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Scenarios of Sustainable Water Use in the Garment Manufacturing and Beverage Industries in 2030

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Abstract: Several industries have a very high water footprint and are responsible for the drain on water resources on the planet. Due to existing global water shortages and the ever-increasing demand for water, these industries have started adopting new designs and innovations resulting in significant changes in the way water is used. In this paper, we explore the current state of the high water footprint in garment manufacturing and beverage industries and examine innovations in these industries. We then derive from these trends and technologies a forecast through scenarios on how water use in these industries will shape up in the future by the year 2030.

Key words: water footprint, waterless dyeing, beverage industry, 'innovate to zero', forecast, scenarios for 2030

1. Introduction

The water crisis has been identified as the number one crisis facing the world we live in today as started by the World Economic Forum's report in 2015. Another report by the WEF, Water Security: The Water-Food-Energy-Climate Nexus, predicts that water demand is expected to exceed supply by over 40% by 2030. A step back is required on this topic of sustainability, to consider life on the Earth holistically, understanding linkages between industries, food, energy, climate, as well as the role of human intervention in all of these. In this paper, we explore two industries that have caused a significant drain on water resources, the garment manufacturing and beverage industries. However, innovations such as waterless dyeing, waterless cleaning and technologies that gives access to safe drinking water anywhere, will be drivers for changes in both industries. We therefore examine the

current trends of water usage in these industries with specific emphasis on the technologies used to minimize water use.

2. Garment Manufacturing and Water Consumption

2.1 The Innovations: Waterless Dyeing and Waterless Cleaning

With respect to the industries, first, we examine the garment product lifecycle and water consumption. Garment manufacturing, especially the dyeing process, is highly water-intensive and is known to release toxic chemicals that pollute natural water. For example, one t-shirt is made with around 700 gallons of water, of which the largest percentage is used for dyeing. With waterless dyeing technologies such as AirDye and DyeCoo being adopted by brands like Nike and Adidas, we can see a trend in minimization of water use in garment manufacturing. Further, in the product lifecycle for a pair of jeans, as opposed to 6% of water that goes into manufacturing, a large percentage, that is, 45% of water, is used in the washing of a pair of jeans. Waterless cleaning innovations in the form of polymer bead cleaning systems exist however, this isn't widely available yet. Based on these two innovations in waterless dyeing and waterless cleaning of garments, we extrapolate a future scenario in 2030 when waterless technology would have reduced water consumption in this industry to virtually zero. This would change the way consumers of garments experience them, in terms of new ways of washing garments without water, which for example, might make detergent manufacturers redundant. Further, we forecast the rising cost of garments along with curbs on excessive consumption of clothes.

2.2 Figure

Here is an example of the amount of water used in the manufacture of a pair of jeans with the possibility of innovating to zero if new technologies are adopted for dyeing and cleaning. Note that the percentage of water used for growing cotton can also be reduced through innovations in garment recycling.

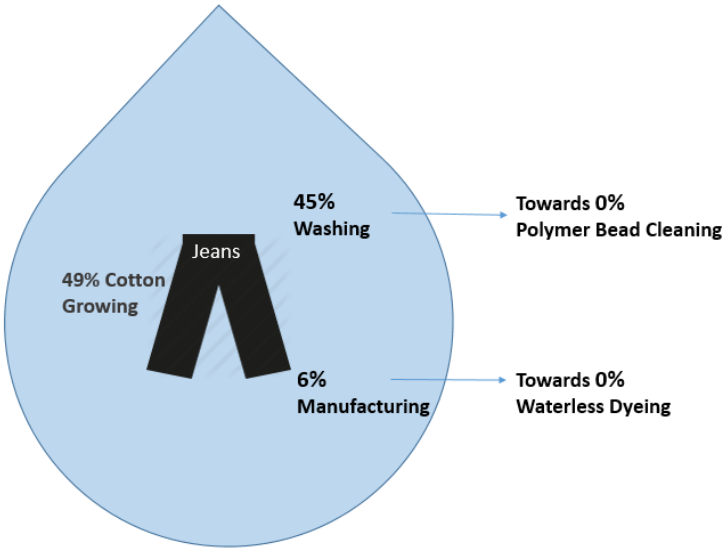

Figure.1 Percentage of Water Consumption in the Manufacture of a Pair of Jeans, and depiction of the innovation to zero related to cleaning and dyeing innovations

2.3 Scenarios for Clothing/Waterless Dyeing in 2030

After the invention of waterless dyeing processes, most fabric manufacturers now have close to zero water consumption throughout manufacturing. Clothes that consume excess water in the "finishing process" (cleaning), such as denim, are no longer in existence. Further, washing any fabric itself has become an entirely waterless activity, with the invention of systems such as polymer bead cleaning. Finally, ownership of clothing itself is highly regulated with heavy fines for owning over a certain number of clothes and recycling is encouraged, to minimize water in the manufacturing process. With 3D printers in homes, used clothes will be recycled into new ones without water, rather than purchased. Other impacts will follow from these scenarios such as the detergent manufacturers will become redundant; high-energy consuming machine dryers will not be needed in case of waterless cleaning; recycled, highly durable clothing will become fashionable. Finally, all cleaning will start to lose its traditional association with water.

3. The Beverage Industry

3.1 Water Consumption and Conservation Laws

Next, we examine the beverage industry, which has a distinct physical and reputational reliance on water since water is the single largest ingredient used. The largest part of the total water footprint of a beverage is in the process of producing the agricultural

ingredients (supply chain), not in the direct operations of manufacturing and processing. The soft drinks sector faces significant challenges to become part of the solution by finding ways to capitalize on a growing need for healthier, more sustainable beverage options. Limited availability of freshwater puts high pressure on industrial activities and often increases operational costs of the plants; and is further reinforced by environmental regulations related with stringent wastewater treatment such as nutrient removal increases the need of proper wastewater and sludge treatment to limit progressing decline in freshwater quality. Increasing cost of process water and wastewater discharge tariffs, stricter environmental legislation, progressing water stress and rising social awareness on water footprint of industrial operations are forcing food and beverage manufacturers to adapt very strict water conservation programs. We foresee a future where, due to an increase in water conservation laws and as a result of depleting freshwater resources, beverage industries have to lower their scale. Speculating from this possibility, we put forward future scenarios in 2030, when water usage laws would have resulted in the beverage and carbonated drinks industry becoming virtually extinct, and explore how this would affect lifestyles and urban environment.

3.2 Figure

This figure shows how if a typical bathtub contains 90 liters of water, we consume about two or three bathtubs full of water when drinking a bottle of cola. The water usage in manufacturing process and transport covered are responsible for the high water footprint of the beverage industry.

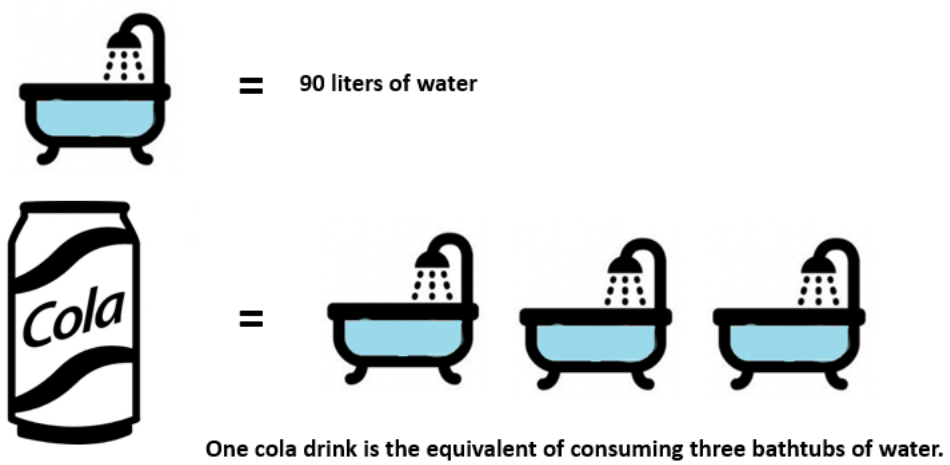

Figure.2 Actual Water Consumption on Consuming a Cola Beverage

3.3 Scenarios for the Beverage Industry in 2030

Beverage industries have been responsible for severe water pollution, which eventually led to most bottling plants being shut down by 2030 due to pressure from the government and environmentally groups. Water and water by-products are exorbitantly priced. The flavor of vintage carbonated beverages/soft drinks gains absolute exclusivity, packaged and sold as very expensive perfumes, mists, maybe even fragrant candles, to reminisce and relive the flavors and memories of now-extinct carbonated drinks. With no bottled water, people carry their own beverage bottles made of sustainable materials. Manufacture of thermoses, air-tight containers, water bottles integrated with clothing, have gained a great market share as it is an absolute necessity to have water-tight, leak proof, carrier bottles and storage units, both for personal and community usage. Aerated beverage companies of the past are now entering a new market to develop products like water desalinizing bottles, life-straws which cleanse any undrinkable water to make it drinkable, and sustainable water carriers, which are now part of everyday objects.

4. Conclusion

Through the futuristic scenarios in relation to the garment manufacturing and beverage industries, we propose that these industries with a high water footprint will have to use innovations as well as change their course of action in order to become sustainable and to treat water as a precious commodity. Through our scenarios in 2030, we visualize a future where industries will be forced to ‘innovate to zero’ in order to meet the needs of the planet.

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