

UBC Social, Ecological Economic Development Studies (SEEDS) Student Reports

The Sustainable Mattress

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1.0 INTRODUCTION

UBC is a university that is responsible for approximately 6000 on-campus residents, and hence has a responsibility towards the sustainable use and disposal of a large number of mattresses as well, to prevent these mattresses from ending up in landfills. At present the mattress disposal system at UBC is not well established and sustainable as most mattresses end up in landfills. The purpose of this report is to propose a sustainable solution to the use and disposal of mattresses on campus. This includes a detailed analysis of sustainable mattress alternatives available to UBC as well as a sustainable system of disposal for these mattresses.

To find out about the existing mattress disposal systems at UBC, interviews were conducted with the Outreach Coordinator of Waste Management, as well as residence representatives. While finding a sustainable disposal system is an effective short-term solution, in order to ensure a sustainable long-term solution, research was conducted into the most sustainable mattresses that are 100% biodegradable, which were found to be Essentia mattresses and inBed Organics mattresses. This report includes a triple bottom line analysis of these two sustainable mattresses, by comparing the economic, environmental and social impacts of the mattresses throughout their lifecycle, in order to propose the most sustainable mattress alternative to UBC.

A sustainable mattress, in turn allows for a sustainable disposal system, if all of the mattress components can be recycled. The forms of disposal available to UBC are charity options, including donations to organisations and NGOs like mattressrecycling.ca and Sleep Country Canada which is affiliated with the advocacy group, West Regional Advocacy Group (WRAGS). Such organisations ensure that mattresses that are still usable are donated to those in need. If the mattresses can no longer be used, then they should be transported to Wastech Services Ltd., where their components will be completely recycled.

2.0 LONG TERM SOLUTION- SUSTANABLE MATTRESSES

As a long term solution to achieving sustainability in the use of mattresses our main goal was to find a completely biodegradable mattress which used products that are created using renewable energy. The product had to have less embodied energy with a minimal environment impact throughout its creation process and transportation. A sustainable mattress could be defined as a product whose production is supported indefinitely by nature. While sustainability is achieved through finding ways to preserve nature as we fulfil our needs, we have learnt that Newton's third law of motion "Every action has an equal and opposite reaction" holds for everything we do. Thus, achieving 100% sustainability is yet to be well developed. Our goal was to find two mattress products that are available to be purchased within Canada that would lead us to use the triple bottom line comparison to choose the best out of the two in terms of a sustainable solution.

The sections below describe in detail, the two mattress products, Essentia mattress and inBed Organics mattress we found through our excessive research. Furthermore, this section provides a comprehensive analysis of the two products using the triple-bottom-line comparison to compare them in deciding which one is more sustainable in its use, production, and transportation.

2.1 ESSENTIA MATTRESS

Essentia is a mattress retailing company based in Quebec, Canada. The closest branch to Vancouver is located in Toronto, with free shipping services. Essentia is known for making its mattresses from natural materials, making them 100% biodegradable. It is the only company in the world that uses natural memory foam in its mattresses, where as other companies use synthetic products made from petrochemicals. Additionally, their production creates 88% less waste than most other mattress manufacturers. These mattresses come with a 20 year warranty, and after 25 years of use, their quality falls by only 7%, where as for spring mattresses, the quality falls by 16% within a year. Apart from being eco-friendly, Essentia mattresses are also healthier for use because they do not emit toxic fumes or chemical odours that could cause respiratory problems. They also provide users with better spinal arrangement and blood circulation and are 80% more breathable than other mattresses, reducing accumulation of bacteria and mites.

2.2 inBed ORGANICS MATTRESS

The inBed Organics Mattress provides a variety of 100% biodegradable latex mattresses. Latex is a rubber material that is extracted from the rubber trees; hence, it is perfectly biodegradable. Even though some latex rubber products may contain artificial additives to dilute its quality, inBed Organics mattresses do not contain any non eco-friendly products in their mattresses. The latex is produced in Sri Lanka, a country that has been famous for mass production of rubber. The solid pieces of pure latex are shipped to California, where they are cut into pieces and shipped to Vancouver. The rubber cores are then brought into the Vancouver plant where they are turned into mattresses using electrically powered machinery. While the major part of the mattress is latex, bedding and the mattress covers are made with 100% organic cotton. The process of creating latex is called vulcanizing* in which the liquid latex rubber is poured into a mould and baked to create bubbles within it. Latex is then cooled immediately to form its shape and washed thoroughly to get rid of any residual minerals. The ingredients used to create latex mattresses are 90-95% natural latex rubber, 2-3% Zinc Oxide, 1-2% fatty acids soap, 1-2% Sulphur, 1-2% Sodium. The latex mattress has a life span of approximately 20 – 30 years with a warranty of 10 years.

2.3 TRIPLE-BOTTOM-LINE ANALYSIS

The triple-bottom-line analysis broadens the research perspective by taking into consideration not only the Economic impacts of a project, but also the Social and Environmental impacts. This analysis has been conducted for both the Essentia mattresses and the inBed Organic Mattresses. The Economic impacts deal with the costs borne by the consumer in choosing a particular product, and the prices for different mattress sizes. The Social Impact deals with the Impact to society and individuals involved in the lifecycle of the product. This includes those impacted from the manufacturing stage to the use of the mattresses. The environmental impact deals with how eco-friendly the entire lifecycle of the product is, including the materials and energy used in the manufacturing process, greenhouse gas emissions, and recycling the mattresses.

*All items marked with an asterisk are defined in the glossary.

2.3.1 Social Impacts

Both Essentia and inBed organic mattresses use organic rubber sap as their major raw material in their production of mattresses. inBed Organics use 100% natural latex rubber to produce mattresses and thus the unit cost of a mattress is very high. The raw rubber is brought from developing Asian countries that mass produce rubber. inBed Organics use latex that was imported to USA from Sri Lanka. The Rubber industry in Sri Lanka has a history of about four decades. The workers that collect the sap of rubber trees are mostly adults who are employed by the companies that own the rubber plants. Child labour is rare but some children help their parents occasionally to work in the fields in collecting rubber sap and maintaining the trees. Rubber is imported from developing countries such as China and Sri Lanka as the labour charges in these countries are very low.

The production of the mattresses is done in Canada where the labour is not as cheap, yet, we are rest assured that the workforce is well paid according to the government regulations and no other ethical issues arise in the production.

The social impact on the end users of the product will be a positive one. Natural materials used in the production of inBed Organics' latex mattresses contain no harmful synthetic additives. 100% natural latex rubber mattresses are naturally hypoallergenic*, anti-microbial*, resist dust mites and are not treated with toxic flame-retardants. A person gets a 7-8 hour average sleep everyday and sleeping on mattress that is 100% natural, with no toxins will definitely promote the health of the user, as they would not be inhaling the toxic chemicals and odours that are emitted by most other mattresses. However, latex mattresses are not as comfortable as memory foam mattresses. Essentia mattresses are made of rubber tree sap which is treated with natural oils, plant extracts and water to form it into the memory foam. Essentia mattresses are far more comfortable than latex mattresses and do not contain any chemically treated materials.

Both Essentia and inBed Organics mattresses are manufactured in Canada employing Canadians in their work force creating employment opportunities within the country. The negative social impacts of both these mattresses are minimal. However, the Essentia mattress is superior to the inBed Organics mattress when it comes to comfort but the inBed Organics mattress is healthier as it is 100% natural.

2.3.2 Economic Impacts

Prices of Essentia mattress range from \$1760 for Twin size to \$2165 for Queen size. For ease of transportation, these mattresses can be compressed and rolled up and shipped in bulk as they take up less space. There are no shipping charges for Essentia mattresses.

inBed Organic mattresses use 100% organic Latex as their core material and hence the prices of these mattresses is higher. inBed Organic mattress prices range from \$1974 for Twin size mattresses to \$2837 for Queen size mattress. This excludes an added delivery cost of \$40 for Twin size and \$90 for Queen size mattresses. Furthermore, Essentia mattresses come with a 20-year warranty period, where as inBed Organic Mattresses have a warranty of 10 years, suggesting that they are far less durable than Essentia Mattresses. The quality of Essentia mattresses is said to reduce only by 7% at the end of 20-years. Since the base price of Essentia mattresses is lower than that of inBed Organic mattresses and since these mattresses would have to be changed less frequently the total cost incurred in purchasing these mattresses would also be less.

2.3.3 Environmental Impacts

Essentia is the only company in the world to produce natural, mattresses made from unbleached organic cotton cover, cotton wrap, natural memory foam and natural latex memory foam, making it a 100% biodegradable mattress (Figure 1). Unlike the petroleum-based memory foam that is used in most other mattresses, the Natural Memory Foam is made from the rubber tree sap, organic oils, plant extracts and water as explained in Section 2.1. Most mattresses available in the market use a synthetic latex layer which is produced from petroleum based products. However, the natural latex used in Essentia mattress is eco-friendly 100% biodegradable, as it is produced from the naturally collected sap of rubber trees. This natural product has an inert resistance to bacteria, molding and mites. Manufacturing Essentia mattresses also produces 88% less waste than most other mattress manufacturers. Additionally, Essentia mattresses do not emit any toxic fumes and chemicals.



Figure 1: Layers of the Essentia Mattress

Source: Essentia(n.d.)*Dormeuse*. Retrieved November 14, 2009 from the World Wide Web <http://www.myessentia.com/>

inBed Organic Mattresses are made of 100% organic cotton and natural latex rubber. The manufacturing process of the latex layer requires vulcanization, a process used to make rubber more durable. The latex does not consist of any chemical additives, flame retardants. These mattresses are also 100% biodegradable. inBed Organic mattresses have an inert resistance to molding and dust mites. The pure latex is shipped from Sri Lanka to California where it is cut into pieces, and then shipped in bulk to Vancouver. However devulcanization* is a costly and non eco-friendly process (ECSER, 2006). This means that the recycling process of these mattresses would consume more energy than that required in Essentia mattresses, since the former uses a greater proportion of Latex in their mattresses. Since both Essentia and inBed Organic mattresses are 100% biodegradable, they can be fully recycled and should not end up in landfills.

3.0 SHORT-TERM SOLUTION- SUSTAINABLE MATTRESS DISPOSAL

In addition to recommending a new sustainable triple bottom line replacement for old mattresses, we will also recommend a sustainable disposal system for the mattresses that UBC disposes every year. Currently there is no particular scheme that UBC housing, or the UBC community at large, follows with regards to mattress disposal. Our efforts will be to unite UBC housing and waste management and implement a mattress disposal plan that benefits UBC in terms of the triple bottom line approach. Once this is set up unilaterally by UBC housing, other housing areas on campus should start to dispose of their mattresses in the same way.

3.1 CHARITY OPTIONS

There are many charity organizations and NGO's that donate mattresses to the needy. Mattressrecycling.ca and WRAGS*, West Regional Advocacy group would be great options for UBC as they already distribute mattresses on a large scale and have been doing so for some time. The demand for used mattresses is quite high, which would make the charity option an attractive one. The cost for transportation and possible repairs would need to be considered in this option. Research on Sleep Country Canada guided our findings to the advocacy group WRAGS. We contacted Sleep Country Canada and talked to their customer support agent who gave us information about their mattress program. The "donate a bed" program only takes mattresses or beds that are reusable. Mattresses that are in a bad condition, with stains or protruding parts are not accepted by Sleep Country Canada. (WRAGS, 2009).

Locally, Sleep Country Canada takes these mattresses to a charity warehouse run by an advocacy group called WRAGS. WRAGS outlines their operational procedure on how the mattresses are first brought to WRAGS and finally are donated to the organizations and people who need them. WRAGS categorizes the beds that come into three categories the last of which is called "unusable". WRAGS claims to "recycle" their unusable beds, but does not outline the exact recycling process. On the WRAGS website there is a link to Mattressrecycling.ca ©, (explained further in 3.2). While it may seem

that giving our mattresses away to charity is the best social and economic solution, it is probably not the best solution because the mattresses being disposed of are possibly too damaged or unhygienic to use.

3.2 MATTRESS RECYCLING.CA

Mattressrecycling.ca's mission statement is to keep used mattresses out of landfills. It does this by donating mattresses and dismantling all others and repurposing over 90% of the material (MR, 2009). However, they do not take your mattress for free. There is a list of their charges and services on their website: www.mattressrecycling.ca. They are the first and only mattress recycling company in BC formed in 2008. The company takes apart the mattresses and box springs and reuses 90% of the material by sending them to local manufacturers and recyclers. These materials include foam, wood, metal, filler, matting, plastic and other materials. The costs of recycling are outlined below:

\$14 / mattress

\$14 / box spring

5 or more = \$10 / unit

3.3 WASTECH SERVICES Ltd.

Some UBC mattress parts are gathered with other wood waste and are recycled at Coquitlam Resource Recovery, now known as Wastech Services Ltd. Wastech Services Ltd is a Canadian company that is a reputed leader in waste and recycling management in Western Canada. The Company has over 20 years of experience and has partnered with many corporations, government agencies, and institutions (WASTECH, 2009). Figure 2 provides a table with a list of Wastech Service Ltd's different recycling rates.

Coquitlam Resource Recovery Facility/Transfer Station
 1200 United Blvd, Coquitlam. 604-521-1715.

The following items are accepted for recycling at no charge at this transfer station:

<i>Item</i>	<i>Comments and Restrictions</i>
Scrap metal and metal appliances	Various items including stoves, refrigerators and freezers up to 6'x6'x3', and other metal appliances.
Propane tanks	
Oil filters (up to 5 per load)	
Lead acid batteries	
Cardboard	
Office paper, mixed waste paper, newspaper	
Glass bottles and jars	No window glass, ceramics, mirrors, broken glass, or light bulbs. No hazardous chemical or paint containers. Plastic lids discarded.
Plastic containers and film (codes 1 -7 acceptable)	No hazardous chemical or paint containers. Clean and free of contaminants.
Metal & aluminum cans and other items (trays, foil paper)	No aerosols, hazardous chemical or paint cans. Clean and free of contaminants.

The following items are also accepted for recycling at this transfer station:

<i>Item</i>	<i>Charge</i>	<i>Comments and Restrictions</i>
Clean wood	\$71 per metric tonne	Clean wood can be taken directly to the Coquitlam Construction Recycling Facility, where tipping fees are lower. Call 604-526-6570 for more information.
Green waste	\$56 per metric tonne	
Gypsum	\$150 per metric tonne	Limit of 1 tonne or 1 pick-up truck per day (no trailers).

Figure 2: Wastech Service Ltd.'s Recycling Rates

3.4 UBC's CURRENT PROGRAM

Between April 2007 and January 2008, 27300 pounds of waste (from mattresses and wood waste) were disposed of and shipped to Coquitlam (Beaudrie, 2009). According to the Wastech Services Ltd. Website, they take wood at \$71 per metric tonne. This would mean that UBC spent $\$71 * (27300 \text{ pounds} * 1 \text{ pound} = 0.0004539237 \text{ metric tonnes}) = \879 last year on recycling wood components (Beaudrie, 2009). However, the mattress components are probably a small portion of this waste. As mentioned above the different UBC housing areas dispose of their mattresses on their own. The following was found after surveying each residence area on campus. Mattresses at UBC have a lifetime in the range of 8-10 years. They are disposed of when they look decrepit or until the resident issues a complaint. The amount of mattresses that need to be replaced changes every year. In 2009 Vanier purchased 50 new mattresses, in 2008 they purchased 100, but in some years they buy only 10 mattresses. Gage also throws away their mattresses in similar containers that end up at Wastech Services Ltd. In June 2008, Gage Towers and Apartments disposed of 1400 kg of mattresses (Beaudrie, 2009). results Because Marine Drive residence is quite new, the number of mattresses that they replace every year is around 5-10. There are currently about 1290 beds in the residence at Marine Drive (Johnny). The mattresses they have now are thrown into a designated dumpster then plant operators picks them up, slashes them and then they are eventually taken to Wastech Services Ltd. Mattresses are slashed in order to prevent them from being used by the homeless and from being remade by illicit manufacturers. Some companies scavenge old mattresses and re-upholster them but this does nothing to address the issue of bedbugs or diseases. Recently UBC has tried using a new type of mattress at Totem residence made out of foam that is recyclable. This foam is still being tested but it is ultimately up to the residents to decide what type of mattress they want (Holmes, 2009). In conclusion, most of the UBC housing areas dispose of their mattresses by slashing them and storing them in large dumpsters. The content of these dumpsters are eventually taken to Wastech Services Ltd by Plant Operations.

4.0 CONCLUSION

After the detailed triple-bottom-line analysis of Essentia mattresses and inBed Organics mattress, the following conclusions can be drawn. Firstly, as both mattresses are manufactured by adhering to sustainable practices, and do not use chemical additives, their social impacts throughout their lifecycle is positive, and equally good in both cases. Secondly, the environmental analysis of these mattresses showed a close competition as well, as both mattresses are 100% biodegradable. However, inBed Organics mattresses are composed primarily of latex rubber and hence require a greater amount of de-vulcanisation, a costly and non eco-friendly process. On the other hand, Essentia uses natural memory foam, a 100% biodegradable compound used only by this company in the entire world. As Essentia mattresses require a lesser amount of latex rubber, their prices are also cheaper than inBed Organics mattresses. Although Essentia mattresses are manufactured in Toronto, there are no shipping charges, where as inBed Organics has transportation costs for each mattress. Since Essentia mattresses also have a longer period of warranty, they would need to be replaced less often, and so these mattresses can be purchased in bulk, as they are also compressible and easier to transport, and stored at UBC until required. Therefore, we recommend that UBC purchase Essentia mattress products to replace the mattresses used at present. More information on the two products used in the assessment can be found on their websites:

Essentia: <http://www.myessentia.com/>

inBed: <http://www.inbedorganics.com/>

In order to optimise the effectiveness of the system, it should be ensured that the mattresses are disposed in a sustainable way. Although giving the reusable mattresses away to a charity or an advocacy organization initially seemed like the best option available, it is likely that mattresses on campus that are being disposed are ones that are damaged or have crossed their life-time, at which point it is no longer advisable to donate them as it may be dangerous or unhygienic to use them. Instead we propose that the disposed mattresses are destroyed and recycled fully. This solution may more costly, however, the social and environmental benefits of this solution suggest that it is the most sustainable triple bottom line solution. This is because it would ensure that the disposed mattresses are not passed over to the needy, and that all of the components are completely recycled. The best solution to this is to phase out the

current mattresses with the fully recyclable Essentia mattresses.

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GLOSSARY AND ABBREVIATIONS

WRAGS	West Regional Advocacy Group
Vulcanizing	The process of treating rubber with sulphur at very high temperatures to improve its strength and elasticity
Devulcanization	The process of treating crumb-like rubber with high heat, pressure and softening agents to regenerate the rubber compound to its original plastic state
Hypoallergenic	The products that are created to contain the fewest possible allergens.
Anti-microbial	A substance that prevents the growth and kills microorganisms such as bacteria, viruses and fungi.

APPENDIX A: INTERVIEW WITH CHRISTIAN BEAUDIRE

On 10 November, 2009, Shruti Menon interviewed Christian Beaudire the Operations Manager of Waste Management at UBC, who is located in the Aquatic Ecosystem Research Lab. Mr. Beaudire provided our group with some useful information about mattress disposal at UBC. We learnt from Mr. Beaudire that only some mattresses get recycled, but most others end up in landfills. The mattress material components, from the few that are recycled, are mixed with accumulated wood waste and the mixture is transported to Coquitlam Resource Recovery Plant (now known as Wastech Services Ltd.) where it is recycled. In June 2008, Gage Towers and Apartments disposed of 1400 kg of mattresses. Between April 2007 to January 2008, 27300 pounds of mattresses and wood waste were sent for recycling

One important fact about the mattress disposal process at UBC is that, the individual residence areas on campus (Totem Park, Place Vanier, Thunderbird Residence, Marine Drive, Gage Towers and Gage Apartments, Ritsumeikan House and Fairview Crescent) are in charge of gathering the mattresses that need to be disposed of at their residence and transferring them to Waste Management. Waste Management is only in charge of transporting these mattresses to the recycling center. Additionally, there is no fixed date for the residences to gather these mattresses; this means that mattresses from the different residence areas may come in at different times, making the system quite inefficient. This is because if very few mattresses come in from any given residence, economically, it would be preferable to dump these into landfills rather than bear the cost of transporting these mattresses to the recyclers.

Mr. Beaudire suggested that, for more specific questions regarding the recycling process, we contact the Residence Sustainability Coordinator at trekstep.one@ubc.ca and Loretta Chui, the Deputy Secretary of Student Housing.

APPENDIX B: SYNOPSIS OF EMAIL FROM SUMIT SIDHU

On November 17th, 2009, Johnny Chen received an e-mail from Sumit Sidhu the Building Service Manager for Thunderbird residence in UBC. Mr. Sidhu provided some useful information about mattresses in UBC for our group. Student Housing and Hospitality Services maintains residence buildings and the furniture within to a standard acceptable to most students. Of course, some expect higher standards than others. When replacing furniture, departmental staffs regularly have to balance the financial, social and environmental sustainability of their decisions. Mattresses are replaced every 5 – 10 years, representing between 10% – 20% annual turnover. In practice, we replace about 12% of mattresses in a typical year.

Here is a list of questions that Mr. Sidhu answered:

1. How many mattresses do dorms dispose every year?

We change mattresses according to area due to the fact that some of our buildings are newer than others and because mattress replacement has historically occurred at different intervals. For example, in a new residence like Marine Drive, where we have about 1600 bed spaces, we have replaced fewer than 100 mattresses since it was built. At an older residence like Walter Gage, we replace about 10% of mattresses annually. As there are about 1400 bed spaces there, we plan to replace about 140 – 160 beds each summer.

2. How often do those mattresses get disposed?

Typically, individual mattresses that are no longer in an usable condition would get replaced throughout the year. When a group of mattresses have reached the end of their useful service for students, many mattresses in an area get replaced during the summer before the students return for school.

3. What is the mattresses disposal system right now in UBC?

Normally, mattresses that are no longer suitable for student use fall into one of two categories: damaged or broken mattresses, and worn out mattresses. Damaged or broken mattresses are no longer useful, and are always discarded. Mattresses that are worn could be re-used by another group (for example a shelter for homeless people), but to date, we do not have a program in place. We are looking for a more sustainable/recyclable product that we could use and would still meet student requirements/standards, as we currently send most used mattresses to the landfills.