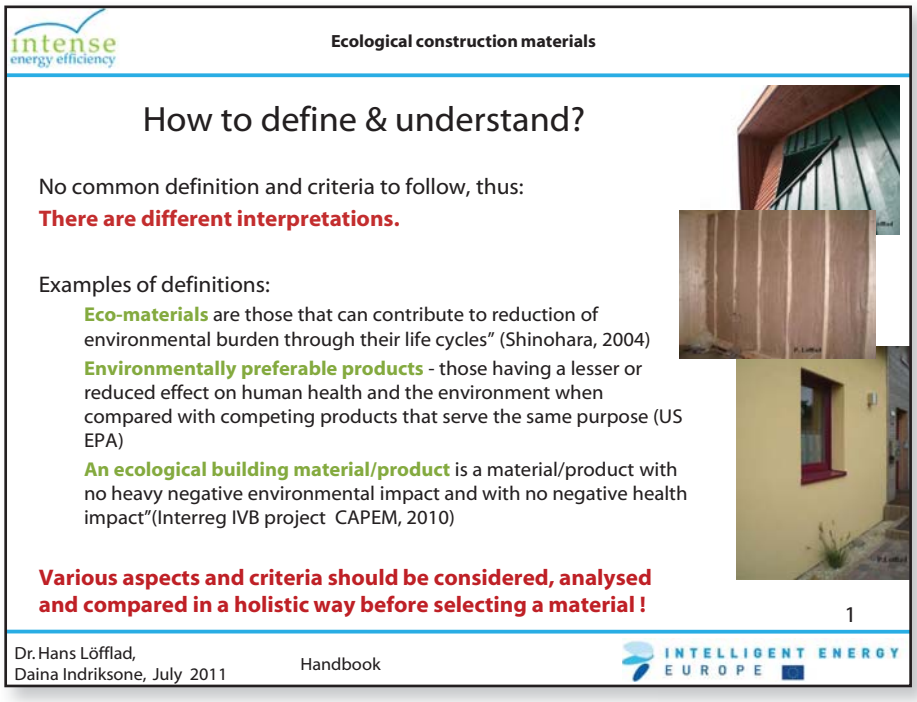


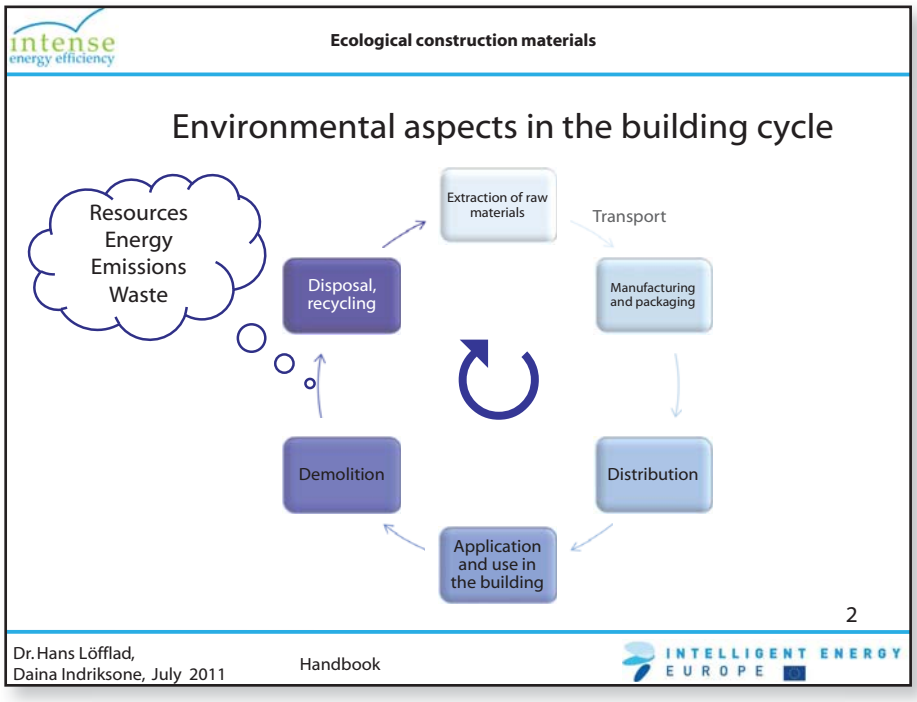
Nowadays the availability of materials that can be used for construction, insulation or finishing of buildings is increasing on the market. But how can the ecological materials be identified from this wide range? There is no common definition for ecological materials, thus allowing various interpretations. The examples of definitions mostly point out aspects of no / no heavy / reduced impacts on human health and the environment thus leading to the conclusion that various aspects and criteria should be considered before deciding on the ecological nature of a material.

Background:

More information available at the CAPEM (Cycle Assessment Procedure for Eco-Materials) project www.capem.eu.

Suggestion for presentation:

Check if there is a definition of ecological construction materials available in your country, e.g., in requirements for green public procurement.



Throughout the whole "life cycle" of a material / product starting from the extraction of raw materials until its disposal or re-cycling ("cradle-to-grave or reincarnation") there are smaller or larger impacts on the environment. The main impacts are related to the use of resources and energy as well as impacts resulting from emissions to e.g., air and water as well as from waste generation at all stages of the building cycle. Additional impacts are caused by the transportation required.

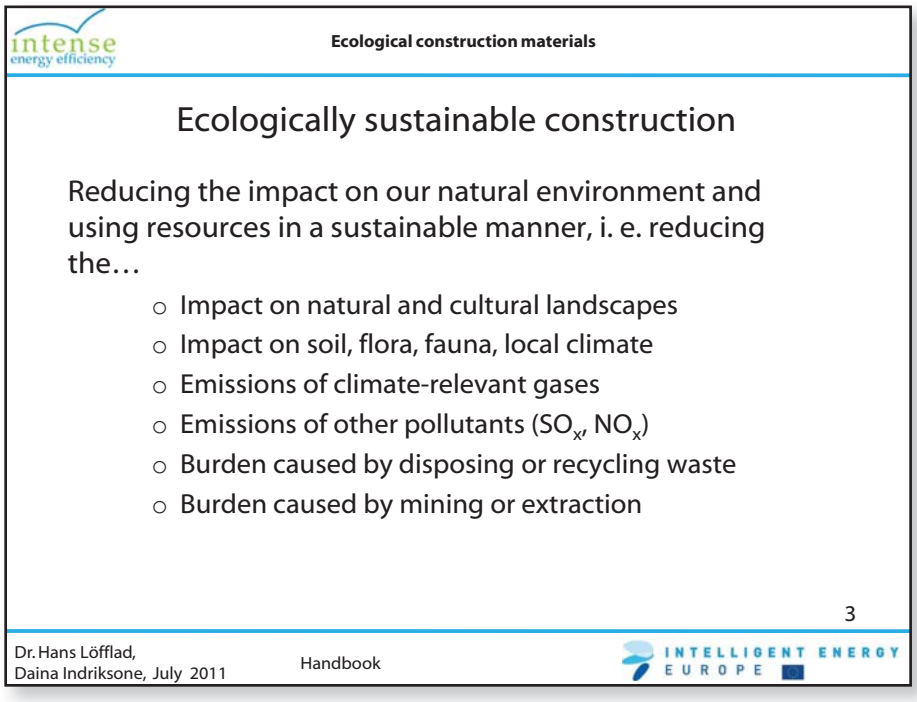
Background:

Life cycle analyses (LCA) - compilation and evaluation of the inputs, outputs and the potential environmental impacts of a product system throughout its life cycle is a measure of the environmental sustainability of the system (Chemistry Innovation Ltd 2009).

In general the priority in choosing materials for construction, insulation and finishing should be given to those materials causing a low environmental impact during the whole life cycle. However, experts discuss that sometimes there might be exceptions - relatively small quantities of materials that have a high impact, due to their other outstanding properties e.g., durability (e.g., steel) may be preferable to large quantities of materials that have a lower impact. Thus, very often designers, builders and building owners have to seek a balance between conflicting considerations.

Suggestion for presentation:

Present examples of life cycle analyses e.g., for concrete, clay brick, PVC, straw. Compare the potential environmental impacts and discuss the results with participants.



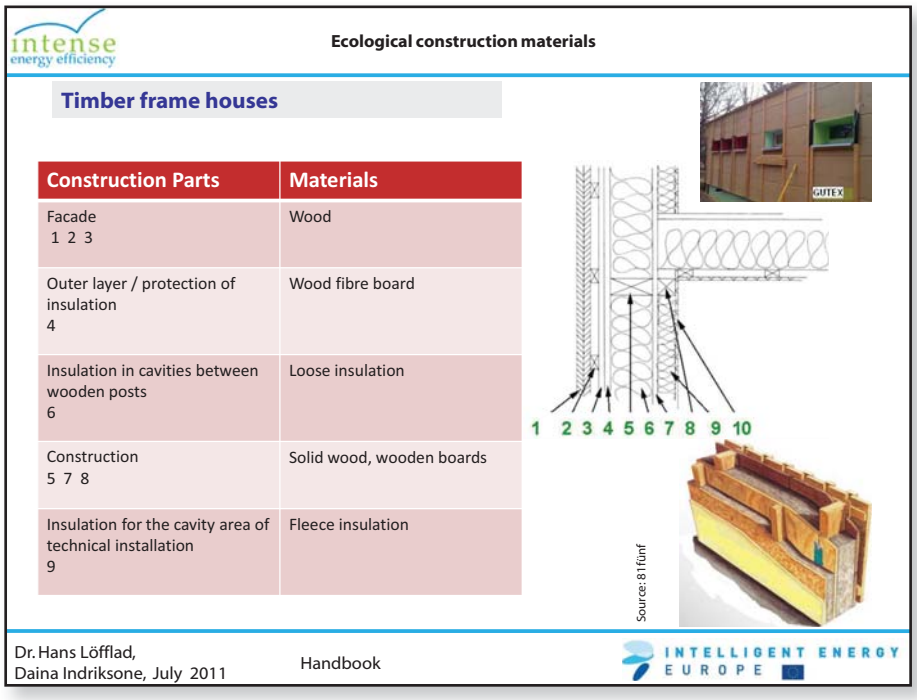
There are various environmental impacts that are associated with the use of materials during the building process. They occur at all stages of the building cycle. Reducing this impact means reducing harmful emissions, reducing the burdens caused by mining, extraction and waste disposal. A proper analysis tries to take such impacts into account. They are not directly measured but expressed in terms of their potential to harm the environment. Typical indicators are the potential for acidification (expressed as SO_2-equivalent) or ozone-depletion potential.

Background:

The building process is associated with several environmental impacts which should be minimised as much as possible.

Suggestion for presentation:

Selected impacts can be illustrated along the production chain of materials (do not forget to talk about recycling and disposal).



Various solutions for construction of timber frame houses are possible. The construction example shown here is an improved version with a cavity area for technical installation. Due to this construction the air-tide membrane, here a wooden board, is quite safe against damages that might be caused during technical installation.

The facade can be built up with wooden planks and air circulation or with plaster. When choosing a plaster facade the wood fibre board (4) should have a thickness of minimum 60 mm; for a wooden facade minimum 20 mm. The main timber frame construction elements are wooden posts, wooden boards and insulation material.

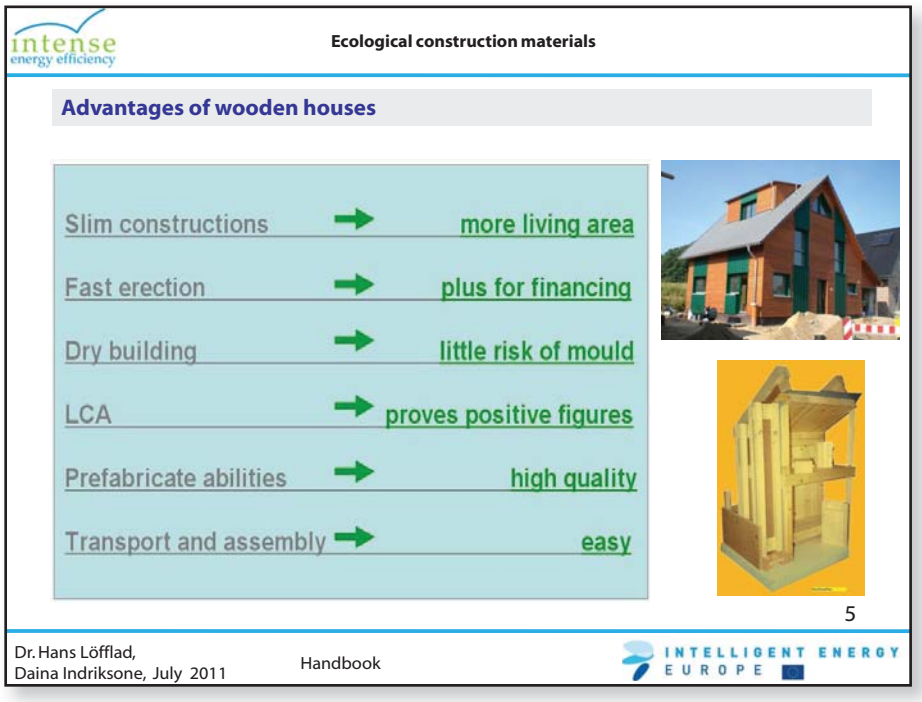
For insulation a loose or fleece material should be used. The best insulation of the cavities of technical installations is a fleece material due to the thinness of the construction. For loose material a cavity approximately 10 cm in width is required, and high pressure for installation of this material (a second wooden board has to withstand the pressure of blowing in the insulation).

Connection to other themes:

Construction of elements, building physics.

Suggestions for presentation:

Participants should draw different timber wall, roof and floor constructions with the connecting parts and discuss the advantages and disadvantages of the constructions.



Wooden houses have many advantages in comparison to stone houses. For example, applying timber constructions you might gain 5 – 10 % more living area with the same outside parameters.

Connection to other themes:

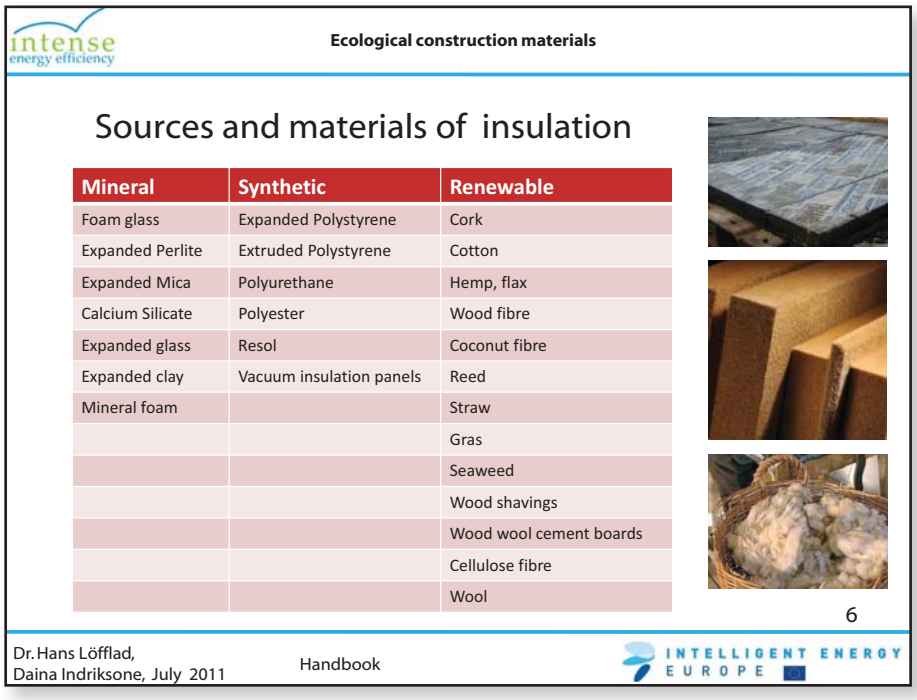
Construction of elements, building physics.

Background:

Good quality timber framed houses cost approximately the same as stone houses of the same quality, especially in the area of thermal insulation.

Suggestion for presentation:

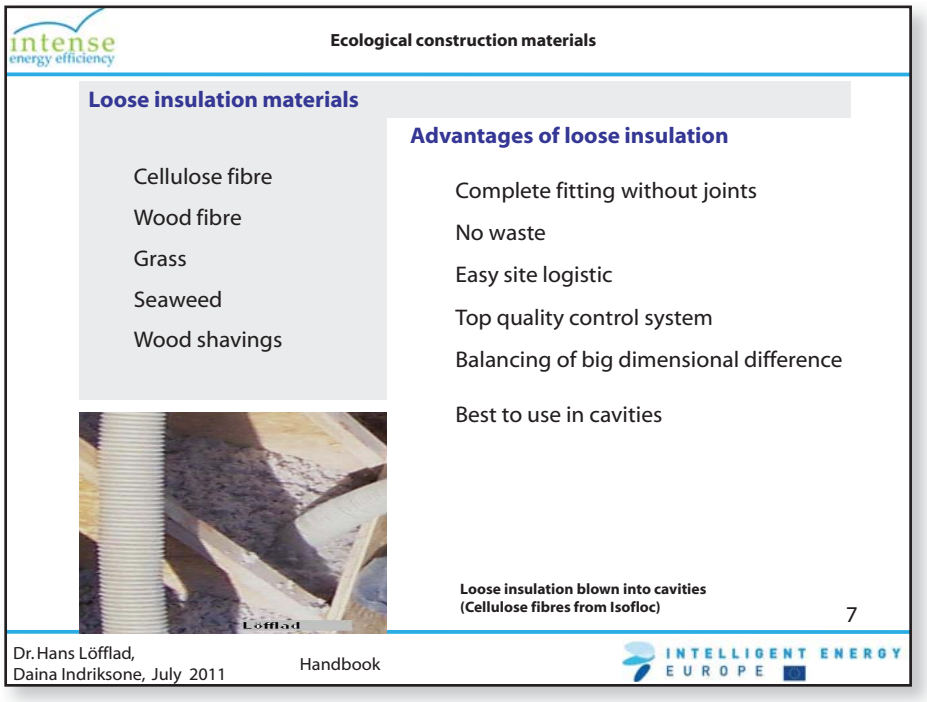
Participants should find more advantages of wooden houses.



The table in the slide gives an overview on various insulation materials – mineral, synthetic, renewable. The embodied energy or primary energy content is a very good for evaluation of the environmentally friendliness of a material. The table below shows embodied energy values for several insulation materials.

Suggestions for presentation:

Participants should write down and later discuss which insulation materials are produced and / or available in their own country.



In this slide a selection of loose insulation materials are pointed out which could be produced within the country.

Connection to other themes:

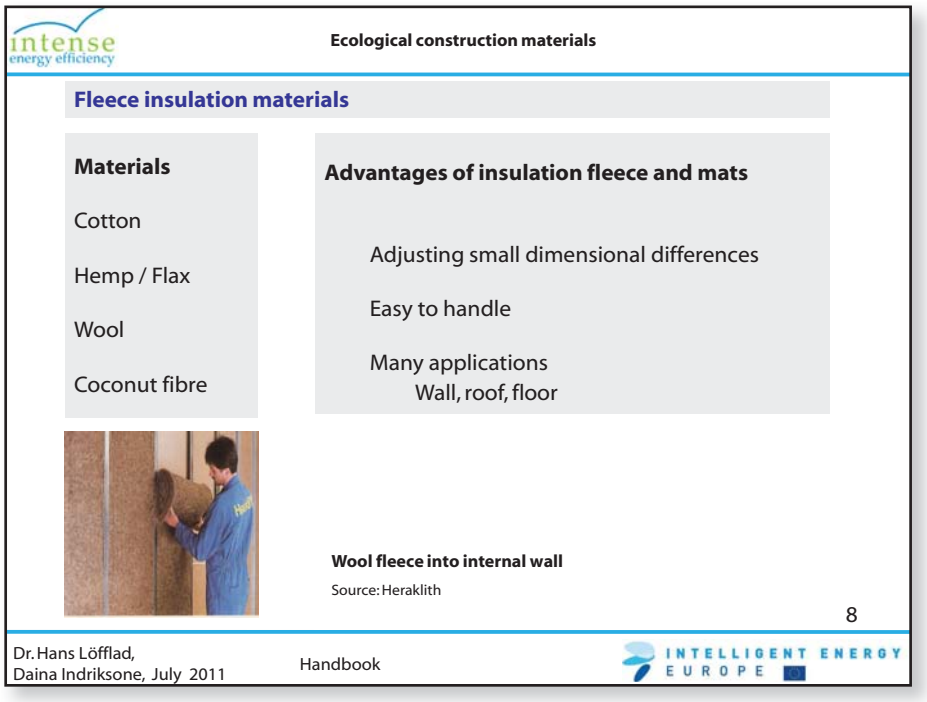
Construction of elements.

Background:

All loose insulation can be blown into cavities filling the smallest gaps. Avoiding cutting of the material means less work and no waste. Material is transported by the blowing machine up to 6 storeys high. Even if dimensions in cavities vary, loose insulation fills them up completely. A top quality control system with internal and external check ups shall be applied.

Suggestion for presentation:

Show the blowing in of loose insulation with pictures, or better still, a video, best during a field trip to a construction site.



Here a selection of fleece insulation materials of a good technical quality and from renewable sources are presented. At least some of them could be produced within the country.

Connection to other themes:

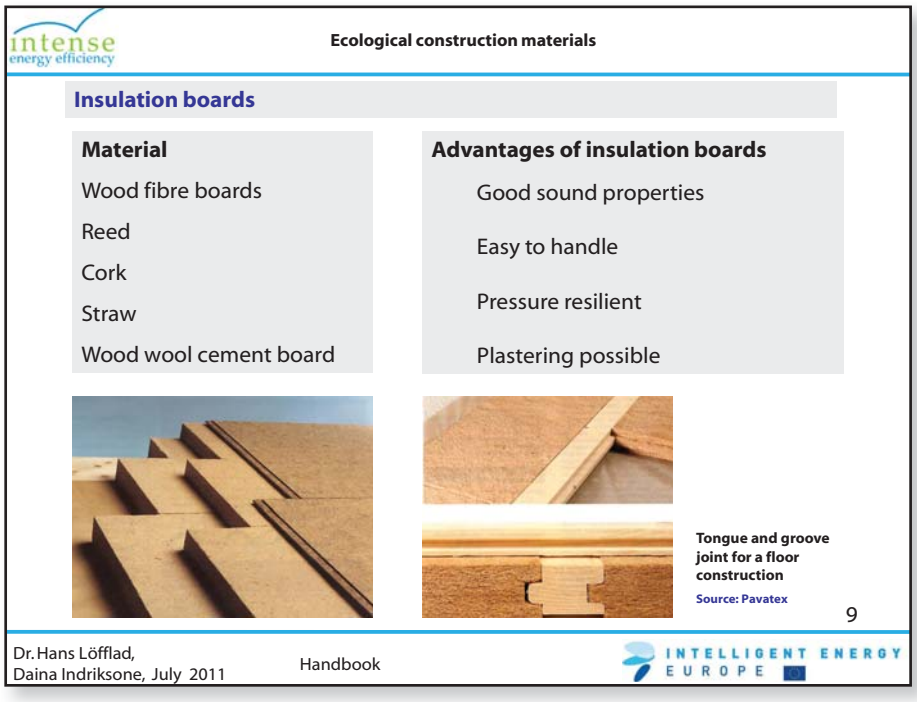
Construction of elements.

Background:

Fleece insulation materials are used for wall, roof and floor constructions. For floor constructions the applied material has to be more dense. Disadvantage - fleece insulation materials from renewable sources are difficult to cut.

Suggestion for presentation:

Participants should have samples from fleece and fibre insulation and be asked to discuss the way of application of these materials. They should test how the material can handle moisture.



A selection of insulation boards are presented here. Most of them could be produced within the country.

Connection to other themes:

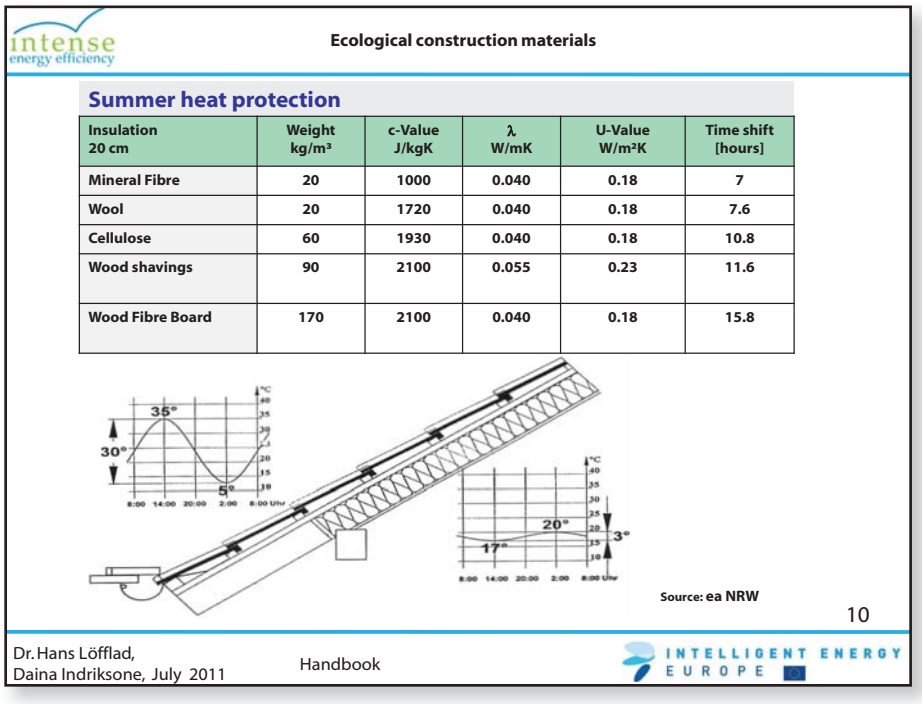
Construction of elements.

Background:

Wooden fibre boards and cork have very good thermal conductivity. Reed boards are as strong as wooden planks. Straw is very cheap. Wood wool cement boards are very good for plastering.

Suggestion for presentation:

Participants should discuss practical application of insulation boards.



Summer heat protection shows the time-shift in hours, how much time does it take for the higher temperature outside (35°C, 14.00 hours) to move through the construction to the interior side (20°C, 02.00 hours). See the figures in the picture. The time-shift depends on the material used. In particular with respect to the light roof construction it is very important which insulation material is chosen. The time-shift of a roof construction should be at least 10 hours, or even better, 12 hours and more.

Connection to other themes:

Building physics.

Background:

Time-shift is quite complex to calculate. It is easier to calculate thermal diffusivity a [m^2/h].

Thermal diffusivity a [m^2/h] = thermal conductivity [W/mK] / density [kg/m^3] x thermal storage [Wh/kgK]

The lower the calculated figure is the more slowly the temperature will move through the construction. Best materials in this sense are wood and wooden fibre boards.

Suggestions for presentation:

Participants should calculate the temperature transfer figure for different materials and compare them.

A wall paint with "food" as an ingredient can't be dangerous J

Connection to other themes:

Construction of elements, building physics.

Background:

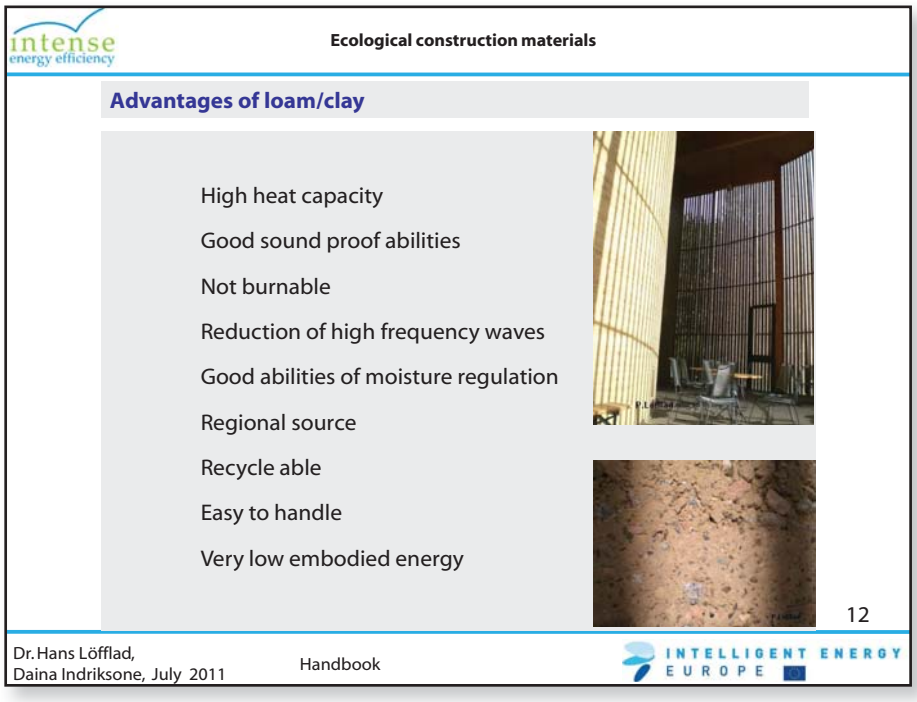
Get more information from www.kreidezeit.de (in English) and

www.natur-am-bau.de (in German).

Suggestions for presentation:

Prepare a paint together with participants and paint a piece of wall paper or better a complete wall.

Note: while the paint is wet, it is a bit grey. When the paint gets dry, it becomes white. If mixing it with other pigments you can get nice effects. The paint is very long lasting. In Germany there are paintings of casein paint applied on church ceilings and having remained for more than 800 years without renovation.



In this slide the main advantages of loam and clay are pointed out. Clay plaster can be fixed onto the wall manually or with the help of a plastering machine. Clay plasters are available in bags, large bags or in containers to be fed directly into the plastering machine. The application is the same as for other plastering materials e.g. gypsum. One of the advantages of using clay: there is no need to clean the plastering machine each day when being used - clay can be smoothed many times and thus lasts longer.

Connection to other themes:

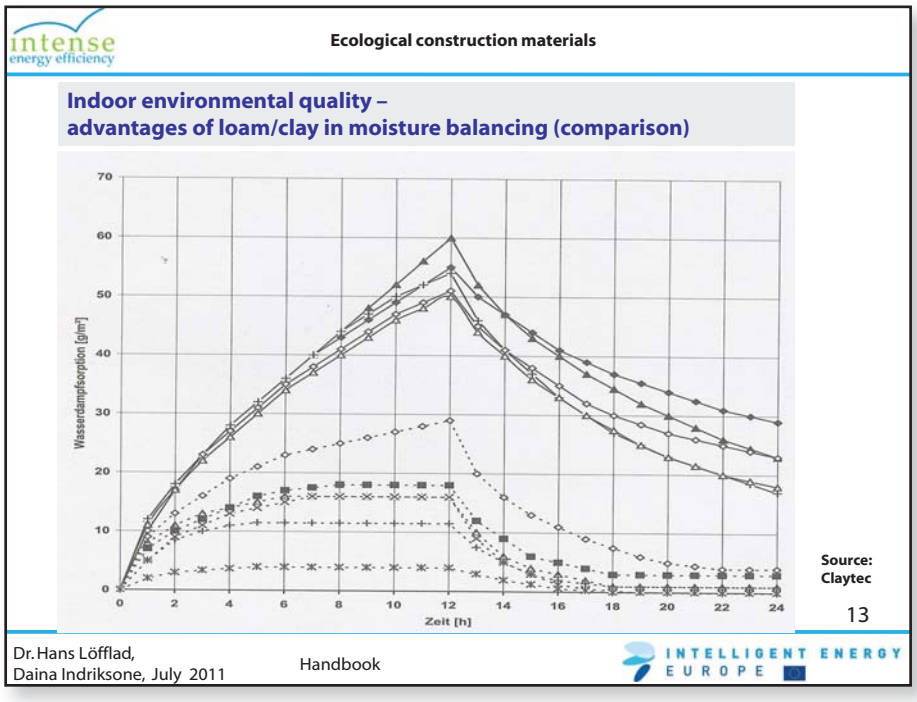
Construction of elements, building physics.

Background:

The picture shows a church in Berlin, Germany mainly built from loam and wood. More information about the church is available at www.kapelle-versoehnung.de

Suggestion for presentation:

To organise a workshop where participants can work with clay and loam.



This slide shows the advantages of loam and clay in moisture balancing in relation to indoor environmental quality. The chart shows the water vapour absorption [g/m^2] of different finishing materials. All samples were tested in the same climate for 12 hours. The absorption was measured and the samples were dried under the same conditions. All finishing surfaces with clay and casein paint show fast and high moisture absorption.

Connection to other themes:

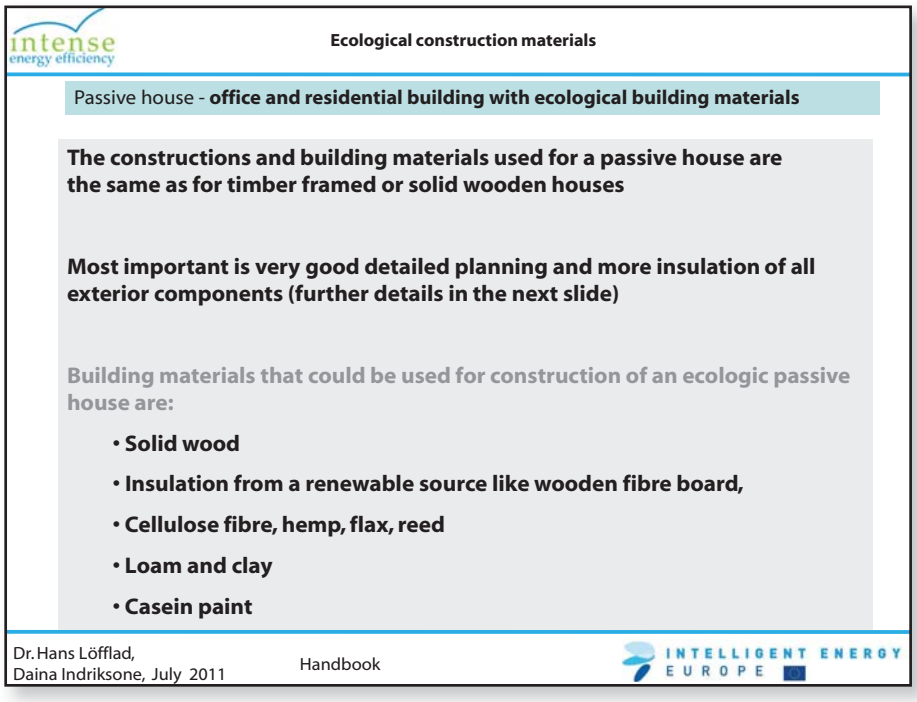
Building physics.

Background:

Natural and renewable raw materials are of great benefit to the indoor climate.

Suggestions for presentation:

Participants should measure the indoor air humidity during the day and note down the changes.



Environmental impacts from building process, the constructions and building materials used for a passive house are the same as for timber framed or solid wooden houses. Most important is very good, detailed planning (technical design) avoiding thermal bridges and better (bigger) insulation than conventional exterior components. Additionally particular attention should be paid to the quality control during the whole construction process.

Connection to other themes:

Quality control, settlement planning and design principles.

Background:

Definition of Passive House according to Passivhaus Institut Darmstadt, Germany (www.passiv.de): A **passive house** is a building in which a comfortable room temperature of about 20°C can be achieved without conventional heating and cooling systems. Such buildings are called "passive" because the predominant part of their heat requirement is supplied from "passive" sources, e.g., sun exposure and heat of persons and technical devices. The heat still required can be delivered to rooms by the controlled ventilation system with heat recovery. The annual space heat demand for passive houses is very low – in Central Europe ~**15kWh/m²/year**. The need for the total primary energy used should not exceed **120kWh/m²/year** (including heating and cooling, domestic hot water, and household electricity).

There are various examples of passive houses built using ecological construction materials available in various countries all over Europe (e.g., Germany, Austria, Sweden, Slovenia, the Czech Republic) – office as well as residential buildings.

Connection to other themes:

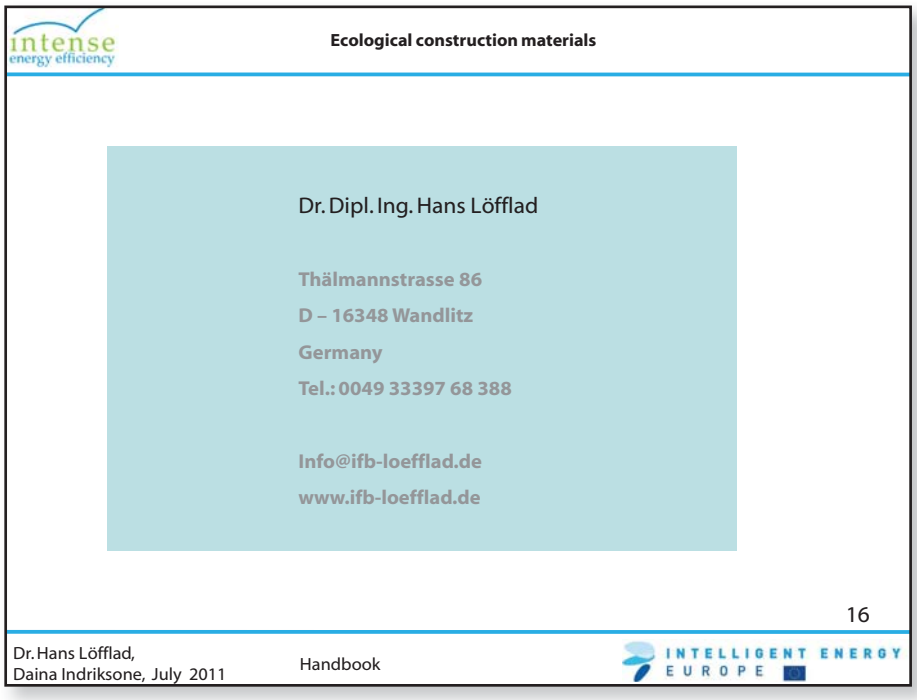
Building physics, construction of elements, systems engineering.

Background:

Passive house is considered as best practice example in Europe (Experience and lessons learned from Western Europe and from CEE countries on best practice examples of energy savings in buildings, 2009 www.intense-energy.eu). More information on construction of passive houses from ecological construction materials is available at *Details for Passive Houses – A catalogue of ecologically rated constructions* (IBO – Austrian Institute for Healthy and Ecological Building (Ed.) 2009, SpringerWienNewYork (3rd edition)) in German and English. This updated and expanded edition, includes a large number of standard cross-sections that now conform to passive house standards as well as up-to-date ecological evaluations.

Suggestions for presentation:

Introduce good practice examples of passive houses from your country, especially if ecological construction materials have been applied. Organise a site visit to these objects.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