and what we are used to can affect our impression of materials. I have some questions specifically about this:

What would you say is a typically [Norwegian] building tradition?
Do you have elements of this in your homes?
Why?/why not?

If we were to say something about trends instead of traditions, how would you know that something is fashionable with respect to housing and furniture?

Who decides what is trendy? Is it different occupational groups or people?

And when does something that is trendy cease to be trendy?

Have you experienced that over time your tastes have changed with respect to what you think is beautiful or ugly inside? If yes, how did you first notice that your taste had changed?

Are there any rooms or surfaces where your tastes almost never change? Which you have 'always' had the same opinion of? Why do you think that is?

Part 7 - Ethics, environment and materials

I have a task for you. I am going to show you a sample of ecolabels that are used in European markets.

**** Present the logos of the ecolabels ****

. First I want you to tell me which of these labels you are familiar with. You can group the logos of the labels into two groups, one for those which you are familiar with and one for those that you are not familiar with. Please rank the ecolabels by familiarity. I would also like to know which of these labels you trust and why you trust them.

Please take a few minutes to finish the task individually.

** Participants should perform the task in silence. They should not discuss the ecolabels and come to a common solution. Write up the rankings from the different participants. Remember to ask the participants from where they know the ecolabels.**

Pause: If time is short, do away with the pause. It should be taken only if more than 15 minutes is left of the time allotted.

We'll take a pause for 5 or 10 minutes. You mustn't leave yet because after the pause I would like us to summarise what we have talked about.

Pause

Phase 4: Pause and review

Pause (5-10 minutes)

Facilitator and recorder confer and plan the summary.

Summary (15 minutes)

I'll give you a brief summary in which I will try to sum up the discussion we have had. If we have understood correctly, the group has concluded:

** Present the findings orally.**

Does anyone have anything they wish to add?

End the discussion

Thank you very much for your help; we are very grateful that you took the time to attend. I'd like to give each of you a gift certificate as a small token of our appreciation.

Distribute the gift certificates and make sure to get the participant's signature on a separate form as confirmation that he or she has received the gift certificate.

Interview guide building professionals

Wood2New - Wood- based interior materials for modern wood construction

Topic Guide for focus groups for building professionals

Aim

To gather views about how construction professionals view the relationship between interior building materials and occupants experience of their environment, what factors influence their choice and what their clients are saying about the topic.

Objectives of session

- To investigate their views about which materials they prefer to specify on their projects and why?
- To find out what their clients see as important in choosing interior materials
- To gather information about how internal building materials are seen as impacting on occupants' health, well-being, productivity etc.
- To find out their opinions about whether the 'naturalness' of a material has any influence on attitudes and choice

Introductions	Time
	10 minutes
<ol style="list-style-type: none"> 1. Introduce facilitator and assistant 2. Health and safety and house-keeping (<i>if appropriate</i>) <ul style="list-style-type: none"> • Location of the emergency exits • Location of the toilets • The focus group will last for approximately 1 hour • Ask participants to switch off mobile phones 	
<ol style="list-style-type: none"> 3. Purpose and aim of the focus group <ul style="list-style-type: none"> • Introduce participants to the project: What is the objective of the main project? • The objective of the focus group is to obtain detailed information about the choice of interior materials that will help us to understand what aspects are important to design and construction professionals and their clients. 4. Audio recording and confidentiality <ul style="list-style-type: none"> • Check participants are happy for the session to be recorded • All information will be kept strictly confidential (subject to legal requirements e.g. Data Protection Act). All names and addresses will be anonymised 	

5. Encouraging participation and explaining rules of participation <ul style="list-style-type: none"> • Explain that we are interested in all viewpoints • Tell them that there are no wrong or right answers • Discourage participants from talking over each other
6. Go round the room for introductions: Name, Company, What their job role is, and what type of projects they specialise in.

Topic A	Time 10 minutes
Choosing interior materials	
1. When you are carrying out a project, how do you choose the materials to use/specify?	<p>Prompt Think about different parts of the rooms i.e. Walls, floor, ceiling, windows and doors?</p> <p>2. What factors do you consider?</p> <p>Probe</p> <ul style="list-style-type: none"> • Cost • Colour • Feel/Texture • Ease of maintenance • Ease of obtaining/delivery time • Fashion • Context • Ease of installation/fitting • Durability • Comfort

Topic B	Time
Clients' views	10 minutes
1. What factors do you think your clients see as important in the choice of interior materials?	

Probe

- *Cost*
- *Colour*
- *Feel/Texture*
- *Ease of maintenance*
- *Ease of obtaining/delivery time*
- *Fashion*
- *Context*
- *Ease of installation/fitting*
- *Durability*
- *Comfort*

2. How far do your clients tend to get involved in the choice?
3. When advising clients, how do you advise them?

Topic C	Time
Well-being	10 minutes
<ol style="list-style-type: none"> 1. What factors do you think influence what a building feels like for the occupants? 2. How can a room or building contribute to the occupants' health, well-being and productivity? 3. What impact do the materials used have on occupants' feelings of well-being? 4. Is this something that you have ever thought about or considered in your choice of materials or the advice you give to clients and in what way? 	

Topic D	Time
'Natural' materials	10 minutes
<ol style="list-style-type: none"> 1. What do you think is meant when people refer to 'natural' materials? <i>Prompt</i> <ul style="list-style-type: none"> • <i>What types of materials do we mean?</i> 	

- *How do we then define non-natural materials?*
2. How far do you think this is a factor in
 - Your choice of a materials?
 - Your clients' preferences?
 3. What is your experience in using wood materials as compared to other types?

Probe

- *Good examples*
- *Anything that is not so good e.g. cost etc.*
- *Are there any particular woods that you prefer*
- *Clients' opinions*
- *Are there woods that you would use in different contexts*

4. What relationship do you think there is, if any, between 'natural' materials, particularly wood and occupants' feelings of well-being?

Topic E	Time
Cleanability	10 minutes

1. To what extent is cleanability an issue that you consider when choosing materials?

What aspects do you consider?

Probe

- *Surface treatment*
- *Maintenance*
- *Installation of material surfaces*
- *Grease, spilled food, water, etc.*
- *Maintenance zones*
- *Areas with low and high traffic*

2. How interested are your clients in these issues?

3. Does cleanability influence your clients' material preferences?

4. Could you give examples of materials that are easy or hard to clean?	
Topic F	Time
Sustainability	10 minutes
1. How far is sustainability an issue that you consider when choosing materials?	
What aspects do you consider?	
<p><i>Prompt</i></p> <ul style="list-style-type: none"> • <i>Sourcing of the material</i> • <i>Supply</i> • <i>'Miles'</i> • <i>Ethical supply chain issues</i> 	
2. How interested are your clients in these issues?	
3. In what way does sustainability interact with 'naturalness'?	
<p><i>Prompt</i></p> <p><i>E.g. If people want a 'natural material but there is a finite supply, not ethical, not local etc.</i></p>	

Topic G	Time
Summing up and thanks	5 minutes
<ul style="list-style-type: none"> • Is there anything else that you would like to add about the things we have talked about today? Go round the room and ask each person. 	
<ul style="list-style-type: none"> • Thank participants • Remind participants about how the information will be used • Ask if they have any questions about the research • Point of contact for any points that they may think of after the session - mention contact person 	

Material samples used in focus groups



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