

# Recycling Is Good. Reusing Is Better.

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## TABLE OF CONTENT

INTRODUCTION.....	2
OVERVIEW .....	2
BENEFIT OF RECYCLING PAPER .....	2
SUSTAINABILITY CHALLENGE .....	3
THE COST OF RECYCLING PAPER .....	3
THE RECYCLING ALTERNATIVE .....	3
THE WEIGHT OF 100 BILLION CORRUGATED BOXES .....	3
STRATEGIC RECOMMENDATIONS .....	4
CHANGING THE STORY WITH REUSING.....	4
CHANGING THE STORY WITH PROLONGED AND SHORTENED LIFE-SPAN .....	5
CHANGING THE STORY WITH NEW BUSINESSES .....	5
CONCLUSION .....	6
WORKS CITED .....	7

# Introduction

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## **Overview**

Lots of corrugated boxes are used every year. In the United States, the number totals to approximately 100 billion corrugated boxes.<sup>2</sup> With the US population being 327.2 million in 2018, each person uses 306 boxes per year or about five boxes per week. These corrugated boxes are used to ship products such as food, shoes, music instruments, electronics, and many other things. Similar to single-use plastic, corrugated boxes are used only one time. These boxes are often discarded in the recycling bin to be recycled. Recycling paper comes with a lot of benefits like saving fuel and water, but often times the boxes that are discarded is in good condition to be reused.

This research paper has three objectives. The first objective examines the possibility of reusing corrugated boxes by comparing the cost of recycling corrugated boxes to the cost of reusing corrugated boxes. The second objective is to address the needs for reusing materials/products as a sustainability challenge. Lastly, the third objective is to develop plans to overcome these challenges.

*\*For simplicity, this research paper will refer to paper, cardboard, corrugated boxes, and paper packaging as one entity. These words are used interchangeably. The reason for making this assumption is that even though paper, cardboard, and corrugated boxes have different unit weight, they would likely have the same material to product efficiency if they are made in the same paper mills.*

## **Benefit of Recycling Paper**

Recycling paper has many major benefits. Recycling cardboard saves lots of resources compared to making new cardboard: “25% in energy saving, 50% less in sulfur dioxide emission, 46 gallons of oil, 4000kW of electricity, 6.6 million Btu’s of energy, 9 cubic yards of landfill space, and 17 trees and 7000 gallons of water”.<sup>2</sup> Making new cardboard from recycled cardboard also has an incredibly shorter production time of 14 days. The process of making new cardboard raw materials, which require logging, material processing, then manufacturing along with transportation time in between production stages, would take months at a time.

All these benefits of recycling paper are undeniable. However, these numbers do not tell the whole story. For example, if 10,000kW is required to make new cardboards from raw materials and 25% of this energy is saved, it means 7,500kW is required to make new cardboards from recycled cardboards. Similarly, a large amount of water that can be saved by using recycled cardboards to make new cardboards, there is likely a larger amount of water that is spent in this process. Saving 25% of energy can easily be a waste of effort if like-new cardboards are discarded and remade a short amount of time. Following the above example, recycling and remaking cardboards for the second time will increase the energy use to 15,000kW. Clearly, speeding up recycling only consumes more energy.

Even though recycling is a good solution that keeps waste out of landfill, it is an energy-intensive process. Recycling process can also waste perfectly good products. A closer look at the cost of recycling will tell a more complete picture of the recycling process.

# Sustainability Challenge

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## ***The Cost of Recycling Paper***

“An estimated 15,000 gallons of water is used for every ton of pulp produced,” according to the article “Water – Meeting Paper’s Need”.<sup>8</sup> 15,000 gallons of water is equivalent to 57 tons of water, which makes that water use to pulp production ratio 57 tons to 1 ton. According to the article “Hidden Water in Everyday Products”, every pound of recycled newspaper can reduce water use in paper production by 3.5 gallons.<sup>7</sup> In terms of water saving, 3.5 gallons of water to 1 pound of paper is equivalent to 21 tons of water to 1 ton of paper. This means that 36 tons of water is required to produce 1 ton of paper, which is 21 tons less of 57 tons. If paper production is equivalent to the production of corrugated boxes and if recycled corrugated boxes are used to make new corrugated boxes, 190 million tons of corrugated boxes require approximately 6.8 billion tons or cubic meter of water, or 1.8 trillion gallons of water.

## ***The Recycling Alternative***

For comparison, one pair of shoes requires 2,257 gallons of water.<sup>4</sup> According to World Footwear, 23 billion pairs of shoes were produced in 2015 alone; that’s 52 trillion gallons of water spent just for making shoes.<sup>9</sup> Looking from people’s perspective, if each person drinks the recommended half a gallon of water per day with the world population currently at 9.7 billion people<sup>10</sup>, the amount of water required to keep everyone alive for a full year is closed to 1.8 trillion gallons of water, rivaling the water spent to make 190 million tons of corrugated paper.

Regardless of perspectives, 1.8 trillion gallons of water is a tremendous amount that is unnecessarily spent. Instead of using this precious water, corrugated boxes can be reused at the cost of zero gallon of water.

## ***The Weight of 100 Billion Corrugated Boxes***

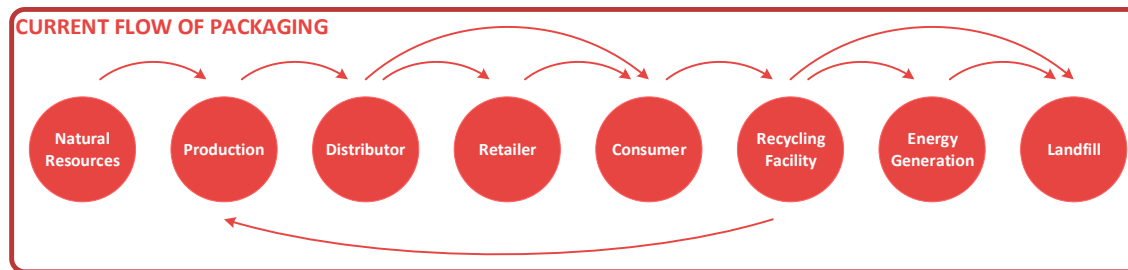
To determine the average size box, corrugated boxes from Uline are investigated. Uline has many sizes for corrugated box. These sizes are categorized into seven groups along with the available quantities: 3”-8” (166), 9”-11” (170), 12”-13” (189), 14”-17” (301), 18”-23” (350), 24”-26” (223), and 27”-48+” (261). For simplification, the average size box is estimated to be the largest size in the category with the largest available quantity, which has the dimensions: 23” x 23” x 23”.<sup>3</sup> The surface area of the average size box, including flaps on the top and bottom of the box, is eight pieces of 23” x 23”, or 4,232 squared inches.

The 23” x 23” x 23” from Uline weighs 38 pounds in a bundle of ten. Each of these corrugated boxes weighs 3.8 pounds.<sup>1</sup> If all 100 billion corrugated boxes are 23” x 23” x 23” boxes from Uline, the total weight would be 380 billion pounds, or 190,000,000 tons. Since 850 million tons of paper and cardboard are thrown away annually, all 190,000,000 tons of corrugated boxes are assumed to be thrown away after single-use.

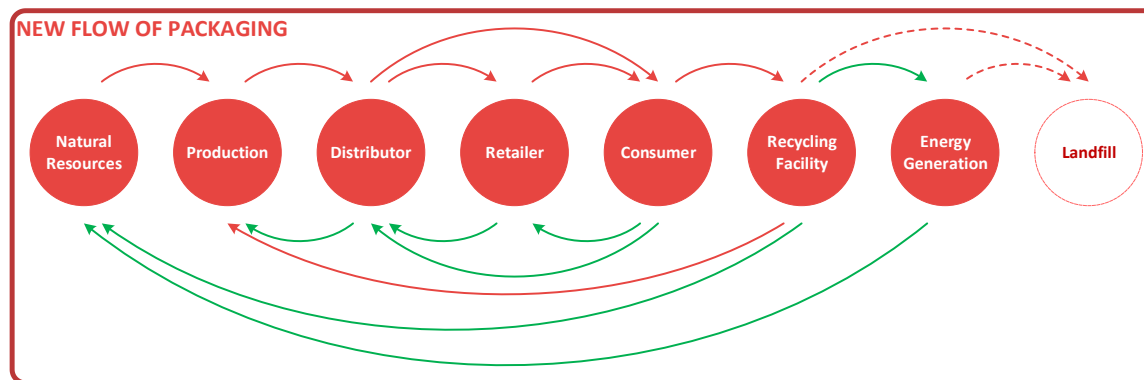
# Strategic Recommendations

## *Changing the Story with Reusing*

Instead of being recycled, cardboard and corrugated boxes are collected to be reused. To understand how recollection works, the distribution of packaging is first captured. Corrugated boxes are used for packaging and transporting goods, protecting goods from being damaged. This packaging is made from natural resources, is sent to a product manufacturing site to be loaded with goods, and is transported to retailer and to consumers. Retailers and consumers often do not find good purposes for using these boxes ending up putting them into recycling bins. More often than not, these boxes are in good condition, hardly worn-out. If corrugated boxes ever make their way to recycling facilities, they will likely end up in paper mills to be made into new corrugated boxes (or be burned to generate energy or be sent to landfill). This process, as discovered in the previous sections, is energy intensive and water intensive.



Corrugated boxes can be collected through the same distribution channel. There are a few scenarios in which this packaging recollection scheme can be accomplished. *Below is the proposed solution.*



At the retailer level, corrugated boxes (shipper packaging) and cardboard boxes (products' primary packaging) can be reshipped to distributors, which can then be returned to manufacturers for reuse. Cardboard boxes, having been inside corrugated boxes during transport and storage, are hardly exposed to the environment (i.e. sunlight, moisture, etc.) remain in good condition until consumers make a purchase. These cardboard boxes are light in weight and do not occupy much space. The thickness of a cardboard paper, for example, can be about 0.01 inch. This means that a 2-inch wide box can store 100 of the same, unfolded and flattened boxes.

At the consumer level, consumers can bring their own containers to stores or markets, eliminating the need to take extra packaging home. In this way, there is no post-consumer packaging that is lost to recycle system. No fuel is used to collect this packaging.

### ***Changing the Story with Prolonged and Shortened Life-span***

The life-span of packaging can be designed to vary based on its purpose. Corrugated boxes can be made to last because their purpose, protecting goods during transport and storage, does not change. Because corrugated boxes require more materials to be made than other paper products, having to remake corrugated boxes will cost more resources. The lifespan of corrugated boxes can be prolonged using protective coating. Protective coating works like wall-paint, which can be applied onto corrugated boxes' external surface. One gallon can of paint can cover up to 400 square feet, which is enough to cover a small room like a bathroom. Considering only the external surface of the 23" x 23" x 23" box or 3174 square inches, a one gallon can of paint (or protective coating) can cover up to 18 boxes. Older boxes can also be rerated to store smaller weights, further prolong their life-span.

On the contrary, the lifespan of secondary packaging (the packaging that is indirect contact with food) can be significantly shorter than the lifespan of corrugated boxes and cardboard. Secondary packaging is meant to be discarded once the food inside it is transferred to containers.

### ***Changing the Story with New Businesses***

Like recycling, there can be new businesses that collect recyclables for reusing purposes. They can work directly with retailers and consumers to recollect paper packaging where many corrugated boxes are often discarded. These businesses can act as distributors whose purpose is to move packaging where it is needed. They can also act as recyclers, sorting out unusable packaging. These packaging boxes can be sorted by different categories such as new, like-new, or downgrade. Downgrade means that these boxes can be reused but not for the full weight carrying capability that they are designed for. Corrugated boxes can even be lent or rent and recollected as soon as they serve no purpose for retailers or consumers. Sharing reusable boxes ensure boxes are used efficiently and effectively, reducing future production of boxes and preventing boxes from unnecessarily be recycled.

# Conclusion

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Even though recycling prevents landfill and pollution to the environment, it is an energy intensive and water intensive process. Remaking 190 million tons of corrugated paper consumes 1.8 trillion gallons of water, the same amount of water that can feed everyone on Earth for a full year. Recollecting and reusing, on the contrary, does not require excessive use of energy and water. Recollecting packaging is simple to move packaging from places where it is not needed to places where it is needed. Recollecting can occur at the retailer level or consumer level, increasing the chance of packaging being reused. Packaging such as corrugated boxes can have longer lifespan by applying protective coating. A useful and long-life packaging can help reduce waste and cost at all levels from resource extraction, production, consumption, recycle, and disposal. Overall, if recycling paper can save 25% of energy use, reusing paper can save the rest.

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