

The Environmental and Health Impact of Eco-friendly Textiles in the Interior Space



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Abstract: Textiles hold a significant percentage in interior spaces. According to a previous article titled “Recognizing textiles as a significant contributing factor to interior design as opposed to conventional understanding”, it was shown that textiles in interior spaces, both residential and commercial spaces, cover a percentage between 60% to 70% of the space. Regular textiles are usually made of materials that are full of chemical components produced during the textile’s production process: pre-finishing, finishing, dyeing, and weaving. Such chemical components in textiles cause many diseases and allergies, making them extremely harmful to use in an interior space. Therefore, and since textiles make up the majority of interior space, interior designers must shift their practice of using regular textiles to selecting, using, and applying eco-friendly textiles, to contribute to the creation of a healthy and sustainable interior space. It is also encouraged that textiles suppliers are made aware of this to allow them to designate sections in their shops for green/eco-friendly textiles, giving the users an option to go for eco-friendly textiles instead of regular ones to avoid diseases, and allergies and reduce negative environmental impact.

Keywords: Eco-friendly textiles; Regular textiles; Interior environment; Environmental impact; User’s health; interior textiles categories; criteria for textiles selection.

1 Introduction

Textiles play a significant role among the many materials that go into the design of an entire interior.

Received: 16 September 2022/ Accepted: 9 October 2022
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With their wide variety of colors, textures, and qualities, they impart a sense of softness, curvature, and flexibility into a static space, making a hard or bare-looking room seem soft, comfortable, and humane. Additionally, they provide countless design options.

Always choose fabrics after conducting a new inventory of what is currently on hand. The fact that textiles are typically chosen almost exclusively based on their aesthetic qualities may be due to their inherent decorative potential. Interior textiles are produced for either residential (also known as domestic) or commercial (also known as contract) markets, the two main markets for interior textiles. Contract textiles are those found in public or commercial interiors, whereas domestic textiles are those seen at home or in private interiors. [1]

Interior textiles are usually discussed with two key categories: ‘furnishing fabrics’ and ‘household textiles’. Furnishing fabrics include upholstery fabrics, soft floor coverings, wallcoverings, window furnishing (curtains, drapes, blinds), and accessories such as cushions and throws. Household textiles include all textiles used in domestic interiors apart from furnishing fabrics. For example bedding, towels, blankets, tablecloths, and napkins. When designed for hospitality and care-type facilities, these products are referred to as ‘institutional textiles’ as they are required to conform to specific performance and safety criteria. [1]

Within these product areas, there are differences in raw materials, fabric structures, aesthetics, and performance requirements. [1]

Interior designers are realizing that textiles have structural and functional responsibilities that are just as significant as those of any other material as they become more responsible and professional.

Below are some terminologies that are closely related to the textiles world:

1. Organic: crops are grown without the use of

pesticides, herbicides, or synthetic fertilizers using bio-fertilizers and organic manures.

2. Eco-textiles: Products made using environmentally friendly practices and approved by organizations like Oekotex and IFOAM.

3. Recycled and Biodegradable: Biodegradable fibers, both natural and manmade, are disassembled to create new textiles or fibers.

4. Textile Processes and Sustainability: When producing fabrics and textiles, every process—from cultivation to printing and finishing procedures—is taken into account. The better for the environment, the lower the chemicals and effluents. [3]

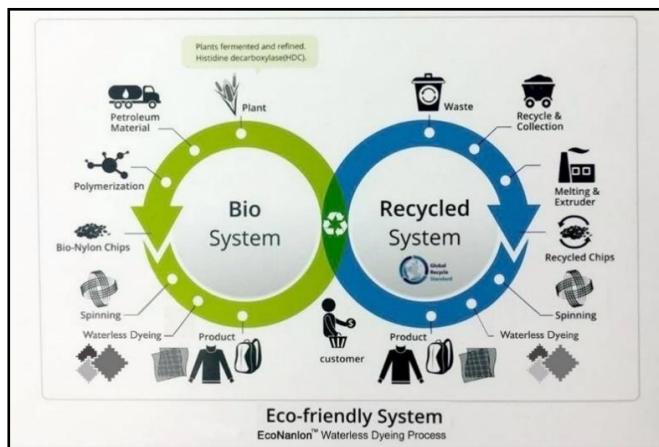


Fig. 1 Comparison between bio-green systems via recycled - sustainable systems [3].

2. Textiles categories and characteristics

2.1 Artificial or Synthetic textiles

Chemically synthesized fabrics are produced in factories. They are additionally referred to as synthetic or man-made fabrics. These materials include rayon, polyvinyl chloride (PVC), nylon, and polyester.

By combining monomers into polymers through the process of polymerization, synthetic fibers are created. [4]

2.2 Natural textiles

These are made of fibers found in our natural environment and are weaved or knitted. Animal, vegetable, and mineral industries all produce fibers that can be used to make fabrics. [5]

2.3 Organic textiles / Eco-Friendly

Eco-friendly textiles are materials made to minimize their negative effects on the environment and replace environmentally hazardous textiles. [6] Green textiles, also known as eco-textiles, are considered to be sustainable and environmentally beneficial alternatives to conventional textiles, which are thought to be the most environmentally destructive industry. [7] The term "green textiles" can also be used to describe apparel or accessories made from recycled or organic materials, with less packaging and more energy-efficient manufacturing.

2.4 Sustainable textiles

Every input and output matter in materials like sustainable textiles. Materials used, procedures carried out, the standard of living of workers, and the product's lifespan are all analyzed and quantified. Sustainable textiles are produced using renewable or recycled resources and materials. [2]

3 Examples of exceptional eco-friendly textiles used in interior spaces: Organic textiles / Eco Friendly

3.1 Linen

Flax is a plant that is good for the environment because it doesn't need a lot of water, artificial fertilizers, or pesticides to flourish. In addition, producing linen from flax uses extremely little energy and produces little to no waste because the entire plant is utilized. [8]

Upholstery, tablecloths, and curtains or drapes are used within spaces.

3.2 Bamboo

Due to its origin in the bamboo plant, bamboo fabric is both biodegradable and renewable. The bamboo plant grows rather quickly without a lot of water or chemical fertilizers, thus the fiber used to produce cloth from this plant doesn't have any potentially dangerous substances.

Its renewable quality is the fundamental aspect that qualifies it as an environmentally friendly fiber. The fabric breathes and has built-in natural anti-bacterial characteristics.

Because of its insulating qualities, drapes and curtains, wallpaper, and upholstery are used in interior spaces [8].

3.3 Organic Wool

Wool is a renewable resource that resists fire and doesn't require chemical additives. Wool that is produced utilizing sustainable farming methods is

becoming more and more readily available. Wool is a very practical cloth with several significant qualities that make it incredibly alluring. The ability of wool to effectively absorb moisture by attracting moisture to the center of its fibers is one of its main advantages. Upholstery, blankets, rugs, and carpets are used indoors. [8]

3.4 Jute

Jute is one of the world's most eco-friendly fibers to produce. This is because it is completely biodegradable. It also absorbs carbon dioxide and releases oxygen grows without the use of pesticides or fertilizers, can enhance the fertility of the soil it grows in, and does not release microfibers, reducing the pollution of waterways. Not only is it eco-friendly but it is also sustainable.

Use in interior space: Curtains, Upholstery, Carpets, Rugs, and Outdoor furniture. [8]

3.5 Soy silk

Waste from the production of tofu was used to create an eco-friendly, 100% biodegradable cloth. Liquid soy protein is stretched into long, continuous fibers that can be cut and spun like any other fiber. There is no need for synthetic colors because soy has a high protein content and the fabric is particularly responsive to natural hues.

Uses for soy silk in interior design include cushions, upholstery, and curtains. [8]

3.6 Lumpur

White pine tree trimmings are used to create this biodegradable fabric, which "offers the softness of silk, the touch of cashmere, and the lightness of linen." Lumpur is superior to other cellulose fibers because of its softness, capacity for absorbing and releasing moisture, and capability for withstanding a wider temperature range. Lumpur can maintain a cold climate in the summer and a warm atmosphere in the winter thanks to the latter capability.

Rugs, upholstered furniture, and curtains are used inside spaces. [8]

3.8 Fish skin leather

This is created using leftover fish skins from the food industry, including those from cod, carp, sturgeon, catfish, salmon, perch, and wolfish. Handbags, belts, clothing, shoes, accessories, furniture, and interior design items can all be made of leather. [2]

3.9 Lotus flower fabric

This fabric is constructed from lotus stem fibers that have been removed and hand-spun into yarn. It is thought to be one of the world's most sacred and long-lasting materials, and saints once wore it. These handloom fabrics, which are primarily handwoven, have the appearance and texture of silk and linen. These are waterproof, stain-resistant, wrinkle-free, and silky. [2]

3.10 Banana fiber

This is made from the banana plant's stalks. Rugs and other home textiles are made from the silky threads created by the long strands. [2]

3.11 Nettle fabric

This is prepared from the popular in Uttarakhand and widely available stem of the stinging nettle plant. The plant is sustainable since it uses little water and can be grown and then replanted in the field to replenish lost nutrients. Because they don't utilize pesticides and are environmentally benign, textiles made from nettle plants also attract consideration. Nettle fabric is velvety and opulent in appearance and is stronger, more elastic, and finer than linen. Strings, ropes, nets, bags, sacks, coats, mats, vests, shawls, cow feed, upholstery stuffing, fuel, and blue dye are some of the common ends used. [2]

4. The impact of regular textiles on health and the environment

Some textiles used in interior spaces contribute to indoor air pollution, particularly those that have undergone chemical processing to give them specific qualities. Either directly or indirectly, this hurts the interior air quality. When textiles are used, laundered, and eventually discarded as waste, hazardous substances can leak from inside textiles in several different ways. As a result, both humans and the indoor environment will be exposed to the chemicals in textiles.

Chemical substance release patterns include leaching, migration, and evaporation in the air, where particle emissions might take the form of indoor dust. These patterns can be absorbed through the skin, saliva, or even the lungs. Particulate emissions, which are made up of fiber pieces, occur during routine use and laundering. Some compounds bond to the material very loosely; as a result, they will release a lot of molecules when in use and quickly migrate to the human body by air (breathing) or skin contact (touch

textile products) [9]

4.1 Direct Effect

When volatile chemical pollutants move throughout a building's interior and mix with the air that people breathe, a direct consequence takes place. The transfer of textile-related compounds from the environment has an impact on human health beginning with the skin, causing inflammation and skin illnesses, as well as the eyes, nose, and mouth. As a result, the rest of the human body is impacted. This also affects the respiratory system since these volatile compounds attach to certain areas of the respiratory system and cause diseases that start with asthma and end with cancer. [9]

4.2 Indirect Effect

The interaction of volatile chemical compounds with other pollutants found in indoor air has an indirect influence and includes:

- Chemical substances from the exterior environment spilled into the inside compartments.
- 3 Potential biological pollutants brought on by certain indoor activities or the raising of animals.
 - 4 Dust and its leaking pollutants into interior spaces.
 - 5 Pollutants seeping from building materials, interior finishes, and raw materials utilized in furniture and accessories as well as interior design.
 - 6 Interaction with indoor human activities including cooking, metabolism, and some harmful habits like smoking. [9]

5. Eco-Friendly textiles processing

5.1 Super Critical Fluid Dyeing Technology:

In this method, certain gases are used in place of water as the solvating medium. To dissolve the dyes, high pressure and warmth are required. CO₂ is utilized out of all the gases that can be transformed into supercritical fluids due to its high diffusion rates and low viscosities that enable the dye to permeate the fiber. Additionally, dye and CO₂ can be recycled by lowering the pressure at the end of the procedure.

5.2 Enzyme Technology:

The almost 250 amino acids that makeup enzymes are protein-based materials. They are produced in the pancreas or by combining bacteria and malt. They are favored because they can take the

place of harsh chemicals, degrade biologically, don't pollute, have focused actions, and function as catalysts.

5.3 Plasma processing:

This method is dry and safe for the environment. To achieve the intended functionality, it simply needs minuscule amounts of chemicals and does not require large quantities of water, heating, or drying.

5.4 Foam Technology:

The newest environmentally friendly method being used is foam technology. It is employed in several textile processing processes, including pretreatment, dyeing, printing, and finishing. A mass of gas bubbles in a liquid continuous phase make up foam, which is a colloidal system. [10]

6. The impact of Eco-Friendly textiles on our health and environment

The use of eco-friendly upholstery and furniture is a step towards a healthy interior with good vibes and energy. The sustainability of upholstery fabric can be determined based on the people who make the fabric, the method of cultivation and manufacturing of the fiber, the properties of the fabric, its biodegradability, its effect on groundwater pollution, and lots more [11]. Utilizing eco-friendly furniture and upholstery is a step toward creating a space that is healthy and has positive energy. Upholstery fabric's sustainability can be assessed based on a variety of factors, including the people who make it, the way the fiber is grown and manufactured, the fabric's characteristics, its biodegradability, how it affects groundwater contamination, and much more.

Health: Many people are allergic to or dislike synthetic textiles. Eco fabrics have all the properties of the new synthetic breathable fibers with added softness and drape. They feel better against the skin. [12]

Health: Many people dislike or have allergies to synthetic materials. The new synthetic breathable fibers' features are all present in eco fabrics, but they also have more softness and drape. They are more comfortable next to the skin.

Absorption: Eco fibers are all-natural and free of abrasive chemicals. Many of them are also thought to be naturally bacterial and hypoallergenic. [12]

Biodegradable: Eco fabric biodegrades naturally over time. Synthetic fibers eventually become waste and let off harmful toxins when they degrade. [12]

Eco-friendly textiles gradually biodegrade organically. When synthetic fibers inevitably break down, they

release toxic fumes into the environment.

Popularity: Organic foods have been popular for a while and it can be considered natural evolution that organic and eco-friendly fabrics will also gain popularity. Eco and Organic fabrics once considered an alternative is now entering the mainstream. [12]

The popularity of organic and eco-friendly fabrics can be seen as a natural progression from the long-standing popularity of organic foods. Previously seen as an alternative, eco and organic materials are now becoming more common.

90% of most people's lives are spent indoors in their houses, which promotes the requirement of making a green and eco-friendly interior space. When designing an interior space, one must be aware of what is suitable for their health and what creates a healthy environment. [13]

Putting eco-friendly as a priority means protecting one's skin from varied harmful toxins and poison through the air around. A good eco-friendly interior design can produce a warmer, healthier, dryer, and more comfortable space in which one can live in. [13]

7. Conclusions

In conclusion, there are many options to choose from when discussing textiles. Going green and choosing eco-friendly textiles is the best choice as it provides protection from various diseases that can affect health, and skin and fill the interior space air with toxins. Over 70% of houses are composed of textiles, hence their significance.

Fabrics people tend to expose their skin too may contain chemicals and toxins that can create allergies. Ramie, pineapple, cocona, linen, banana, bamboo, and many more eco-friendly fibers are great options that give a stunning interior space and are also healthier and more comfortable alternatives. To conclude, eco-friendly textiles must be prioritized in the design process. Therefore, awareness of this topic and its environmental importance must be raised. In the same vein, eco-friendly must be considered as one of the important fabric selection criteria, no less important than functionality, aesthetics, and appearance.

8. Recommendations

Having understood the positive impacts that eco-friendly textiles have, below are

recommendations for ensuring a green environment and interior space:

- 1 Retail shops to dedicate specific corners for showcasing eco-friendly textiles to promote their usage to consumers.
- 2 Awareness to be raised among youth and adults about the importance of green textiles in everyday lives. This can be achieved through schools, universities, and social media.
- 3 Eco-textiles to be considered as the first criteria when buying new furniture. At least half of the below criteria are to be met:



Fig. 2 Eco-textiles

- 4 Consider avoiding one or more of the below notable activities that pose a threat to the environment.



Fig. 3 activities

- Green textiles to be officially categorized to prove their importance.
- Attempting to prioritize the use of eco-textiles; the frequent use of them would develop into a habit, leading to a safer environment.

References

- [1] Yeager, J., & Teter-Justice, L. (2000). Textiles for Residential & Commercial Interiors. Fairchild Pubns.
- [2] Aishwariya, S., & S. Greeshma. (2019, 12). Eco-Design: Focal Point of Sustainable Textiles. Retrieved from www.fibre2fashion.com: <https://www.fibre2fashion.com/industry-article/8491/eco-design-focal-point-of-sustainable-textiles>
- [3] Figure 1. Tai, W. (2014). Environmental Friendly Processing Fabrics (Green Products). Retrieved from www.wah-tai.com: http://www.wah-tai.com/index.php?route=product/product&product_id=385
- [4] Association, A. F. (2015, august). Polymer

- fundamentals: fiber applications. Retrieved from web.archive.org:
<https://web.archive.org/web/20151109151957/http://www.fibersource.com/f-tutor/poly.htm>
- [5] anonymous. (n.d.). what-is-natural-fabric. Retrieved from www.digitalfabrics.com.au:
<https://www.digitalfabrics.com.au/what-is-natural-fabric/>
- [6] School, T. (2018, march 12). what-is-eco-textiles. Retrieved from www.textileschool.com:
<https://www.textileschool.com/368/what-is-eco-textiles/>
- [7] Choudhury, R. A. (2013). Green chemistry and the textile industry. *www.tandfonline.com*, 3-143.
- [8] anonymous. (n.d.). eco-friendly-fabrics-for-home. Retrieved january 14, 2022, from <https://www.zameen.com>:
<https://www.zameen.com/blog/eco-friendly-fabrics-for-home.html>
- [9] Hendy, A. M., & Bakr, D. K. (2020, october). Indoor Air Quality Between Textiles' Treatment. *INTERNATIONAL JOURNAL OF SCIENTIFIC & TECHNOLOGY*, 9(10), 202. Retrieved january 5, 2022, from <https://www.ijstr.org/final-print/oct2020/Indoor-Air-Quality-Between-Textiles-Treatment-And-Human-Health.pdf>
- [10] Kumari, P., Saroj , S. J., & Neelam , M. R. (2013, april). Eco – Textiles: For Sustainable Development. *International Journal of Scientific & Engineering Research*, 4(4), 1384-1385. Retrieved from <https://www.ijser.org/researchpaper/Eco-Textiles-For-Sustainable-Development.pdf#:~:text=Production%20ecology%20%E2%80%93%20This%20refers%20to%20the%20process%20of,waste%20treatment%2C%20and%20for%20the%20protection%20against%20noise>
- [11] fabrichouse. (2019, june 20). eco-friendly-upholstery-fabric-going-green-with-upholstery-and-furniture. Retrieved from www.textileschool.com:
<https://www.textileschool.com/5325/eco-friendly-upholstery-fabric-going-green-with-upholstery-and-furniture/>
- [12] Organic-Fabrics-Info-Booklet.compressed. (n.d.). Retrieved january 10, 2022, from <https://www.telio.com>:
<https://www.telio.com/wp-content/uploads/2014/08/Organic-Fabrics-Info-Booklet.compressed.pdf>
- [13] biofit. (n.d.). sustainable-interior-and-why-is-it-important-for-your-health. Retrieved from <https://biofit.io>:
<https://biofit.io/news/2019/12/23/sustainable-interior-and-why-is-it-important-for-your-health>
- [14] Figure 2 and 3 - Eco-review. (n.d.). fiber-eco review. Retrieved from <https://www.sustainyourstyle.org>:
<https://www.sustainyourstyle.org/en/fiber-ecoreview>.