

Sustainability Assessment: Seventh Generation Diapers versus gDiapers



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Sustainability Science

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I. Introduction

Each year in the United States, approximately four million babies are born (BabyCenter, 2011). During the first few years of a child's life many mothers opt to use disposable diapers over cloth diapers for convenience purposes (Shanon et al., 1990). Infants in the United States spend approximately two and a half years in diapers and require approximately four diapers per day, equalling 1,500 diapers per year and 3,796 diapers in a lifetime (National Geographic, 2011). Since diapers are often disposable, they are discarded in the trash and ultimately end up in landfills. The most widely used disposable diapers contain polyacrylate granules and fibers, which are plastics derived from petroleum (U.S. Environmental Protection Agency, 2007). With a petroleum base, the average disposable diaper takes four-hundred and fifty years to disintegrate in the ocean and over five-hundred years in landfills (U.S. Environmental Protection Agency, 2010). The large amount of waste that diapers produce is the reason for conducting a life-cycle analysis of two different diaper brands. We are doing this comparison through a life-cycle analysis lens, a method used in Sustainability Science. We understand that there are limitations with using a life-cycle analysis, but we believe it is an adequate indicator for comparing these two products. In this analysis both *Seventh Generation Baby Diapers* and reusable *gDiapers* will be examined and compared to see what environmental and social impacts they have.



Figure 1: Two children stand before the 3,796 diapers used during a typical American's lifetime

II. Company Background

a. Seventh Generation



Seventh Generation is a company whose mission is “to inspire a revolution that nurtures the health of the next seven generations” (Seventh Generation, 2011e). Seventh Generation produces a variety of household products including all-purpose cleaner, laundry detergent, baby wipes and hand soap. In 2009, the company decided to establish sustainability goals to reduce the impact of Seventh Generation on the environment. These goals include; using only sustainably harvested palm oil, an eighty percent reduction in petrochemical plastic use by 2014, identifying toxins in cleaners and eliminating them from the product, making products biodegradable, one-hundred percent sustainable water use, offsetting electricity use by 2012, reducing eighty percent of green house gas emissions by 2050, reducing employee carbon footprint and contributing one thousand hours of community service. These goals reflect the importance of sustainability in Seventh Generation’s business practices. They offer information on the progress they have made at reaching these goals since the company “holds a strong belief in transparency [and] highly value corporate responsibility, sustainability and stakeholder engagement” (Seventh Generation, 2009b).

b. gDiapers

gDiapers is a company that solely focuses on diaper production. The company was founded by Jason and Kim Graham-Nye, an Australian couple who were amazed by the amount of waste generated by diaper use. The gDiapers philosophy is an Australian expression, *Fair Dinkum*, which means “be genuine and real with everyone you encounter” (gDiapers, 2011a). This expression is the company’s philosophy toward the business, employees and customers, and the planet, which influences the company’s practices (gDiapers, 2011a). gDiapers strives to improve working conditions by offering services such as on site child care, lessens their impact on the planet by adopting Cradle-to-Cradle practices and reaches out to the broader community by supporting other social justice and environmental organizations.



III. Materials

a. Seventh Generation

Seventh Generation believes in being relatively transparent as far as their practices, and thus they are quite forthright about the materials used in each of their products. According to the “Ingredients” section of their website, the Free & Clear Diapers contain “chlorine free wood pulp fluff, sodium polyacrylate (also referred to as SAP or absorbent gel), polyolefin nonwoven fabric, adhesives, polyolefin film, synthetic rubber elastic strands” (Seventh Generation, 2011a). With the exception of the pulp fluff and possibly adhesives, each of these is derived from non-renewable petroleum. Seventh Generation has five categories to communicate the extent to which an ingredient comes from plant oil and how much it has been modified (Seventh Generation, 2011b). The term “synthetic” is used “if the carbon in an ingredient is derived exclusively from petroleum or natural gas,” as the elastic strands are labeled (Seventh Generation, 2011b). Each of these components will be discussed in the following sections to the extent of which information could be disclosed.

As seen in Figure 2, a disposable diaper, including those made by Seventh Generation, consists of an absorbent pad between two sheets of nonwoven fabric, one of which is permeable (the layer closest to the skin) and one which is impermeable (the outer layer). The pad is comprised of a hydrophilic polymer and a fibrous material, leading to maximum absorption capacity (Madehow, 2011).

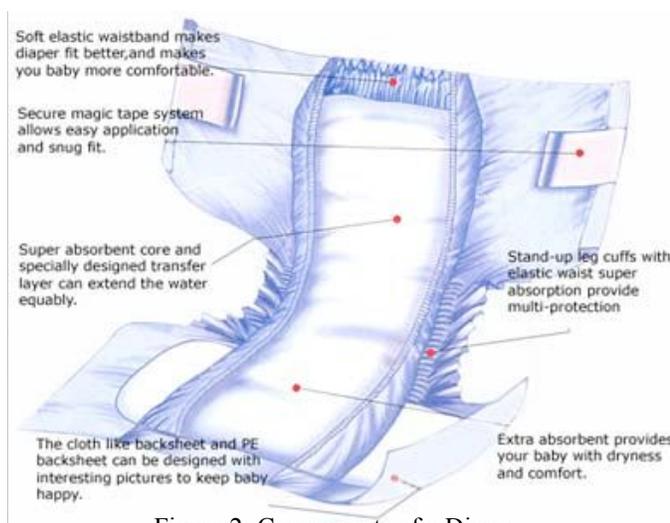


Figure 2: Components of a Diaper

These polymer molecules have the ability to interact with water molecules and to link with other polymer molecules to create cross-linked chains that are not water soluble, but can hold large amounts of water. The pad is held in place by nonwoven fabric sheets that are made from plastic resins and assembled by interlocking the plastic fibers (Madehow, 2011). The permeable layer is often made from polypropylene while the impermeable sheet is made from polyethylene. In the

Seventh Generation diapers, there is little potential for recycling of any of the aforementioned materials. The components are destined for the landfill and it is unlikely that anything will be done with a soiled diaper.

i. Component A: Wood fluff pulp

Fluff pulp is a type of chemical pulp, a product made by combining wood chips and chemicals in a large tank called a digester where lignin, a protein that binds cellulose fibers together, is broken down (Diaper Industry Source, 2007). The pulp is made from long fiber softwoods, which are conifers such as pines, cypresses, and spruces. Many conventional diaper brands purchase their fluff pulp from companies that use a whitening process that is elemental chlorine free (ECF), where chlorine gas is not used, but the chemical chlorine dioxide is used in bleaching. Seventh Generation chooses to use a method that is totally chlorine free (TCF) and uses agents such as hydrogen peroxide and sodium hydrosulfite in the phase from whitening pulp to producing paper. The use of chlorine can result in chlorinated



Figure 3: Seventh Generation Chlorine-Free Diapers

hydrocarbons, of which many derivatives are seen as causing harm to the environment (AET, 1994). Also called organochlorides, these compounds have a wide array of applications including use in polyvinylchlorinates (PVCs), pesticides, and polychlorinated biphenyls (PBCs). While not all organochlorides are toxic, and some are found in common foods and medicines such as Splenda or Claritin, they have attained notoriety as a result of efforts from people like Rachel Carson and her widespread call to action on banning DDT (Madehow, 2011).

Due to the reliance on a manufacturing partner to help them source the diapers' components, Seventh Generation was not able to disclose specific company names because of proprietary agreements, making some of our findings a bit vague (Seventh Generation, 2011f). We were able to find out that Seventh Generation sources its fluff pulp primarily from a Scandinavian, sustainably harvested forest in the region of Finland. This company is certified

through Sustainable Forestry Initiatives, which has had its validity called into question recently. In 2009, Seventh Generation made the commitment to a goal of all virgin wood pulp being Forest Stewardship Council (FSC) certified by 2015 (Seventh Generation, 2009). They claim that, “the wood for almost all of our virgin pulp production is FSC certified however we have not certified the chain of custody” (Seventh Generation, 2009). A representative from Seventh Generation stated that they are working toward maintaining sustainable practices across every step of the supply line.

There is even debate over the sustainability of ECF or TCF wood pulp though, with the Alliance for Environmental Technology (AET, 1994) coming down firmly on the side of ECF. They point to many contradictions in the sustainability aspects TCF purports to provide. On their website, they claim that “research has shown the environmental risks to aquatic ecosystems from ECF bleaching are negligible and there is no toxicological difference between wastewaters generated from ECF-based or TCF-based bleaching” (AET 1994). Furthermore, they state that more trees are required to make paper with TCF, as this process produces 3-4% less paper from the same amount of wood from the ECF process. UPM-Kymmene Corporation, a Finnish company, has noticed an increase in both hardwood and softwood consumption during the production of bleached Kraft pulp with the TCF method as compared to ECF production (AET, 1994). In addition, there are far fewer tons of TCF-produced pulp being made (as of 1994), especially in the United States where it is approximately 1% of what is produced using ECF processes. With so few suppliers in the country, the costs of purchasing TCF pulp from abroad, leading to the carbon emissions from travel, must be weighed in comparison to ECF methods. All of Seventh Generation’s diapers are assembled in the United States though, reducing carbon emissions from long-distance transportation and shipping.

As for the impacts on the environment, the wood pulp fluff is processed without any chlorine and thus will not produce any harmful byproducts. The Scandinavian supplier supposedly harvests their wood sustainably, but they have only become SFI-certified and not FSC-certified. This is somewhat controversial in that SFI was created by the American Forest & Paper Association in order to promote timber companies’ practices as being “sustainable” (National Wildlife Federation, 2001). Claims have been put forward that SFI does

not “adequately protect the rights of workers, communities, and indigenous peoples...does not require adequate verification of companies’ compliance with relevant laws and policies, and does not require adequate consultation with stakeholders and experts during assessments” (Credible Forest Certification, 2011). FSC is a third-party, international forest certification system that operates independently and is funded by independent sources (CFC, 2011). Seventh Generation’s manufacturing partner is trying to push the supplier toward becoming FSC certified (Seventh Generation, 2011e).

Components B-F are derived from petroleum, which the extraction of has numerous environmental and social impacts. Exploration, production, and refinement of oil cause major detrimental impacts to soils, surface and ground waters, and local ecosystems (Kharaka, 2005). The possibility for oil spills creates risk for both human and wildlife populations. The social impacts of oil are well-documented, particularly in the cases of Royal Dutch Shell on the river deltas in Nigeria, and British Petroleum in Indonesia (Demer, 2011). The reliance on any type of fossil fuel presents a problem for sustainability, but the industry is working toward deriving more ingredients from plant-based materials.

ii. Component B. Super absorbent polymer

Sodium polyacrylate [-CH₂-CH(COONa)-]_n, a type of super absorbent polymer (SAP) or absorbent gel, is made through the polymerization of acrylic acid with sodium hydroxide (NaOH) in the presence of an initiator which forms a poly-acrylic acid sodium salt (Madehow, 2011). A polymer is a macromolecule that consists of many subunits, forming a chain connected by covalent chemical bonds. A polymer

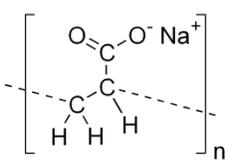


Figure 4: Sodium polyacrylate composition

that is superabsorbent is one that can retain large quantities of water or liquid relative to its own mass. SAPs are used frequently in disposal hygiene products, such as baby diapers, adult protective underwear, and sanitary napkins, given the capacity of the gel to hold amounts of fluid even under pressure.

While Seventh Generation is not pleased that an element of their diapers is derived from petroleum, there is currently no known alternative to match its performance. The SAP they use is a food-grade gel that is non-bioaccumulative and thus should not cause harm to any person,

but it will have an impact on the environment (Seventh Generation, 2011f). A representative from Seventh Generation's Consumer Insights Team estimated that the SAP comprises less than 10 percent of the diaper's mass. While the SAP might not break down at any point, they maintain that it is a small proportion of their diaper. They state that the ratio is 30-50 parts wood pulp to 5-15 parts SAP, meaning they do not see it as a significant component of the product. Although diapers generally contain more than fifteen ingredients, the fluff and SAP make up over 60 percent of the product's weight together (Seventh Generation, 2011g).

iii. Components C-F. Polyolefin nonwoven fabric, polyefin film, adhesives, synthetic rubber elastic strands

The other parts of the diaper include a polyolefin nonwoven fabric, adhesives, polyolefin film, and synthetic rubber elastic strands. The nonwoven fabric is used for the outermost layer of the diaper and the one nearest the skin, the adhesives for both fastening the diaper and to bind the fabric to the film, and the rubber elastic strands to hug tightly around the baby's legs, preventing leaks and optimizing comfort. An olefin is an unsaturated chemical compound that contains at least one carbon-to-carbon double bond and polyolefin, also sometimes referred to as polyalkene, is a polymer produced from this (Mama Stories, 2007a). The properties that make it beneficial for use in diapers include its superior insulation capacity, lightweight material, durability, and its ease of care. Nonwoven fabrics are convenient due to the range of functions they can provide, and due to the balance between product use-life and cost (Madehow, 2011). In some circumstances, nonwoven fabrics have the potential to be recycled, but in the case of diapers, that seems problematic. The application of single-use products in hospitals and nursing homes, as well as in diapers, necessitates that more research be done on the feasibility of this form of cycling.

Seventh Generation was not able to speak much about the sourcing for their polyolefin nonwoven fabric, except that it is derived from non-renewable petroleum. They apologized for not being able to say more, but they maintain that the diaper industry is fairly tight-lipped concerning information, because of its high technological basis that allows it to produce over 400 diapers a minute (Seventh Generation, 2011f). As far as adhesives, Seventh Generation said that a "blend of bio and petro chemicals is typical, however, 100 % synthetic is not necessarily out of

the question in some of the applications” (Seventh Generation, 2011g). In fact, an ultrasonic bonding technology is fast growing and uses sound wave energy to adhere components together, although it does not entirely eliminate glue yet.

It may also be of relevance to mention the materials that Seventh Generation does not use in their diapers. Being that the product is part of the company’s Free & Clear line, they do not use additional lotions or scents, as some other disposable diaper brands do. They do not include cartoons or images on their diaper to avoid using inks or dyes that are derived from oil, whether plant-based or synthetic (Seventh Generation, 2011a). The diapers do contain a pigment that is added to give the diapers a light brownish color to distinguish them from others in the marketplace, and while some have criticized this on the grounds that Seventh Generation is “greenwashing” the consumer, the company maintains that without some sort of dye the diaper would be transparent and direct feedback indicated that this is not desirable for most parents (Seventh Generation, 2011b). It also excludes tributyl tin (TBT) that is commonly used as a fungicide and the diapers are also latex-free (Mama Stories, 2007a).

As for the end of the diaper’s life, Seventh Generation maintains their stance on choosing not to produce a biodegradable diaper (Seventh Generation, 2011d). As of 2007, they claimed that in the disposable (non-cloth) diaper market, the best technology that had been achieved was up to 80 percent biodegradability, and that is in Europe where access to biopolymers is easier (Mama Stories, 2007b). The remainder is derived from non-renewable petroleum and will not break down. They state that touting diapers as biodegradable can be misleading, because even those that are designed to biodegrade will not be disposed of in a manner conducive to actually doing so given that landfills are generally anaerobic and have no water or light facilities (Mama Stories, 2007b). It is generally not advocated that consumers attempt to home-compost diapers for fear of possible feces contamination in ground water, and according to a representative of another diaper company, there are no commercial composting facilities for disposable diapers (Mama Stories, 2007b).

b. gDiapers

The gDiaper is a brand of partly reusable and partly disposable/compostable diaper. The diaper is composed of three layers: an outer layer called the “little gPants,” an inner nylon liner, and a disposable absorbent “refill.” The refill is meant to absorb the baby’s waste and the nylon liner acts as a barrier against leaks, while the gPants holds everything together. The company began in 2004 with the mission of providing a more environmentally friendly alternative to conventionally used disposable diapers (gDiapers, 2011b).

i. Components A-B: wood fluff pulp, sodium polyacrylate

The absorbent refill has received Silver Cradle-to-Cradle design certification by McDonough Braungart Design Chemistry. It is composed of wood fluff pulp and sodium polyacrylate, an absorbent chemical commonly used in diapers. There are less than four grams of sodium polyacrylate per gDiaper refill, compared with up to fifteen grams in a Seventh Generation diaper. Sodium polyacrylate, also known as SAP, or super-absorbent polymer, is not biodegradable. However, it is not an environmental toxin. It is a nonhazardous chemical and is nontoxic to both terrestrial and aquatic organisms at predicted exposure levels. It is immobile in landfills and does not affect the performance of wastewater treatment in small quantities. It is not regulated by the federal government and is not regulated by any state government. The Environmental Protection Agency has declared that SAP is harmless even when ingested, and McDonough Braungart Design Chemistry has assigned SAP with a “GREEN” label, meaning that there is little to no risk in using it (McDonough Braungart Design Chemistry, 2011a).

Aside from the SAP that is used, the gDiaper refills are completely biodegradable and can be flushed, thrown away, or composted in home composting operations. When composted, the refill will completely degrade after about fifty days. When thrown away, the refill will not biodegrade in the landfill, but contributes less waste to the landfill than a Seventh Generation



Figure 5: gDiapers “gPant” and liners

diaper. When flushed, the refills contribute to biosolid waste at wastewater treatment facilities. Approximately 80% of the biosolid waste in wastewater is used in agriculture as fertilizer (Mama Stories, 2007b). The company recommends that refills with feces on them should be flushed rather than composted. The wood pulp used in refills is mostly harvested from farmed trees in China, but the trees are not certified by the Forest Stewardship Council, meaning that some species of tree that are used could be endangered or harvested unsustainably. The company hopes to soon purchase wood exclusively from FSC-certified sources (The Forest Stewardship Council, 1996). The refills are bleached with chlorine, but are completely free of elemental chlorine. Instead, they are bleached with chlorine dioxide. Most wood fluff pulp manufacturers treat their pulp with chlorine in some form, but gDiapers hopes to be totally chlorine free in the near future. However, there is no proof of toxicological differences between materials treated with chlorine dioxide and those treated with chlorine-free alternatives, such as hydrogen peroxide. The wood fluff pulp is mostly manufactured in China, but the finished refills are manufactured in the United States (Mama Stories, 2007b).

ii. Components C-E: Cotton, Spandex, Nylon

The outer layer of the diaper, the “little gPants,” is composed of 92% cotton and 8% spandex. The liner is composed of 100% nylon. Both of these parts of the gDiaper are washable and reusable. These parts of the diaper have not been certified Cradle-to-Cradle at any level by McDonough Braungart Design Chemistry. This means that the company has not identified all of the materials that are involved in the manufacture of these products and that many of the materials have not been assessed for their toxicity or for their impact on human health and on the environment. It also means that the company has failed to identify the sources of some of the materials used in making these parts. The company has, however, said that the outer pants are manufactured in China. This could be of concern since the Chinese government maintains much less stringent regulations on potentially hazardous chemicals than the United States.

IV. Comparison

Components	Seventh Generation	gDiapers
1	Wood pulp fluff	Wood pulp fluff
2	Sodium polyacrylate	Sodium polyacrylate
3	Polyolefin nonwoven fabric	Cotton
4	Adhesive	Spandex
5	Polyolefin film	Nylon
6	Synthetic rubber elastic strand	

Table 1. Comparison of materials for Seventh Generation and gDiapers

V. Cradle-to-Cradle Certification

a. Cradle to Cradle Certification for Diapers

The Cradle to Cradle Certification is an eco-label that assesses the safety of a product to humans and the environment through a comprehensive approach of evaluating the materials and manufacturing practices of the product. Specific guidelines help businesses implement the Cradle to Cradle framework that uses safe, recyclable, and decomposable materials. Designed by McDonough Braungart Design Chemistry (MBDC), there are four levels of achievement to the goal of visionary product designs and manufacturing that are based on five categories of criteria: "Material Health, Material Reutilization, Renewable Energy Use, Water Stewardship, and Social Responsibility" (McDonough Braungart Design Chemistry, 2011b). The certification levels run from basic, to silver, gold and finally platinum; they all build off of each other so that the following level includes the criteria of the previous ones.



Materials must be defined as "technical or biological nutrients that are safe and healthy for humans and the environment" (McDonough Braungart Design Chemistry, 2011a). The company must break down and map out the chemical constituents which are evaluated against 19 criteria based on a toxicity rating of Red, Yellow, or Green (high hazard and risk to little or no risk respectively). This compares to other programs that simply measure emitted chemicals from a product, the Cradle to Cradle Certification process examines the toxicity of every material that

goes into a product and provides a path to help manufacturers improve product design and safety to humans and the environment" (McDonough Braungart Design Chemistry, 2011a). The Basic level mainly concerns the elimination or reduction of these harmful and toxic chemicals such as PVS and chloroprene to a level less than 100ppm (0.01%). At the Silver and Gold levels, toxic heavy metals are addressed and include little or no chemicals falling in the Red zone of the toxicity scale.

A significant accomplishment of reducing and eliminating toxic chemicals found in products is apparent after the product's life cycle when it is buried and compressed under tons of waste in landfills or worse, flooding streets or contaminating water. In an attempt to reduce waste all together, the Cradle to Cradle framework promotes design that is comprised of recyclable materials that when broken down provide technical or biological nutrients for future life cycles. Products who's waste is recycled, made into something else, and sold as a new recycled product are considered to "close the loop," and are acknowledged in the higher levels of certification. A Material Reutilization score determines where the product falls in terms of reusable waste. In order to reach the Platinum level, the score must be ≥ 80 , whereas Silver is only ≥ 50 (McDonough Braungart Design Chemistry, 2011a).

Figure 6: Material Reutilization Equation

$\text{Material Reutilization Score} = \frac{1}{2}(\% \text{ Recyclable/Compostable Content } X2) + (\% \text{ Recyclable/Renewable Content } X)$

Going energy efficient was an up-and-coming concept a couple years ago. Now, manufacturers are encouraged to go beyond simply reducing fossil fuel use and to commit to renewable energy use such as solar, wind, water, and geothermal. In terms of final assembly, energy used must be quantified and characterized, and the percent of renewable energy used determines the level at which is ranked. The Gold level requires 50% of energy to be powered directly through "Green-e Certified renewable energy certificates (RECs)" (McDonough Braungart Design Chemistry, 2011a). Along with energy conservation, water conservation and condition are deeply advocated as a criteria for Cradle to Cradle design. Companies must work

their way up in stewardship by publishing principles that guide water usage, conduct self-assessment of use, and finally, at the Platinum level, the company must implement innovative water conservation and water discharge measures. Water that enters the factory must be as clean or cleaner than when it came in.

Finally, in order to qualify for the Cradle to Cradle certification, participating companies must follow corporate ethics and fair labor practices. The "applicant shall demonstrate that the organization has begun the process of obtaining a third party social accreditation or is beginning a self-assessment by internally collecting data for workplace certification criteria adopted from a third party assessment, certification, or accreditation system" (Social Responsibility, 2008).

b. gDiapers

gDiapers are a 21st century hybrid designed to be 100% biodegradable, keeping the baby and planet happy. Besides being biodegradable, the gRefills are compostable and flushable, so no

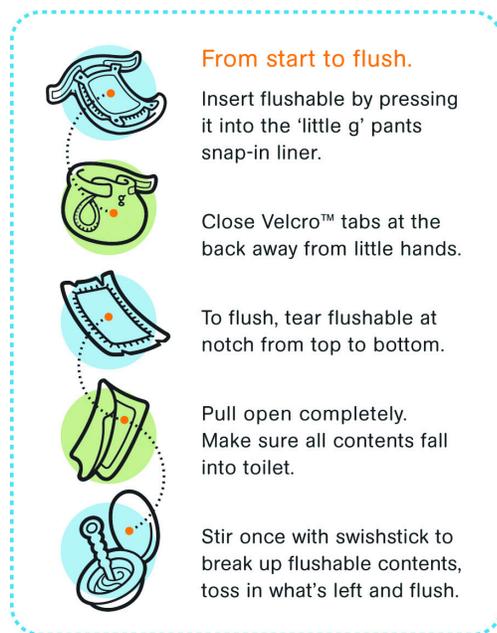


Figure 7: Cradle-to-Cradle Principle

more landfills will be plagued with dirty one-time use diapers. The gCloth inserts are reusable cloth diapers made of four layers of chlorine free microfleece, hemp and cotton designed to draw moisture away from the baby's skin. gDiapers are the only Cradle to Cradle certified diaper on the market, and they have achieved a Silver certification. They have met all nineteen human and environmental health criteria and are proven to reenter the ecosystem in a neutral or beneficial way (McDonough Braungart Design Chemistry, 2011a). In as little as two months, the used diaper can break down in a domestic compost and help to maintain and improve soil fertility. Since the diapers are plastic free, there are no

contaminants left over after the decomposition (gDiapers, 2011b).

gDiapers claims that flushing the diapers down the toilet has been passed by the "North American flushability test by a third party, independent laboratory" (gDiapers, 2011b). This has

the intention of keeping infant waste in the same waste management cycle as the rest of human feces, though it does require water use for the flushing. According to the founder of gDiapers, Jason Graham-Nye, the flushable gDiaper refills come from a company in Ohio that is run on 100% renewable energy, and because of their Cradle to Cradle certification, they impact the other companies up the supply chain (Green America, 2006). He does not disclose what type of energy supplies the offices of gDiapers. The company does strongly emphasize their support of many grassroots organizations that advocate the lives of babies and children worldwide. With a strong humanitarian and environmental mindset, gDiapers has well earned their Silver certification of Cradle to Cradle.

VI. Social and Political Implications

Since Seventh Generation was established in 1988 and gDiapers in 2004, both companies have been determined to be socially responsible and accountable through ethical and sustainable corporate behavior. Both companies strive to be socially, environmentally and politically responsible by working to achieve a “triple-bottom line” business. A “triple bottom line” business works to create a profit for its shareholders, while protecting the environment and being socially accountable by improving the living standards of its employees and suppliers. The operations of both Seventh Generation and gDiapers focus on business, environment and social interests. Each act as a pillar that supports and strengthens the business.

a. Seventh Generation

Seventh Generation is a company that strives to provide their employees with a “flex-friendly” workplace, but they have yet to achieve certification within this field. The company was named “Best Places to Work” by Outside Magazine in 2010, proving that the company holds the comfort of its employees to a high standard. Seventh Generation’s goal is to provide their employees with great benefits and opportunities for growth. To achieve that goal, Seventh Generation provides comprehensive health insurance for all employees and their dependents, including unmarried or same sex partners. Seventh Generation also has a company wide policy

to ensure that no employee's base salary is more than fourteen times the lowest paid full time employee and no more than five times that of the average employee (Seventh Generation, 2009a).

Seventh Generation has also implemented a company wide initiative to reduce their overall carbon footprint and provides incentives for each employee to do so. Instead of spending money on other forms of offsets, Seven Generation provides loans of up to \$5,000 to employees in order to finance the purchase of more energy efficient cars, such as a Prius. Over the past three years, Seventh Generation's employees have collectively purchased twenty-six new energy efficient vehicles, which have greatly contributed to their carbon reduction goals. On average, the car mileage of the company is now thirty-nine miles per gallon, instead of eighteen miles per gallon. This initiative has more than doubled the company's fuel economy and has saved around fifteen thousand gallons of gasoline per year (Seventh Generation, 2009a).

In addition, Seventh Generation provides employees with loans of up to five thousand dollars to invest in home improvements in order to increase energy efficiency. The company also pays for household energy audits and provides each employee with five-hundred dollars in rebates for *Energy Star* appliances. Each employee has been provided by Seventh Generation with a carbon-tracking tool to help mark individual and collective improvements. Over all, Seventh Generation has been able to reduce their carbon footprint by approximately fifteen percent and some individual employees have achieved a reduction of almost forty percent (Seventh Generation, 2009a).

Seventh Generation is also dedicated to contributing to the community as a whole, and due to the fact that they are a well-established corporation, they have the resources to do so. Each employee is provided with sixteen hours of paid time-off in order to volunteer at a local organization. Collectively, Seventh Generation achieved more than 1,220 hours of volunteer work during 2009 (Seventh Generation, 2009a). The company also sponsors up to four employees each year to participate in national and international volunteer efforts. To give back to the community, Seventh Generation dedicates ten percent of its profits to the non-profit community that is working towards environmental health, as well as to other responsible business organizations working for a positive change.

There are two specific non-profits that Seventh Generation has been recently involved in. The first is a partnership with WAGES, Women’s Action to Gain Economic Security. This non-profit organization is based in San Francisco and works to help Latina women start and run their own cooperatively owned, green residential cleaning company. WAGES provides Latina women access to healthy jobs that provide fair pay and benefits, as well as a chance to build personal economic security. WAGES is a green business that works to create green jobs while protecting their workers and the environment. Seventh Generation representatives teach workers green practices by encouraging the use of safe products that are bio-degradable and do not contain any harmful ingredients, as well as conserving resources by minimizing water use and buying products with minimal packaging (WAGES, n.d.). Most importantly, this organization works to increase equity and justice towards jobs that are usually marginalized and underpaid, as well as promote environmentally safe and sustainable business practices.



Seventh Generation is also involved with the non-profit organization Baby Buggy. Baby Buggy, founded in 2001, works with a network of over fifty community-based organizations to distribute new and gently used family essentials such as diapers, strollers, cribs and clothing. This company serves approximately 1,600 families and over 2,000 children in the following six cities; Chicago, Dallas, Los Angeles, Minneapolis, New York and Washington D.C. Of these families, 30% are homeless or live in a shelter, 21% live below the federal poverty line, 25% are the working poor, and 43% are single mothers with at least one child (Baby Buggy, 2001). Seventh Generation has formed a contract with Baby Buggy, donating around five thousand diapers each year to the organization (Baby Buggy, 2001).

On the political front, Seventh Generation has been involved in recent toxic reform legislation. Seventh Generation joined the Safer Chemicals, Healthy Families Coalition to demand reform of the Toxic Substances Control Act of 1976 (TSCA). In order to spread a awareness and support for this campaign, Seventh Generation created the “Million Baby Crawl for Reform of Toxic Substances” campaign, which invites concerned citizens to create a virtual

baby who can join the virtual crawl to Washington. These virtual babies' are similar to a petition, but the image of hundreds of babies crawling towards Washington has a larger impact than a bunch of signatures at the bottom of a letter. These visuals were used to run a number of television commercials for this campaign (Seventh Generation, 2009a). On April 15th, 2010 a bill calling for a Safe Chemical Act, as well as reforms to TSCA, was introduced to the senate. These reforms would require safety testing of all industrial chemicals and would put the burden of proof on industry to prove the safety of these chemicals before they are allowed onto the market (Seventh Generation, 2010a). Changes have been implemented at the state level by new regulations, but the bill is still tied up at the federal level.

Since Seventh Generation was established in 1988, the company has evolved over time. With this time, the company has the ability to shape and define the industry standards for what constitutes a socially, environmentally and politically responsible company. Many corporations claim to be corporately responsible with sustainable business practices, but the lack of universal standards and measurements of what entails has enabled many companies to state this claim without really earning it. (Seventh Generation, 2009a). In some instances, this has allowed corporate responsibility claims to be just another form of green washing and has come to focus more on how companies are less bad, rather than companies being good.

Seventh Generation has tried to combat this problem by founding The Sustainability Consortium in 2009. This organization is a collaboration among consumer-goods companies, retailer and academic institutions that are working to build a scientific foundation for improving, measuring and reporting the sustainability of all stages of a products life cycle. This organization is striving to scientifically standardize the means to measure and report sustainability information to multiple audiences through a common system. (Arizona State University, 2011). The mission of this organization is as follows:

“Through multi-stakeholder collaboration, our mission is to design and implement credible, transparent and scalable science-based measurement and reporting systems accessible for all producers, retailers and users of consumer products.” – (ASU, AU)

This will aid consumers in making informed decisions, as well as combat confusion regarding what constitutes an actual sustainable product and what is just green-washing.

Seventh Generation has also partnered with Kaplan EduNeering to create The Online Sustainability Institute. This is an online learning program launched in 2009 that is designed to teach business strategies and sustainable practices to businesses that are interested in promoting a sustainable agenda. This Institute focuses teaching in three main areas: the development of a common framework for understanding sustainability, identifying how to integrate sustainability into a business, and the complexity of the supply chain. (Kaplan EduNeering) This institute helps to spread the concept of a sustainable triple line business and is important in helping interested companies learn how to alter their business practices and goals to create long-term economic, social and environmental viability.

b. gDiapers

gDiapers founders, Jason and Kim Graham-Nye, are originally from Australia and have committed to running their business in a manner that reflects the Australian expression “Fair Dinkum.” This phrase means “to be genuine and real, truthful and honest with everyone you may encounter” (gDiapers, 2011a) and is the grounding philosophy that runs gDiapers. As a company that revolves around the production of children’s diapers, gDiapers is determined to create a product that will not damage the world that the babies who are wearing their product will inherit.

“As a socially responsible company, we make sure all of our stakeholders are respected and treated fairly as well. We ensure that the people who make our little gPants are treated fairly and that working conditions are continuously being approved. We care about everyone involved in our business People, Planet, Profit = Fair Dinkum.” (gDiapers Inc.)

An important aspect of being a socially responsible corporation is providing a fair and safe workplace for all employees, which has been a goal of gDiapers since its conception (gDiapers, 2011a). gDiapers is a Flex-Friendly Certified company, which receives help to “promote themselves to candidates and consumers while learning best practices from other savvy employers” (Seibel, n.d.). In addition, the Flex-Friendly Certificate “help[s] organizations develop business strategies to maximize performance using their most important resource—their human capital” (Seibel, n.d.). A flexible work arrangement allows employees to

alter the time and place to work on a regular basis, allowing for flexibility in the amount of hours worked, flexibility in scheduling and flexibility in the place of work, such as working from home or from a satellite connection. A flexible work environment is beneficial for any workplace, creating healthier and happier employees, as well as reducing costs related to absenteeism and reducing the turnover rate within companies (Seibel, n.d.). Since gDiapers has implemented this type of working environment, they have maintained a near zero attrition rate, which is the continuous wearing down or weakening of a company do to the gradual reduction of the work force as personal resign or retire (Seibel, n.d.).

The cost of replacing an employee is estimated to be 1.5 times the annual salary of that employee; The Flex-Friendly environment helps gDiapers avoid these internal costs (Seibel, n.d.). This flexible framework is imperative to create a vibrant and productive workforce, create a reciprocal, trusting relationship within the industry, and allows for employees to finish their work when it makes the most sense for them. Some 'gTeam' employees will work four longer days in the office, in order to have a three day weekend with their families, while others will work two days in the office and three days from home (gDiapers, 2011a). Most employees will leave the office early in order to be home with their families, and then log back on to finish their work from home after the kids have gone to bed (gDiapers, 2011a).

The importance that gDiapers stresses upon family is shown within the physical office as well. Parents working at the company are encouraged to bring their children to work with them, as an on-site childcare and education center are provided. gDiapers has formed a partnership with Growing Seeds, a leading company fostering early childhood development. Growing Seeds



provides year round education for children aged six-weeks to kindergarten (Growing Seeds Inc., 2004). The mission Growing Seeds is to nurture a happy future for their students by fostering respect for each other and for the environment at an early age. gDiapers strives to take care of their employees because the company understands that work and family should be intertwined cooperatively, not in continual conflict (gDiapers, 2011a).

c. B-Corporations

In the realm of corporate responsibility and accountability, both businesses are committed to sustainable, ethical and transparent behavior. gDiapers and Seventh Generation are both Certified Beneficial-Corporations (B-Corporations), which is critical in supporting the companies' mission of achieving a bottom line business. Seventh Generation is actually one of the founding B-Corporations and their business practices have been critical in setting standards for measuring and achieving corporate responsibility in the United States. Fairly new to the market, gDiapers has already achieved B-Corporation Certification and are continuously striving to achieve and push the boundaries of these standards.

Certified B-Corporations are emerging businesses that seek to use the power of business to solve social and environmental problems, with the main unifying goal of redefining how success is perceived within the business cycle. These B-Corporations are required to meet rigorous and advanced standards of social and environmental performance, accountability and transparency as well as to meet higher legal accountability standards. B-Corporations provide individuals with greater economic opportunities, better places to work, stronger global communities as well as working towards a more positive environmental footprint (B-Lab, 2011a).



B-Corporations address two critical problems that are prevalent within our current economy. First, current corporate law and practices make it difficult for businesses to take community and environmental interests into consideration when making business decisions. Second, the lack of transparency required of most businesses make it increasingly difficult for consumers to identify the difference between an 'actual good business' and one that just has extremely good marketing techniques (B-Lab, 2011a). In order to address these two conflicts, B-Corporations have expanded corporate accountability so they are required to run their business in a way that is good for society on a whole, not just the company's shareholders and bottom line.

B-Lab is a non-profit organization that certifies businesses as B-Corporations. B-Lab works in a similar fashion to the way TransFair certifies Fair Trade Coffee or how the US Green Building Council certifies LEED buildings. B-Lab implements the use of a Global Impact Investing Rating System (GIIRS) to assess the social and environmental impacts associated with

companies. These ratings consist of specific ratings in 15 sub-categories and key performance indicators relevant to the company's industry, geography, size and social mission, establishing an overall rating. In order for a company to be eligible for B-Corporation certification, they must score an eighty or above on their GIIRS (B Lab, 2011c).

The following are the results of 2010 G-Diapers and Seventh Generations GIIRS:

		2010	
2010 Rating: 103.3			
<i>Rating Details</i>		Points Earned	% Points Available
<i>Accountability</i>	Area of Excellence*	8.2	82 %
Governance		5	83 %
Transparency		3.2	80 %
<i>Employees</i>	Area of Excellence*	33.3	68 %
Compensation & Benefits		19.4	65 %
Employee Ownership		6.3	63 %
Work Environment		7.6	87 %
<i>Consumers</i>		14.9	50 %
Benefit Products or Services		14.9	49 %
<i>Community</i>		15.6	39 %
Suppliers		7.4	74 %
Local		2	20 %
Diversity		2.7	27 %
Charity / Services		3.5	35 %
<i>Environment</i>	Area of Excellence*	31.3	68 %
Facilities		9.6	83 %
Energy Usage		4	50 %
Supply Chain		17.7	67 %
Manufacturing		n/a	n/a
<i>Total</i>		103.3	

b.

Figure 8: gDiapers (B Lab, 2011b)

2007		2010	
2010 Rating: 111			
<i>Rating Details</i>		Points Earned	% Points Available
Accountability	<i>Area of Excellence*</i>	7.6	76 %
Governance		4.6	77 %
Transparency		3	74 %
Employees	<i>Area of Excellence*</i>	33.3	68 %
Compensation & Benefits		20	67 %
Employee Ownership		6.3	63 %
Work Environment		7	80 %
Consumers		15	50 %
Benefit Products or Services		15	50 %
Community		24.3	51 %
Suppliers		4.7	49 %
Local		3	30 %
Diversity		1.4	14 %
Charity / Services		7.2	72 %
Beneficial Business Model		8	
Environment	<i>Area of Excellence*</i>	30.8	62 %
Facilities		8.3	70 %
Energy Usage		2.9	37 %
Supply Chain		19.5	65 %
Manufacturing		n/a	n/a
Total		111	

Figure 9: Seventh Generation (B Lab, 2011d)

VII. Recommendations

From a sustainability standpoint, we have decided to recommend gDiapers because they are cradle to cradle certified and they do have versatility in providing both a compostable component and a longer-lasting, durable fabric part. It's a hybrid product that combines the best elements of both cloth and disposable diapers. For further research, we recommend looking into the amount of water and detergent used for laundering the outer cover, as this would need to be taken into account. The frequency of washing and the efficiency of machines would be variable by households, but it is important data to gather. Another factor to consider is how receptive consumers will be to gDiapers given the extra effort required to use the product as intended and if the consumers really do flush or compost the liner versus throwing it in the trash. However, even if the compostable liner ends up being thrown away, the liner alone is less mass in a landfill than a full diaper. In terms of cost, Seventh Generation is slightly cheaper by selling forty-four diapers for \$12.99. gDiapers charges \$20.00 for the reusable g-pant and the compostable liners cost \$15.00 for forty liners. Since most families will need more than one g-pant, the initial cost is an investment more expensive than purchasing Seventh Generation diapers.

In order to move the diaper industry toward low environmental impact production, policies such as taxing disposable diapers could push consumers toward using products like gDiapers. Federal regulations that implement market-wide standards for the materials used in diapers, such as tax credits for reducing the amount of non-biodegradable materials within the diaper by 20%, could be an effective way to inspire producers to make a more environmentally-sound product. The government could also demand that companies must have all the materials used in the diaper tested for toxicity, use elemental-free chlorine, and adopt basic cradle-to-cradle practices, such as using renewable energy to power production, by 2035. The diaper industry is rapidly advancing and Europe especially is doing research on how to use biopolymers for diapers. Perhaps within the next few years this technology will become refined and more widely available so that companies may begin to use alternative materials in diaper manufacturing such as plant-based adhesives for diaper straps or FSC certified wood fluff pulp. With new technological advancements, we're optimistic about the future of diapers.

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Diaper Group: Project Roles

Alie was responsible for writing the introduction and background information on Seventh Generation and gDiapers. She also compiled everyone's sections, added images, made the title page, table of contents and prepared the bibliography using each member's sources. She also worked with the other members of the group to write the recommendations section of the paper.

C.J. contributed the Materials Assessment section for gDiapers. He researched the materials and environmental impacts of gDiapers as well as e-mailed the company to acquire more information

Emily researched and wrote the Cradle-to-Cradle section.

Katie contributed the Materials Assessment section for Seventh Generation. She contacted company representatives through both phone and email, and made extensive use of the information provided on their website. She thoroughly researched the chemistry behind the product's components and the ways in which the diaper is made. She did all of the writing and research for this section.

McKenna researched and wrote the Social and Political Implications section.

For the PowerPoint and presentation, each group member played an equal part in the creation. Each member contributed information toward the slide content and spoke to the class.