



Biomass Burning: The Fashion Industry's False Phase-Out

Contents

Executive Summary	3
Greenwashing in Fashion: Misleading Sustainability Claims	4
The Dark Side of Biomass Burning	5
Fashion’s Biomass Frenzy in Asia	7
Paving the Way to a No-Burning Future	12
References	14



Executive Summary

In the face of an escalating climate crisis, the fashion industry stands at a critical crossroads. As one of the major global emitters, the fashion industry is responsible for 2-8% of global emissions.¹ In light of this, it is imperative the fashion industry takes a leadership role in ensuring a rapid and fair phase-out of fossil fuels throughout its supply chains and transitions to renewable energy alternatives like wind or solar. Unfortunately, on the way to eliminate fossil fuels, many global fashion giants are resorting to biomass as a “green” alternative despite the associated human and environmental risks and harms.

This report reveals that the fashion industry’s reliance on biomass boilers is a short-term bridging solution. It is crucial to clarify that within this context there is no such thing as “sustainable biomass”. The increased use of biomass boilers in the production and processing of apparel and footwear threatens climate, ecosystems, and human health, while also hindering the industry’s transition to renewable energy in Asia. Furthermore, the move toward biomass boilers, which have a lifespan of approximately two decades², threatens to lock the fashion sector into a counterproductive strategy, impeding urgent climate action and the shift to renewable energy in this sector. Unfortunately, the report finds that the fashion industry is fanning the flames of a global boiling era.³ Many

fashion brands are actively promoting biomass as a substitute for coal in manufacturing countries across Asia. As this report will show, major brands are misleadingly claiming that biomass boilers are clean and sustainable, a claim that lacks credible substantiation.

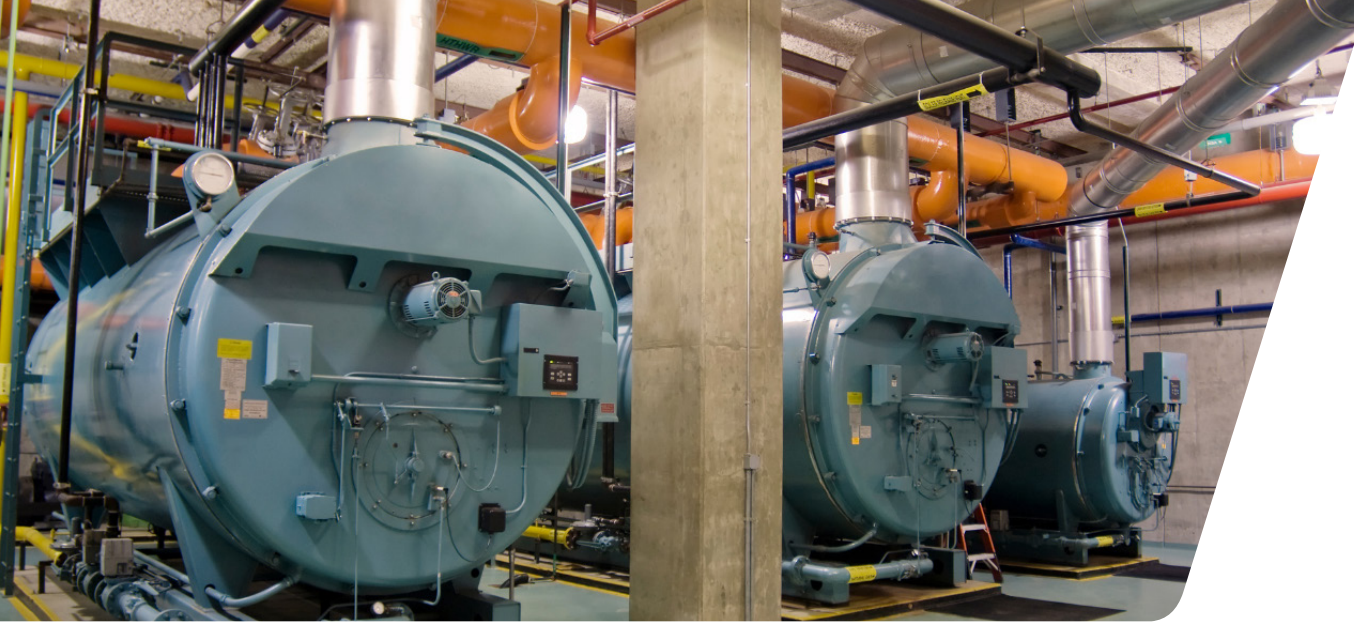
Stand.earth strongly urges fashion brands to act responsibly and prioritize long-term sustainability over short-term gains. This includes a multifaceted approach:

- **End Transition to Biomass:** Brands must cease the adoption of biomass boilers within their supply chains while prioritizing electrification and/or the deployment of renewable energy for thermal energy demands.
- **Prove No Harm:** Brands must disclose a robust plan for transitioning to renewable energy. They should also demonstrate that their plans do not harm the climate, the environment, or humans, and comply with international standards on environment and human rights.
- **Advocate for Policy Change:** Brands should actively advocate for policies that advance and enable renewable energy integration and discontinue the use of biomass boilers in textile factories.

¹“UN Alliance Aims to Put Fashion on Path to Sustainability,” UNECE, July 12, 2018, <https://unece.org/forestry/press/un-alliance-aims-put-fashion-path-sustainability>.

²“Economic Life Cycle of Biomass Equipment and Its Renovation,” TEM Journal 9, no. 4 (2020): 1419–25.

³“Hottest July Ever Signals ‘Era of Global Boiling Has Arrived’ Says UN Chief,” United Nations, July 27, 2023, <https://news.un.org/en/story/2023/07/1139162>.



Greenwashing in Fashion: Misleading Sustainability Claims

Global brands may resort to labeling their products as “green” or exaggerating their eco-friendliness to appeal to the environmentally-aware and eco-conscious consumer. The labeling of a product, process or solution as being good for the planet in the face of evidence that proves the contrary, or without any substantiating evidence, is called greenwashing. It not only leads to an increase in vague, unsubstantiated, or misleading claims about what’s good for the planet but also hinders genuine efforts by companies to advance meaningful actions and solutions that will help stay within 1.5 degrees of global warming.

While a growing number of regulations^{4,5} seek to prevent companies from making false, exaggerated, or misleading claims about the environmental benefits of their products, services, or practices, the fashion industry often engages in greenwashing, which often

manifests in subtle and hard-to-detect forms.⁶ An illustrative case in point is the use of biomass boilers in the manufacturing and processing of apparel and footwear.

Biomass, is defined⁷ as non-fossilized and biodegradable organic material originating from plants, animals and microorganisms, is being positioned by the fashion industry as an alternative to fossil fuels. It is also used as the preferred means of accounting for reductions in carbon emissions within supply chains. Derived from sources such as wood pellets, crop residues, rice husks, straw, bagasse, and palm shells, biomass is incinerated to produce thermal energy, pivotal for various fabric-enhancing procedures. As many brands look to phase out coal, the adoption of biomass-fueled boilers is viewed by the industry as a quick and low-cost transformation plan.⁸

⁴ Advertising Standards Authority | Committee of Advertising Practice, “Advertising Guidance - Misleading Environmental Claims and Social Responsibility,” ASA, 2023, <https://www.asa.org.uk/resource/advertising-guidance-misleading-environmental-claims-and-social-responsibility.html>.

⁵ “Green Claims,” European Commissions, October 20, 2023, https://environment.ec.europa.eu/topics/circular-economy/green-claims_en.

⁶ Rachel Kitchin and Xixi Zhang, “Fossil-Free Fashion Scorecard 2023” (Stand.earth, 2023), https://stand.earth/fashion/wp-content/uploads/sites/2/2023/03/Fossil-Free-Fashion-Scorecard-Stand.earth_.pdf.

⁷ “Clean Development Mechanism” (United Nations), https://cdm.unfccc.int/Reference/Guidclarif/glos_CDM.pdf.

⁸ Katrin Ley et al., “Unlocking the Trillion-Dollar Fashion Decarbonisation Opportunity: Existing and Innovative Solutions” (Apparel Impact Institute, Fashion for Good), <https://reports.fashionforgood.com/wp-content/uploads/2021/11/REPORT-Unlocking-The-Trillion-Dollar-Fashion-Decarbonisation-Opportunity-Fashion-for-Good-Aii.pdf>.



The Dark Side of Biomass Burning

Around 500 scientists warned world leaders about the dangers of taking biomass as a renewable energy source.⁹ There is evidence to suggest that the escalating reliance on biomass in the fashion sector not only threatens climate, ecosystems, and human health but also poses significant risks to the broader push toward genuine renewable energy, especially in Asia.

First, contrary to popular statements by companies that biomass is “low carbon”, burning biomass can increase GHG emissions within international fashion brands’ supply chains. Biomass is not the carbon-neutral energy source as it is frequently promoted to be. Rather, it has been demonstrated to generate higher carbon emissions than conventional fossil fuels, particularly when accounting for the

CO₂ emitted during cultivation, transportation, and processing phases, as well as the depletion of carbon stocks resulting from forest harvesting.^{10,11,12} For suppliers in many countries, biomass relies on imports, which emit large amounts of GHG emissions during transportation.¹³ And if carbon stock is not restored, burning wood may actually emit more CO₂ to the atmosphere than burning coal.¹⁴ The emissions from additional upstream logistics, which are often overlooked in carbon accounting, cumulatively enhance the overall carbon footprint of the fashion industry value chain and exert long-term impacts on the environment.

Second, a surge in on-site biomass boilers is leading to increased deforestation, ecosystem

⁹ The scientific community, “Letter Regarding Use of Forests for Bioenergy | Environmental Paper Network,” 2021, <https://environmentalpaper.org/biomass-library/letter-regarding-use-of-forests-for-bioenergy/>.

¹⁰ John D. Sterman, Lori Siegel, and Juliette N. Rooney-Varga, “Does Replacing Coal with Wood Lower CO₂ Emissions? Dynamic Lifecycle Analysis of Wood Bioenergy,” *Environmental Research Letters* 13, no. 1 (January 2018): 015007, <https://doi.org/10.1088/1748-9326/aaa512>.

¹¹ “NGO Joint Statement: Co-Firing of Biomass in Coal Plants or Conversion of Coal Power Plants to Dedicated Biomass Power Plants Is Greenwashing,” *Mighty Earth* (blog), April 11, 2023, <https://www.mightyearth.org/2023/04/11/ngo-joint-statement-co-firing-of-biomass-in-coal-plants-or-conversion-of-coal-power-plants-to-dedicated-biomass-power-plants-is-greenwashing/>.

¹² William H. Schlesinger, “Are Wood Pellets a Green Fuel?,” *Science* 359, no. 6382 (March 23, 2018): 1328–29, <https://doi.org/10.1126/science.aat2305>.

¹³ “NGO Joint Statement.”

¹⁴ Sterman, Siegel, and Rooney-Varga, “Does Replacing Coal with Wood Lower CO₂ Emissions?”

degradation, biodiversity loss, and land resources competition. Taking wood pellets – a major source of biomass¹⁵ – as an example, this material has been proven to endanger forest biodiversity.¹⁶ It is not easy for destroyed forest ecosystems to restore their function, and it is impossible for them to recover to a qualitatively equivalent ecosystem.¹⁷ Research has proven that the demand for wood pellets and chips from garment factories of some international fashion brands fuels the illegal cutting, transporting and selling of timber in Cambodia.¹⁸ Roughly a third of the estimated 1,200 garment factories across Cambodia were burning through an average of 562 metric tons of forest wood every day, using it as fuel for generating thermal energy, according to researchers at Royal Holloway, University of London, who conducted a study in 2021.¹⁹ This has been proven that burning food wood exacerbates forest degradation, destroys the local ecological environment and threatens the survival of wild animals.²⁰ Biomass co-firing has been shown to damage Indonesian natural forest ecosystems by killing off biodiversity including those that are mega-diverse or carbon-rich.²¹ Research has shown that crops grown for biomass compete with food production for land, water, and other resources.²² This is particularly true in densely populated countries where agricultural land and food resources are already limited.

Third, studies have shown that biomass burning in boilers can negatively impact the health of workers and the environment of local communities. Crop residue burning in India has been found to emit various pollutants that pose a serious threat to human health and the environment, which exposes vulnerable groups to higher risks.²³ Particulate emissions from the process of burning biomass waste of palm fiber and shell in Malaysia have caused concerns.²⁴ Stockholm Environment Institute Asia has documented pollutants including soot and particulate matter, nitrous oxide and sulfur dioxide released from on-site boilers in Cambodia's textile industry as having seriously threatened the health of workers and local communities.²⁵

In conclusion, branding biomass as “carbon neutral” or “sustainable”, in light of the negative human and environmental risks associated with its burning, is a flawed and misleading narrative. The widespread adoption of biomass in these regions comes with alarming environmental, health, and climate risks and impacts as mentioned above. The multifaceted risks of biomass – from the lifecycle of CO₂ emissions to ecological degradation and health hazards – are too significant to overlook.

¹⁵ Lisa Zhu, “The Unintended Consequences of Biomass,” *Fashion Takes Action* (blog), April 11, 2023, <https://fashiontakesaction.com/articles/the-unintended-consequences-of-biomass/>.

¹⁶ Schlesinger, “Are Wood Pellets a Green Fuel?”

¹⁷ “NGO Joint Statement.”

¹⁸ Gerald Flynn and Andy Ball, “Forests in the Furnace: Can Fashion Brands Tackle Illegal Logging in Their Cambodian Supply Chains?,” *Mongabay*, July 12, 2023, <https://news.mongabay.com/2023/07/forests-in-the-furnace-can-fashion-brands-tackle-illegal-logging-in-their-cambodian-supply-chains/>.

¹⁹ “The Hidden Footprint of UK Production Overseas” (Royal Holloway, University of London, 2021), <https://static1.squarespace.com/static/5ede332153d01455ccf35f36/t/61bb5202b8309d434c0b57a4/1639666210516/Disaster+Trade+report.pdf>.

²⁰ Flynn and Ball, “Forests in the Furnace: Can Fashion Brands Tackle Illegal Logging in Their Cambodian Supply Chains?”

²¹ “Supposedly ‘Green’ Biomass Energy Plantations Threatens Deforestation in World’s Second Largest Rainforest,” *Trend Asia*, November 10, 2022, <https://trendasia.org/en/supposedly-green-biomass-energy-plantations-threatens-deforestation-in-worlds-second-largest-rainforest/>.

²² A. Muscat et al., “The Battle for Biomass: A Systematic Review of Food-Feed-Fuel Competition,” *Global Food Security* 25 (June 1, 2020): 100330, <https://doi.org/10.1016/j.gfs.2019.100330>.

²³ Khaiwal Ravindra, Tanbir Singh, and Suman Mor, “Emissions of Air Pollutants from Primary Crop Residue Burning in India and Their Mitigation Strategies for Cleaner Emissions,” *Journal of Cleaner Production* 208 (January 20, 2019): 261–73, <https://doi.org/10.1016/j.jclepro.2018.10.031>.

²⁴ N R Jamian et al., “Estimation of Particulate Emission Generation in Palm Oil Mill Boiler,” *IOP Conference Series: Materials Science and Engineering* 808, no. 1 (March 1, 2020): 012039, <https://doi.org/10.1088/1757-899X/808/1/012039>.

²⁵ Jessica Slater and Kadesiree Thossaphonpaisan, “SEI Asia Podcast: Air Pollution and Its Impacts on the Health of Workers in Cambodia,” *SEI*, 2022, <https://www.sei.org/featured/sei-asia-podcast-air-pollution-and-its-impacts-on-the-health-of-workers-in-cambodia/>.



Fashion's Biomass Frenzy in Asia

Although burning biomass has been proven problematic from various angles as mentioned above, Asia is still in the midst of a biomass boom. Fashion giants are increasingly leaning towards biomass as the preferred way to move away from coal, particularly in Asian manufacturing hubs like Cambodia, China, India, Indonesia, Pakistan, South Korea, Taiwan, Thailand, and Vietnam. Based on publicly available data, such as CDP reports, ESG reports and brands' supplier lists, Stand.earth has identified a concerning trend in the significant and expanding use of biomass boilers within fashion manufacturing practices. To guarantee the accuracy of information, Stand.earth proactively reached out to the six fashion companies featured in the report before its release. Stand.earth sought feedback and any additional public information or updates that might not have been captured during the initial data collection phase. By November 10, 2023, responses were received from only H&M, Fast Retailing, Inditex, and PUMA.

Fast Retailing

Fast Retailing, the parent company of the clothing brand Uniqlo, sources from several suppliers in Asia

that have adopted biomass as an energy alternative to coal. A close examination of Fast Retailing's supplier list^{26,27} reveals that five of their Asian suppliers have integrated biomass into their operations (see Figure 1). These suppliers include: Makalot Industrial Co Ltd, Pan Brothers Tbk PT, Shenzhou International Group Holdings Ltd, and Toray Industries Inc. Makalot Industrial Co Ltd has not provided details of its biomass use. Pan Brothers Tbk PT has reported increasing use of energy derived from biomass (palm shells, kapok shells) in early 2022.²⁸ Within the span of just one year, Toray Industries reported a biomass consumption of 271,052 MWh from April 1, 2022, to March 31, 2023.²⁹

Fortunately, in a reply email sent to Stand.earth, Fast Retailing mentioned that they "recognize the issue of biomass boilers and are currently acting across [its] supply chain to minimize their use" and committed they "will take immediate action with [its] production partners, including a review of the use of these boilers with serious impacts".

²⁶ "Production Partners List," Fast Retailing, 2023, <https://www.fastretailing.com/eng/sustainability/labor/list.html>.

²⁷ <https://www.fastretailing.com/eng/sustainability/labor/list.html>

²⁸ "A New Paradigm towards Sustainability of People, Planet & Profit" (PT Pan Brothers Tbk., 2022), <https://www.panbrotherstbk.com/public/doc/suit/PBRX%20Sustainability%20Report%202022.pdf>.

²⁹ Toray Industries, Inc. CDP report 2023

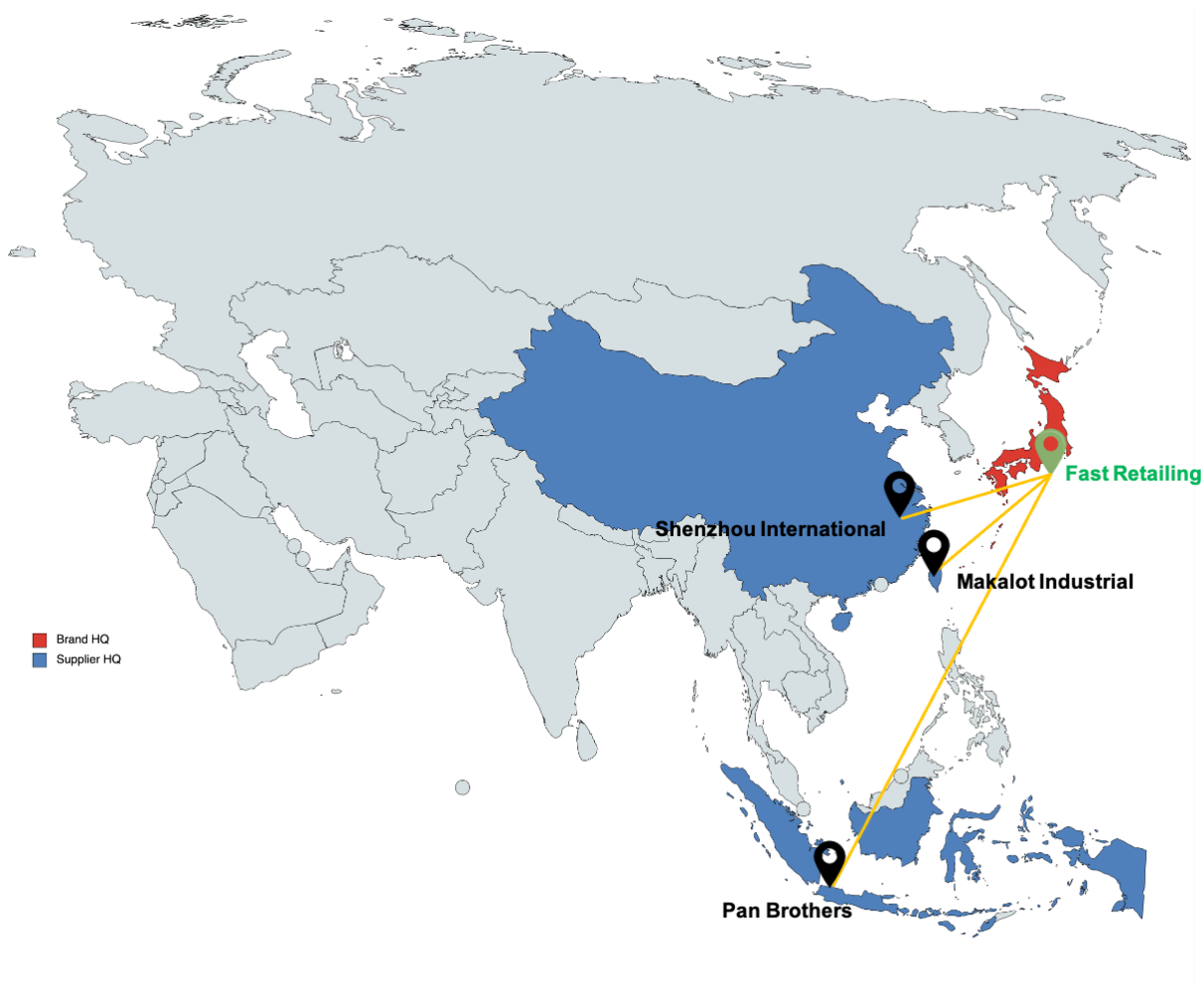


Figure 1. Map of Fast Retailing Suppliers using biomass³⁰

Gap

Three manufacturers in Gap's supplier list³¹ in Asia were also found to be using biomass (see Figure 2). These include Gokaldas Exports Ltd, Hansae Co. Ltd., and Makalot Industrial Co Ltd. Among them, Gokaldas Exports Ltd has not provided any details on

its biomass use. Makalot Industrial Co Ltd is reported stepping up the pace of deploying biomass boilers at all production sites.³² Hansae Co Ltd reported that several sewing facilities have swapped liquid fuel and coal for biomass sources like firewood, sawdust briquette, wood waste, and rice hull, with the intent to increase their biomass utilization.³³

³⁰ The map is created with mapchart.net and collected data. To avoid confusion, Toray Industries Inc – the Japanese suppliers of Fast Retailing – are not listed on the map.

³¹ "Gap Inc. Factory List," 2023, <https://gapinc-prod.azureedge.net/gapmedia/gapcorporatesite/media/images/values/sustainability/documents/2023/gap-inc-factory-list-march-2023.xlsx>.

³² "Makalot Sustainability Report 2021" (MAKALOT INDUSTRIAL CO., LTD., 2021), <https://www.makalot.com.tw/uploads/CSR%20report/2021%E5%B9%B4%E8%8B%B1%E6%96%87%E7%89%88%E5%B9%B4%E5%A0%B1Final%E9%99%84%E9%80%A3%E7%B5%90%EF%BC%BF0914.pdf>.

³³ "Sustainable Management," Hansae, https://www.hansae.com/en/esg/sustainability_management.asp.

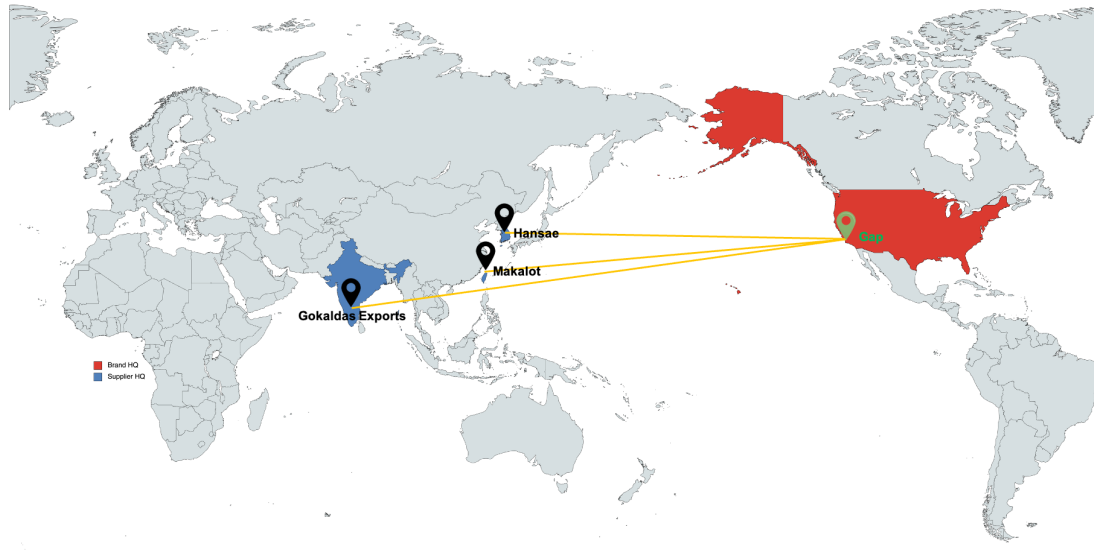


Figure 2. Map of Gap suppliers using biomass³⁴

H&M

In a reply email sent to Stand.earth, H&M mentioned that they are “utilizing biomass as a transitional onsite energy source”. According to the research, H&M regards rice husks, cashew shells, sugarcane stalks and other agricultural waste products as sustainable materials for apparel production and processing.³⁵

In Cambodia, H&M supported the burning of rice husks for heat and steam generation in garment production³⁶ and has indeed reported using biomass in the textile sector in this country.³⁷ A few of its suppliers – including Gokaldas Exports Ltd, Hansae Co Ltd, and Makalot Industrial Co Ltd – were found by Stand.earth installing and using biomass boilers in their factories (see Figure 3).

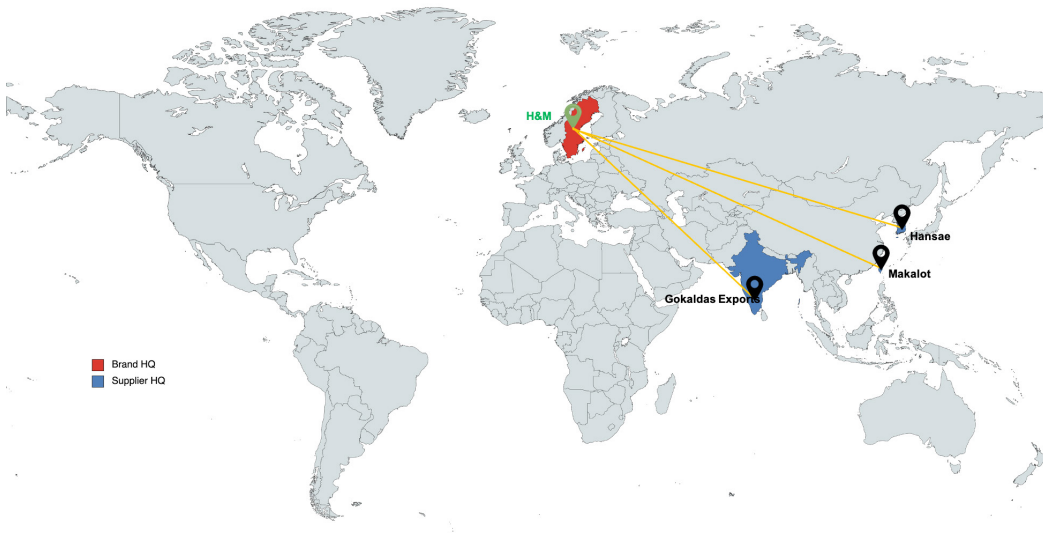


Figure 3. Map of H&M suppliers using biomass³⁸

³⁴ The map is created with mapchart.net and collected data.

³⁵ Flynn and Ball, “Forests in the Furnace: Can Fashion Brands Tackle Illegal Logging in Their Cambodian Supply Chains?”

³⁶ “Sustainable Steam for Cambodian Garment Factories” (Geres, 2019), https://www.geres.eu/wp-content/uploads/2019/10/Brochure_Garment_EN-1.pdf.

³⁷ H&M CDP report 2023

³⁸ The map is created with mapchart.net and collected data.

Inditex

Inditex, the owner of Zara, views biomass as a green energy solution and spurs its installation across Asian factories as shown on its website.³⁹ In a reply email sent to Stand.earth, Inditex mentioned that they see “biomass as a transition solution as other alternatives are developed and scaled”. And ‘biomass derived from agricultural waste’ is recommended. As the way pointed by Inditex, Six suppliers of the company – including Azgard Nine Ltd, Delta Galil Ltd, Gokaldas Exports Ltd, Hansae Co Ltd, Indorama

Ventures PCL, and Pan Brothers Tbk PT – were found using biomass boilers in their Asian factories (see Figure 4). Of its suppliers, Azgard Nine Ltd, based in Pakistan, reported 100% steam energy coming from biomass.⁴⁰ Delta Galil Ltd has reported using rice husk for biomass.⁴¹ Indorama Ventures PCL has reported generating 160895.59 MWh of heat by burning rice husk, wood chips, and other biomass in 2022. In addition, some factories in India, Indonesia, and Thailand have reported combining coal and biomass for heat, aiming to offset emissions.⁴²

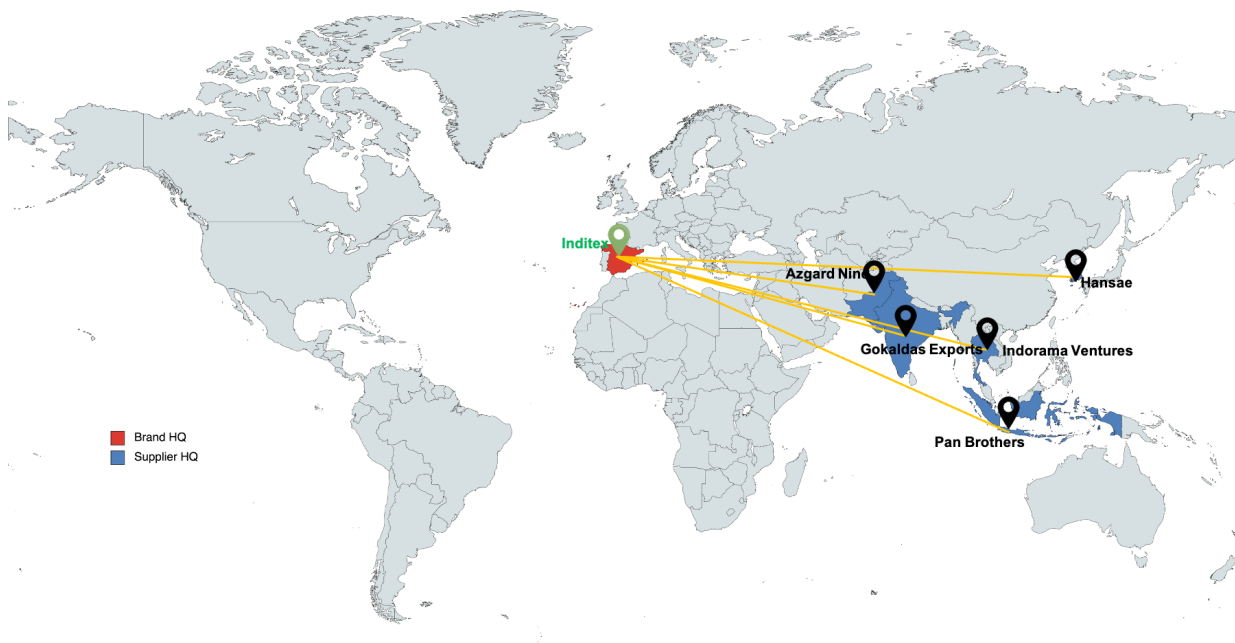


Figure 4. Map of Inditex suppliers using biomass⁴³

³⁹ “Best Available Technologies and Measures to Reduce Environmental Impacts,” Inditex, 2023, <https://app.powerbi.com/view?r=eyJrjoiNTI4NjMwNGQtZGRkNi00MmZjLTkzYmEtNGMzMmM1NWU3YTFmliwidCI6ImM4ZThiZGI2LThIN2MtNDFkNS1iYzQxLTM3ZmZmM2MzZmM2I3NSlsmMiOjh9>.

⁴⁰ “Azgard 9 Profile,” April 10, 2018, https://issuu.com/soh62ahmed/docs/azgard_9_profile.

⁴¹ Delta Galil CDP report 2023

⁴² Indorama Ventures PCL CDP report 2023

⁴³ The map is created with mapchart.net and collected data.

Nike and PUMA

In its CDP report 2023, Nike clearly stated that it “continued to explore lower-carbon fuel alternatives to coal, such as biomass” in the contracted factories.⁴⁴ PUMA has reported offering training to Vietnamese suppliers for a smoother biomass transition.⁴⁵ But in a reply email sent to Stand.earth, PUMA mentioned that they “accept biomass as a renewable energy to replace fossil fuels”. Meanwhile, they “are aware of potential environmental impacts of usage of biomass in the supply chain”. Stand.earth found that their shared supplier – Shenzhou International Group Holdings Ltd – is using biomass boilers in the process of manufacturing shoes. The supplier has been commissioning biomass boilers in Vietnam since 2022.⁴⁶ Huali Industrial Group Co Ltd, the supplier of Nike, stands out for its “de-coalification” policy for boiler fuel, achieving a full shift to biomass by 2017. Huali used 44,229 tons of biomass fuels, accounting for 35.2% use of energy in 2021.⁴⁷ In addition, Adidas has also been found taking biomass as “a source of fuel for boiler combustion to facilitate renewable energy adoption”.⁴⁸ Levi’s, Primark, and VF Corporation have been found by Mongabay using biomass in its supply chain in Cambodia.⁴⁹

In conclusion, as shown by the above information, 10 global fashion brands are using biomass to replace fossil sources for wet processing, producer, and

manufacturing sites. 10 Asian suppliers, distributed in Cambodia⁵⁰, Japan, South Korea, Indonesia, India, Pakistan, Taiwan and China were listed here. It is worth noting that the actual numbers of brands and suppliers using biomass may be much higher than this, as these are just the ones that are reported publicly and investigated by Stand.earth. As discussed in this section, brands are stepping up their deployment of biomass boilers in the supply chain, and this so-called “sustainable” alternative is gradually expanding in Asia. Despite the evidence of harm detailed in this report, the escalating use of biomass boilers continues in the fashion sector. This trend must stop immediately to prevent the sector from substituting fossil fuels with another detrimental alternative.



⁴⁴ Nike CDP report 2023, p.30-31

⁴⁵ “PUMA Sustainability Report,” PUMA Annual Report 2022, 2022, <https://annual-report.puma.com/2022/en/sustainability/climate/index.html>.

⁴⁶ “Environmental, Social and Governance Report 2022” (Shenzhou International Group Holdings Limited, 2023), <http://www.shenzhouintl.com/uploadfile/file/20230427/183d23cf6.pdf>.

⁴⁷ “Annual Sustainability Report 2021” (Huali Industrial Group Co., Ltd., 2022), <https://www.huali-group.com/en/static/upload/file/20220411/1649657490283856.pdf>.

⁴⁸ “Environmental Good Practice Guide & Toolkit” (adidas, 2019), https://www.adidas-group.com/media/filer_public/1b/28/1b28e1cc-c702-4dd4-8f1d-4779ca61f083/envgoodpracticetoolkit_en_2019.pdf.

⁴⁹ Flynn and Ball, “Forests in the Furnace: Can Fashion Brands Tackle Illegal Logging in Their Cambodian Supply Chains?”

⁵⁰ Although Cambodia is not shown on the above maps, many suppliers listed operate factories there where biomass is utilized.



Paving the Way to a No-Burning Future

As discussed above, the use of biomass boilers in the manufacturing and processing of apparel and footwear is problematic. By promoting biomass, fashion companies might be overselling their sustainability to eco-conscious consumers. This not only obscures but potentially hinders the genuine transition to renewable energy that aims to reduce the burden on the environment. In sum, it is time to recognize the true cost of biomass burning – it is neither green for our planet nor safe for its inhabitants.

When faced with the stark reality, it is worth asking the following question: **is the short-term veneer of sustainability worth further risking harm to the people and communities in manufacturing regions, particularly in Asia?**

True climate action demands more than merely adopting temporary fixes or dubious methods. The fashion industry must invest in using and exploring other well-substantiated alternatives rather than relying on biomass as a quick fix. Instead of intensifying the use of biomass boilers, brands should assist their suppliers in using energy sources with the least environmental and social consequences – like solar and wind energy – and

integrating cutting-edge, low-emission technologies. In the quest for a carbon-neutral future, Stand.earth urges fashion brands to take their environmental and social responsibilities rather than deflecting responsibility onto their affiliated factories, which include:

- **End Transition to Biomass:** Fashion brands should cease the adoption of biomass boilers within their supply chain. Where possible, biomass boilers in use should be decommissioned with the costs of transitioning to clean alternatives supported by brands. Alternative, cleaner energy solutions like solar and wind should be pursued, with a focus on minimizing environmental and social trade-offs. They must also transparently communicate their actions to promote and invest in renewable energy among manufacturers and policymakers.
- **Prove No Harm:** Fashion brands should commit to a comprehensive and well-executed plan for transitioning to renewable energy sources within their supply chains. As part of this, they should disclose energy use details, including type, origin, quantity, transactions, and carbon footprint, and disclose their compliance with international standards on business

and human rights through detailed environmental and human due diligence, including stakeholder consultations. In addition, international fashion brands should avoid misleading claims and practices, and uphold the highest standards of sustainability in all aspects of their operations.

- **Advocate for Policy:** Fashion brands should take full responsibility for their environmental and social impacts of their operations instead of relying on partner factories to address these issues. Brands need to actively engage in advocacy initiatives to influence policymakers and government institutions to endorse policies that facilitate the

integration of renewable energy systems and the discontinuation of biomass within the fashion industry.

As an influential industry, fashion holds the capability to spearhead transformative change towards a just renewable energy transition. The prevailing biomass trend, however, steers the industry away from this path. It is time for the fashion industry to redouble its efforts, abandon misleading practices, and wholeheartedly invest in a truly sustainable future. Let's extinguish the flames of biomass burning and pave a pathway towards a greener and cleaner future.





References

- “A New Paradigm towards Sustainability of People, Planet & Profit.” PT Pan Brothers Tbk., 2022. <https://www.panbrotherstbk.com/public/doc/suit/PBRX%20Sustainability%20Report%202022.pdf>.
- “Annual Sustainability Report 2021.” Huali Industrial Group Co., Ltd., 2022. <https://www.huali-group.com/en/static/upload/file/20220411/1649657490283856.pdf>.
- “Azgard 9 Profile,” April 10, 2018. https://issuu.com/soh62ahmed/docs/azgard_9_profile.
- “Clean Development Mechanism.” United Nations, https://cdm.unfccc.int/Reference/Guidclarif/glos_CDM.pdf.
- “Economic Life Cycle of Biomass Equipment and Its Renovation.” TEM Journal 9, no. 4 (2020): 1419–25.
- “Environmental Good Practice Guide & Toolkit.” adidas, 2019. https://www.adidas-group.com/media/filer_public/1b/28/1b28e1cc-c702-4dd4-8f1d-4779ca61f083/envgoodpracticetoolkit_en_2019.pdf.
- “Environmental, Social and Governance Report 2022.” Shenzhou International Group Holdings Limited, 2023. <http://www.shenzhouintl.com/uploadfile/file/20230427/183d23cf6.pdf>.
- European Commissions. “Green Claims,” October 20, 2023. https://environment.ec.europa.eu/topics/circular-economy/green-claims_en.
- Fast Retailing. “Production Partners List,” 2023. <https://www.fastretailing.com/eng/sustainability/labor/list.html>.
- Flynn, Gerald, and Andy Ball. “Forests in the Furnace: Can Fashion Brands Tackle Illegal Logging in Their Cambodian Supply Chains?” Mongabay, July 12, 2023. <https://news.mongabay.com/2023/07/forests-in-the-furnace-can-fashion-brands-tackle-illegal-logging-in-their-cambodian-supply-chains/>.
- “Gap Inc. Factory List,” 2023. <https://gapinc-prod.azureedge.net/gapmedia/gapcorporatesite/media/images/values/sustainability/documents/2023/gap-inc-factory-list-march-2023.xlsx>.

- Hansae. "Sustainable Management," https://www.hansae.com/en/esg/sustainability_management.asp.
- Inditex. "Best Available Technologies and Measures to Reduce Environmental Impacts," 2023. <https://app.powerbi.com/view?r=eyJrjoiNTI4NjMwNGQtZGRkNi00MmZjLTkzYmEtNGMzMmM1NWU3YTFmliwidCI6ImM4ZThiZGI2LThIN2MtNDFlKNS1iYzQxLTM3ZmZmM2MzM2I3NSlslmMiOjh9>.
- Jamian, N R, M Rashid, S M M Muzi, N Hussein, D Munisamy, K M Pa'ad, A H M Ali, and S Y Yusuf. "Estimation of Particulate Emission Generation in Palm Oil Mill Boiler." IOP Conference Series: Materials Science and Engineering 808, no. 1 (March 1, 2020): 012039. <https://doi.org/10.1088/1757-899X/808/1/012039>.
- Kitchin, Rachel, and Xixi Zhang. "Fossil-Free Fashion Scorecard 2023." Stand.earth, 2023. https://stand.earth/fashion/wp-content/uploads/sites/2/2023/03/Fossil-Free-Fashion-Scorecard-Stand.earth_.pdf.
- Ley, Katrin, Lewis Perkins, Rogier van Mazijk, Ryan Gaines, and Rory Hugill. "Unlocking the Trillion-Dollar Fashion Decarbonisation Opportunity: Existing and Innovative Solutions." Apparel Impact Institute, Fashion for Good, <https://reports.fashionforgood.com/wp-content/uploads/2021/11/REPORT-Unlocking-The-Trillion-Dollar-Fashion-Decarbonisation-Opportunity-Fashion-for-Good-Aii.pdf>.
- "Makalot Sustainability Report 2021." MAKALOT INDUSTRIAL CO., LTD., 2021. <https://www.makalot.com.tw/uploads/CSR%20report/2021%E5%B9%B4%E8%8B%B1%E6%96%87%E7%89%88%E5%B9%B4%E5%A0%B1Final%E9%99%84%E9%80%A3%E7%B5%90%EF%BC%BF0914.pdf>.
- Mighty Earth. "NGO Joint Statement: Co-Firing of Biomass in Coal Plants or Conversion of Coal Power Plants to Dedicated Biomass Power Plants Is Greenwashing," April 11, 2023. <https://www.mightyearth.org/2023/04/11/ngo-joint-statement-co-firing-of-biomass-in-coal-plants-or-conversion-of-coal-power-plants-to-dedicated-biomass-power-plants-is-greenwashing/>.
- Muscat, A., E. M. de Olde, I. J. M. de Boer, and R. Ripoll-Bosch. "The Battle for Biomass: A Systematic Review of Food-Feed-Fuel Competition." *Global Food Security* 25 (June 1, 2020): 100330. <https://doi.org/10.1016/j.gfs.2019.100330>.
- Practice, Advertising Standards Authority | Committee of Advertising. "Advertising Guidance - Misleading Environmental Claims and Social Responsibility." ASA, 2023. <https://www.asa.org.uk/resource/advertising-guidance-misleading-environmental-claims-and-social-responsibility.html>.
- PUMA Annual Report 2022. "PUMA Sustainability Report," 2022. <https://annual-report.puma.com/2022/en/sustainability/climate/index.html>.
- Ravindra, Khaiwal, Tanbir Singh, and Suman Mor. "Emissions of Air Pollutants from Primary Crop Residue Burning in India and Their Mitigation Strategies for Cleaner Emissions." *Journal of Cleaner Production* 208 (January 20, 2019): 261–73. <https://doi.org/10.1016/j.jclepro.2018.10.031>.
- Schlesinger, William H. "Are Wood Pellets a Green Fuel?" *Science* 359, no. 6382 (March 23, 2018): 1328–29. <https://doi.org/10.1126/science.aat2305>.
- Slater, Jessica, and Kadesiree Thossaphonpaisan. "SEI Asia Podcast: Air Pollution and Its Impacts on the Health of Workers in Cambodia." SEI, 2022. <https://www.sei.org/featured/sei-asia-podcast-air-pollution-and-its-impacts-on-the-health-of-workers-in-cambodia/>.
- Sterman, John D., Lori Siegel, and Juliette N. Rooney-Varga. "Does Replacing Coal with Wood Lower CO2 Emissions? Dynamic Lifecycle Analysis of Wood Bioenergy." *Environmental Research Letters* 13, no. 1 (January 2018): 015007. <https://doi.org/10.1088/1748-9326/aaa512>.
- Sustainable Biomass Program. "The Promise of Good Biomass." Sbp, <https://sbp-cert.org/>.

- "Sustainable Steam for Cambodian Garment Factories." Geres, 2019. https://www.geres.eu/wp-content/uploads/2019/10/Brochure_Garment_EN-1.pdf.
- "The Hidden Footprint of UK Production Overseas." Royal Holloway, University of London, 2021. <https://static1.squarespace.com/static/5ede332153d01455ccf35f36/t/61bb5202b8309d434c0b57a4/1639666210516/Disaster+Trade+report.pdf>.
- The scientific community. "Letter Regarding Use of Forests for Bioenergy | Environmental Paper Network," 2021. <https://environmentalpaper.org/biomass-library/letter-regarding-use-of-forests-for-bioenergy/>.
- Trend Asia. "Supposedly 'Green' Biomass Energy Plantations Threatens Deforestation in World's Second Largest Rainforest," November 10, 2022. <https://trendasia.org/en/supposedly-green-biomass-energy-plantations-threatens-deforestation-in-worlds-second-largest-rainforest/>.
- UNECE. "UN Alliance Aims to Put Fashion on Path to Sustainability," July 12, 2018. <https://unece.org/forestry/press/un-alliance-aims-put-fashion-path-sustainability>.
- United Nations. "Hottest July Ever Signals 'Era of Global Boiling Has Arrived' Says UN Chief," July 27, 2023. <https://news.un.org/en/story/2023/07/1139162>.
- Zhu, Lisa. "The Unintended Consequences of Biomass." Fashion Takes Action (blog), April 11, 2023. <https://fashiontakesaction.com/articles/the-unintended-consequences-of-biomass/>.

Credits

Author

Xixi Zhang

Contributors

Seema Joshi, Gary Cook, Rachel
Kitchin, Shuting Ren

Acknowledgments

Valuable comments and input
were provided by (alphabetically):
Erdene Batzorig, Tegan Hansen, Ruth
MacGilp, Liz McDowell, Shane Reese,
Richard Robertson

Copyright © Stand.earth

DISCLAIMER: This document has been prepared using best practices and due diligence using information available at the date of publication. All information is subject to change. This report is published ONLY for the purposes of reference, information sharing, and the wider public interest in environmental protection. Any liability shall not be borne by Stand.earth due to the use of this report during the course of any investments or other decision-making processes. The content of this report is based on information from publicly available sources or officially disclosed by companies. If you represent a company that appears in this material that you believe is not accurately represented, supplemental information can be sent to fashion@stand.earth.