Christine Rösch

July 1999

Use of renewable primary products in housing construction

Summary

TAB Working report no. 61

TAB
Office of Technology Assessment
at the German Bundestag

SUMMARY

Construction or purchase of houses and apartments is one of the longest term and most far-reaching investments that people make in their lifetime. It is also the fulfilment of dreams of independence and security for old age. Correspondingly high expectations are made of the design, construction and materials used. Industrially-manufactured building materials meet these expectations: they are characterised by high functionality and performance, good handling qualities and durability, together with a long useful life and low price. This has meant that they have extensively replaced natural materials formerly very widely used in housing construction.

The general positive basic attitude towards modern products has shifted somewhat in recent years. With new construction or conversion, developers today expect exact costs and also information on energy, ecology and health. In contrast to what has often been a one-side focus on the investment phase, attention is increasingly being paid to the complete life cycle of buildings. In this, developers are responding to current demands to ensure sustainable development in the construction sector as well.

One reason for this development is recognition of the generation of refuse which is barely – if at all – recyclable in housing construction or subsequent demolition. More decisive, however, is probably the debate over the possible health hazards posed by construction materials and products or additives contained in these 8 e.g. formaldehyde). These have led to greater public awareness of chemical compounds contained in building shells.

For these reasons there is steady growth in renewable primary materials. The range of renewable primary materials which can be used as construction materials or supplies is broad. They range from plants containing wood cellulose and fibres (e.g. reed, flax, hemp) through oleaginous plants (e.g. seed flax, rape) to amylaceous plants (e.g. potatoes) and dye plants (e.g. dyer's woad). Renewable primary materials can be used in a variety of ways in housing construction. They are suitable for manufacturing walls and building elements (e.g. windows), roofing and reinforcement in building materials, insulation (thermal, acoustic and moisture), flooring bases or floor coverings, for producing coatings and paints and as building supplies (e.g. oils for boards).

Despite the wide range of applications only relatively minor amounts of renewable primary materials are currently used to manufacture building materials or

supplies. Quantitatively speaking, the only significant use of renewable primary materials in housing construction is in thermal insulation. The share of insulation from biogenic and other alternative materials has grown slowly but steadily in the past few years to 3–5% of the insulation market.

In view of the impending increase in requirements for thermal insulation of building components as part of the planned energy conservation ordinance, sales of alternative thermal insulation materials can be expected to increase to up to 10% of the thermal insulation market, or around 7 million cu. ft. a year. The anticipated growth will, however, probably mainly benefit established low-cost insulation with good thermal insulation properties from recycled materials (e.g. waste paper) and production residues from forestry and agriculture (e.g. wood waste).

By contrast, insulation from renewable primary materials grown specially for this purpose will continue to be limited to the ecological niche, unless they can be supplied more cheaply. The cost of thermal insulation using products made from renewable primary materials is determined by the resource-intensive and expensive processes of processing the primary materials and manufacturing and installing the insulation. However, prices for the primary materials themselves also play a role, accounting for between 10–25% of total production costs. As genetic and industrial advances can only reduce primary material costs to a limited extent, the prospects for sales are probably limited, at least for the main agricultural products (flax and hemp fibres).

Building materials and products from renewable primary materials bind exactly as much carbon dioxide in production as they release in their final use as fuel. This means they can contribute to reducing the release of additional greenhouse gases. The fact that renewable building materials and products can be biodegradable and can absorb and release large quantities of moisture is a further advantage, particularly in interior finishing. However, there are also possible drawbacks in application associated with this: the addition of various protective substances can effectively hinder flammability and premature microbial degradation, but these additives may cast doubt on the validity of the claim of biological building materials to be better for health and the environment than comparable conventional products.

It is not currently possible to make any final statements about the ecological advantage of renewable building materials compared with conventional ones. The multifunctionality and – in some cases – very long useful life of building products in particular cause problems with data and evaluations in preparing ecological

balance sheets. The possibilities of recycling or use as fuel after the end of their useful life could enable greater use of renewable building materials to contribute towards reducing the generation of non-recyclable construction waste.

As far as the connection between building materials and building-related illnesses is concerned, there are (with a few exceptions, e.g. asbestos) no confirmed toxicological findings on the relevant concentrations, so that there are virtually no protective regulations for building occupants. In terms of prophylactic health protection, the legislative situation generally is unsatisfactory. In these circumstances the demand for natural building materials and products with no implications for health, particularly for interior finishing, is understandable.

The existing building code poses obstacles to the introduction of new building products based on renewable primary materials. The new products must demonstrate their suitability for use according to building codes and building product legislation through a national or European licensing procedure. The existing regulations can also become obstacles in the introduction of new building materials if legislation and standards are not researched in time and possibly strategic use made of them.

Despite the current limited prospects for sales of building materials and products from renewable primary materials, many SMEs are working with them and already marketing corresponding products. The development and demonstration of new, innovative building products based on renewable primary materials are promoted by the responsible agencies. Although results to date are modest, promising approaches can be identified. Some possibilities for using renewable primary materials can certainly serve as starting points for broader use in housing construction. Developers are very interested in using renewable primary materials in housing construction, but cost considerations mean that actual use is only sporadic. Appropriate strategies for information, use and marketing could promote sales and make full use of potential for reducing costs.

The Office of Technology Assessment at the German Bundestag is an independent scientific institution created with the objective of advising the German Bundestag and its committees on matters relating to research and technology. Since 1990 TAB has been operated by the Institute for Technology Assessment and Systems Analysis (ITAS) of the Karlsruhe Institute for Technology (KIT), based on a contract with the German Bundestag

TAB

Office of Technology Assessment
at the German Bundestag

Büro für Technikfolgen-Abschätzung
beim Deutschen Bundestag
Neue Schönhauser Str. 10 · 10178 Berlin
Telefon: 0 30 / 28 49 10
Telefax: 0 30 / 28 49 11 19
e-mail: buero@tab.fzk.de
Internet: www.tab.fzk.de