

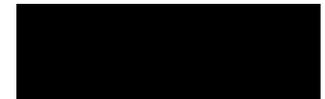


The Mattress Assessment

The environmental impacts of natural vs. synthetic materials in mattresses



ECO-AUDITING 2018



OBJECTIVE

The focus of my assessment for Eco-auditing course will be comparing mattresses and most importantly the material footprints in the production phase. The comparison will be between a mattress made of natural materials and a mattress made of regular synthetic materials.

This idea surfaced as I am looking for a new mattress to buy for myself. I want to buy a mattress made of natural materials but what is always difficult to know is the sustainability level of them. How much will the cotton's carbon footprint be compared to a polyester? Will the production of my natural mattress consume more water than the synthetic mattress?

We spend around 1/3 of our day (and our life!) sleeping so it really matters, what kind of mattress you purchase. Our sleep and its effects to our health is a widely researched field and everyone knows that a good night sleep is essential. Lately I've noticed that people are more interested in natural materials in mattresses, because of different kinds of allergies and chemical sensitivity. It can be said that natural materials would be better in a health perspective when choosing a mattress.

This assessment will not dive deeper into toxicity levels of each material as there are not enough information to evaluate that aspect. It is also worth mentioning that the Finnish Allergy, Skin and Asthma Federation started a study about the toxicity and emissions of mattresses and their effect on health in 2015 but couldn't get enough information from the mattress producers in order to make the study.

FACTS ABOUT SLEEP

- In general, most healthy adults need 7-9 hours of sleep a night.
- We naturally feel tired at two different times of the day: about 2:00 AM and 2:00 PM. It is this natural dip in alertness that is primarily responsible for the post-lunch dip.
- Sleep deprivation will kill you more quickly than food deprivation.
- Sleeping on nontoxic (organic) materials can e.g. improve your breathing during sleep while some synthetic materials emit toxic fumes.
- When sleeping on wool, you will fall asleep quicker and the sleep is deeper and calmer.
- *The National Sleep Foundation* recommends that we should change to a new mattress in every 8 years.

BOUNDARIES



To make the assessment as comparable as possible, I chose two mattresses with the most similar kind of structure, the difference being the materials used: another one being made of natural materials and the other synthetic, plastic-based materials. Also, the size of 140 x 200 cm was chosen for both mattresses in order to evaluate the material amounts and their impacts.

The natural mattress is designed and manufactured by a Finnish company Villa & Peite. The synthetic mattress is IKEA's Morgedal-mattress. These mattresses are in this case the basic versions without any additional structures, such as wire box spring.

Because there is no clear information about the final manufacturing phases of each mattress, this assessment will only focus on assessing the environmental impacts of the materials. There will also be a comparison between the water usage and carbon footprint of each material to give the assessment even more detailed information about the impacts.



LIFE-PHASES & STAKEHOLDERS

MATERIALS

The different materials are usually produced by different producers so each material comes from a different place. The natural materials are easier to track down to their original production place.

MANUFACTURE

The natural mattress is manufactured in Pori, Finland by a family business with long history. The original manufacturing place of IKEA's synthetic mattress is unknown, although they note that most of their products are produced in China.

TRANSPORTATION

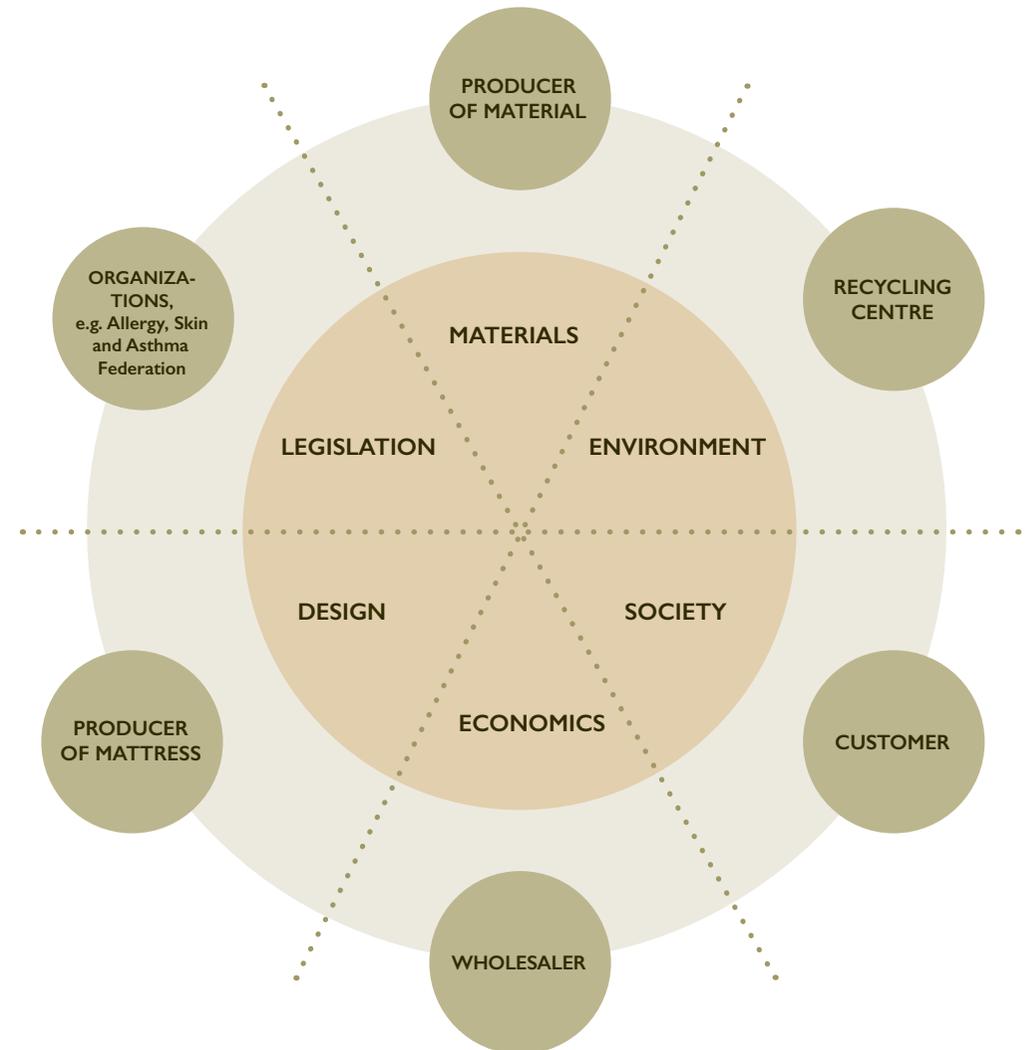
For this assessment the assumed place of use for the mattresses is in Helsinki. For the natural mattress, the transportation from Pori to Helsinki would happen with a smaller delivery truck. For the IKEA's synthetic mattress, it would have to be imported from China probably in ocean freight shipping.

USE

As the National Sleep Foundation suggests the mattress should be changed in every 8 years, this time scale is used in a product life assessment. Usually people do not wash their mattresses due to the difficult size, so it's assumed that during the 8 years the mattress is not washed.

END-OF-LIFE/DISPOSAL

Usually mattresses end up in the landfills because the structure is complex, and especially in the synthetic mattresses, it's hard to know details about the materials for recycling.



ECO-AUDIT & ASSESSMENT

To start the assessment I took some time to research the chosen mattresses, their production lifecycles and especially the materials used. I noticed very soon that the bigger producers do not provide detailed information about the materials (the density, where the materials are produced, used chemicals or standards). It was also notable that when it came to synthetic materials, there was a lack of information while in natural materials the information was very detailed.

For a few materials (marked ** in the material listing) I had to use estimated density based on the research I did. For example, the fabric's density depends on how thin or thick the fabric is, and as IKEA didn't provide this information, I used similar densities that other mattresses have.

Using these densities, the amount of each material in the mattress was calculated based on the mattress's size. The stitchings of mattresses are not covered in this assessment as the amounts would be so little it wouldn't really matter.

In the next few pages the results of Eco-audit, water usage and CO2 usage are presented.

Villa&Peite: Wool-natural rubber mattress



MATERIAL	AMOUNT kg/mattress	DENSITY OF THE MATERIAL
Wool* (filling)	5.6 kg	1.0 kg/m ²
Organic cotton* (filling and cover fabric)	18.85 kg	3.0 kg/m ² and
Natural rubber (filling)	13.65 kg	65 kg/m ³ **

IKEA: Morgedal, foam mattress



MATERIAL	AMOUNT kg/mattress	DENSITY OF THE MATERIAL
High-resilience polyurethane foam	12.67 kg	35 kg/m ³ and 28 kg/m ³
Polyester fiber wadding (filling)	2.5 kg	200 g/m ² **
Non-woven polypropylene (lining)	1.35 kg	200 g/m ² **
Polyester (fabric)	1.06 kg	260 g/m ² **
Cotton (fabric)	0.76 kg	300 g/m ² **



*The STANDARD 100 by OEKO-TEX® is a worldwide independent testing and certification system for raw, semi-finished, and finished textile products at all processing levels. The OEKO-TEX® tests for harmful substances such as formaldehyde, Azo colourants and other chemicals that might affect the health of customer.

** estimate, no details given by the manufacturer

ECO-AUDIT



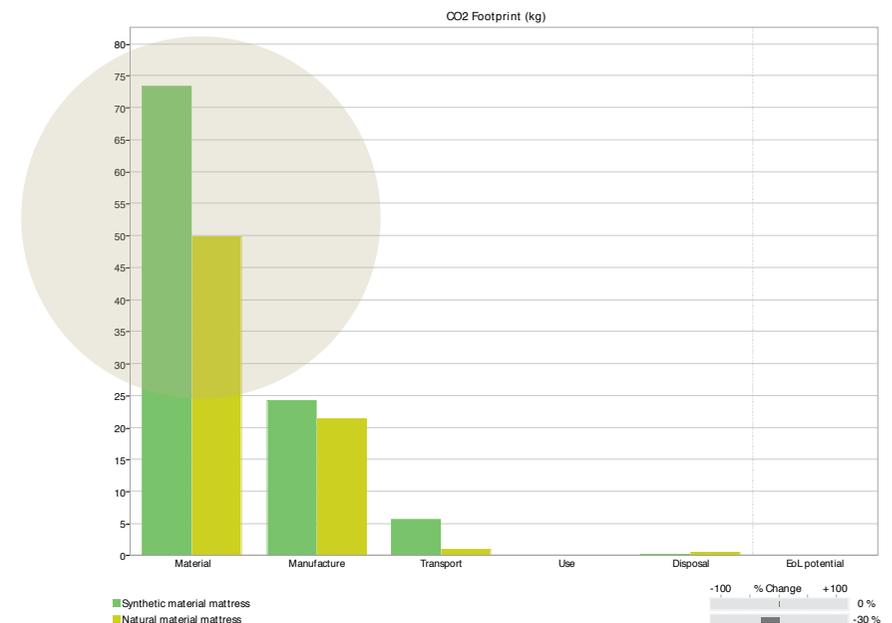
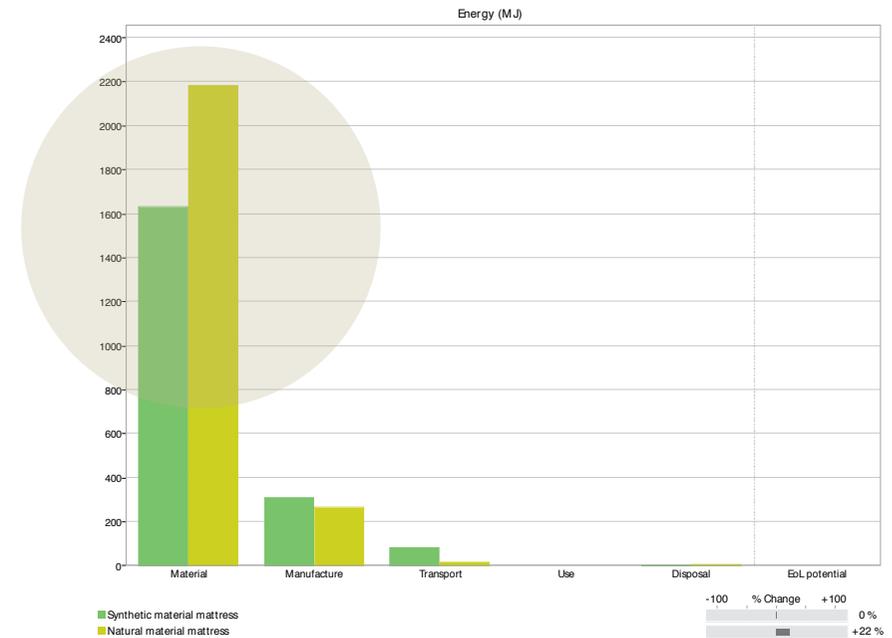
When comparing the life phases of the natural and synthetic mattress, one can immediately see that the material production phase is the most energy-consuming and with the highest CO2 footprint. Other lifephases are then in a much lower level, the transportation level being surprisingly low compared to the material production.

It's also notable that it takes more energy to produce natural materials such as wool, cotton and natural rubber as the growing phase of each material takes resources and time. Each lamb needs to be tended to get the wool, each cotton field cultivated and watered and, the same with the rubber trees. But after the material production, the energy usage in other life phases of natural materials mattress is lower than for the synthetic mattress.

CO2 footprint is much higher for the synthetic mattress, which was actually surprising when you think of how long it takes to produce the natural materials. But perhaps that the synthetic materials are produced with various chemicals and in larger factories, it makes the CO2 levels higher.

The transport phase in both energy and CO2 footprint is higher for synthetic mattress as it's imported from China to Finland. But because the importing is done not just for the one mattress but with a larger vessel, the level is not that high.

In the disposal phase the mattresses usually end up in a landfill, which is not the most environmentally friendly way but here we can also see that it has low impacts in energy and CO2 footprint levels.



IMPACTS OF MATERIALS

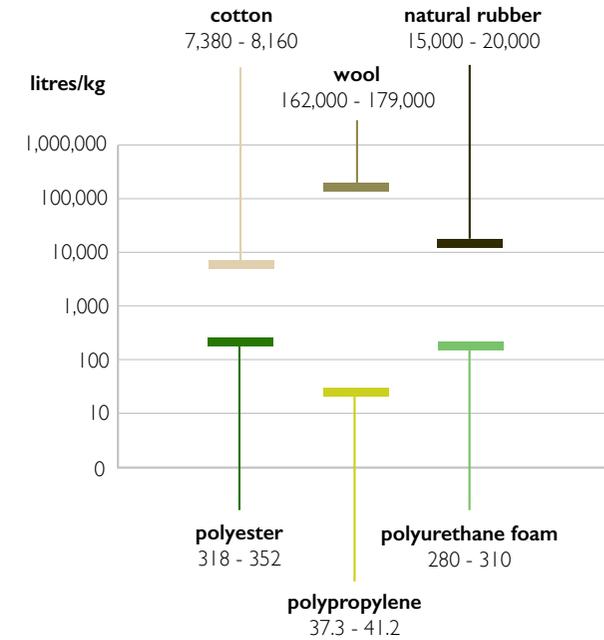


To get more information about the environmental impacts of specific material, the water usage and CO2 footprint information were researched from CES Edupack.

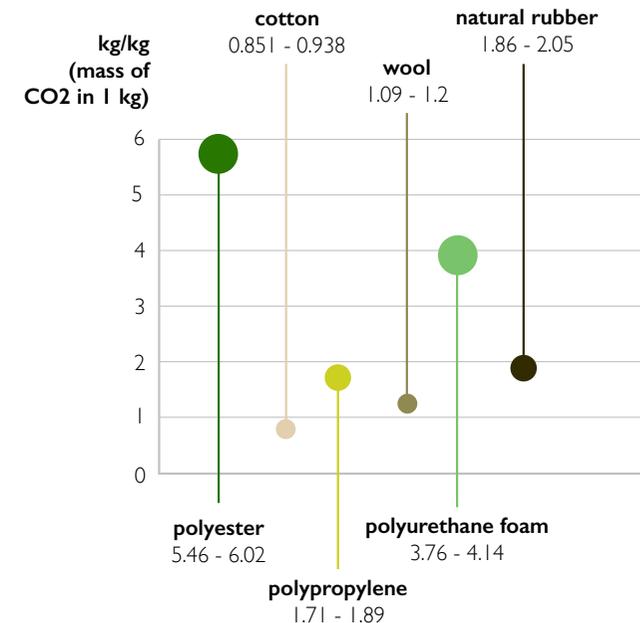
The water usage levels were surprising as the natural materials take a lot more water to produce compared to synthetic ones. The upper diagram shows that producing one kilogram of wool takes up to 179,000 litres of water compared to most lowest level of polypropylene (at least 37.3 litres for kg). Please note that the scale of this diagram is logarithmic. These differences result from the production in itself as natural materials need to be grown for a longer period of time, thus needing more water.

On the lower diagram we can see in a more detailed way what we already saw on the previous page: the synthetic materials have a higher CO2 footprint, polyester being the highest. But we can also see that there are differences in synthetic materials as well. Polypropylene is almost in the same level as natural materials.

WATER USAGE



CO2 FOOTPRINT (primary production)



REFLECTIONS



Based on the assessment it's not that clear which mattress is actually more environmentally friendly. As in many sustainability solutions, it's more of a trade-off. If we just look at the CO2 footprints, then it's obvious that the mattress made of natural materials is a better option than synthetic one. But when it comes to the water usage, the natural mattress loses the battle.

Although this assessment focused on environmental impacts and resulted in them being more conflicting than straightforward, the other aspects of sustainability can also be assessed when trying to resolve which mattress would be better in sustainable way. As several studies have shown, the natural materials in mattresses also affect our breathing and health in positive way, while synthetic materials emit toxic fumes. When taking this into account, the natural mattress would be a better option.

As mentioned before, some assumptions had to be made when figuring out the densities of each materials. Also, in CES Edupack there was no option and information for organic cotton, that was the actual cotton used in the natural mattress. Because of these variations the assessment can give only an indicative result.

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