Patagonia and other apparel companies can proactively address environmental impacts during the design phase of products by using alternative material and dye technologies.

There is a tension between assumed company growth (orange) and the GHG savings rate (teal), which poses a challenge to reducing net GHG emissions.

Implementing the recommended strategy decreases the GHG intensity of Patagonia’s entire product portfolio as the 31 product swaps occur over the 15-year timeframe (left). When the GHG intensities are applied to the mass of products (right), GHG emissions are lower but continue to rise with annual growth.

To understand the full scope of apparel production’s environmental impacts, other categories, such as water scarcity and eutrophication, should be analyzed. Considering these other impacts may yield different product change recommendations.

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More information about the project can be found at https://sustainapparel.wixsite.com/groupproject or by contacting gp-sustainapparel@bren.ucsb.edu.
61 changes in raw material source, dye technology, or a combination of the two were identified for various products in Patagonia’s portfolio. The graphic below illustrates how these product swaps work.

For each product swap, the GHG intensity of an existing material or dye technology was swapped for the alternative GHG intensity, and the resulting change in GHG emissions was calculated. The GHG intensity is the rate of GHG emissions per unit of material. By multiplying the GHG intensity by the mass of the products, the result is GHG emissions.

GHG Intensity (kg CO\(_2\)e/ kg material) x Product Mass (kg material) = GHG Emissions (kg CO\(_2\)e)

The GHG intensities (kg CO\(_2\)e/kg material) of conventional and alternative technologies: raw materials (left) and dyes (right).

While 51 of the product swaps decreased GHG intensity, 10 product swaps made the impacted products more GHG intensive.

The graphs above show changes in GHG intensity (kg CO\(_2\)e/kg material) for material (left) and dye (right) technologies. Decreases in GHG intensity are below the x-axis and increases are above. Changes in raw materials led to the reduction of GHG intensities in 39 product swaps. Changes in dye technologies led to the reduction of GHG intensities in 16 product swaps.

Changes in GHG intensity, multiplied by the mass of products impacted in each product swap, determine changes in GHG emissions. All product masses increase exponentially with company growth.

This is an example of GHG emissions savings (tonnes CO\(_2\)e) from one product swap. Once the change occurred in 2020, there was an immediate decrease in GHG emissions. As more products are sold over time, GHG emissions continue to increase exponentially.