

Results of Our Environmental Impact



OUR IMPACT AT A GLANCE

Colorifix dyeing versus conventional methods results in:

-77%

use of
water

-80%

use of
chemicals

-71%

use of
natural gas

-31%

contribution to
global warming

-53%

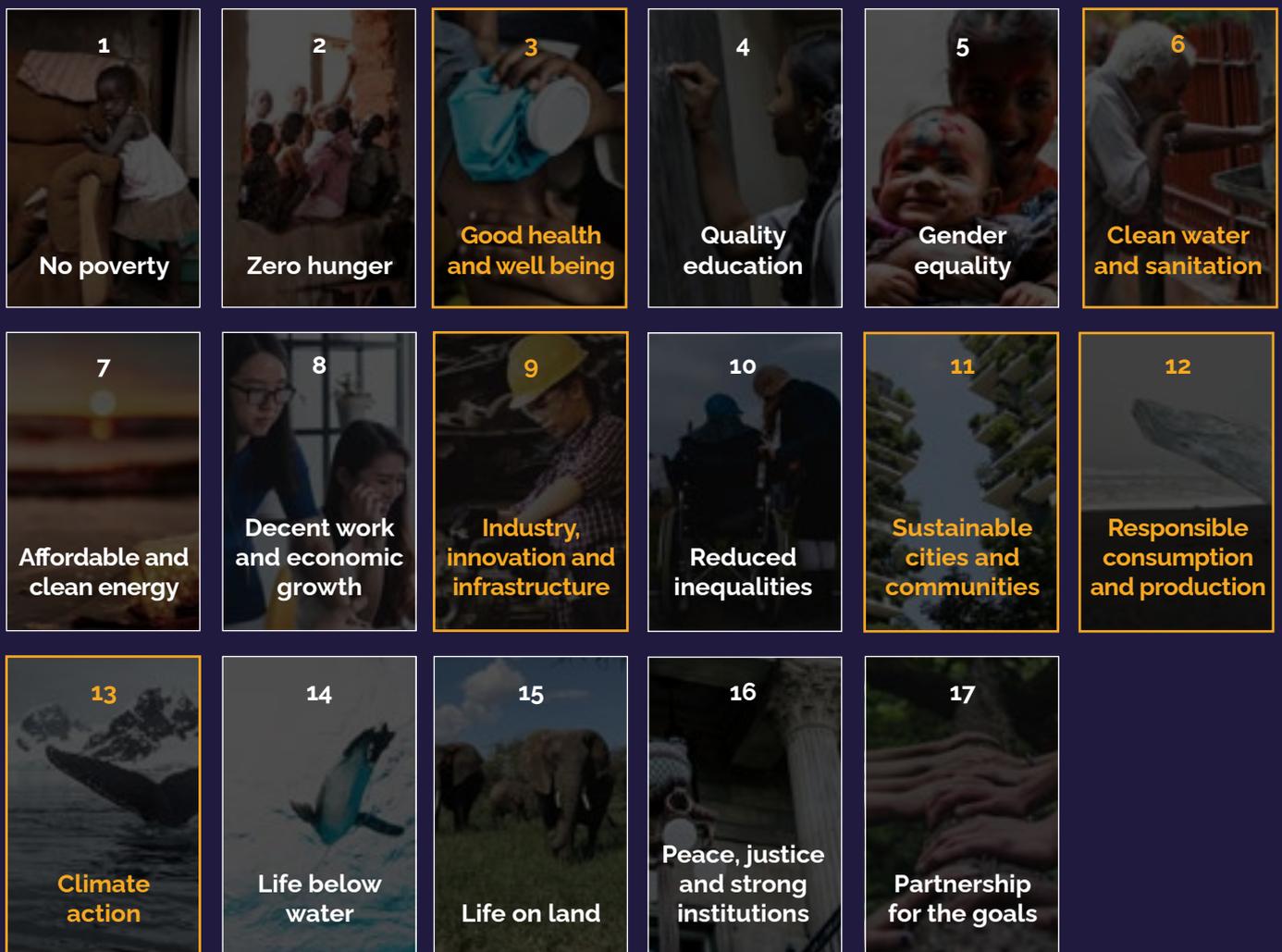
use of
energy

Figures include dyeing and final washing stages and exclude half bleaching stage

OUR IMPACT AT A GLANCE

Our contribution to the United Nations Sustainable Development Goals

Through our products and operations we are working to deliver the UN SDG's highlighted in yellow below.



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INTRODUCTION



Colorifix® lab in our headquarters in Norwich, UK

Summary: Results to shout about

The results are in! Our most recent environmental impact assessment demonstrates that the Colorifix dyeing process is significantly less harmful to the environment across a range of measures. These results encourage a much-expanded role for Colorifix technology at a time when sustainable practices are more important than ever to apparel makers and consumers alike.

“The Colorifix dyeing process is significantly less harmful to the environment across a range of measures.”

About Colorifix and the dyeing industry

Most of the clothes we wear and the fabrics we use are coloured with synthetic dyes that have a negative impact on the environment around us. The textile dyeing industry has grown by using heavy metals, harsh and often toxic chemicals, and large amounts of water and power. Conventional methods of chemical synthesis and colour-fixing are simply not sustainable — especially on the scale the industry has reached today.

Colorifix is dedicated to developing an environmentally friendly way to create and fix colour. While our technology is advanced, our goal has always been simple: create colours the natural way, as nature does it. Our biological process starts with DNA sequences from a wide variety of organisms. We recreate leaf green, canary yellow, or pebble grey in the most literal sense, then turn these pigments into dyes using microorganisms.

Colorifix's environmental footprint

The Colorifix process is inherently more eco-friendly than conventional textile dyeing. It combines pigment production and dyeing in a single process that uses plant-based, renewable feedstocks; lowers usage of water and other resources; and virtually eliminates the use of toxic chemicals.

With sustainability in mind, we are trying to further understand the impact of our production on resource usage as well as land and water systems. To do this we commissioned a Life Cycle Assessment in 2022. The results are the core of this report.

Life Cycle Assessments

A Life Cycle Assessment (LCA) is a quantitative analysis of environmental impact at every stage of a product's value chain. It analyses impact holistically from inputs like grain, water or petrochemicals through to production, transportation, and the stages where it is used by people and discarded as waste.

The scope of this LCA focuses on the dyeing process, where we can make a direct comparison to conventional dyeing with hard numbers. It includes methods like half bleaching that are part of the dyeing process but outside of Colorifix's control. The assessment does not consider the full life cycle of the dyed textile itself, as it is used and then discarded.

Test providers and key factors

We performed the tests at a dye house in Portugal that provides services for leading fashion brands. **Piep**, a Portugal-based



Dyeing at Colorifix® pilot plant in Cambridge, UK

industrial testing specialist, worked with a team of sub-specialists including **Sinambi** for energy consumption and air emissions and **Pimenta do Vale** for wastewater analysis.

Key test factors included:

- A functional unit of 1kg of jersey knit, made of 52% recycled cotton and 48% recycled polyester
- Knit dyed purple with Colorifix-patented bacteria STCX231
- A standard mix of renewable and nonrenewable energy from Portugal's electricity grid
- Verified transportation distances between suppliers and the dyeing facility
- All stages of the fermentation process included
- Textile waste excluded

PROCESS

The dyeing process

The Colorifix process is similar to that of conventional dyeing. Both use inputs like energy, steam, and water and emit wastewater and air emissions. Production starts with half bleaching, when the fabric's natural colour is removed so that it can absorb a dye. Next comes the dyeing stage, when a pigment is fixed to the fabric. A final stage of washing helps set the dye and prepares the fabric for processing.

But there are two key differences.

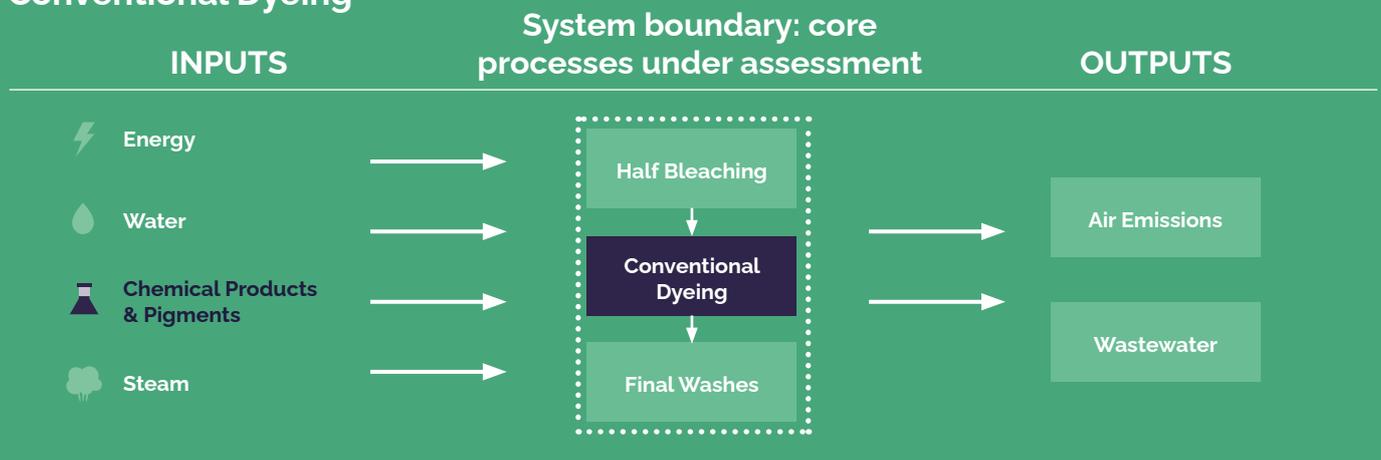
Inputs stage: Colorifix creates pigments through fermentation. The conventional process, on the other hand, makes pigments with synthesised dyes that require toxic and carcinogenic chemicals.

Dyeing stage: Colorifix uses microorganisms that bind pigments to textiles through their natural concentrations of metal salts like magnesium. To achieve the same results the conventional process requires high amounts of added salts and other chemicals.

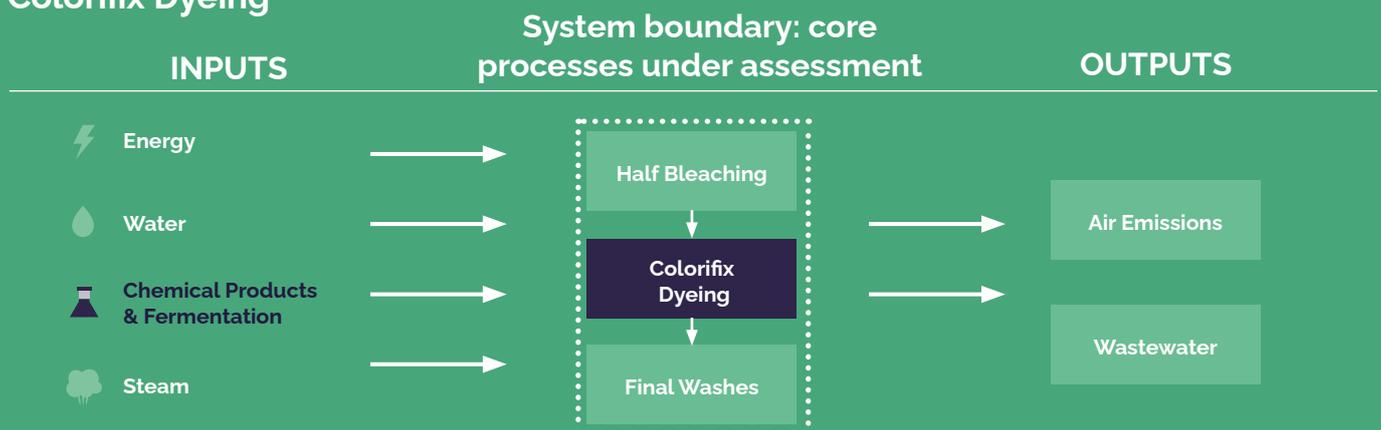
A note on half bleaching

While the half-bleaching stage is run by the dye house rather than Colorifix, it is included here for transparency. Half bleaching is an essential step in preparing a textile for dyeing. The impact of upstream processes like this shows where the industry as a whole could make textile dyeing more sustainable.

Conventional Dyeing



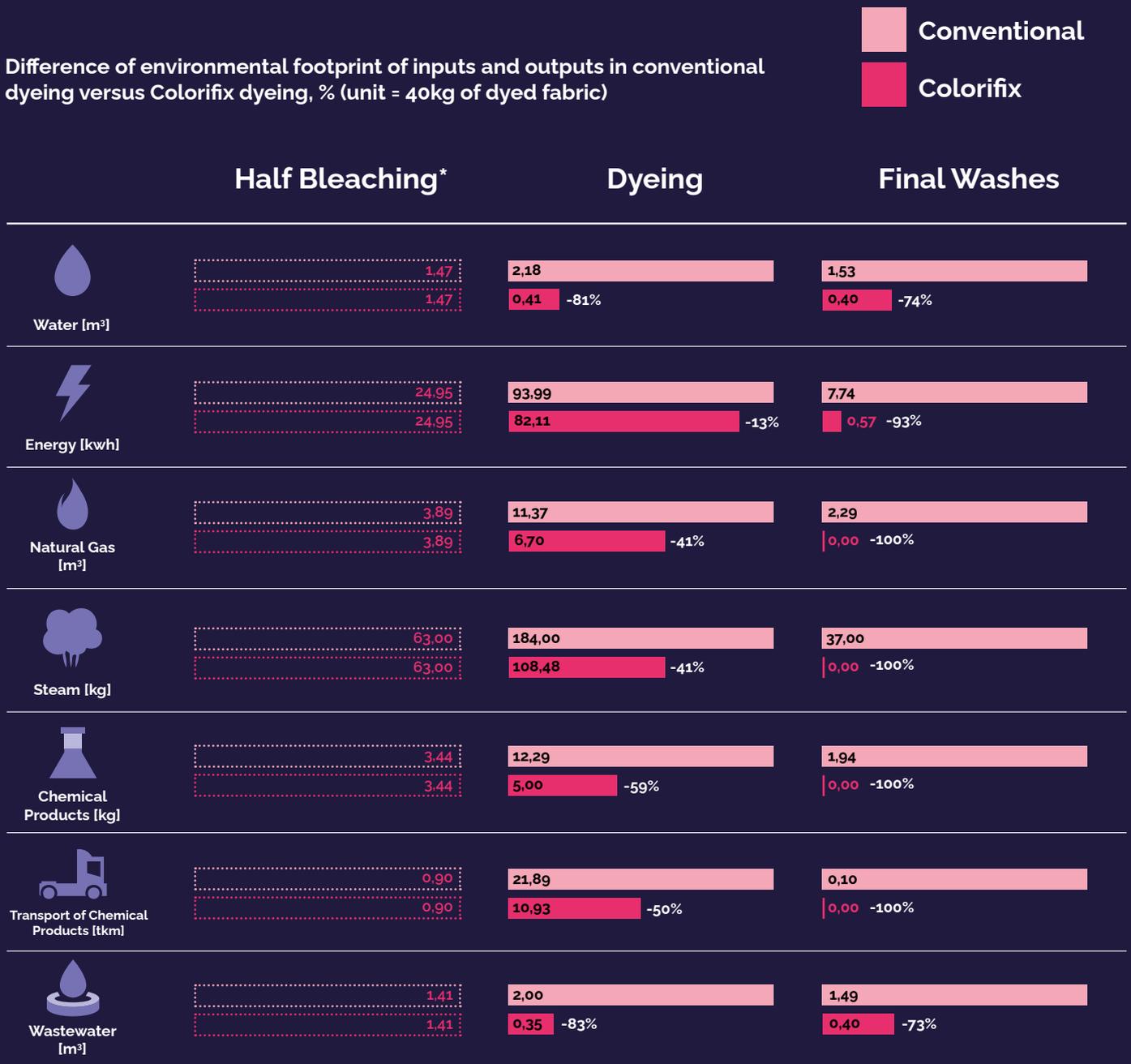
Colorifix Dyeing



RESULTS

Environmental footprint, inputs and outputs

At the dyeing stage Colorifix uses less energy, natural gas, and chemicals and markedly less water — which results in less wastewater. At the final washing stage Colorifix drastically reduces energy and wholly eliminates chemicals and other inputs.



*Half bleaching stage is run by the dye house

RESULTS

Environmental impact, per stage

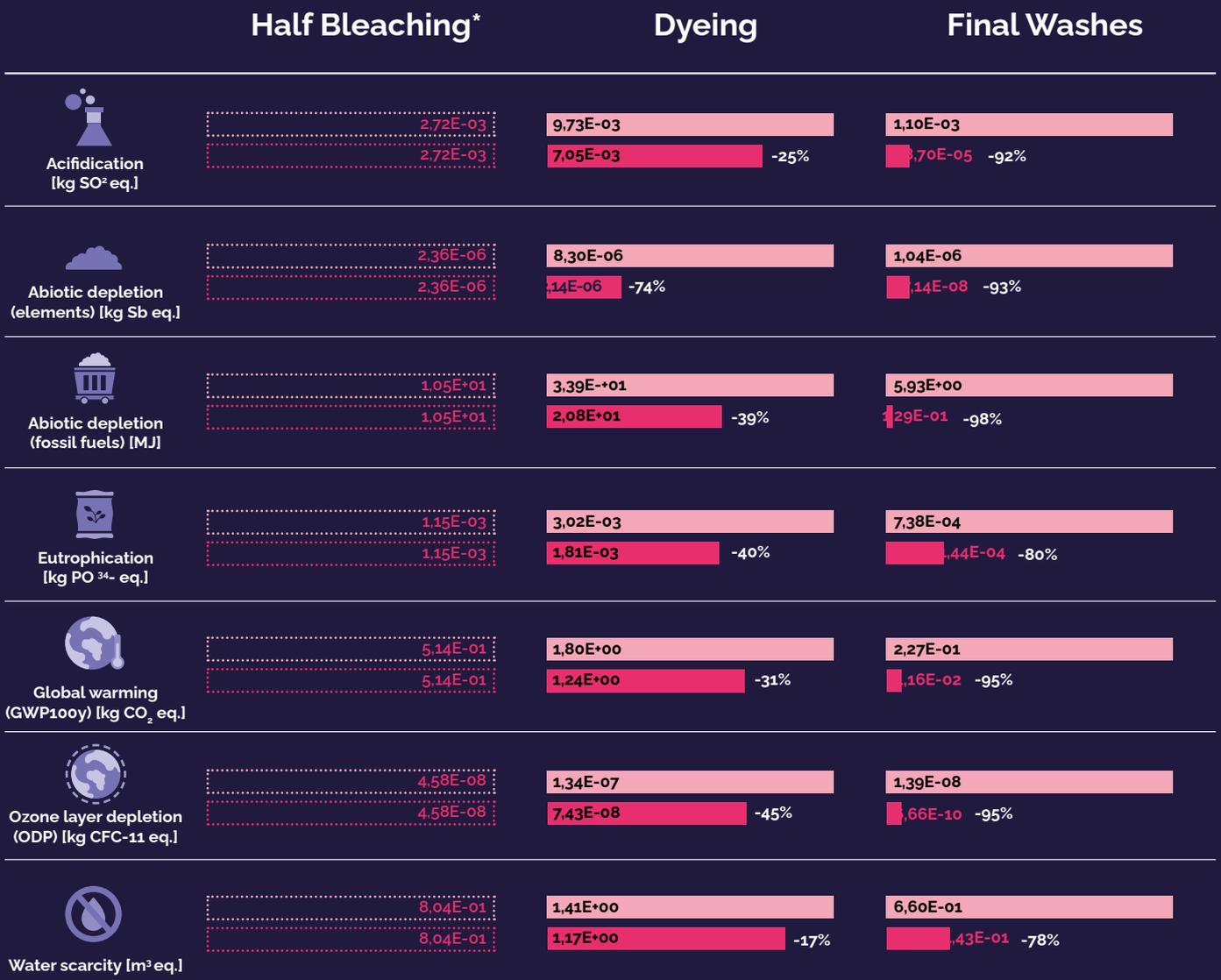
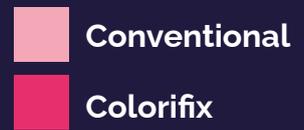
Across a range of impact categories the Colorifix process is less harmful.

Impact categories:

Acidification: impact of acidification on soil, water, air, and ecosystems
Abiotic depletion (elements): impact on people and ecosystems from the extraction and use of natural resources like salt
Abiotic depletion (fossil fuels): impact on people and ecosystems from the extraction and use of fossil fuels like oil and gas

Eutrophication: impact of excessive use of fertilizers and other macronutrients on soil, water, and air
Global Warming: impact from greenhouse gas emissions and resultant climate change
Ozone layer depletion: impact on human and ecosystem health from a reduced ozone layer in the atmosphere
Water scarcity: impact on water scarcity in a region, relative to the world average

Difference of environmental impact in conventional dyeing versus Colorifix dyeing, % (unit = 1kg of dyed fabric)



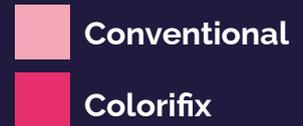
*Half bleaching stage is run by the dye house

RESULTS

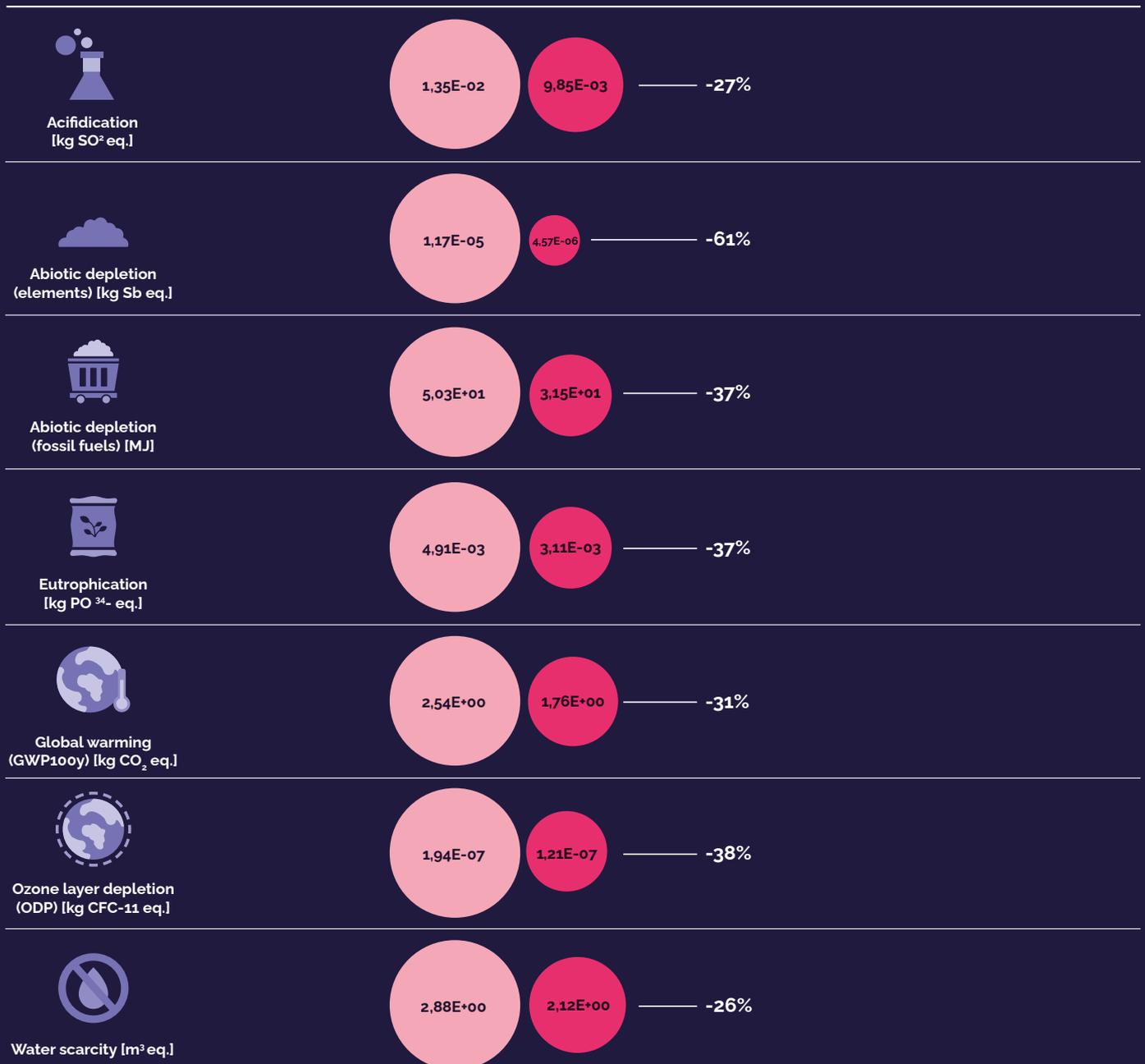
Environmental impact, total

Taken as a whole, Colorifix shows a lower environmental impact across every one of the Life Cycle Assessment's categories — including a 31% lower contribution to global warming.

Difference in total environmental impact across all stages, conventional dyeing versus Colorifix dyeing, % (unit = 1kg of dyed fabric)



Dyeing

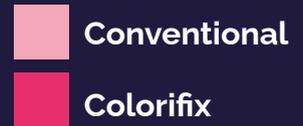


RESULTS

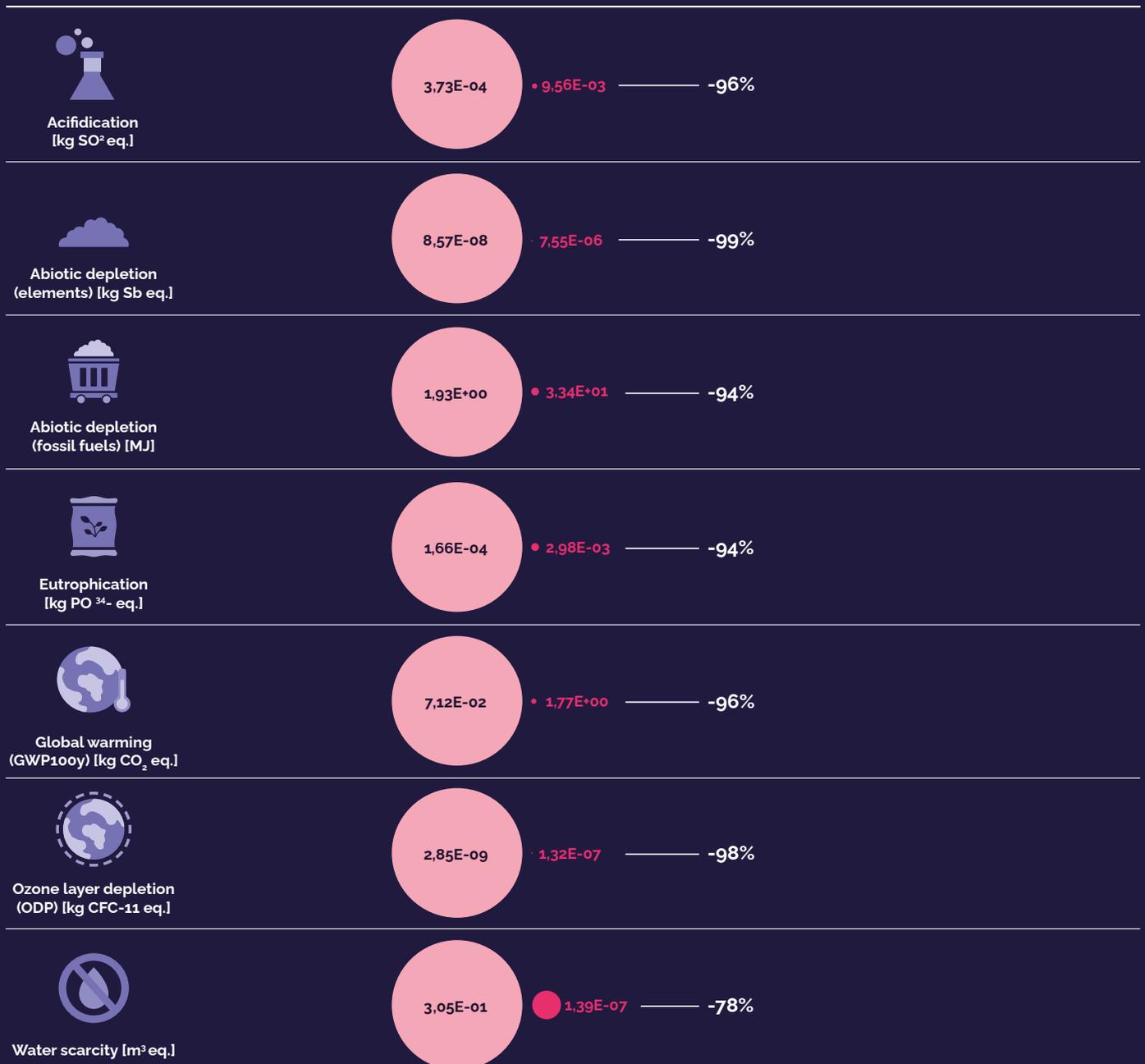
Environmental impact, like for like scenario

This model presents a narrower but more direct, like-for-like comparison. Colorifix's pigment production is left out, because the absence of this process in conventional dye production makes an accurate comparison impossible. Additionally, only water consumption was included at the fermentation stage, because other inputs vary depending on the bacteria used to create the dye.

Difference of total environmental impact in like-for-like model, conventional dyeing versus Colorifix dyeing, % (unit = 1kg of dyed fabric)



Like for Like Scenario



CONCLUSIONS

The Colorifix advantage: Environmentally friendly, competitively priced

Anyone who buys clothes or bedsheets today is likely to be concerned about the environment at a time when climate is changing, the natural world is destabilising, and future livelihoods are under threat. These concerns are shared by companies up and down the textile and apparel industries' supply chains. They are trying to adopt environmental solutions that add to, rather than undercut, their businesses.

The Colorifix Life Cycle Assessment provides strong evidence of an eco-friendly alternative to current dyeing techniques that require huge amounts of chemicals, water and energy. If scaled, Colorifix technology could materially lower the environmental impact of the entire industry.

“If scaled, Colorifix technology could materially lower the environmental impact of the entire industry.”

Importantly, the Colorifix process is also competitively priced. It offers an easy switch in terms of budgets as well as technical implementation. Now validated by this LCA, the process shows how years of research and development can yield technological solutions that get companies and industries closer to their sustainability goals faster.



Colorifix® x Pangaia Hoodie — Courtesy of BIOFABRICATE™

CONCLUSIONS



Colorifix finds the exact DNA sequences that create a pigment in nature. Working with laboratory equipment as shown here, technicians insert the pigment into a microorganism that becomes a biological factory, replicating the genetic information and creating natural colour.

More work to do

This Life Cycle Assessment is a milestone, but the work continues. As we grow and test new techniques, we will run more assessments to gauge progress and shortcomings.

The LCA showed, for example, that the fermentation step of our dyeing process has the highest environmental impact — because of energy usage during the 18 hours that fermentation takes to complete. This is one example of where we would like to become even more efficient.

We are also interested in testing different fibres for their relative impact, since our approach to creating and fixing Colorifix pigments varies widely from fibre to fibre.

“This Life Cycle Assessment is a milestone, but the work continues.”

Beyond our industry there is much discussion about technology-driven sustainability solutions and how to implement them. Some of the best solutions are collaborative and come from thinking outside the box of one sector. We would like to share our experience with any partner who might benefit from this knowledge in their own sustainability journey.

Learn more about Colorifix at colorifix.com or email us at info@colorifix.com



Colorifix grows its microorganisms in a Colorifix® 300 L Fermentor, as shown here, using the same technique as beer brewing. These microbes consume renewable feedstocks such as yeast, dividing every 20 minutes and producing a large quantity of dye liquor in a single day.



Colorifix

Colorifix is a sustainable pigment brand that uses natural pigments to create a wide range of colors. The brand is committed to ethical sourcing and environmental friendliness. The brand is committed to ethical sourcing and environmental friendliness. The brand is committed to ethical sourcing and environmental friendliness.

PLEASE
DON'T
TOUCH

This Stella McCartney designed dress, dyed with Colorifix pigments, was exhibited at the Fashion For Good Experience in Amsterdam in 2018. Credit: Alina Krasieva