THE ENVIRONMENTAL IMPACT OF RESCUING AND RECYCLING SOAP FACTORY WASTE

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Eco-Soap Bank |
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Introduction

The natural world we all rely on for survival is being detrimentally affected by an ever-intensifying portfolio of human activities. Climate change and increased freshwater scarcity has been directly connected to this expanding anthropogenic transformation,[1] and the need to contain and mitigate the fallout of human activities becomes more urgent for every year that passes.

Children are the least responsible for these changes, yet they are the most susceptible to its impact. Water shortage has become one of the most pressing and serious issues facing our planet today, and around 420 million children are currently exposed to either high, or extremely high, water vulnerability – meaning they simply do not have enough water to meet their daily needs. 820 million children are highly exposed to heatwaves. 570 million children are vulnerable to some form of flooding. 600 million are highly exposed to vector borne disease (malaria, dengue fever, etc.) carried by mosquitoes thriving in an increasingly hot and humid climate. 349 million people are suffering from food insecurity, with children being most affected by the consistent lack of nutrients. All numbers are expected to rise as a direct consequence of further climate change.[2]

To ensure a sustainable environment for future generations, every sector of society has a responsibility to do its utmost to reduce waste, greenhouse gas emissions, and freshwater usage.

This, of course, includes the soap manufacturing industry.

Every year, the soap manufacturing industry produces and directly discards perfectly usable soap "scraps" equivalent to around 410 million soap bars.[3] The raw material extraction and manufacturing processes associated with these wasted resources – consisting mainly of deformed bars and soap shavings – creates large water and carbon footprints. To help the industry reduce its environmental footprint, more needs to be done to save and utilize these valuable resources.

Eco-Soap Bank is a non-profit organization trying to reduce soap factory waste and redistribute recycled soap to at-risk communities. Within the next five-year period, the organization aims to expand its reach and rescue, recycle, and redistribute 80% of the global soap factory waste stream.

To better understand the impact of these efforts, this report briefly outlines the environmental footprint created by the yearly stream of soap factory waste and explores the gains that can be made by expanding attempts to reduce it.

[1] A. Ertug Erchin & Arjen Y. Hoekstra (2012): *Carbon and Water Footprints: Concepts, Methodologies and Policy Responses*, United Nation World Water Assessment Program
[2] UNICEF (2021): *The Climate Crisis is a Child Rights Crisis: Introducing the Children's Climate Risk Index*. New York: United Nations Children's Fund (UNICEF); UNICEF (2023): *Water and the Global Climate Crisis: 10 Things You Should Know*, available at, https://www.unicef.org/stories/water-and-climate-change-10-things-you-should-know, [last accessed 2023-02-15]; World Food Program et al. (2009): *Climate Change, Food Insecurity and Hunger*, available at: https://interagencystandingcommittee.org/system/files/legacy_files/IASC%20submission%20on%20CC%2C%20food%20insecurity%20and%20hunger.pdf [last accessed 2023-02-15]; World Food Program (WFP) (2023): *A Global Food Crisis*, available at: https://www.wfp.org/global-hunger-crisis, [last accessed 2023-02-15]
[3] 8.2 million tons of bars soap was produced globally in 2024. Out of that, 25,3% was handwashing soap bars, 62,5% bathing/body bars, and 12,2% specialty bars (organic, therapeutical, etc.). Focusing on handwashing soap bars only and assuming an industrial production scrap rate of 2% (which is in the lower range of accepted industry standard ratio of maximum 5%), this equates to ≈ 41,000 metric tons, or 410 million 100-gram soap bars. (8,200,000×0,253×0.02×1000) /1000 = 414 920 000. See: IndexBox (2025): World - Soap And Organic Surface-Active Products In Bars - Market Analysis, Forecast, Size, Trends And Insights, available at: https://www.indexbox.io/blog/soap-in-bars-world-market-overview-2024-5/?utm_source=chatgpt.com; Future Market Insights Inc. (2025): Bar Soap Market, available at: https://www.futuremarketinsights.com/reports/bar-soap-market?utm_source=chatgpt.com; Shoplogix (2024): Understanding Scrap Rate: Key Insights and Strategies; available at: https://shoplogix.com/scrap-rate/?utm_source=chatgpt.com

Focusing exclusively on raw material extraction, processing, and soap production process, we find that the production of 1 kilo of bar soap is estimated to generate around 1,6 kg of carbon dioxide equivalents emissions (CO_2e) and consume 4.48 liters of freshwater. Rescuing and recycling the entirety of the yearly soap factory waste stream would thus result in **annual** gross savings of approximately **65 million kilos of CO_2e** and **184 million liters of freshwater**. Considering the latest calculations regarding the social costs of carbon dioxide emissions[4] – i.e. the monetary value of the damages to society caused by a metric ton of CO2 emissions - the emission savings alone would be valued at **over 12 million USD a year**.

The Eco-Soap Bank Soap Recycling Model

Eco-Soap Bank is a non-profit organization employing disadvantaged women to rescue and recycle leftover soap waste from factories and redistribute it among at-risk communities. By harnessing the value of a previously wasted resource, the organization is working to 1) reduce soap industry waste, water footprints, and carbon emissions 2) create new good-wage employment opportunities for women in low-income countries, and 3) produce affordable high-quality recycled soap products that contribute directly in critical settings towards the fight against one of the world's most damaging and overlooked humanitarian disasters – hygiene-related illnesses and deaths.

Through evidence-based programming, Eco-Soap Bank is focused on making recycled soap specifically targeted at the world's most vulnerable populations. The recycled soap bars are on average 57% cheaper than commercial alternatives globally. Soap distribution initiatives implemented by the organization – creating sustainable handwashing solutions for at-risk populations – have been found to increase handwashing at key events by as much as 72%, while reducing the risk of preventable illnesses (diarrhea, respiratory illness, fever etc.) with up to 43%.[5] Meanwhile, women in Eco-Soap Bank's employment and training programs have reported significant increases in key economic empowerment dimensions, including a 73% average increase in personal savings.[6] By investing directly in women – making them the agents of change – Eco-Soap Bank is working to make communities cleaner, healthier, more egalitarian, and more economically secure.

1. Manufactures high-quality bar soap at a fraction of the usual cost, passing savings onto NGOs and low-income consumers
2. Reduces soap industry waste and environmental footprints
3. Creates good-wage employment and training opportunities for women in low-income countries
4. Produces innovative recycled soap products designed to instill sustainable handwashing behavioral change

[4] See: Rennert, Kevin et al. (2022): Comprehensive Evidence Implies a Higher Social Cost of CO2, *Nature*, Vol. 681, pp. 687-692
[5] Full report available on request
[6] Full report available on request

How Eco-Soap Bank works:

1. We collect truckloads of virgin soap scrap from partner factories.
2. We hire and train marginalized women to recycle the soap into high-quality soap bars and innovative nudge products to instill and sustain long-term handwashing habits.
3. We donate and sell soap at ultra-affordable rates to under-resourced institutions (schools, clinics), aid organizations, and in communities via last-mile retail microenterprises led by women.
4. The more soap scrap we collect and recycle, the more we can help reduce the environmental footprint of the soap manufacturing industry, create employment for marginalized women, and distribute soap to people in dire need.

Eco-Soap Bank currently operates 4 sustainable soap recycling hubs in Africa and Asia, employing 175 women. To date, the organization has rescued over 80,000,000 bars worth of leftover soap scraps and reached over 20 million people in 25 countries with soap and hygiene education.

The Carbon and Water Footprint of Soap Manufacturing

Carbon and water footprints are conceptual tools developed to gain better understanding of the environmental implications of human activities. A carbon footprint is defined as the impact on the environment in terms of greenhouse gas emissions - mainly measured in terms of carbon dioxide (CO_2) or carbon dioxide equivalents (CO_2e) emissions. CO_2e is mostly used as a measurement since it provides a more accurate representation by also encompassing other emission sources with similar negative environmental impacts as CO_2.[7]

The water footprint represents the total volume of freshwater use associated with a product or activity. Since water is consumed in different ways, the concept is usually summarized in terms of a blue, green, and grey water footprint. The blue footprint represents the use of surface and groundwater resources, the green refers to the consumption of rainwater stored in the soil as soil moisture, and the grey illustrates pollution by measuring the volume of freshwater needed to dilute the pollutants engendered by a product. [8]

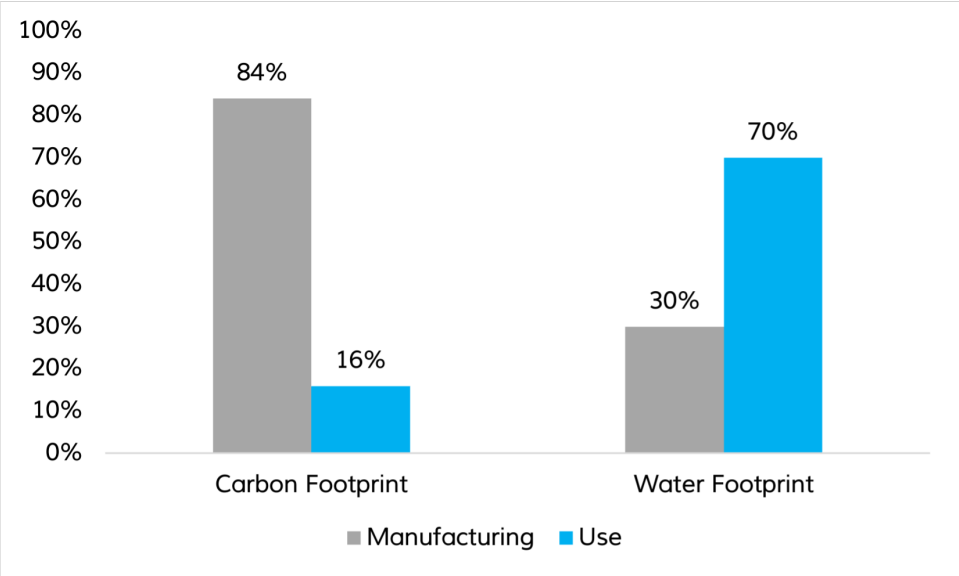
When the carbon and water footprint tools are applied to the soap industry, it illustrates how soap manufacturing can produce a quite significant environmental footprint.

Traditional soap bars are made from a raw material base consisting of vegetable or animal fats – tallow, palm oil, etc. – that has been saponified to release fatty acids. After saponification, the fatty acids are dried and mixed with fragrances, colorants, and other artificial enhancers before ultimately being pressed into uniform bars. The manufacturing process is predominantly constituted by the mixing of raw materials and chemicals with water. The main energy input is attributed to the heating, blending, and pressing of the ingredients.[9]

Studies show that a majority of a soap bar's negative environmental footprint is engendered during the raw material extraction and manufacturing process. The graph below shows the proportion of the footprint associated with the manufacturing versus the end-usage (consumption) stage of a soap bar's life cycle. While the water footprint is higher at the usage stage, it should be noted that this footprint is almost entirely constituted by the volume of water used to wash hands,[10] and hence represents an unavoidable aspect of handwashing practices.

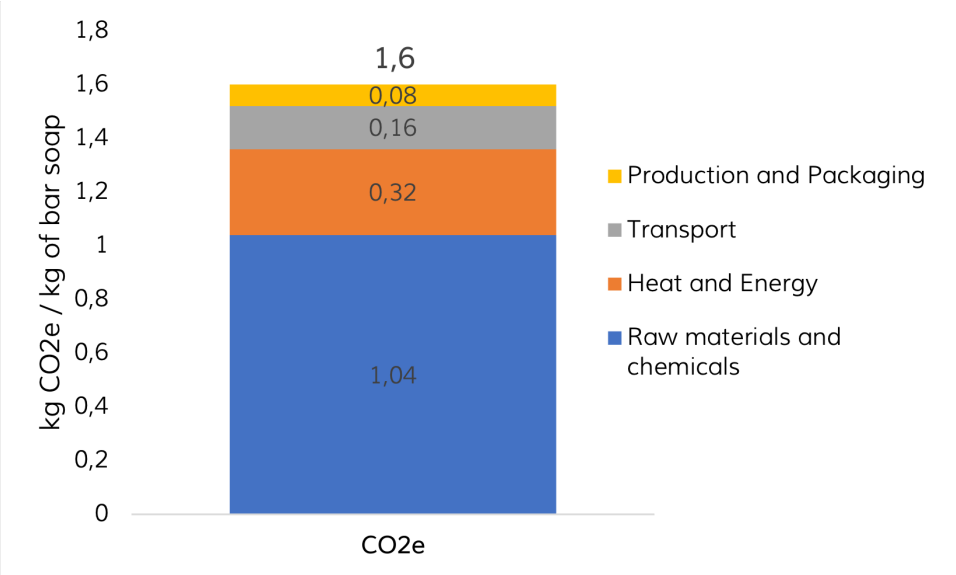
[7] A. Ertug Erchin & Arjen Y. Hoekstra (2012): *Carbon and Water Footprints: Concepts, Methodologies and Policy Responses*, United Nation World Water Assessment Program
[8] A. Ertug Erchin & Arjen Y. Hoekstra (2012): *Carbon and Water Footprints: Concepts, Methodologies and Policy Responses*, United Nation World Water Assessment Program
[9] Marta Escamilla et al (2012), *Revision of European Ecolabel Criteria for Soaps, Shampoos and Hair Conditioners: Preliminary Results from the Technical Analysis*, Joint Research Centre - European Commission, pp. 26
[10] Francke I.C.M & Castro J.F.W. (2013): Carbon and Water Footprint Analysis of a Soap Bar produced by Natura Cosmetics, *Water Resource and Industry*, Vol. 1, pp. 37-48

Figure 1. Share of environmental footprint produced during manufacturing vs. use[11]



Soap bars are made using a variety of ingredients - both natural and chemical – but the main source of carbon emission is attributed to the cultivation and processing of raw materials. Such materials can be either plant or animal based, but they all require a considerable input of energy to farm and harvest. When analyzing the environmental impact of these processes, life cycle studies – focusing on different raw materials bases and manufacturing facilities – have found that the raw material extraction and manufacturing stages of a soap bar produce on average **1.6 kilogram of CO_2e** per **1 kilogram** of finished product.

Figure 2. CO_2e emissions associated with the manufacturing of 1 kg of finished bar soap (kg of CO_2e / kg of soap)[12]



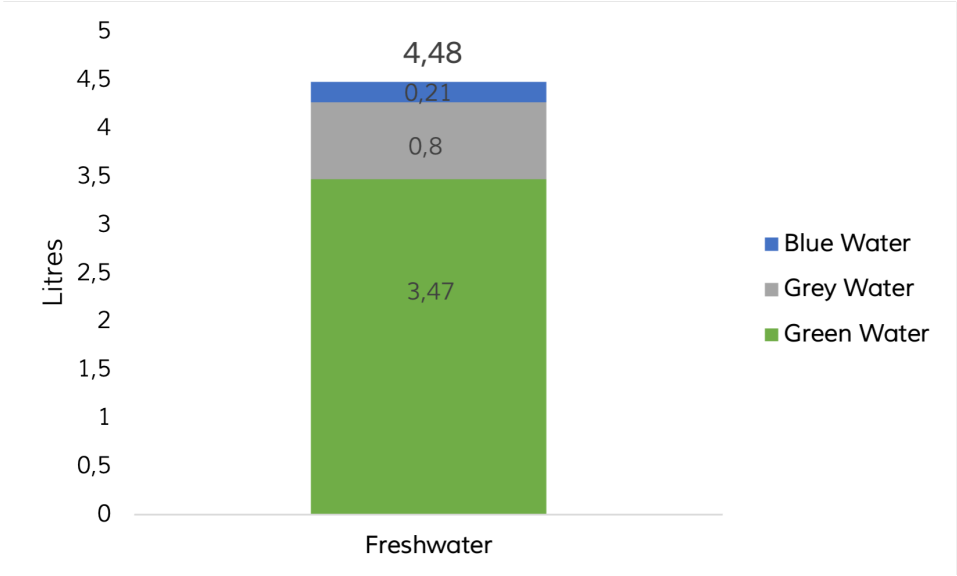
Raw material extraction is thus the major source of CO_2e emission, and it also generates a large water footprint. This footprint is mainly constituted by the green water consumption occurring during the cultivation and harvesting of the raw materials. Including both the farming and subsequent

[11] Francke I.C.M & Castro J.F.W. (2013): Carbon and Water Footprint Analysis of a Soap Bar produced by Natura Cosmetics, *Water Resource and Industry*, Vol. 1, pp. 37-48

[12] Decimal values in charts follow European notation (comma as decimal separator). The results represent a conservative approximation based on data from: Science and Technology for Humanitarian Action Challenges (HAC) (2025): *Life Cycle Assessment of Body Soap Bars Project: Accelerating the Reduction of the Environmental Impact of Humanitarian Action*, Version 1.0; Francke I.C.M & Castro J.F.W. (2013): Carbon and Water Footprint Analysis of a Soap Bar produced by Natura Cosmetics, *Water Resource and Industry*, Vol. 1, pp. 37-48; Koehler, Anette & Wildbolz, Caroline (2009): Comparing the Environmental Footprint of Home-Care and Personal-Hygiene Products: The Relevance of Different Life-Cycle Phases, *Environmental Science and Technology*, Vol. 43, No. 2, pp. 8643-8651; Witlox Kasja, Keller Regula, Jungbluth Niels: A LCA Case Study on Handwashing with Liquid and Bar Soap, *ESU-Services*, available at: https://esu-services.ch/publications/;

manufacturing processes into calculations, it is estimated to take approximately **4.48 liters of freshwater** to produce **1 kg of finished soap bars**.[13]

Figure 3. Freshwater usage associated with the manufacturing of 1 kg of finished bar soap (liters/kg of soap)



The Environmental Impact of Industrial Soap Waste Reductions

Due in large parts to a resource-intensive raw material extraction and processing phase, wasted soap generates a significant environmental footprint. As shown above, every kilo of soap waste that is being directly discarded into landfills has emitted approximately 1.6 kg of harmful CO_2e and consumed 4.48 liters of freshwater. All to no benefit at all for end-users.

Every year, soap factories throw away over 41,000 metric tons of fully usable soap scraps. When considering these staggering volumes, it is clear that enhanced efforts to rescue and reduce soap waste can lead to significant CO_2e and freshwater savings. Raw material extraction and processing constitute the bulk of the negative environmental footprint, which strongly emphasizes the need to ensure that these resources do not go to waste.

Within a five-year period, Eco-Soap Bank aims to expand operations to rescue, recycle, and redistribute at least 80% of the soap scraps generated annually by the soap manufacturing industry. If 100% of the annual waste stream was successfully rescued and put back into circulation, it would result in gross savings of approximately **65 million kilos** of CO_2e and **184 million liters** of freshwater.

Figure 4 and 5 illustrate the environmental savings associated with different levels of success. Figure 6 incorporates the latest calculations regarding the social cost of carbon dioxide emissions – i.e., the monetary value of the damages to society created by carbon dioxide emissions – to put a value (USD) on the gains that can be made through these waste reductions. The most recent social damage models estimated that the cost of carbon dioxide emissions is around $185 per metric ton.[14]

Figure 4. Yearly CO_2e emission saved by rescuing 0 to 100% of global soap waste (kilos)

[13] Francke I.C.M & Castro J.F.W. (2013): Carbon and Water Footprint Analysis of a Soap Bar produced by Natura Cosmetics, *Water Resource and Industry*, Vol. 1, pp. 37-48
[14] Rennert, Kevin et al. (2022): Comprehensive Evidence Implies a Higher Social Cost of CO2, *Nature*, Vol. 681, pp. 687-692

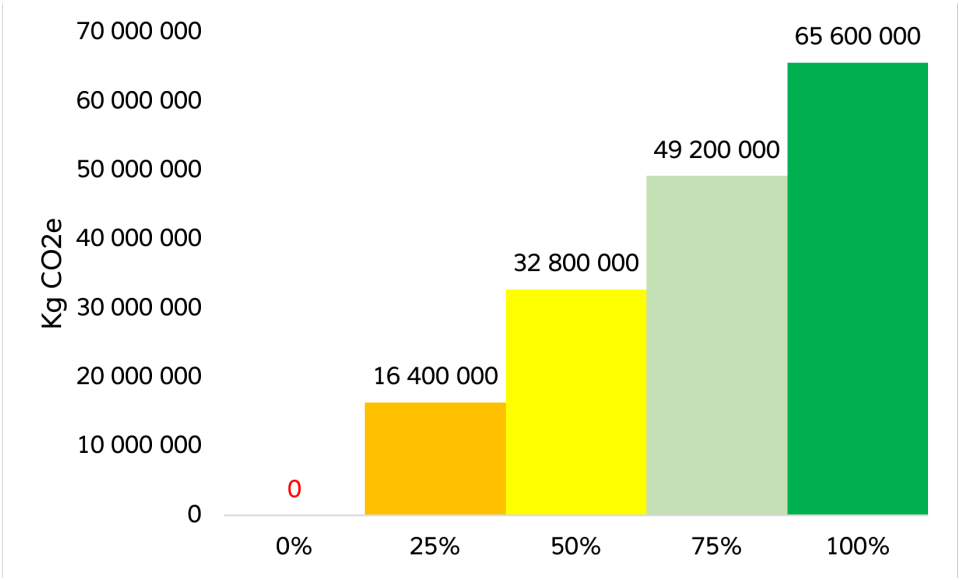


Figure 5. Yearly freshwater use saved by rescuing 0 to 100% of global soap waste (liters)

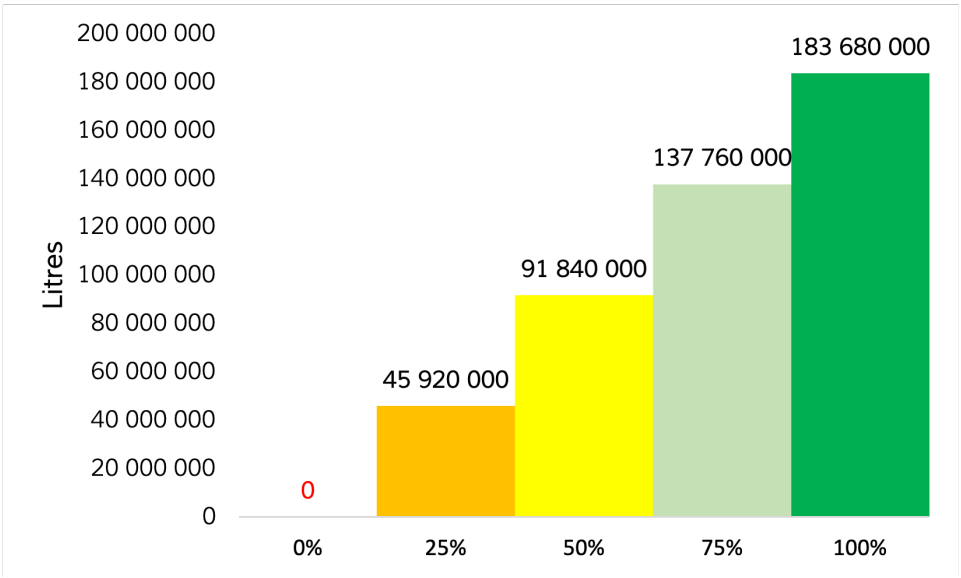
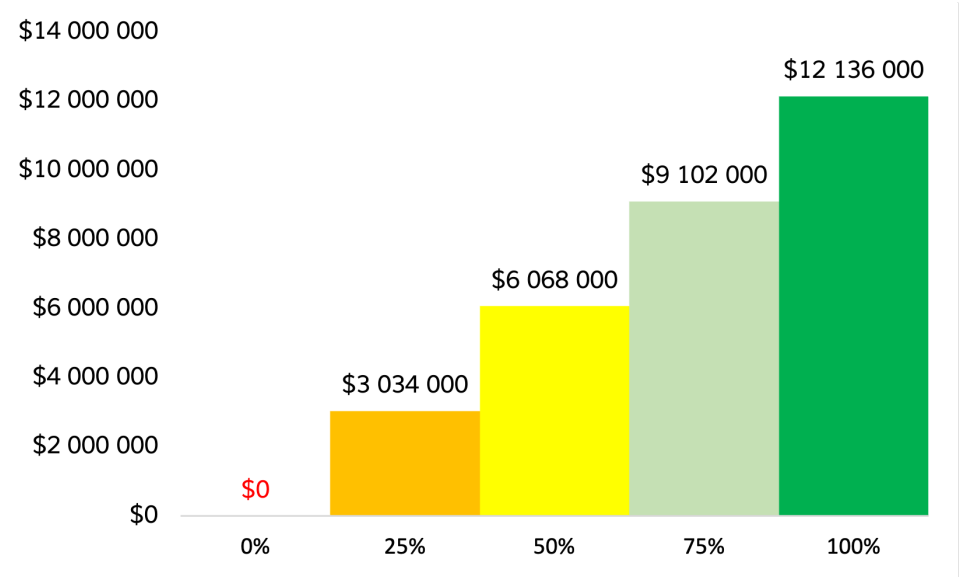


Figure 6. Yearly monetary savings (USD) associated with 0 to 100% reduction of soap waste related carbon dioxide emissions



Conclusions

Reducing greenhouse gas emissions and freshwater waste are key measures to lay foundations for a more sustainable future. The purpose of this brief report has been to shine the spotlight on the environmental implications of the unnecessary waste stream engendered by the soap manufacturing industry. Not in any way to limit the manufacturing of this essential, lifesaving product, but to highlight the urgent need to stop wasting it and start harnessing the full value of all that is being produced.

Today, the soap industry waste stream means that massive volumes of CO_2e are being generated, and millions of liters of freshwater consumed, to no benefit at all. Ending soap waste would represent a crucial step towards a more sustainable industry and future. This simple act would not only stop an unnecessary waste of natural resources, but by recycling and redirecting the soap towards at-risk communities, it can also be utilized to combat the prevailing prevalence of preventable illnesses and deaths among vulnerable populations.

Soap is a lifesaving hygiene tool that remains sadly inaccessible to many segments of the global population. 2 billion people are currently excluded from basic access to soap for handwashing[15] - resulting in an unmitigated spread of highly preventable deadly and debilitating illnesses (mainly among young children).[16]

Improving access to soap for handwashing is not only a desirable aim – it is an urgent part of global poverty reduction attempts. With better opportunities for handwashing among children and vulnerable populations, millions of lives,[17] and billions of dollars,[18] a year can be saved as a direct consequence of reduced disease burdens. For individual families, reducing disease burdens will help improve the development of young children, increase school attendances, and allow impoverished households to save money for other activities (e.g., productive investments, education, and food).[19] All this assures that vulnerable groups become better situated to forge new pathways out of poverty.

[15] UN Water (2023): "Handwashing/Hand hygiene", available at https://www.unwater.org/water-facts/handhygiene/
[16] Townsend et al (2017): Costs of diarrhoea and acute respiratory infection attributable to not handwashing the cases of India and China, *Tropical Medicine and International Health*, Vol. 22
[17] GHP (2020):Global Handwashing Day 2020, Fact Sheet, available at: https://globalhandwashing.org/wp-content/uploads/2020/09/GHD-2020-Fact-Sheet-English.pdf; Ross et al (2021Costs of hand hygiene for all in household settings - estimating the price tag for the 46 least developed countries, New York UNICEF
[18] Townsend et al (2017): Costs of diarrhoea and acute respiratory infection attributable to not handwashing the cases of India and China, Tropical Medicine and International Health, Vol. 22
[19] See pp. 145-146, Biran et al (2014): Effect of a behaviour-change intervention on handwashing with soap in India (SuperAmma): a cluster-randomised trial, Lancet Global Health, Vol. 2; See pp. 74, Townsend et al (2017): Costs of diarrhoea and acute respiratory infection attributable to not handwashing: the cases of India and China, Tropical Medicine and International Health, Vol. 22, No. 1