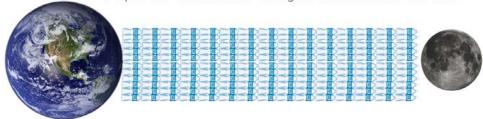
Life cycle impacts of a water bottle By William Martin, Yanchao He, and Tianyi Lu

We all know that drinking enough water is critical for our health, but what about the health of the planet and society? It turns out your choice of drinking vessel has a big impact on the health of the planet and society. To find out just how big that impact was we performed a social and environmental LCA for an aluminum water bottle from Hit Promotional products. The environmental LCA compared the impact of the production of this aluminum water bottle against the impact of a disposable water bottle from deer park. The two were compared using a functional unit equal to the volume of the aluminum water bottle (.75 liters). The social LCA will look at where the component materials for the aluminum water bottle are sourced from, manufactured, and assembled to give an idea of how people are being treated all along the supply chain. We hope this information will help inform your decision to use a reusable or disposable bottle.

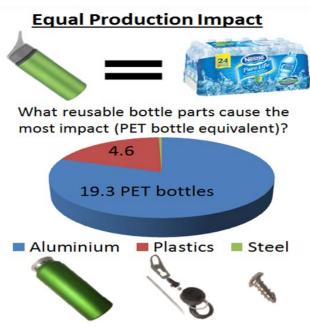
22 Billion disposable water bottles were used last year.

Stacked on top of one another that's enough to reach the moon 11 times



To perform the environmental LCA for the water bottle we first got an idea for the maximum scope of the analysis using the Economic Input-Output Life Cycle Assessment (EIO-LCA) method from Carnegie Mellon [6]. This gave us the upper limit on the scope for this LCA. After carefully considering the possible results we decided that the most equitable way to compare the deer park water bottles with our aluminum water bottle was to perform a

Cradle to Gate analysis. This method was chosen because the two products could theoretically be shipped anywhere in the world and the results might vary depending on where they end up. We will include the use phase of the two bottles in addition to the Cradle to Gate analysis separately to give some idea of the other effects that need to be considered when buying a water bottle. The LCA analysis was performed in SimaPro using the ReCiPe Endpoint (H) V1.13 / Europe ReCiPe H/A method [1]. We modeled the production chain for the aluminum bottle based on the bill of materials and used Simapro's internal function for PET bottles to compare the impact of the two products using milli-points [3][1]. It was found that the production of one aluminum water bottle has the same environmental impact as production twentyfour disposable bottles.



However, we assumed that the aluminum bottle would be reused every day for three years and that each person would drink one bottle a day (.75 liter) and use .1 liters for cleaning a day. This means that over the course of three years the reusable water bottle could replace 1642 deer park bottles while using 110 liters of water for cleaning. From the environmental LCA it is clear that for your own health and the health of the planet the aluminum bottle is better.

During Use Phase

110 liters of wash water and 1 aluminum bottle

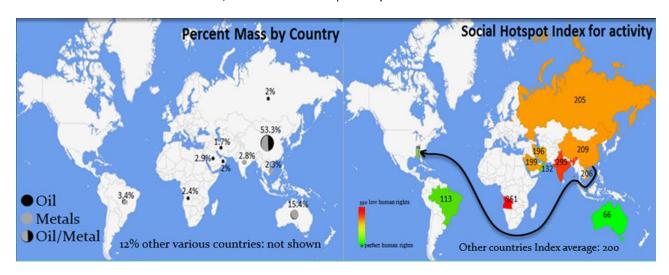
1642 PET bottles



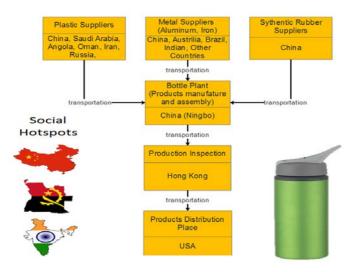
Replaces



But hold on! We don't just care about the planet people live on, but also the condition that people are living in. To measure the aluminum water bottle's impact on global wellbeing we performed a social LCA with the help of socialhotspot.org [2]. To perform this we first figured out where all the component materials for the aluminum water bottle were coming from by using the observatory for economic complexity [7]. We found that China, Saudi Arabia, Angola, Oman, Iran, Russia, Australia, Brazil, India, Vietnam, and other countries were all involved in providing the raw materials for the bottle in ratios of 53.28%, 2.9%, 2.36%, 1.99%, 1.67%, 1.99%, 15.44%, 3.43%, 2.79%, 2.29%, and 11.86% respectively. We used socialhotspot.org to find a normalized index indicating the relative working conditions of people in those countries these conditions can be seen in the infographic [2]. We also looked at the index for manufacturing in China, and the sales and disposal in the United States those index values were 226.53, 64.04 and 65.79 respectively.



We can see that the working conditions in China, India and especially Angola have the highest indices at 209, 295, and 351 respectively. Thus, manufacturers and purchasers should check the corporate social responsibility reports and efforts of companies sourcing these materials from these countries. The deer park water bottles are manufactured in factories all around the world including Italy, China, and Argentina [8][9]. We hope that these two LCAs will help you to make a more informed decision when choosing a water drinking vessel.



Disclaimer: The results in this study are estimated using assumptions and available data. They do not claim to be definitive measures of any particular producer's impacts.

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Experimental verification for washing water bottles in MRDC bathroom

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