Post-industrial textile waste recycling in Viet Nam

Mapping the ecosystem of the textile waste value chain in Viet Nam
for the transition to closed-loop textile-to-textile recycling

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Hợp tác Đức
DEUTSCHE ZUSAMMENARBEIT

Implemented by

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BỘ KẾ HOẠCH VÀ ĐẦU TƯ
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Preface

As the world's third-largest apparel exporter and second-largest footwear exporter, Viet Nam is well positioned to thrive in textile circularity. By adopting sustainable practices, the country can foster economic growth while ensuring decent work for its labour force.

Key export markets are implementing policies that enforce circular product requirements. Multinational apparel brands and retailers are also aiming to increase the use of recycled content in their products. The European Union's Strategy for Sustainable and Circular Textiles, published in 2022, along with the Corporate Sustainability Due Diligence Directive and the Eco-design for Sustainable Products Regulation adopted in 2024, introduce new mandates.

This study draws upon insights from key stakeholders in Viet Nam's textile and apparel industry, including manufacturers and waste facilities, to examine the transition towards textile circularity. By examining data and practices from these primary actors, the study highlights the significant influence of brands in driving sustainable transformations. The goal is to inform relevant private sector entities and other stakeholders by providing evidence of ongoing developments, fostering collaboration and informed decision-making in the pursuit of a circular textile economy.

Conducted as part of the global "Go Circular" programme - commissioned by the German Federal Ministry for Economic Cooperation and Development (BMZ) and implemented by the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH, in partnership with Viet Nam's Ministry of Planning and Investment (MPI) - this study aims to provide a comprehensive understanding of the current landscape and opportunities for advancing textile circularity in Viet Nam.

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Executive Summary

Viet Nam's textile and apparel industry produces **approximately 250,000 tonnes** of post-industrial textile waste annually, not including contributions from footwear and domestic production. Currently, about **60%** of this waste is sorted, pre-processed and then recycled via basic mechanical and thermo-mechanical processes. It constitutes predominantly 'downcycling' into lower-quality products. The remaining **40%** is directed to waste-to-energy facilities or other disposal methods. Advanced technologies such as chemical recycling are emerging as promising solutions for the "harder-to-recycle" textile waste.

Risks

The current waste management practices present several challenges:

- **Inefficient Waste Management at Source:** While sorting at source has commenced, there is significant potential to enhance these practices at manufacturer level to enable effective textile-to-textile (T2T) recycling.
- **Fragmented Recycling Ecosystem:** Viet Nam's textile recycling sector involves over 200 waste facilities, including collectors, aggregators, pre-processors, and recyclers. This network is highly fragmented and lacks transparency, complicating waste traceability and due diligence processes.
- **Occupational Hazards:** Waste facilities frequently face compliance issues, with noticeable health and safety concerns.

Despite these challenges, there are substantial opportunities to position Vietnam as a global hub for textile circularity. Strengthening the domestic waste sector and adapting advanced recycling technologies are crucial steps forward.

Call to Action

To capitalise on these opportunities and mitigate associated risks, the following actions are essential:

1. **Enhance Waste Management Practices at Scale and Speed:** Manufacturers, aligned with brands' circularity targets, should start sorting textile waste at source and revise their contracts with waste management companies.
2. **Improve Transparency, Compliance, and Optimisation in the Waste Sector:** The waste sector must evolve to function as an integral part of the textile supply chain, often referred to as Tier 3.5. This transformation involves traceability systems, ensuring compliance, and optimising operations to provide consistent, high-quality feedstock for recycling processes.
3. **Enable Investment Opportunities:** The government should support investments in the recycling infrastructure in Viet Nam while also developing a clear regulatory framework. International recyclers should seek cooperation with local recyclers drawing on their expertise to support the transition to textile-to-textile recycling.
4. **Strengthen Brand Leadership:** Global brands should leverage their market influence to guide and accelerate improvements in waste management practices and recycling investments across the supply chain, as well as contribute to the associated costs.
5. **Promote Collective Action:** The government, sector associations and international organisations should foster collaboration among all stakeholders and competitors in the value chain to drive systemic change at scale and speed, in line with the waste hierarchy principle.

By addressing these areas, Viet Nam can transform its textile waste management landscape, reduce environmental impact, and establish itself as a leader in sustainable textile production.

Glossary

Circular economy	The circular economy is a model of production and consumption, which involves sharing, leasing, reusing, repairing, refurbishing and recycling existing materials and products as long as possible. In this way, the life cycle of products is extended. In practice, it implies reducing waste to a minimum. When a product reaches the end of its life, its materials are kept within the economy wherever possible thanks to recycling. These can be productively used again and again, thereby creating further value. *Source:* **Circular economy: definition, importance and benefits | News | European** Parliament **(europa.eu)** Circular economy is an economic model which encompasses the design, production, consumption and services activities aimed at reducing raw materials, extending product life, reducing waste generation and minimising adverse impacts on the environment. *Source:* Article 142, Section 1. Law on Environment Protection (2020). Viet Nam.
All terms hereafter are defined based on the Textile Exchange Glossary.	
Downcycling	A form of recycling in which discarded textiles are reprocessed to create new consumer or industrial products. Discarded textiles are no longer in their original form, and new products do not re-enter the textile supply chain (open loop). Most recycled industrial nutrients (materials) lose viability or value in the process of recycling, which means they can only be used in a degraded form for components other than their original use.
Upcycling	The process of converting an industrial nutrient (material) into something of similar or greater value, in its second life. Aluminium and glass, for example, can usually be upcycled into the same quality of aluminium and glass as the original products.
Post-industrial material/waste	Material diverted from the waste stream during the manufacturing process, determined as the percentage of material, by weight. The designation excludes rework, regrind, or scrap materials capable of being reclaimed within the same process that generated them (ISO 14021). Also known as 'pre-consumer material'.
Post-consumer material/waste	Material generated by households or by commercial, industrial and institutional facilities in their role as end-users of the product which can no longer be used for its intended purpose. This includes returns of material from the distribution chain (ISO 14021).
Mechanical recycling (synthetic fibres)	Mechanical recycling (of plastics) is the recovery of materials from waste while maintaining the polymers' molecular structure. In principle all types of (thermo-) plastics can be mechanically recycled with little or no quality impairment. Mechanical recycling of pure thermoplastic textile waste involves pre-processing, melting and extrusion into new fibres, while 'purely mechanical' recycling of cotton-rich and blended textile waste involves only mechanical actions, such as cutting, shredding and spinning, in recycling.

Chemical recycling	Chemical recycling (feedstock recycling) refers to operations that aim to chemically degrade the collected plastic waste into its monomers or other basic chemicals. The output may be reused for polymerisation into new plastics to produce other chemicals or as an alternative fuel.
Closed-loop recycling	Closed-loop recycling is a production process where waste (post-industrial and post-consumer) is recycled into new materials and products. Ideally, a zero-waste supply chain that completely reuses, recycles, or composts all materials. However, the term can also be used to refer to corporate take-back programs, where companies that produce a good are also responsible for its disposal. Textile-to-textile (in some cases known as 'fibre-to-fibre') recycling is a model of closed-loop recycling that brings textile waste back into new textile materials and products.
Global Recycled Standard (GRS)	The Global Recycled Standard (GRS) tracks recycled materials through the supply chain. The standard applies to the full supply chain and addresses traceability, environmental principles, social requirements, chemical restrictions, and labelling. Developed with the textile industry in mind, the GRS may also be applied to products from any industry. See also Recycled Content Standard (RCS) and Content Claim Standard (CCS).
Feedstock	A raw material that supplies or fuels an industrial process.

The study at a glance

Objective: This study aims to build a solid understanding of the textile waste recycling ecosystem in Viet Nam from waste generation at the manufacturers to waste handlers and recyclers and finally feed-in options at the various recyclers. In addition, it identifies opportunities for improving the value chain processes and technologies to close the loop for post-industrial textile waste.

Key research questions:

- What are the volumes of post-industrial textile waste generated in Viet Nam?
- Who are the key actors in the value chain for managing post-industrial textile waste generated by textile, apparel and footwear (including waste handlers, pre-processors, and recyclers)?
- What are the current collecting and recycling pathways and output applications? What is the potential of textile-to-textile (T2T) recycling - bringing textile waste back into the supply chain for producing new textiles and apparels?
- What are the status and main risks related to compliance with labour and environmental conditions at collection and recycling units across the waste value chain?

Scope:

- The study focuses on the textile waste value chain in Viet Nam, particularly pre-consumer (or post-industrial) textile waste. The term "textile" thereby includes yarn, fibres, fabric, apparel, and footwear products.
- The study provides aggregate estimates of post-industrial textile waste volumes. It does not provide data on the availability of specific textile waste materials as feedstock for specific recycling technologies for commercial use.
- The study gives a general overview of textile recycling technologies currently applied in Viet Nam without providing an in-depth technology analysis.
- The study does not include a review of the regulations and policies concerning textile waste in Viet Nam.

Methodology:

- This study used a mixed-method approach, including desk based research, data analysis, site visits, interviews, expert consultations and risk assessments.
- Data and insights were gathered throughout 2023 and early 2024.
- See **Annex** for more details.

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1. Estimated volumes of post-industrial textile waste generated in Viet Nam

The estimated annual volume of post-industrial textile waste in Viet Nam generated from textile production for exports in 2022 ranges from **184,000 to 276,000 tonnes**, with a reference value of **250,000 tonnes**. Of the total amount of post-industrial textile waste generated about 35% is polyester-rich, 20% is cotton-rich and 45% is blended. Differentiating these types makes it possible to approximate to approximate the potential for respective recycling technologies, as cotton knitted fabric can be recycled more easily by mechanical recycling method than other types e.g., woven fabric.

The study utilised several sources and assumptions for the estimation of the amount of textile waste generated in Viet Nam:

(1) the export volume of goods within HS code chapter 61("Articles of apparel and clothing accessories, knitted or crocheted") and 62 ("Articles of apparel and clothing accessories, not knitted or crocheted"), with an assumed waste-to-fabric ratio of 10-15%;

(2) The assumption that 1,000 factory workers generated approximately 100 tonnes of textile waste annually; and

(3) consultation with industry experts.

See **Annex** for more details on the methodology for the estimation.

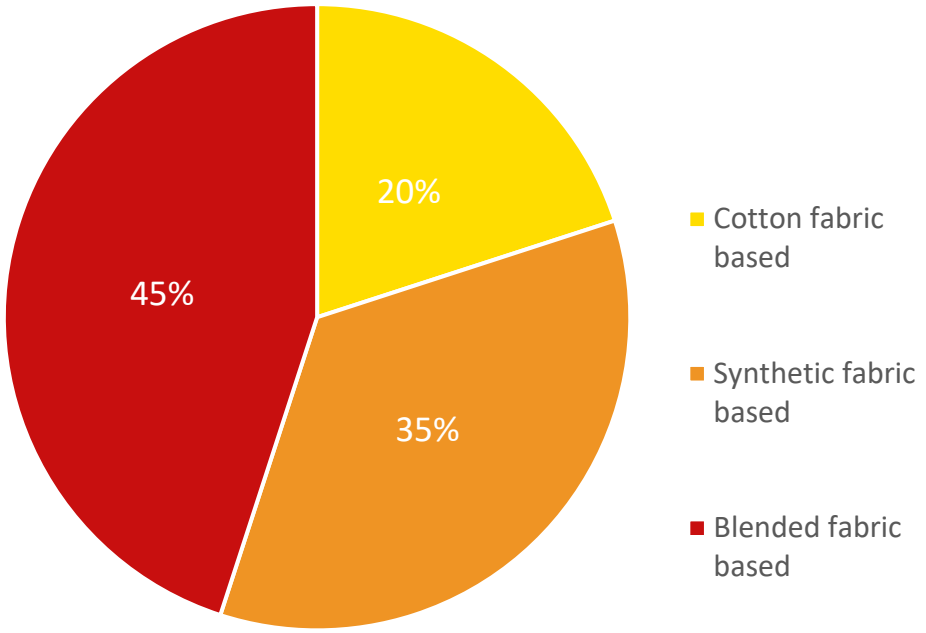

Figure 1: Percentage of fabric composition of exported garment in 2022

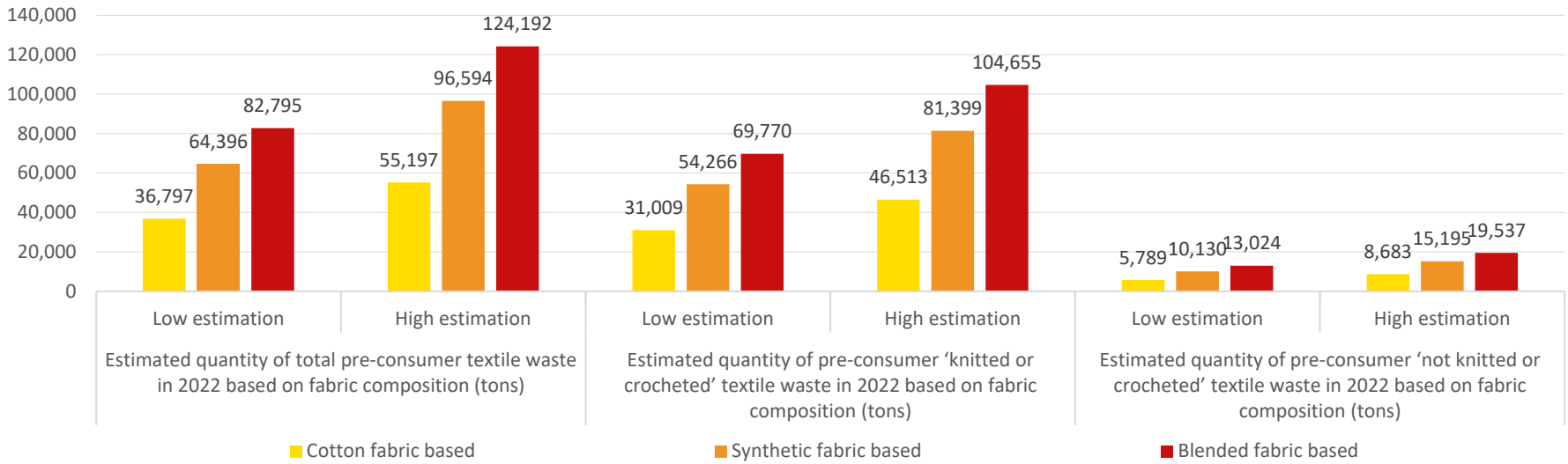

Figure 2: Estimated quantity of post-industrial fabric waste in 2022 based on exported garment volume

The volume of post-industrial textile waste is estimated based on the export volume of goods within HS code chapter 61 and 62 (see **Annex** for more details) combined with consultation with local experts on waste trading. Obtaining textile waste data at the country level remains a significant challenge as waste is transacted throughout a complex system that is largely inaccessible to research.

The estimation based on export volumes does not include other forms of post-industrial textile waste, such as fabric deadstock or rejected products. Fabric deadstock is defined as leftover fabric from production. It is either sold to domestic buyers, re-exported or disposed of. In the first case, the deadstock sold can be registered as "repurposed goods" or indirect export . If the deadstock is to be disposed of, the enterprise must follow the required procedures according to Vietnamese laws; in practice, disposal of deadstock remains the frequently used method. The Viet Nam Waste Recycling Association has developed a Helpdesk to provide advice on this and other matters.

In addition to the post-industrial textile waste generated in Viet Nam, there is potential for aggregating waste from neighbour countries with strong textile sectors, such as Cambodia, to meet the demand of feedstock for recycling. While Vietnamese regulations prohibit the import of textile waste, the proximity of recycling facilities in souther Viet Nam to the Cambodian border has led to an informal flow of textile waste. This helps meet the demand for cotton-rich and polycotton textile waste by recyclers in Viet Nam.

2. Overview of the textile waste value chain: Status quo and potential

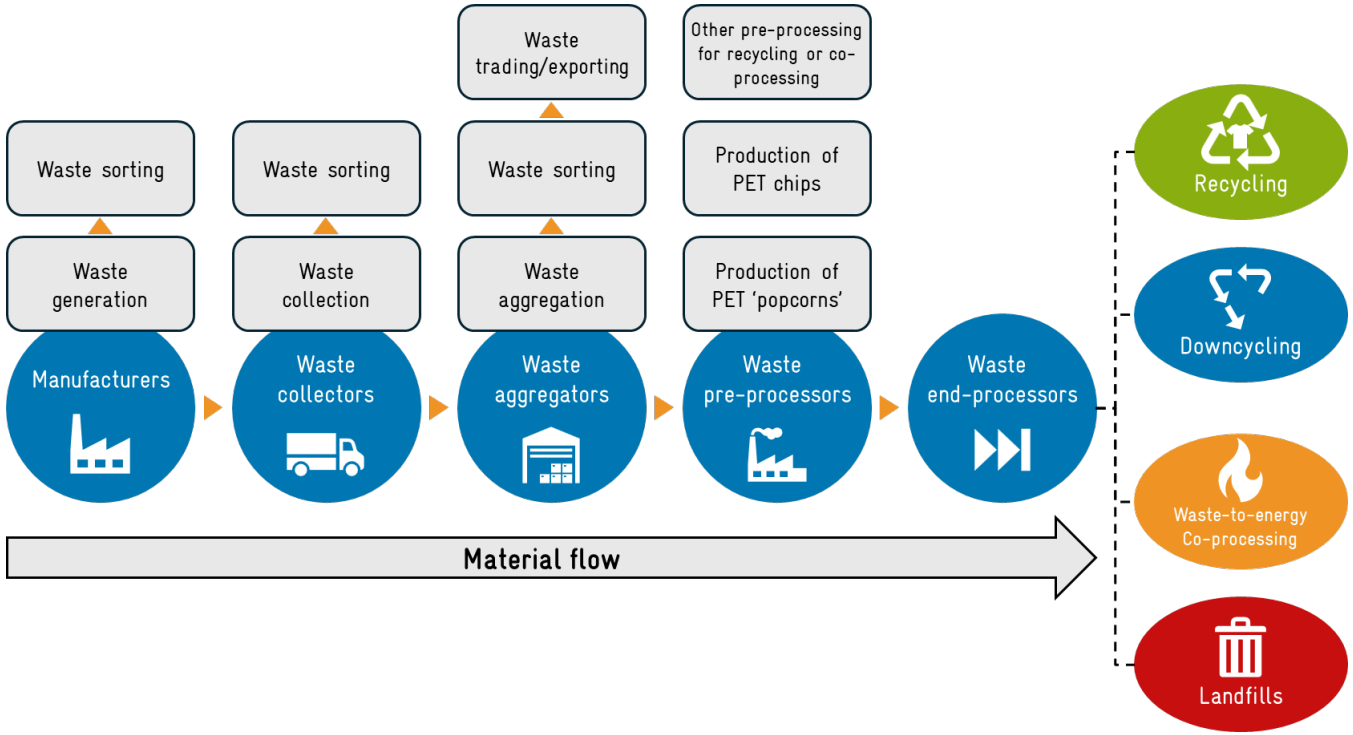

Figure 3: The generalized textile waste value chain in Viet Nam

Since 2021, as co-processing facilities and waste-to-energy plants increase in number together with multinational brands' commitments to "zero to landfill", much textile waste has been diverted from landfills and disposal by incineration. It is estimated that **60%** of post-industrial textile waste in Viet Nam is recycled, the remaining **40%** is disposed of by waste-to-energy (W2E) incineration, co-processing plants or incineration without energy recovery. Due to a lack of verified data these figures are based on consultations with industry experts only and are only indicative. Strengthened waste management and recycling infrastructure may further valorise this 40%, moving them up the waste hierarchy from W2E to recycling. This waste hierarchy principle is an order of preference for managing and disposing of waste in the most environmentally sustainable way.

Key actors in the textile waste value chain include textile manufacturers (who generate textile waste), waste handlers, waste recyclers, and waste-to-energy and co-processing plants.

The study identified more than 100 waste handlers, mainly collectors contracted with manufacturers. Waste collectors collect, process, trade and transport the waste from manufacturers, including post-industrial textile waste. They are also responsible for most waste sorting, which takes place in two stages: pre-sorting and refined sorting. Pre-sorting practices typically separate textile waste from cutting based on composition (pure cotton, pure polyester, pure polyamide, blended textiles) and colour, with an aim of minimising contamination of other materials. Some manufacturers require their contracted collectors' workers to sort waste on-site and use baling machines to optimise collection and transportation costs. After pre-sorting, most of the refined sorting for recycling is done manually by the waste handlers' experienced workers. Large scale waste collectors and aggregators have their own facilities while also using a network of small waste handlers mostly for cost-effectiveness. This network, with multiple layers of small, informal firms or even household businesses, presents challenges for the traceability of recycled materials as well as workers' rights and environmental risks. Larger recyclers including more advanced and foreign-invested firms operating in Viet Nam mostly aim to contract or source their feedstock via large waste handlers.

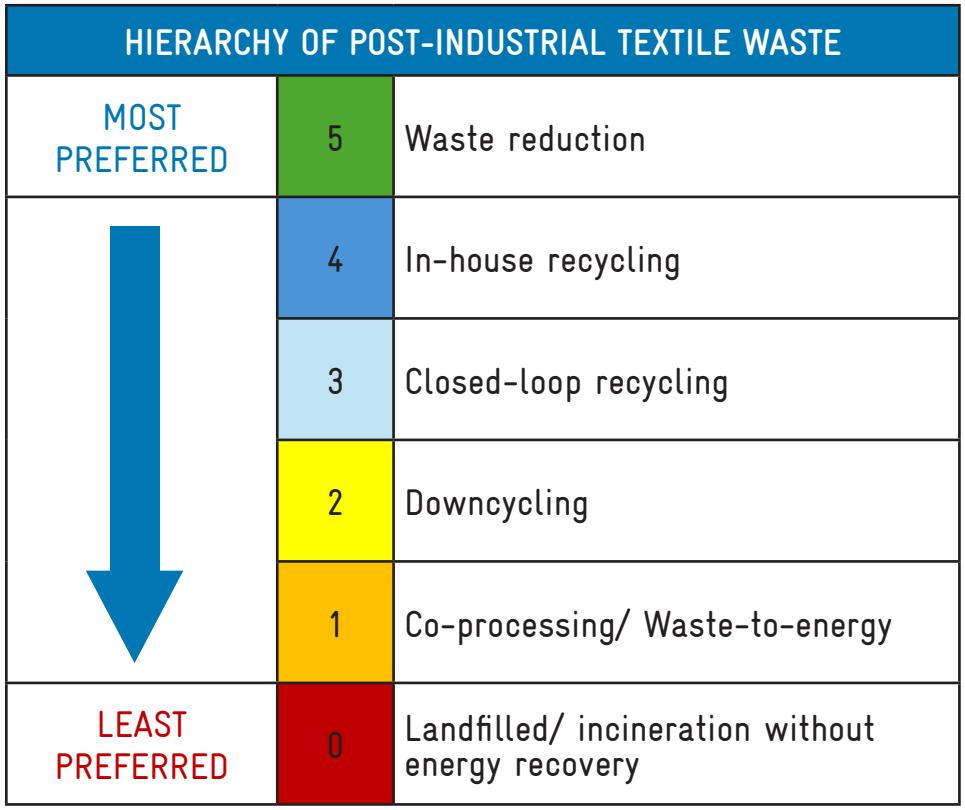

Figure 4: Waste hierarchy for post-industrial textile waste

This waste hierarchy, customised for post-industrial textile waste, is an order of preference for managing and disposing of waste, inspired by the waste hierarchy included in the EU Waste Framework Directive (Article 4) and NIKE, Inc. waste hierarchy (FY20 Impact Report, p.95).

In line with emerging developments, medium- to large recyclers are seeking to optimise **the procurement mechanisms** as well as at alternative procurement channels **to secure feedstock in a more reliable and transparent manner**. There have been discussions and some pilots within the industry on direct procurement of textile waste by recyclers from manufacturers bypassing intermediaries such as collectors and aggregators. In this procurement approach, large apparel manufacturers supply their waste directly to recyclers - well-sorted and fully traceable.

For example, one polyester pre-processor producing PET (polyethylene terephthalate) 'popcorn' (recycled PET in granular form) in the South reported sourcing around 30% of its monthly feedstock (1000 tonnes of PET waste), directly from manufacturers, and the remaining 70% via a network of waste handlers. A waste strategist provided a case study in which a 6-month pilot of direct procurement of EVA (ethylene-vinyl acetate) and rubber from waste sources to recyclers was discontinued and not further scaled up. A large plastics recycler in Viet Nam has also included direct sourcing of feedstock from manufacturers in its procurement methods.

In addition to waste handlers, the study also identified 17 major recyclers active in textile waste recycling. Most of the identified recyclers produce recycled polyester staple fibre, recycled cotton and polycotton, though their processes and products are mostly classified as downcycling as the output products are of lower quality than the original products that generate the waste. While some recyclers claim closed-loop recycling capabilities with fabrics, consultations with representatives of multinational brands have indicated that most T2T recycled polyester materials (yarn and fabric) are imported. Viet Nam currently has the capacity to produce recycled polyester fibre and filament only from PET bottles or equivalent, and not from textile waste. Meanwhile, cotton-rich and polycotton textile waste are mainly downcycled into products such as rugs, carpets, and coarse yarn for home textile applications and gloves.

Not all textile waste bought by recyclers is recycled as the recycling processes themselves generate waste. For example, on average 20% of recycled cotton or polycotton fibre produced by weight is too short for subsequent production of yarn. These fibres are then used as stuffing materials or fuel for W2E schemes.

3. Mapping the post-industrial textile waste recycling stakeholders and pathways in Viet Nam

3.1 Manufacturers

There are **approximately 7000 textile and apparel enterprises in Viet Nam with more than 10 employees**[1]. A survey conducted with 162 manufacturers in April 2024 suggested that 56% of them pre-sort material waste. The level of pre-sorting varies between manufacturers, depending on brands' requirements and contracts with waste handlers. In most of the cases, pre-sorting is limited to seperating cardboard, plastics, metallic, wooden and textile materials. High-performance manufacturers separate textile waste into cotton-rich, polyester-rich, polyamide and blended waste, while ensuring that they are not polluted with dust, non-textile plastics, paper, metallic waste and other materials.

The financial arrangements between manufacturers and waste depend on the waste composition and sorting level: manufacturers either pay handlers to collect and treat the waste or are paid by handlers for sorted materials. **Most surveyed manufacturers conducting waste sorting reported economic and environmental benefits.**

While pre-sorting at source yields economic benefits for both manufacturers and waste handlers, manufacturers mostly pre-sort their waste due to brands' requirements. A few brands have been leading waste sorting projects, mainly for footwear with focus on EVA and rubber. On the other hand, much less effort is seen with textile waste. Some large manufactures are demonstrating leadership in waste management by showing that sorting at source - by composition and colour - can generate clear economic benefits.

Regarding the economic aspect, the average prices for sorted post-industrial textile waste range between 0.08 and 0.22 USD per kilogram during the study period, with cotton-rich textile waste yielding the highest prices and blended textile waste the lowest. These prices are very volatile, and in general, the demand is currently well exceeding supply. For each type of waste, the price further fluctuates depending on colour, purity, and amount. In 2023, the price for cotton-rich fabric clips in Viet Nam has increased by 70%, significantly surpassing the price in Bangladesh. This was caused by a shortage in supply and competition for feedstock among existing and incoming recyclers.

Table 1: Indicative Ex Works prices for common types of sorted consumer textile waste in Northern Viet Nam as set by waste traders in 2024.

Textile waste type	Price (VND)	Price (USD) (1 USD = 25,000 VND)	Note
Cotton-rich	5,000 VND/kg	0.2 USD/kg	Beige, white, knit – high quality fabric clip price can be as high as over 20,000 VND or 0.8 USD/kg
100% PET	3,500 VND/kg	0.14 USD/kg	
Blended	2,000 VND/kg	0.08 USD/kg	
Polyamide	5,500 VND/kg	0.22 USD/kg	

[1] Vietnam Textile & Apparel Association (VITAS). Vietnam Textile and Apparel Industry Directory 2024, p.9.

3.2 Waste handlers

Waste handlers act as intermediaries in the textile waste flow: they collect waste from manufacturers, sort and in some cases pre-process waste, then sell sorted waste or pre-processed products to buyers, including bulk buyers, recyclers, co-processors and waste treatment companies. While they may handle hazardous or non-hazardous waste, post-industrial textile waste is generally considered non-hazardous waste.

This study identified **over 220 waste handlers** located across Viet Nam that collect, trade or aggregate post-industrial textile waste. The list is available via Asia Garment Hub and constitutes the first public database on waste handlers. Viet Nam Waste Recycling Association (VWRA) , in collaboration with GIZ, is developing a directory of waste sectors linked to the textile and footwear supply chain based on this list.

Geographically, around **70%** of textile and apparel production in Viet Nam takes place in the South. Accordingly, most textile waste handlers and recyclers are also located in the South and there is a significant flow of textile waste from the North to the South to be observed.

Some waste handlers have their own recycling facilities and recycle the collected textile waste to a certain extent. For instance, A Chau Environment Company (A Chau) produces industrial wiping cloths from cotton or polycotton textile waste of sufficient size, with monthly production capacity of approximately 300 tonnes, in which 90% are sold domestically while the rest are for exports.

Some waste handlers who act solely as intermediaries for various waste handlers and recyclers. Waste trading between handlers and their customers are usually conducted via instant messaging apps such as Zalo or private social media groups.

Waste handlers vary greatly in scale. Larger firms may employ hundreds of workers and process 30,000-70,000 tonnes of textile or footwear waste annually. At the other end of the spectrum, informal enterprises and household operations typically employ 5-20 workers and process less than a thousand tonnes of waste in a year.

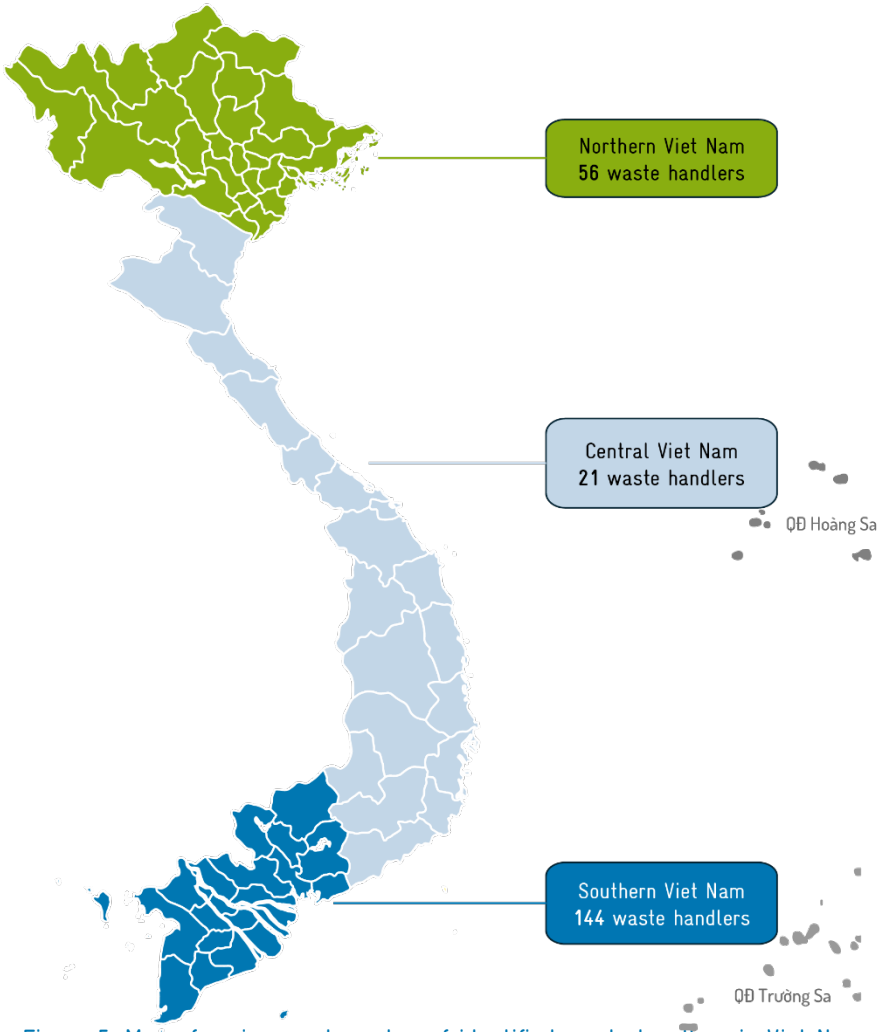

Figure 5: Map of regions and number of identified waste handlers in Viet Nam.

ETC Environment Resources Investment and Technical JSC.

Established in Nam Dinh Province in 2010, ETC Environment Resources Investment and Technical JSC. (ETC) is one of the major waste collecting, sorting and treatment companies in Northern Viet Nam and the North Central region. ETC is currently a waste collection and disposal partner company for many factories in the textile & footwear supply chain in Northern Viet Nam.

- **Size:** 148 employees
- **Annual treatment capacity: hazardous waste:** 80,000 tonnes; normal industrial solid waste: 50,000 tonnes
- **Waste sources:** hazardous and normal industrial solid waste from textile, footwear and other factories
- **Services:** Hazardous and medical waste treatment; industrial waste (including textile waste) collection and sorting; environmental consulting
- **Certifications:** ISO 9001 / ISO 14001

Trat Cau Craft Village

Trat Cau Craft Village has 1,538 households with about 6,000 people, of which about 27-28 households are engaged in purchasing and sorting fabric waste. 90% of the remaining households are engaged in making blankets, sheets, pillows, and mattresses that may utilise textile waste.

- **Size:** 27-28 households
- Annual treatment capacity: 18,000 tonnes (2023)
- **Waste sources:** Textile waste (fabric, yarn, fibre) from textile and footwear factories
- **Services:** Normal industrial solid waste collection and sorting
- Certifications: N/A

3.3 Waste recyclers

The study identified **17** textile waste recyclers operating in both the North and the South of Viet Nam. All are formally registered and have earned globally recognised certifications, including OEKO-TEX 100 and GRS. The recyclers purchase sorted textile waste from waste handlers (and directly from textile manufacturers in a few cases) to produce recycled materials and sell them to manufacturers or to other customers.

There are two main technologies are being applied in Viet Nam:

- thermo-mechanical recycling for polyester and to a lesser extent for polyamide (Nylon) textile waste, and
- mechanical recycling for cotton-rich or blended textile waste in the form of shredding and spinning the resulting fibres.

Both methods maintain the molecular structure of the materials, but thermo-mechanical recycling involve melting the thermoplastic materials, such as polyester and polyamide, and extrusion into new fibres; whereas the mechanical recycling only involves mechanical actions – cutting, shredding, mixing and spinning – in recycling the textile waste.

Currently, most recyclers in Viet Nam are downcycling, with only a few recyclers capable of closed-loop recycling for cotton-rich post-industrial textile waste. Nevertheless, Viet Nam has become a potential location for advanced (closed-loop) recycling investors in recent years. This is due to its strategic position in the textile supply chain with vertical capability and capacity (yarn spinning, fabric mills, apparel production), and especially its significant amount of post-industrial textile waste, among other factors.

Table 2: Waste recyclers identified in the study

No	Company name	Recycling technology	Product	Location
In the North				
1	Vikohasan Joint Stock Company	Thermo-mechanical	Recycled polyester staple fibre	Ha Nam Province
2	Hop Thanh Ltd. Co	Thermo-mechanical	Recycled polyester staple fibre	Thai Binh Province
3	Khai Thanh Ltd. Co	Thermo-mechanical	Recycled polyester staple fibre	Vinh Phuc Province
4	Nam Vang Ha Nam Polyester Staple Fibre	Thermo-mechanical	Recycled polyester staple fibre	Ha Nam Province
5	PVTex & Shinkong Synthetic Fibres	Thermo-mechanical	Recycled polyester DTY	Hai Phong Province
In the South				
6	Trinh Trung L.A Ltd. Co	Thermo-mechanical	Recycled polyester staple fibre	Long An Province
7	Hang Bang Ltd. Co	Mechanical	Recycled cotton fibre	Long An Province
8	Doan Ket International Textile	Mechanical	Blended TC recycled yarn	Long An Province
9	Le Tam Phat Ltd. Co	Mechanical	Blended TC recycled yarn	Long An Province
10	Recover VN	Mechanical	Recycled cotton fibre	Dong Nai Province
11	GDI Textile Ltd. Co	Thermo-mechanical	Recycled polyester staple fibre	Tay Ninh Province
12	Hai Thien Synthetic Fibre Ltd. Co	Thermo-mechanical	Recycled polyester staple fibre	Long An Province
13	Mekong Fibre Limited	Thermo-mechanical	Recycled polyester staple fibre	Tien Giang Province
14	Tah Tong Textile Ltd.	Mechanical	Recycled cotton/polyester fibre	Ba Ria – Vung Tau Province
15	Shundao Viet Nam Industries Co., Ltd	Mechanical	Recycled cotton/polyester yarn	Long An Province
16	Far Eastern Polytex Viet Nam	Thermo-mechanical	Recycled polyester POY, FDY, DTY	Tay Ninh Province
17	Century (TW/VN) - Trang Bang factory	Thermo-mechanical	Recycled polyester POY, FDY, DTY	Tay Ninh Province

3.4 Current pathways of recycling textile waste by material type in Viet Nam

In Viet Nam, post-industrial **polyester textile waste** is pre-processed into popcorn, then mixed with PET bottle flakes and PET waste from other industries (such as used PET trays from electronics manufacturers) to produce recycled polyester staple fibre via thermo-mechanical recycling. The ratio of recycled PET from fabric waste utilised in the feedstock varies from 1% to 50%. Recycled PET staple fibres of various specifications are used for domestic and export markets, mainly for bedding, mattresses and stuffing materials in furniture. Lower quality PET textile waste, such as with 5% or more spandex, is subjected to make PET chips for injection moulding.

Polyamide textile waste (nylon) is pre-processed into chips, either on its own or mixed with polyamide waste collected from used fishing nets. Polyamide chips are already being recycled (among others through chemical recycling procedures) in closed-loop models at production scale. One example is Formosa Chemicals & Fibre Corporation's recycled nylon fibre (Sunylon) for apparels or other application. Lower quality materials are used for various downcycling pathways.

In 2023, 225 thousand tonnes of recycled PET staple fibres were exported, with a similar amount produced for domestic usage. Pure PET post-industrial textile waste remains in high demand as feedstock for the downcycling recycling sector.

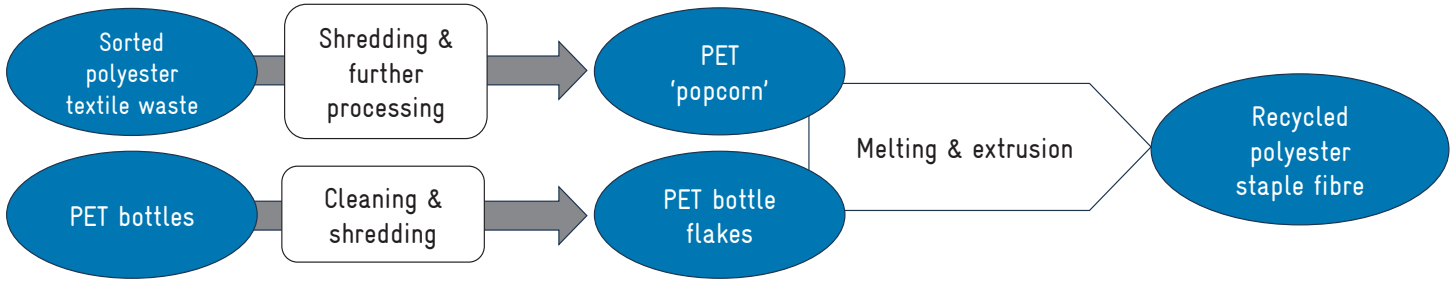

Figure 6: Generalised pathway of recycled polyester textile waste in Viet Nam, based on the pathways used by surveyed recyclers

GDI Textile Co., Ltd

Located in Tay Ninh Province (with a representative office in Ho Chi Minh City), GDI Textile manufactures recycled polyester staple fibres. GDI Textile is GRS certified.

- **Size**: ~300 employees
- Annual production capacity: 20,000 tonnes
- **Feedstock**: PET flakes from bottles, recycled PET 'popcorn' and PET lumps
- **Products**: Recycled PET staple fibres

Recycling post-industrial **blended textile waste** is mainly recycled using mechanical processes. The waste is sorted based on specific compositions and colours, then cut and shredded into fibre, and finally spun into relatively coarse yarn (Ne 6). This yarn is mainly used for producing PPE gloves or similar products for both domestic market and exports. Another application of blended textile waste is for the production of expoerted non-woven floor covering.

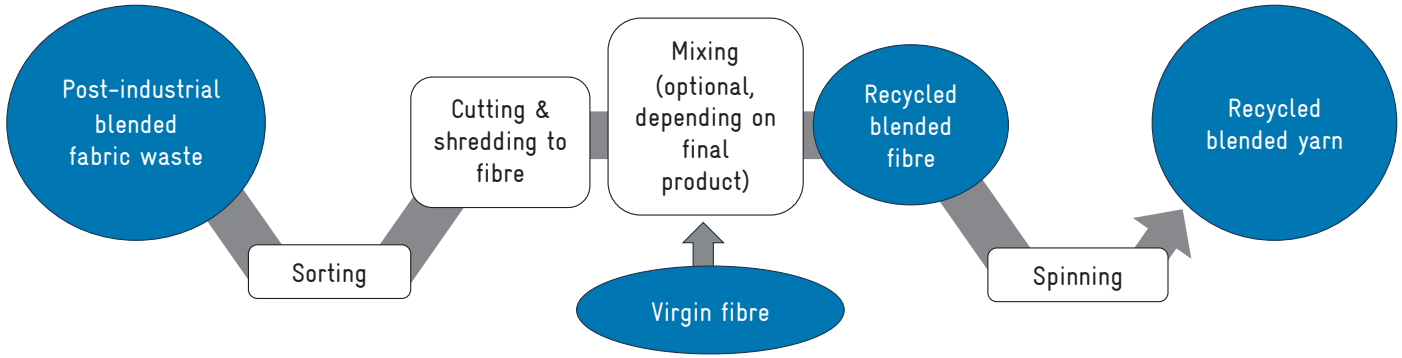

Figure 7: Generalised pathway of recycled blended textile waste in Viet Nam, based on the pathways used by surveyed recyclers

Tan Nam Trung

Located in Long An Province and 100% Vietnamese owned, Tan Nam Trung recycles textile waste combined with yarn spinning for polycotton blended composition.

- **Size**: 125 employees
- **Annual production capacity**: 10,000 tonnes (recycled fibres), 7,200 tonnes (yarn)
- **Feedstock**: post-industrial textile waste of various composition
- **Products**: recycled fibres, OE coarse polycotton yarn (Ne: 6)


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The primary method for closed-loop recycling of post-industrial cotton waste involves mechanical recycling. This process entails sorting and shredding the waste into fibres, which are then blended with virgin cotton to produce recycled yarn. Cotton-rich post-industrial textile waste is highly valued and in demand by some domestic and foreign recyclers. Additionally, several vertically integrated apparel manufacturers are exploring internal closed-loop recycling initiatives for post-industrial cotton waste, with some projects in trial phases and others already progressing to production stages.

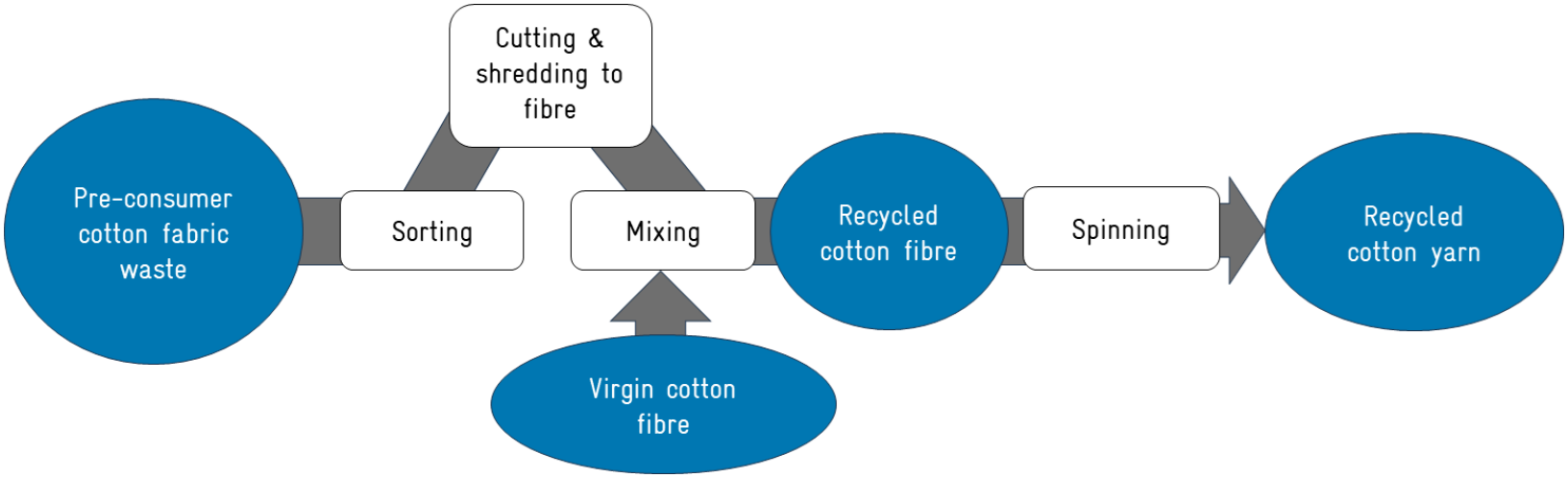

Figure 8: Generalised pathway of recycled cotton textile waste in Viet Nam, based on the pathways used by surveyed recyclers

Recover Textile Systems (Recover™)

Recover™ is a leading materials science company and global producer of low-impact, high-quality recycled cotton fibre and cotton fibre blends. Its products are created in partnership with the supply chain for global retailers and brands, offering a sustainable solution to achieve circular fashion for all. Recover™ focuses on textile-to-textile recycling of textile waste based on the mass balance approach and offers technical adoption and support services.

Backed by investment from STORY3 Capital and Goldman Sachs, Recover™ is aiming to scale its proprietary technology. The company is headquartered in Spain, with facilities in Pakistan and Bangladesh, with an additional production hub planned for Viet Nam and expected to start operation in Q4/2024.

- **Feedstock**: post-industrial and post-consumer textile waste
- **Products**: 100% cotton and cotton-polyester blended fibre.

3.5 Co-processing, waste-to-energy (W2E), and incineration schemes for textile waste in Viet Nam

Co-processing has emerged as a recommended waste treatment method for some types of textile waste as a solution towards the "zero to landfill" goal. Co-processing technology uses suitable waste materials in manufacturing processes to recover energy and resources, thereby reducing the need for conventional fuels and raw materials through substitution.

In Viet Nam, co-processing mainly refers to the generation of energy from incinerating waste and uses the resulting ash as material for the cement production process. There are **5 co-processing plants in operation** in Viet Nam: 3 VICEM plants (one in the north and 2 in the south), one plant belonging to Siam City Cement Viet Nam (INSEE) and one plant belonging to FICO Tay Ninh in the south of Viet Nam. In addition, some other cement manufacturers are being licensed to test co-processing technology for operation.

In addition to that, W2E plants in Viet Nam are also growing in number, which can also serve as a solution for the "zero to landfill" goal. There are **3 W2E plants in operation** in Viet Nam: one in the capital of Hanoi, one in Bac Ninh Province (Northern Viet Nam) and one in Can Tho Province (Southern Viet Nam).

Consultation with industry stakeholders estimates that about 40% of textile waste coming from apparel factories and 60% of textile waste coming from footwear factories is ultimately subject to co-processing and waste-to-energy, incineration, significantly higher than the 1% figure as reported in India by Fashion for Good2 but similar to the 45.5 % reported for the textile & apparel industry in Sri Lanka (Edirisinghe, Alwis & Wijayasundara, 2023, p.1)3.

Textile & footwear manufacturers **pay 1,400-2,000 VND/kg (0.056 – 0.08 USD)** for disposing post-industrial textile waste through co-processing/W2E. The rates are **6,000-10,000 VND/kg (0.24 – 0.4 USD)** for hazardous waste.

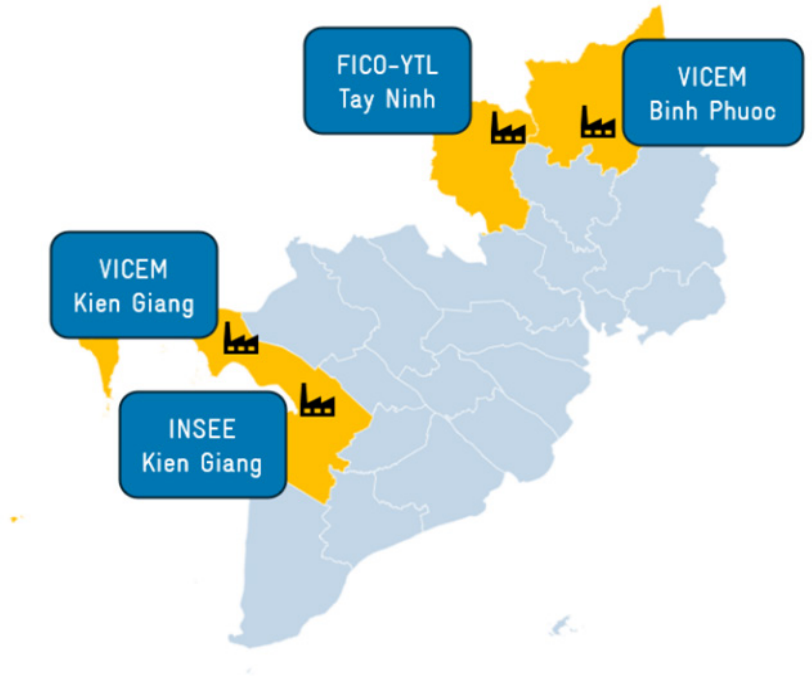

Figure 9: Current operational co-processing plants in the south of Viet Nam

Although not a widespread practice, incineration of post-industrial textile waste without energy recovery still happens in Viet Nam. Manufacturers would burn their own post-industrial textile waste as fuel for boilers, or the waste may be burned at other facilities such as brick kilns. This practice, despite being illegal in Viet Nam, persists especially in central Viet Nam due to the lack of co-processing and licensed waste-to-energy facilities, along with factors such as transportation costs.

[2] Fashion for Good, Sattva Consulting, Reverse Resources and Saahas Zero Waste (2023). Wealth in Waste: India's Potential to Bring Textile Waste Back into the Supply Chain. p.26. https://reports.fashionforgood.com/report/sorting-for-circularity-india-wealth-in-waste/

[3] Edirisinghe, L. M., Alwis, A., & Wijayasundara, M. (2023). Uncovering the circular economy potential of industrial waste in Sri Lanka (case study from textile industrial – fabric waste). E3S Web of Conferences, 436,08012. https://doi.org/10.1051/e3sconf/202343608012

4. Overview of traceability and compliance in Viet Nam's textile waste sector

Traceability is a relatively new concept for textile waste handlers in Viet Nam, partly due to minimal tracking requirements within an ecosystem largely focused on downcycling, co-processing, and incineration. The complexity and opacity of the waste value chain further complicate traceability efforts. A small number of handlers involved in brand-led closed-loop recycling of EVA post-industrial waste have implemented traceability practices, enabling recycled materials to re-enter production.

For many waste handlers, compliance is primarily demonstrated through permits and licenses. Some facilities, particularly those handling hazardous waste and pre-processing, face challenges related to basic compliance, especially in occupational health and safety. Certain recyclers have obtained certifications such as GRS or ISO 14001, often at the request of clients, though stakeholders continue to discuss how certification systems might evolve to better address workplace standards.

Obtaining accurate data on waste disposal currently, data from waste handlers often relies on estimates, resulting in higher reported recycling rates of textile waste from apparel and footwear manufacturers —sometimes exceeding 90%— without substantial verification.

Waste contractor assessments (audits) are the primary mechanism for apparel and footwear manufacturers to select and monitor contracted waste handlers, particularly for compliance purposes. However, waste handlers have noted an excessive number of audits, many of which they feel lack substantive value. One waste contractor with over 100 employees reported receiving around 50 audits annually, estimating that fewer than 5 provided actionable insights. Such anecdotal information is backed by feedback from producers: in a GIZ-led survey from April 2024, approximately 50% of manufacturers reported implementing these assessments, with 85% indicating a need to improve assessment quality due to a lack of suitable tools, the complexity of the waste sector, and resource constraints. Some brands have encouraged suppliers to conduct due diligence with waste contractors, influenced by evolving EU regulations. Strong brand leadership and guidance, along with the development of a transparent, compliant, and competent waste sector that can support advanced recycling practices, have been highlighted as essential for positive change in this complex area.


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5. Opportunities to further develop closed-loop recycling for textile waste in Viet Nam and in the region

Enhancing domestic recycling infrastructure in the short-term

The shift toward textile-to-textile recycling presents both a threat and an opportunity for Viet Nam's established downcycling sector, which has traditionally relied on post-industrial waste for low-value applications. With advanced recyclers now competing for post-industrial waste, the downcycling sector **must elevate its recycling value, moving closer to textile-to-textile industry standards to remain viable.** There are some promising technical pathways that domestic recyclers are currently exploring and piloting:

- **Cotton-rich textile waste**: Viet Nam has an established capacity for mechanical textile-to-textile recycling of 100% cotton post-industrial textile waste. Some vertically integrated manufacturers are already recycling their own cotton-rich fabric clips and are considering incorporating waste from other facilities. This business model is promising; however, challenges related to licenses, taxes, and customs have impacted efforts to scale up integrated recycling.

- **Polycotton blended textile waste**: Currently, polycotton blends are primarily downcycled through mechanical processes. Compared to countries like India, downcycling high-quality post-industrial waste is viewed as a missed opportunity. There is significant potential for value chain collaboration and process optimisation to support textile-to-textile recycling of blended textiles through existing and mechanical recycling technologies. Short fibres (around 20% of the textile waste feedstock) which are generated as a by-product from the mechanical recycling of cotton-rich and blended materials could potentially serve as feedstock for future chemical recycling processes. There are other textile waste types, such as spandex-containing fabric clips, which are unsuitable for mechanical recycling and require advanced recycling solutions.

- **Polyester textile waste:** post-industrial pure PET textile waste is in high demand as feedstock, commonly mixed with PET bottle flakes for large-scale production of staple recycled PET fibres. This process is essentially a form of downcycling for both bottle flakes and textile waste. The role of this sector within emerging closed-loop recycling models—such as bottle-to-bottle and textile-to-textile recycling—requires further study to clarify its position in the shift towards closed-loop recycling.


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Leveraging advanced recycling technologies in line with the waste hierarchy

More advanced textile recycling technologies – often referred to as chemical recycling – are emerging as an additional recycling pathway to be further scaled up. In general, chemical recycling processes chemically decomposes textiles into their fundamental components, allowing the production of fibres comparable to virgin quality. Advanced chemical recycling technologies are crucial for achieving a circular economy in the textile & apparel industry, as they promise to recycle complex materials and blends that are challenging for mechanical processes.

In recent years, numerous textile recycling companies and startups have incorporated chemical recycling – mostly for polyester - as a part of their solutions. They include Gr3n (Switzerland), Ambercycle (USA), Samsara Eco (Australia), Syre (Sweden), Cure Technology (Netherlands), and Saya Renew (Taiwan (China)). For polycotton fibres, pioneer companies include Circ (USA) and BlockTexx (Australia).

Viet Nam is becoming increasingly important for advanced recycling providers due to its supply of post-industrial textile waste, key role in the global fashion supply chain, yarn spinning capacity, and favourable economic and socio-political factors. While advanced recycling technologies are being developed to address primarily the globally bigger issue of post-consumer waste, post-industrial waste will be essential as feedstock during the initial scaling, with a gradual shift toward post-consumer waste. Chemical recycling may thereby present an opportunity to divert post-industrial waste from lower-value recovery pathways like downcycling, co-processing, or waste-to-energy (W2E) to higher-value recycling.

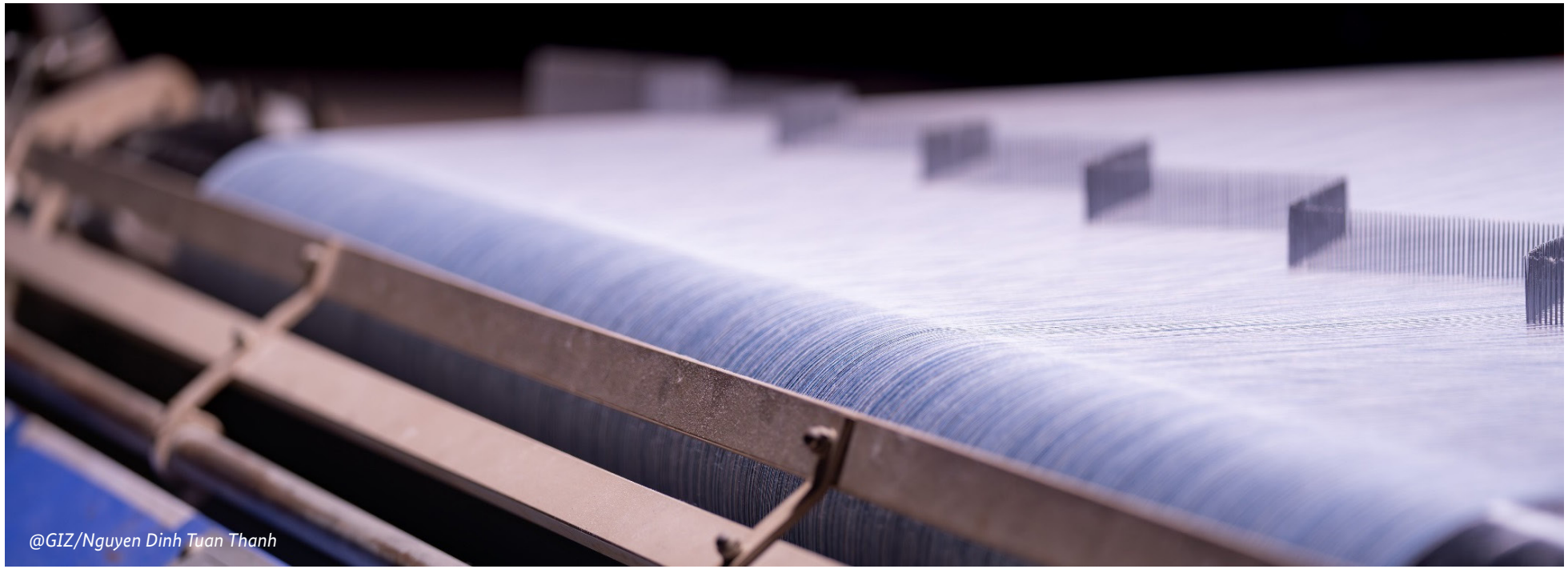
Nevertheless, **both mechanical and chemical recyclers require large and reliable feedstock materials for their operation causing competition for especially readily available higher quality waste materials on the market**. It is crucial to apply an adaptive feedstock strategy that prioritises high-quality feedstock for mechanical recycling and directs more complex, harder to recycle waste to advanced recycling in line with the waste hierarchy principle. This approach requires collaboration among competitors and partners along the value chain as well as a supporting regulatory framework, allowing both advanced and mechanical recyclers to co-exist in order to bring materials back into production in the most environmental and economic manner.

Against this background trade restrictions for waste materials may need to be reconsidered. In Taiwan (China), regulations now permit importing post-industrial textile waste that meets quality standards, with strict waste flow monitoring. India also allows post-industrial textile waste imports and has piloted post-consumer waste imports. Bangladesh has advocated for similar policies. In contrast, Viet Nam restricts imports of post-industrial textile waste, which is considered a secondary material, potentially limiting recycling growth in the country.

Creating an enabling framework and ecosystem

Industry stakeholders believe that transparent waste handling, optimised business models, and access to high-quality textile waste - supported by circularity-focused policies - are essential for Viet Nam's growth as a recycling hub as the whole industry continues to emphasise sustainability and circularity. A metabolic analysis in Thua Thien-Hue Province, conducted by the United Nations Development (UNDP) in Viet Nam, estimated that increasing the recycling and regenerative content in garment production by 20% can add 24 million USD to the province's GRP in 2030 (UNDP, 2023, p.58)[4].

Advancing the shift to a circular industry in Viet Nam will require three key elements: collaboration between brands and manufacturers, increased capacity from smaller waste enterprises, and supportive regulatory changes. In the short term, Viet Nam's competitiveness in the textile, garment, and footwear sectors within the global supply chain are enhanced by adopting circular technologies for post-industrial waste. In the longer term, over a 5 to 7-year horizon, the technology infrastructure can support Extended Producer Responsibility (EPR) for post-consumer textile waste generated by Viet Nam's projected population of over 100 million by 2030.



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[4] United Nations Development Programme (2023). Towards a circular economy in Thua Thien-Hue Province – A metabolic analysis to assess the socio-economic and environmental impacts, UNDP, Hanoi. A metabolic analysis to assess the socio-economic and environmental impacts in Thua Thien-Hue province | United Nations Development Programme

6. Collective action to optimise textile waste management in Viet Nam in the shift to circularity

The **initiative "To the Finish Line" (TFL)** organised by GIZ and its partners, is **promoting collective action to improve the environmental performance of Viet Nam's fashion supply chain.** Using the **Higg Facility Environment Module (FEM)** as its core framework, TFL provides practical, context- specific knowledge for Viet Nam. This initiative has developed into a **Professional Peer Learning Community** for specialists from manufacturers, brands, and service providers. Since its inception in 2022, TFL has engaged over 910 manufacturers in 2024. TFL is now an annual training platform and a foundational course for industry-wide environmental topics. Each year, based on community needs, TFL deepens its focus with specialised topics such as energy, greenhouse gases (GHG), and waste, upholding its principle of collective action for environmental improvement at scale.

The **Waste No More (WNM)** initiative, implemented by GIZ and its partners, is **advancing closed-loop recycling of post-industrial waste in Viet Nam's apparel and footwear supply chain, while promoting decent work in the waste sector**. Based on the findings on this mapping, the initiative engaged over 20 multinational brands, nearly 500 manufacturers and 6 textile recyclers, further waste collectors and four business associations in 2024. It has and is working on 3 key action areas: 1) Improving waste management at manufacturers to promote separation at source and implement waste data tracking 2) Ensuring transparency, compliance and traceability in the waste sector; and 3) Piloting the production of a clothing item with 30% recycling content from textile-to-textile recycling made in Viet Nam with a domestic recycler, weaver and apparel manufacturer to showcase the technical and economic feasibility.

The United Nations Development Programme (UNDP), funded by the German Federal Ministry for Economic Cooperation and Development (BMZ) and supported by GIZ, is aiming to promote **web-based marketplaces** to foster the market for secondary materials in Viet Nam, starting with **recycled plastics and textiles**. The project supports 3 existing marketplaces in providing a more accessible and user-friendly platforms for sellers and buyers while emphasising transparency and verification.

About Go Circular

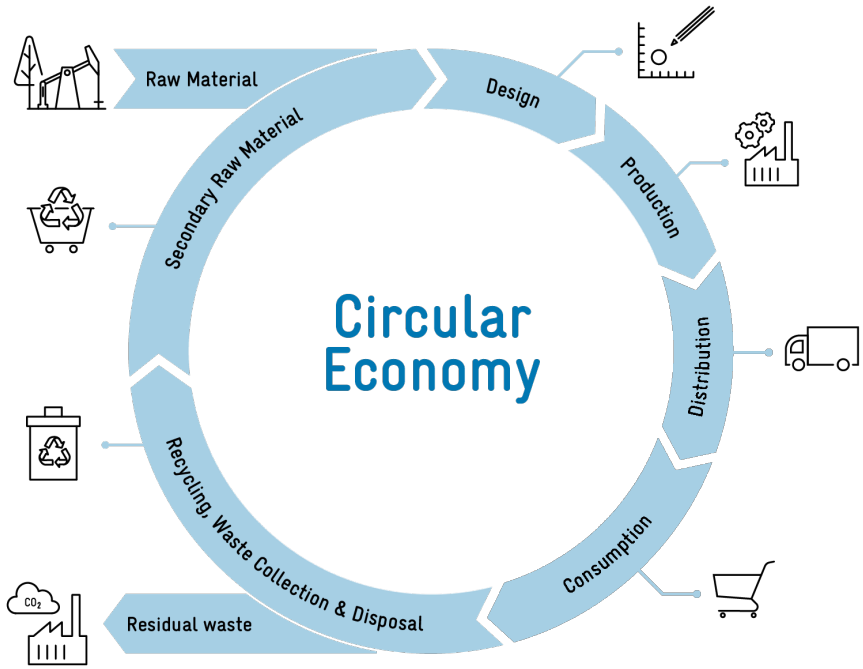
The global programme "Go Circular" aims to support the transition to a Circular Economy (CE) at global level and in the three partner countries: Colombia, Ghana, and Viet Nam. Go Circular works in three priority areas: i) Promoting innovation, ii) Scaling up solutions, and iii) Action in global alliances.

In Viet Nam, the project works closely with the Ministry of Planning and Investment (MPI) as well as the private sector. It aims to promote CE business models through private sector support and advice on relevant decrees and policy initiatives.

Go Circular is commissioned by the German Federal Ministry for Economic Cooperation and Development (BMZ) and implemented by the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ).

More information:

https://www.giz.de/en/worldwide/109471.html



Annex: Methodology for estimating the post-industrial textile waste volumes

Method

- The volume of textile produced domestically in Viet Nam in 2022 is calculated indirectly via calculating the quantity of exported apparel in Viet Nam by HS code data.
- The amount of post-industrial textile waste is then calculated from the production volume of the textile.
- A reasonable calculation formula was devised via close consultation with key experts and surveys with manufacturers.

X = [(A * 1.5 * 180)/ (1-D)] *D/1,000,000

In which:

X:	Estimated weight quantity of exported apparel by ton
A:	Estimated quantity of exported apparel by piece
1.5:	1.5 m^2 – Average needed fabric area for a piece of apparel size M
180:	180 gsm – Average fabric weight
D:	Estimated wastage of cutting process. The commonly accepted range of 10-15% is used.

Limitations

- Product information declared in HS code is not standardised, leading to difficulties in defining product classification and raw data.
- Difficulties in verifying the accuracy of declared information of HS code.
- Time limitations leading to approximate estimation of the amount of exported textile products. Domestically produced and consumed goods were undefined.

Due to these limitations, the study does not claim that the estimated amount of post-industrial textile waste in Viet Nam is definite and authoritative. Further study is necessary to determine more accurate data on the amount and composition of textile waste in Viet Nam.

Imprints

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