# SUSTAINABLE APPLICATION OF WOOD IN CHILDREN'S DESIGN

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## ABSTRACT

After a period of massive use into the industrial production of plastic and synthetic materials, the trends are once again directed to natural materials and wood holds the championship in this respect. The variety of timber applications in design for children is large. There are huge series of products as well as limited series and unique ones. In the most of the designer developments is clearly visible the desire to focus on sustainable design searches. The report is an attempt to explore the possibilities for sustainable use of wood in the context of the increased criteria for harmlessness and safety as well as to address the extent to which these two aspects are complementary or opposing.

**Key words:** sustainable design, eco-friendly design, design of children's environment.

The wood has been used since antiquity to nowadays for various purposes. It has been incorporated into the building since the first shelters built by people and it is still a preferred material in the modern construction. In all ages and different places around the world, it has been used in the making of household products like furniture, utensils, shoes, jewels, tools and accessories, musical instruments, weapons, religious and ceremonial objects, etc. Because of its qualities, wood has been and remains one of the main and most preferred materials for making various types of furniture, toys and facilities for children for thousands of years.

From the archaeological point of view, wood is a relatively non-durable material, but we have a variety of artifacts, which give us information about the massive use of this material. From ancient finds, such as from the Egyptian, Hellenic, Scandinavian and other cultures, scale models of wood like vessels, dwellings, farm animals, human figures, were found out. Some of the little wooden human figures were used in the cult life, but some of them have been children's toys.

The first series-produced toys were made by wood. Settlements in the region of today's western Germany and the eastern Czech Republic developed a big production and trading of wooden toys. Today, the manufacture of furniture woodworking and woodworking tools is a well-developed industry. Supply, and demand of the market, especially in well developed countries, is relatively large. There are many examples of wood application in the contemporary design field. Some of the most attractive are those, which follow the sustainable design development trends. The interference with the natural structure of wood is minimized. Often the technology of the production is related to ancient and traditional methods of processing and they use raw material with a broken structure or low technological qualities. There is a good method which allows plants to regenerate relatively quickly and naturally.

Nowadays, there is a wide variety of technologies and corresponding mechanized woodworking tools. Besides being an array, wood is widely used as a derivative for veneer and plywood. Shredded to pieces or fibers, it serves for the manufacture of different types of boards, and for the production of paper. It's used like an ingredient for various synthetic substances. Lower-quality, waste

and recycled wood can be used for their production as well. These materials are typically produced, put in the form of slabs, sheets or molds and are increasingly used in the modern design and architecture.

The most applicable and in relation to sustainable models of design and production in children's design are plywood and paper. Plywood has some advantages over the array. It is made with a smaller production wax and can be produced in large-sized panels. The perpendicular structure has perfect qualities such as exceptional strength and resistance to drift, at relatively low thickness, and that's why it allows the intermediate layers to be made of a lower quality raw material. Vision and touch feel are closed to the solid wood. The use of plywood in the manufacture of furniture and toys allows a more appropriate use of the material and guarantees long duration of the articles (Fig. 1 and 2).

**Figure 1: Plywood furniture**

**Figure 2: Plywood modular system**

The majority of examples of sustainable wood use are distinguished by the use of low-tech materials, damaged during the process of growth, storage and processing, manufacturing waste or it's re-used with a new purpose. Defects, formed by the growth of the tree, mechanically damaged by pests or in the working process, are emphasized and converted into effects. Very often the defects define the structure and the shape of the new article in the process of making.

The use of branches is very early and primitive method of using wood. Their extraction and processing did not require special tools. Broken or dried parts of trees were used as weapons for hunting and defenses, land processing and in the building of shelters. Branches have been useful in the first steps of furnishing. This material is relatively widespread, available and inexpensive. Its harvesting can be defined as ecological, because it is not necessary to cut the plant, but only a part of the crown, which recovers after that. Also, as a source of material are used young self-seeders and shoots. Removing them helps clean river beds and gullies, creating good environment for the development of forest vegetation. In the examples of tree branches treatment could be seen a contrast combination between the natural and rough structure of the bark and the treated surfaces. The naturally left details stand out as center of the composition, highlighting construction and function. Branches are invested in the production of various items of small series and unique character. One of the most widespread games, designed for children, are these with a constructive character. Different in diameter and length cuts of branches and thin trunks are used without removing the bark of the wood. Through them children have the opportunity to play, construct and create, playing with natural materials and en-

riching their tactile sensitivity. Such a solution also contains an educational moment as it clearly demonstrates the origin of the material. This type of games-constructors or finished products develop the imagination and constructive skills of children (Fig. 3–5).

**Figure 3: untreated wood construction set for children**

**Figure 4: untreated wood toy**

**Figure 5: Didactic toys**

**Figure 6: Didactic toys with color elements**

The natural appearance of wood is also emphasized in various toys of educational, manipulative or figurative character. In one of them, the natural untreated appearance of the wood contrasts with the bright color scheme that stimulates the active cognitive interest of the children (Fig. 6).

**Figure 7: Branch pencils**

**Figure 8: Natural wooden toothbrush**

Another common and curious example is the branch pencil in which is inserted graphite (Fig. 7). Interesting eco ideas are also the toothbrushes that use the natural wood fiber structure for the brush surface (Fig. 8). Branch chattels, traditionally used in

the making of hooks and hangers, nowadays are put like an accents in contemporary interiors. They give variety in a delicate and unobtrusive way, especially in the interior design for children. Raw or partially processed tree trunks are also applied in modern design. They are more widespread in parks and yards. Trunks are more and more used in the interior, becoming the accents of contemporary lodge design. Because of their massiveness and their heavy weight, they are mainly used like elements for outdoor gameplay in children's design, where the risk of woody insects and microorganisms under the bark is significant and in the most cases the articles have short life.

Long ago invented, but still not very familiar and widespread, is the technique, named tree shaping. Living trees and other woody plants are used as the medium to create structures and art. It is used for making furniture, accessories, partitions, decorative plastics, etc. (Fig. 9 and 10). Mirror shape products are attractive to children precisely because of the interesting technology that stimulates their curiosity. In this method the material consumption and the energy input in the manufacturing process, are minimized and in the and the natural tree trunk form is saved.

**Figure 9: Branching out, Patrick Doughert**

**Figure 10: tree shaping chair, Gavin Munro**

Separation of core and sapwood, which is observed in the growth of certain tree species and distorts the technological qualities of the material, is often and successfully used as an effect in the creation of unique products. The difference in the color shades of the material has a very pleasant decorative impression. Combined with another defect, such as uneven circles, wavy, eccentric construction, makes wood unusable in standard woodworking. Cleverly used, these flaws provoke the creation of wonderful unique furniture and decorative elements. The children's stools of the "Stool" series are a great example. They possess the elegance achieved through precisely turned and white-finished legs, as well as through the white painted trim of the seats (Fig. 11).

**Figure 11: “Stool”, project by Vlad Zhukovets**

Children's design has specific requirements for the use of low-quality and defective timber. Defects may pose a risk to the safety and health of small users like being cracked and affected by woody insects and

others. Wood that is normally applicable in design couldn't be used in children's design because of the potential risks of injuries, stuck in the cracks and wholes of the damaged material as well as due to the increased hygienic requirements.

In the design for children, sustainable timber use is also applicable through several specific materials and related technologies. Rattan is a fast-resisting, renewable material extracted from the stems of Calameae, which is a palm tree in the subfamily Calamoideae, grown in Southeast Asia. The stems thickness reaches a few millimeters to 7 cm. and the length up to 100 m. In temperate climatic zones for the production of furniture and other products traditionally are used branches and stems of shrub willow – Salix viminalis and the lianas of a climbing shrub with branched – Clematis vitalba.

Rattan products are becoming increasingly popular and often preferred when designing child-friendly home environment. There are special series of furniture, which design, shape and aesthetics are made in line with the specifics of the traditional models. Their shape is provoked by the type and possibilities of working with this material. They meet the requirements for ergonomics and safety of the furniture for children of different ages. Rattan furniture boasts natural radiance and unrivaled beauty, warm presence, good hygienic qualities and relatively easy maintenance. The great advantage especially in child-friendly design is that they are much lighter than furniture, made of different kind of materials with similar sizes and volumes. They even possess good structural stability (Fig. 12-15).

**Figure 12: Rattan toy**

**Figure 13: Rattan frame end bed**

**Figure 14: Child's rattan chair**

**Figure 15: Rattan baby crib**

An attractive use of rattan in the children's environment is borrowed from the well-known traditional hut construction techniques, knitting baskets and bee hives. They from the other side are inspired by the variety of bird nests forms and constructions. Different types of houses, huts and nests are an attractive and favorable environment for children in different ages to play and communicate (Fig. 16 and 17). The interlaced construction allows the creation of relatively large-scale facilities with extremely stable base, made from minimal amount of low-quality and quickly renewable material. Play huts create a favorable environment in the exterior, isolated from the sun and wind, allowing good ventilation without dirt and sands.

**Figure 16: Playhouses**

**Figure 17: Beehive inspired castle**

Bamboo is a natural and durable material. They come from East and South Asia and are evergreen perennial flowering plants in the subfamily Bambusoideae of the grass family Poaceae. The material has a structure and qualities that allow in few applications to successfully replace timber. The possibilities of fine craftsmanship, the fact that it does not release splinters, its antimicrobial and hypoallergenic qualities, its dust incontinence and, last but not least, its good aesthetic appearance, makes bamboo preferred in the production of furniture, accessories and toys for children. Bamboo-made gaming tools have specific features. They attract with their naturalness, clean stylistics and creative design. The material encourages the design of toys with interesting constructive solutions that impress children with their simplicity and logic (Fig. 18–21).

**Figure 18: Bamboo dump truck**

**Figure 19: Bamboo racing car**

Figure 20: Bamboo balancing game

Figure 11: Bamboo construction play-set

An interesting example is the modular constructor, in the design of which, are used bamboo elements with different thicknesses and trunk diameters (Fig. 22 and 23). The larger diameter stems are used as longitudinally cut details, demonstrating the specific possibility of making arched details of natural material without gluing, bending or other processing and at the same time the material is utilized with a minimal loss of material.

Figure 22 and 23: Bamboo playing set

Bamboo made products are moisture and water resistant, including preparations as well as saliva when placed in the mouth and do not require additional surface coating. The bamboo-made games are extremely pleasing to touch. Their natural, dense and smooth structure, which is different from the outer and inner parts of the stem, helps to develop a delicate sensitivity of children tactile perceptions.

Cork is a specific wood material. It is extracted from the cork oak bark, which is separated by a special technology that preserves the vitality of the tree. A plant can be harvested from 12 to 18 harvests. The big part of cork is used in the production of wine-making stoppers and the wastage is used in the production of insolation in construction. Cork is also becoming increasingly popular in the production of various design products. Cork veneer or insulating technical cork, produced in the form of sheets and boards is often used as starting material. These materials have good strength and plasticity that allow their easy bending in different forms. Because of its porous structure, cork has high thermal insulation properties. It is a preferred material for floor and wall facing in the chil-

dren's environment. Its sound proofing quality is an important advantage in the children's environment.

It is elastic and deforms under pressure, which contributes to its good absorbing qualities. Its structure allows a rapid return to the original shape in case of potential injuries. It's normal for a child to hit or drop a toy but if this is a cork toy, its form will be restored shortly. The cork is waterproof and allows full wet cleaning. Another big advantage of cork is its weight – because of its porous structure it is comparatively lighter than other wood materials, which along with its elasticity makes it extremely suitable for making furniture and toys for children (Fig. 24–28).

**Figure 24: Cork playing set**

**Figure 25: Cork car**

**Figure 26: Cork construction**


**Figure 27: Bathtub toy /cork/**

**Figure 28: Child's chair with storage /cork and wood/**

Children's design is one of the areas /along with the food industry and medicine/ where the use of recycled raw materials /at least under the recycling model being applied nowadays/ is undesirable and even unacceptable. The reason for this is that design and production itself are not a complete cycle in which there is a separation of the various components and their recycling. In addition, inefficient collection and sorting leads to the mixing of heterogeneous materials from different vendors, which could result in raw material with unclear content. Such recycled raw materials could be extremely dangerous, especially for children.

Massive wood itself is homogeneous and harmless, but it is often treated with various types of preparations to improve its properties and to protect it from pests, molds, decay, burning, moisture penetration, and so

on. The risk of dangerous after re-use ingredients makes this kind of wooden articles and furniture unreasonable for the children's health. Whatever high-quality and natural materials are used if they are covered with inappropriate surface coatings, much of their valuable qualities will be lost. This applies to a very large extent to wood, whose functionality, maintenance, durability and good vision are highly dependent on coating. Sustainable use of wood implies the use of natural dyes and natural surface coatings. Colors and wood finishes must be of vegetable, animal or mineral origin. The most affordable and popular varnish is based on beeswax, wood resins, animal and vegetable oils. Treated with such materials, wood retains its natural radiance, beauty, and child-friendly qualities. This allows more complete recycling, and when it comes to waste in nature or burning, it will not produce harmful substances.

## CONCLUSION

The increased interest in natural materials and their sustainable use in children's design are provoked by the concern to preserve natural resources and bio diversity, and on the other side by the need of a healthy way of raising and educate children. Designers are increasingly targeting their quest for a natural and friendly environment and wood is deservedly one of the most widely used materials in this area. Its use helps to fully reflect the children's need in creating an environment that is safe, spare their health, perceptions and psyche, actively affecting through its structure, natural color and tactile contact. The opportunities for sustainable use of wood for children's design purposes have their specific framework, mainly related to the increased safety and security criteria. The desire to enrich the environment and children's openness to new, creative ideas and non-standard approaches provides a wide field for development. Designing for children is one of the areas in which the sense of a sustainable orientation is especially well-grounded. There is hardly any other target group that can derive great and immediate benefit from sustainable design, both in the short and long term. The use of wood contributes not only to maintaining ecological balance and building a favorable environment for the development and growth of children, but it also creates basis for shaping their emotional, aesthetic and behavioral education in the direction of establishing ecological and sustainable models.

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