

THE TIMBER UTILIZATION OPPORTUNITIES IN THE ECOLOGICAL CONSTRUCTION

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Abstract

Topicality of the research is based on comparatively small usage of wood in construction, and broader application of timber in ecological construction would allow using Latvia's natural preferences to a fuller value. On the basis of topicality of the issue, solutions must be found in taking measures to move timber in market. The objective of the research is, through clarification of the main preconditions of ecological construction and evaluation of properties of timber and possibilities of using these materials in ecological construction - to give suggestions on taking sustainability-favouring management decisions in order to move timber in market. In the end of the article, the main conclusions are summarized and suggestions are set forth on possibilities of using timber in ecological construction and its movement in the market.

Key words: ecological construction, movement in market, timber, competition.

Introduction

In recent years inhabitants globally and in Latvia are increasingly affected by changes in global climate, consequences of which are difficult to predict precisely due to the complicated interaction of various processes. However, based on the studies performed to date it is possible to note the most significant tendencies: rise of water level in oceans and seas; changes in natural habitats, which causes extinction or migration of the traditional herb and animal species; rise in temperature.

As the majority of scientists indicate, the main cause of global warming and adverse changes in the global climate is increase of carbon dioxide (CO₂) emission in atmosphere (at least 60% of the observed climate changes occur due to the increased carbon dioxide emission caused by human activity).

Integrated approach in planning, designing, construction, equipment and maintenance of building projects tends to lessen the bad influence on the environment an increase welfare of inhabitants. It is a way of living more environmentally friendly without giving up the comforts and quality standards that are usual nowadays.

By creating a qualitative, environmentally friendly and healthy living space, ecological, economic and social sustainability in future is favoured. All of the above mentioned can be summed up in two words - ecological construction. Usage of its advantages in construction of buildings could be one of the possible solutions for decreasing carbon dioxide emission by usage of environmentally friendly materials and renewable resources in construction.

Results of researches of German specialists show that when comparing influence of different construction materials on the environment, the most load on the environment is caused by production of various plastic materials; in turn the least load on the environment is caused by timber.

From the above mentioned results also topicality of the research, which is related to comparatively small usage of wood in construction, and broader application of timber in ecological construction would allow using Latvia's natural preferences to a fuller value. For that reason, on the basis of topicality of the issue, it is necessary to find solutions in taking measures to move timber in market. The objective of the research is, through clarification of the main preconditions of ecological construction and evaluation of properties of timber and possibilities of using these materials in ecological construction - to give suggestions on taking sustainability-favouring management decisions in order to move timber in market.

In order to achieve the objective set in the research, it is necessary to define content of ecological construction, to identify preconditions of implementing ecological construction, to look at advantages of timber and determine deficiencies in its usage possibilities in ecological construction, to consider the possible solutions to move timber in the market and to summarize the main conclusions on possibilities of using timber in ecological construction.

Results and discussion

Ecological construction was started in the United States of America where first buildings of

such type were built on initiative of local businessmen in the late 20th century. Ecological construction is only one of denominations used in Latvia and worldwide to label the term sustainable construction.

The main accent in ecological building is on the necessity for sustainable development that satisfies needs of the present generations while not jeopardizing needs of the next generations, therefore sustainability is based on balancing environmental, economic and social issues, thus ensuring balanced development [1].

Ecological construction is a comparatively new construction area, even overlooking the fact that its fundamentals can be found in traditional construction methods of different nations.

Regardless of the fact that experience of ecological construction in Latvia is comparatively small, there are construction companies that are aiming to acquire the main principles of ecological construction in their operation and to be "one step ahead" of other market participants, i.e. to adapt to the new requirements of consumers - to build environmentally friendly houses, thus taking care for sustainable development.

On the basis of the aforementioned, it must be acknowledged that as a result of changes in the general situation that can be observed worldwide, in ecological, economic and social aspects, also the "buying" habits of consumers are changing, requirements towards product properties and characteristic values are increasing, which results in an emerging necessity to develop new technologies and approaches in customer service with a view to fulfil the variable desires and growing needs of customers as much as possible [4].

"The one who changes will exist." [7]. By paraphrasing this already classic saying, it must be concluded that just these market participants that will change with time and will adapt to the new market requirements and challenges as much as possible, will be able to more completely and precisely fulfil the desires and needs of consumers.

The real economic life shows that exactly market and competition is the key development mechanism of today's economy. The more active is competition and better conditions for its display, the higher is market functioning efficiency.

Competition is in point of fact rivalry that ensures development of market economy and more efficient usage of a company's resources. Competition is often associated with threats, yet

competition should be perceived also as a challenge and new opportunities. Under influence of competition prices decrease and quality of goods and services improves, which in turn increases choice options of consumers [3].

It must be acknowledged that the main condition in ecological construction is the fact that all the necessary materials are taken from nature, and as the building wears out, it again transforms into a pure environment that can be easily put in order. The key principle - the building in any stage (in construction process, during operation and also during deterioration period) is close to nature and is both ecologically pure and aesthetic.

Motto of ecological construction is the utmost effect with the least consumed resources and the least impact on environment. The key priority is creation of an ecologically pure and natural environment by usage of construction materials that do not cause pollution of the environment, production and transportation of which does not cause too big consumption of power resources, and does not cause excessive consumption of nature and resources and environmental pollution during operation.

Therefore, it is important to use all the available resources (natural, recycled materials) in construction that would allow saving on resources for their production, purchase and delivery.

It is not easy to very precisely disassociate ecological construction from non-ecological construction, because it is a very complicated issue. Hence it is possible only to define the main most characteristic principles of ecology:

- naturalism of the used materials;
- repeated utilization of used materials (when the material has already "worn out");
- reprocessing of construction materials;
- "natural decomposition" of raw materials;
- economical usage of materials;
- economy of power resources.

These are the main and determinative criteria that characterize observance of ecological construction principles [8].

Natural (ecologic) materials commonly mean materials that are natural or produced from natural raw materials. It is pleasant to live in a house built of natural materials, it has a good microclimate.

When choosing construction materials, it should not be forgotten that a completely natural material can be used in construction and decoration of a house, but if it is unsuitable for the particular building or room, incorrectly treated or built-in, improperly maintained, the material might cause unhealthy and even unpleasant microclimate. The key criteria of ecological materials are reflected in Figure 1.

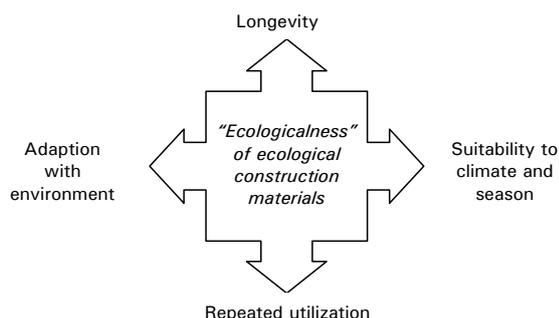


Fig. 1. "Ecologicalness" criteria of ecological construction materials

Before being built into a building, any natural raw material is usually transformed - it can be crumbled, grinded, pressed, glued, polished, smoothed, supplemented with some other components, covered or impregnated with surface-protective coating. Depending on whether the material maintains or loses its naturalness in this process, it can be regarded as: ecological, environment and human friendly; non-ecological.

Another one of the main conditions of ecological construction is usage of recyclable materials.

It must be admitted that there are enough different synthetic materials nowadays that are harmless to people. These are different polymer materials, synthesized from natural substances or chemical elements, interaction of which can result in obtaining good things. These materials have characteristic properties of ecological materials - they do not exude hazardous chemical compounds during usage, they can be operated for a long time and are recyclable. If these characteristic values are considered, then ecological construction obtains a new content with two important conditions – the material to be used is not harmful to people and the environment, its production process does not harm the environment.

Results of researches of specialists show that by comparing impact of different construc-

tion materials on the environment, the utmost load on the environment is caused by production of various plastic materials, in turn one of the least loads on the environment is caused by timber.

The most relevant advantages of timber in terms of ecology are as follows:

- timber is obtained from renewable resources;
- their waste biologically decompose themselves;
- their waste can be burnt.

Based on the aforementioned, it must be noted that although there is no gold, oil, iron ore and other mineral resources in Latvia, Latvia has woods.

It must be added that woods in Latvia take about 50% of the state's territory, while elsewhere in the world woods overall take about 30,3% of the territory, but in Europe – 44,3% [5].

Thus Latvia can be identified as a state where usage of woods fortune is a significant part of national economy. Geographical situation of Latvia, quantity of woods and their quality allow usage of woods sector production both to satisfy the local consumption and in external trade.

While functioning in conditions of free economy, and as its globalization extent increases, the woods sector, which is one of the largest economic sector of Latvia, has to compete in the local production resources market with other economic sectors, and it is also necessary to compete with the imported wood products, as their producers desire to participate in satisfying demand in the woodwork market, by offering a higher quality and/or lower price.

Regardless of the fact that the woods sector in Latvia has experienced and is still going through substantial "impacts" - decrease in export volumes, decrease in investment volumes made in this area, etc., it is still regarded as one of the major and most perspective Latvian economic sectors [5, 9].

Wood has been widely used in construction already from time immemorial exactly for its positive qualities. Summing up the main advantages of timber and noting also the possible problems in their application in ecological construction (see Fig. 2), it must be admitted that the main positive features of timber in terms of sustainability are related to the material's "friendliness" with the environment.

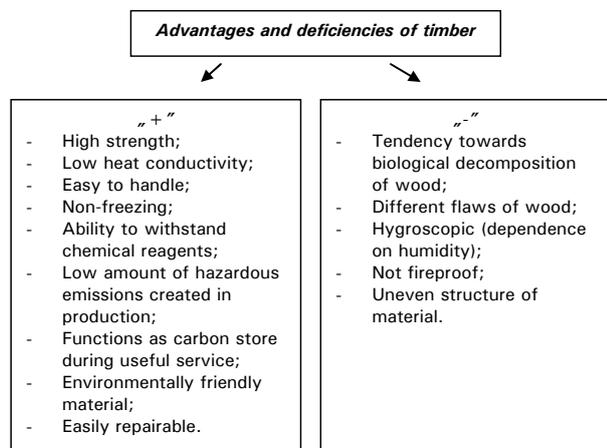


Fig. 2. Advantages and possible problems of timber

Wood is one of the oldest materials used in construction, because its positive properties ensure continuous demand for it. Wooden doors and wooden windows are becoming more popular, same as wooden floorboards that create a comfortable feeling. Each species of wood has its own technical features, which must be dealt with in the entire time of using the building.

The most popular in building are coniferous trees (they are more available compared to deciduous trees, they have high technical properties that add to their leading positions in building). Pine-tree is regarded as one of the most suitable trees for construction of buildings, although it is also included in the softwood species group.

Wood in Latvia is the only widely available material, which is renewable, and this fact plays an important role in reducing consumption of non-renewable resources, so broader usage of timber in ecological construction is a very topical issue.

Another important aspect in favour of using wood is the fact that wood that is used in construction helps to slow down climate changes, because the carbon dioxide absorbed by wood remains in it the entire time of service. From point of view of lifespan, wood as a construction material is a choice favourable to environment in aspects relating to natural resources, power usage, carbon dioxide emissions and waste.

Woods and wood products have a unique ability to ensure two types of reducing concentration of carbon dioxide in the atmosphere: by reducing amount of emission or by attracting and storing carbon dioxide.

Growing woods absorbs carbon dioxide from the atmosphere, and it is stored in the wood after cutting down the tree, until the tree burns or decomposes biologically, but carbon dioxide returns to the atmosphere. After that it is again absorbed by other growing trees. Furthermore, the woods managed by people absorb carbon more effectively than the woods that remain in their natural condition, because young and intensely growing trees absorb more carbon dioxide than grown trees.

Based on the aforesaid, it must be added that areas of woods and volumes of wood in Latvia increase every year, also the wood increase (by about 16,5 million m³ per year) is larger than the amounts of cutting out trees.

It must be added that the carbon dioxide attracted by woods does not get to the atmosphere during the entire lifespan of the wooden product, as well as after it, if the wood production is recycled or reused. That means that the longer lifespan of a wooden product is, the better it affects the environment, by reducing the amount of energy necessary to replace these products.

Wood's durability and possibilities of using it in construction are affected by a number of positive qualities, which are:

1. **Durability.** It is wood's ability to resist wear-out processed under influence of different loads. Wood's durability largely depends on the wood's species, density and humidity, as well as direction of load and existence of flaws.

2. **Resistance to wear.** That means wood's ability to resist wear-out processes under influence of friction (resistance to wear is proportional to wood's solidity and density).

3. **Resistance to cracking.** This quality directly depends on the wood's shrinkage level. It must be added that in the process of desiccation, moisture vaporizes from wood unevenly, which in turn can cause internal tension that might result in cracking of the wood. Such wood species as spruce, cedar, pine and white fir are regarded as the least subject to shrinkage.

4. **Wood is able to hold metal fastenings.** When using wood in construction, this parameter, which is not insignificant, depends on such aspects as humidity and density (the denser wood, the more complicated to remove fastenings from it).

5. **Lightness of wood.** Although this is not the determinant factor in choice of wood, light-

ness of wood is regarded as considerable advantage [2].

Timber for construction can be divided in several categories: lumber; construction timber; timber for scaffolds; decoration timber; joinery timber and block timber [1].

To get a deeper understanding to evaluate possibilities of using timber for construction, it is necessary to view application of each group and their contribution to construction process.

Timber assorted by strength are usually used in bearing constructions as **lumber**. Sorting is performed both visually and mechanically. Also tenon junction timber, with individual exceptions, can be used in bearing constructions as lumber.

Exactly **construction timber** form over a half of the total amount of materials in a wooden building. Timber of a quality that corresponds with requirements set for lumber is used in the bearing parts of wooden structures. Planed spruce timber in sizes and quality corresponding to the purpose of usage are used in construction.

Timber of highest quality is often used for production of **decoration timber**, especially where the material's surface is visible. Usually both pine and spruce is used indoors, but in outdoor conditions - mostly spruce. Panel boards are used to decorate walls and ceiling both indoors and outside the building.

Sawn timber containing core wood (central timber) are usually used as **cladding boards for outer walls**. Timber can be of lower grade.

Lower grade of pine or spruce timber are used for **panels that are used indoors** for walls and ceiling.

Laths are usually produced from massive timber in many different profiles and sizes. If a covering painting or foiling is used, also lower grade laths are sufficient.

Both pine and spruce timber can be used for softwood **massive timber floorings**. *Block timber*. If it is planned to use a hardening material (e.g. concrete) in a building, then lower grade materials than in construction can be used to shape their construction forms.

Timber for scaffolds. Timber that meets requirements set for construction timber is usually used for scaffolds, and it can also be used.

Joinery timber. This timber type includes window frames, doors, stairs and various interior details.

The above outline justifies the broad timber application options in the process of ecological

construction. It is essential to evaluate necessity of each building timber and possibilities of using it in the process of ecological construction.

Regardless of the fact that Latvian companies are players in market economy for over twenty years (until then - in command economy), Latvian economy is very young compared to other European countries. Latvian companies lack appropriate experience in consumer servicing, which prevents them to be as competitive in this area as companies in other European countries having experience of much longer time.

To facilitate wider usage of timber in ecological construction, in decision-taking of a company's management on moving products in the market, it would be useful to apply the practical suggestions and approaches given by the marketing science. It must be admitted that many companies in Latvia are still using these options too "passively" to sell their products.

Ability to effectively "present" one's product to the consumer largely affects also the product's general success in the market. The product is one of the most relevant values in the market, because "where is no product, there is nothing". The product in this case is timber that is used in the process of ecological construction.

As a result of ecological building is created a house that is built of ecological, natural and "warm" materials - timber. It is important to persuade the potential consumers on usage of ecological materials in the construction process, by choosing exactly timber, emphasizing the advantages and positive features of this material. The product's characteristic values are the product's quality, design, the product's properties, etc., so also product levels must be taken into account when speaking about the product [6].

Sequence of formation of product levels show how the consumer perceives the product and its characteristic values. In the first level the consumer perceives the product's usage value - what they expect from usage of the product (warmth, natural material).

In the second level the dominating are the product's properties - the characteristic features, quality and appearance of the product, as well as the "packing".

The third product level includes the product with already added service - installation, payment forms, after-sale service and guarantees.

When moving the product towards the consumer, it is important to consider all these levels that form the product.

From the consumer's viewpoint what matters is not only the product as such, but also the timber's price, because the price aspect is very important for the consumer - these will be construction costs for them. Significance of price is very high because both the company's income and loyalty of consumers will depend from and optimal and precisely set price.

When setting price of timber, it must be taken into account that different other substitute materials can be used in construction process, so their price must also be evaluated and considered.

Distribution and location of timber for consumer firstly means "availability", therefore it takes a very significant role in the body of measures taken when forming and moving flow of products to a consumer. Distribution starts already when the product is ready for delivery or selling and ends when the final consumer receives it.

As the distribution processes develop and improve, the product becomes more and more available to the consumer (development of logistics chains, warehouse management, etc.). Delivery of timber in the required time, place and amount is essential when meeting the consumer's desires and requirements.

Very relevant is not only existence of the product as such for a certain price and with distribution characterizations - important is also communication with the customer.

Taking into account that communication elements are advertising, sales promotion, public relations and direct selling, it is important to take optimal management decisions as to using these communication elements to move the product towards the consumer. It must be admitted that each one of these movement elements has pros and cons, so their optimal usage can help companies to have a better understanding of desires and needs of customers.

For example, by creating and implementing an advertising "campaign" on the basis of advantages of advertising, it is possible to inform the consumer on one's offered product - to inform, persuade or remind (depending on the set objective).

In turn sales promotion is in fact a way of increase temporary sales activities, which supplements advertising, direct advertising and also direct selling (discounts, fairs, etc.). It is entirety of all the possible methods used during the lifespan of a product, by influencing market partici-

pants with a view to attract new market participants in a short period of time.

Public relations can be regarded as free-of-charge advertising provided in press publications, telecasts, etc. Consumers trust such type of information more than advertising. However, this movement element has its pros and cons as well. One of the possibilities to stimulate wider usability of timber is forming (maybe even changing) a public opinion on benefits of ecological construction to provide and encourage sustainability of the entire society.

In direct selling, what considerably differs from the previous communication types (more perceivable than instruments of indirect selling), a characteristic feature is that the seller directly persuades the buyer to decide on making a purchase. It must be admitted that direct selling is much more expensive than other elements of movement. This type of movement into the market has become very popular, because its advantage is that it is possible to "affect" the buyer directly, to change their perception about the product in the "desirable direction" of the seller.

The previously reviewed practical suggestions of marketing science in relation to the characteristic values of timber as a product to be emphasized, a correctly set price of timber, availability of the product for the consumer at the right time, place and amount, the optimally chosen most suitable communication means, could favour solutions of broader usage options of timber for possibilities of moving timber in the market.

The reflected research results allow to draw a conclusion that broader usage of timber in ecological construction would balance business goals with environmental requirements, by reducing the negative impact on it and allowing to implement and ensure sustainable development and increase welfare of inhabitants.

Conclusions

1. In recent years, inhabitants in Latvia and globally are more and more affected by changes in the global climate, consequences of which are rather difficult to predict precisely due to the complicated interaction of different processes. The main cause of global warming and adverse changes in the global climate is increase of carbon dioxide emission in the atmosphere.

2. Using advantages of ecological construction could be one of the possible solutions for decreasing carbon dioxide emission, by usage of

environmentally friendly materials and renewable resources in construction, such as wood.

3. The main condition in ecological construction is the fact that all the necessary materials are taken from nature, and as the building wears out, it again transforms into a pure environment that can be easily put in order.

4. The most load on the environment is caused by production of various plastic materials; in turn the least load on the environment is caused by timber, because it is: obtained from renewable resources, its waste decompose themselves biologically, its waste can be burnt (comparing influence of different building materials on the environment).

5. Wood is one of the oldest materials used in construction, because its positive properties ensure continuous demand for it. The main positive features of timber in terms of sustainability are related to the material's "friendliness" with the environment.

6. Wood in Latvia is the only widely available material, which is renewable, and this fact plays an important role in reducing consumption of non-renewable resources, so broader usage of timber in ecological construction is a very topical issue.

7. Using practical suggestions of marketing science (to emphasize characteristic values of timber as a product; to set correctly price of timber; to ensure availability of the product for the consumer at the right time, place and amount; to choose the most suitable communication means), might favour broader usage of timber in ecological construction.

References

1. *Kas ir ilgtspējīga būvniecība? (What is sustainable construction?)*. [online] Zalamajas.lv. [viewed on 10.08.2010.]. Available at: <http://www.zalamajas.lv/ilgtspējiga-buvnieciba/>.
2. *Koksne būvniecībā. (Wood in construction)*. [online] Website of the Architecture and Construction Agency. [viewed on 25.07.2010.]. Available at: <http://lv.lv.allconstructions.com>.
3. *Konkurence un konkurences politika. (Competition and competition policy)*. [online] Website of the Competition Council. [viewed on 15.07.2010.]. Available at: www.kp.gov.lv/.
4. *Latvija, mēs tevi dzirdam! (Latvia, we hear you!)*. [online] News portal TVNET.lv. [viewed on 3.08.2010.]. Available at: http://www.tvnet.lv/online_tv/6059.
5. *Meža nozare Latvijā. (Woods sector in Latvia)*. 2009. [online] Website of the Ministry of Agriculture of the Republic of Latvia. [viewed on 27.07.2010.]. Available at: http://www.zm.gov.lv/doc_upl/Meza_nozare_Latvija_2009.pdf.
6. Praude, V. *Mārketings. (Marketing)*. Rīga. Izglītības soli. 2004. p. 324.
7. Rainis, J. *Zelta zirgs. (Golden Horse)*. [online] Letonika.lv. [viewed on 26.07.2010.]. Available at: <http://www.letonika.lv/literatura/>.
8. *Videi draudzīgu celtniecības un apdares materiālu pielietošana būvniecībā. (Usage of environmentally friendly construction and decoration materials in construction)* [online] Website of Lauku ceļotājs (Countryside traveller). [viewed on 10.08.2010.]. Available at: <http://www.macies.celotajs.lv/>.
9. *Ziņojums par Latvijas tautsaimniecības attīstību. (Report on development of Latvian national economy)*. Rīga: Ministry of Economics of the Republic of Latvia. June 2010. p.140.