

# Guidelines for Greening the Textile Sector in Viet Nam



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# Abbreviations

<b>AOX</b>	Adsorbable organic halogen
<b>BATs</b>	Best Available Technologies
<b>BEPs</b>	Best Environmental Practices
<b>CMT</b>	Cut, Make, Trim
<b>CO<sub>2</sub></b>	Carbon dioxide
<b>CPTPP</b>	Comprehensive and Progressive Agreement for Trans-Pacific Partnership
<b>EVFTA</b>	European Union - Vietnam Free Trade Agreement
<b>FOB</b>	Free on Board
<b>GHG</b>	Greenhouse gases
<b>MOIT</b>	Ministry of Industry and Trade
<b>MONRE</b>	Ministry of Natural Resources and Environment
<b>PES</b>	Polyester
<b>RFT</b>	Right-First-Time
<b>SDG</b>	Sustainable Development Goals
<b>VINATEX</b>	Viet Nam National Textile and Garment Group
<b>VITAS</b>	Viet Nam Textile and Apparel Association
<b>WWF</b>	World Wild Fund for Nature

# Preface

Led by WWF Vietnam with cooperation from the Vietnam Textile and Apparel Association (VITAS), and with financial support from HSBC, the Swiss Agency for Development and Cooperation, and Tommy Hilfiger, the Greening Textile Sector Project was launched in 2018 to transform the textile sector in Vietnam and engage sectoral and environmental governance to bring social, economic and conservation benefits to the country and the entire Mekong region. The project focuses on improving water and energy management with the long-term goal of enhancing Mekong River's governance and improving the sustainability of Mekong River ecosystems and habitats. The project also supports climate change mitigation through increasing energy efficiency and the use of sustainable energy. This handbook on guidelines for greening the sector is one of the project's main deliverables and serves as a resource document for stakeholders interested in working towards a sustainable pathway to secure long-term sector growth.

In recent years, the textile and garment industry has had the largest export turnover and growth rate among Vietnam's export products. In 2019, export value reached 39 billion USD. The Prime Minister hoped that the sector will maintain its position in the top 3 textile exporting countries with the target of at least 30 Vietnamese fashion brands competing in the world market by 2030, and to fully embed the principles of environmental conservation in the sector development.

Given the significance of the sector in socioeconomic and environmental aspects, WWF is striving to build a broad coalition of stakeholders committed to creating a sustainable industry.

# About these Guidelines

These guidelines are designed to be a basis for discussion among stakeholders on actions that can be implemented in short to medium term for the sector green transformation.

## Part 1

Part 1 offers a rationale for greening the textile sector. The sector's momentum for long-term development and changing market requirements driven by multilateral trade agreements, buyers' sustainability targets, rising consumer awareness and support for brands promoting sustainability. Examples have also been provided for each case. The concluding section of Part 1 outlines Vietnam's policy framework, which is committed with global SDGs, climate change mitigation and adaptation as well as green growth strategies, with concerning issues related to textile sector.

## Part 2

Part 2 presents examples of Best Available Technologies (BATs) and Best Environmental Practices (BEPs) in Bangladesh, China, the European Union and India, followed by actions implemented by leading brands (H&M, GAP, Levi Strauss, and UNIQLO) and also shares two examples from manufacturers in Vietnam.

## **Part 3**

Part 3 is about textile sustainability trends and platforms. In connection to practical experiences demonstrated in Part 2, some most recognized tools and certifications that address the sustainability improvement of textile supply chain are introduced in this Part under 3 categories: (i) sustainable materials promotion with GRS, BCI and Cradle-to-Cradle; (ii) Tools applied in textile manufacturing process including Higg Index, Bluesign Approved, GOTS, ISO 14001, Oeko-Tex; and (iii) Eco-tag for products, typically Bluesign Product, EU Eco Label and Fair Trade.

## **Part 4**

Part 4 presents an overview of practical actions that can be undertaken by stakeholders to embed environmental sustainability in their operations. Section 1 begins with a vision of what can be achieved followed by a sector outlook and opportunities for green transformation and a 'map' of stakeholders in the textile value chain. The stakeholder map helps to identify their roles in greening Vietnam's textile sector. Section 2 shares suggested goals and targets for textile sector sustainability by 2030. Section 3 discusses key workstreams toward green transformation. Section 4 is a draft action plan for taking this agenda forward.

# Reading Guide for specific audience group

<b>If you are</b>	<b>You may be interested in</b>
Ministry official	<ul style="list-style-type: none"><li>• Opportunities and existing obstacles to creating a circular economy and gaps in policy and legislation (<i>ref. to Part 1</i>).</li><li>• Setting standards, requirements and enforcement (<i>ref. to Part 4</i>).</li></ul>
Provincial authority official	<ul style="list-style-type: none"><li>• Industrial park design and sustainable operations that minimize environmental and social impacts and improve resource efficiency (<i>ref. to Sec. 1, Part 2</i>).</li><li>• Local policy for attracting investment projects with green-oriented designs (<i>ref to Sec. 3, Part 1</i>).</li></ul>
VITAS member	<ul style="list-style-type: none"><li>• Networking with stakeholders in other sectors such as manufacturing companies and investors, local authorities, and policy makers (<i>ref. to Part 3 and 4</i>).</li><li>• Sector strategy and policy recommendations and advocacy.</li></ul>
Factory owner/operator	<ul style="list-style-type: none"><li>• Recommended best practices and techniques to improve production with win-win benefits (<i>ref. to Annex 3</i>).</li><li>• Certifications, labels, and standards.</li><li>• Legal documents related to sustainable development, including incentives and green financing (<i>ref. to Sec. 3, Part 1</i>).</li></ul>
Buyer or brand representative	<ul style="list-style-type: none"><li>• Getting and sharing information on techniques, trends, and support (<i>ref. to Part 3 &amp; 4</i>).</li><li>• Public-private partnerships and networking (<i>ref. to Part 3 &amp; 4</i>).</li></ul>

<b>If you are</b>	<b>You may be interested in</b>
Investor or banker	<ul style="list-style-type: none"> <li>• Legal documents related to sustainable development, including incentives for green investment (<i>ref. to Part 1</i>).</li> <li>• Information on Best Available Technologies, Best Environmental Practices (<i>ref. to Part 3 and Annex 3</i>).</li> </ul>
Development partner	<ul style="list-style-type: none"> <li>• Public-private partnerships and networking (<i>ref. to Part 3 and Annex 3 &amp; 4</i>).</li> <li>• Policy advocacy (<i>ref. to Part 3 and Annex 3 &amp; 4</i>).</li> <li>• Information on Best Available Technologies, Best Environmental Practices (<i>ref. to Part 3 and Annex 3 &amp; 4</i>).</li> </ul>
NGO, CSO or concerned citizen	<ul style="list-style-type: none"> <li>• Eco-tag, eco-labels, fair trade, industry sustainability guidelines (<i>ref. to Part 3</i>).</li> </ul>
HR professional	<ul style="list-style-type: none"> <li>• Training and human resource requirements (<i>ref. to Annexes</i>).</li> </ul>
Technician or engineer	<ul style="list-style-type: none"> <li>• Technical information, Best Available Technologies, Best Environmental Practices (<i>ref. to Annexes</i>).</li> </ul>

A large industrial tank, likely at a textile or garment factory, is shown. A thick, white, foamy substance covers the surface of the liquid inside. A vertical pipe is positioned on the right side, from which a dark, turbulent stream of liquid is being poured into the tank, creating a large splash and disturbing the foam.

# Part 1.

# Why Vietnam needs

# a green textile and

# garment sector

## Section 1. Drivers of change

The global textile industry was estimated to be worth USD 920 billion in 2018 and forecast to reach approximately USD 1,230 billion by 2024. Vietnam's textile and garment industry comprises nearly 15% of the country's total export turnover. Between 2005–2017, Vietnam's market share increased from 1.7% to 2.5%, making it one of the five largest textile exporters in the world. In Vietnam, the sector currently employs over 2.5 million people, accounting for approximately 20% of the national industrial workforce<sup>1</sup>. While the industry has significant economic benefits, the production of textiles and garments is resource intensive and a major source of pollution.

Textile production and cotton farming globally use around 93 billion cubic meters of water annually. This is 4% of all the freshwater withdrawals worldwide. In addition, 20% of industrial water pollution globally comes from dyeing and textile treatments. Textile manufacturing also uses a lot of energy to operate machinery, heating and cooling, and to produce heat and steam for material processing. Textile production emitted a total of 3.3 Gt of CO<sub>2</sub> equivalent, or 6.7% of global emissions in 2016.

The global Covid-19 pandemic has been causing tremendous social and economic turbulence. The apparel industry has experienced an immediate drop in global sales. A global consumer survey by McKinsey in April 2020<sup>2</sup> indicated that as an immediate response, 60% consumers cut down fashion spending during and after the pandemic; while in long run, 65% will shift from fast to low enduring fashion and 67% care about the environmental and social sustainability of fashion brands. Consumer's pressure is a key driver for fashion brands to commit and act for improving sustainability throughout their supply chain.

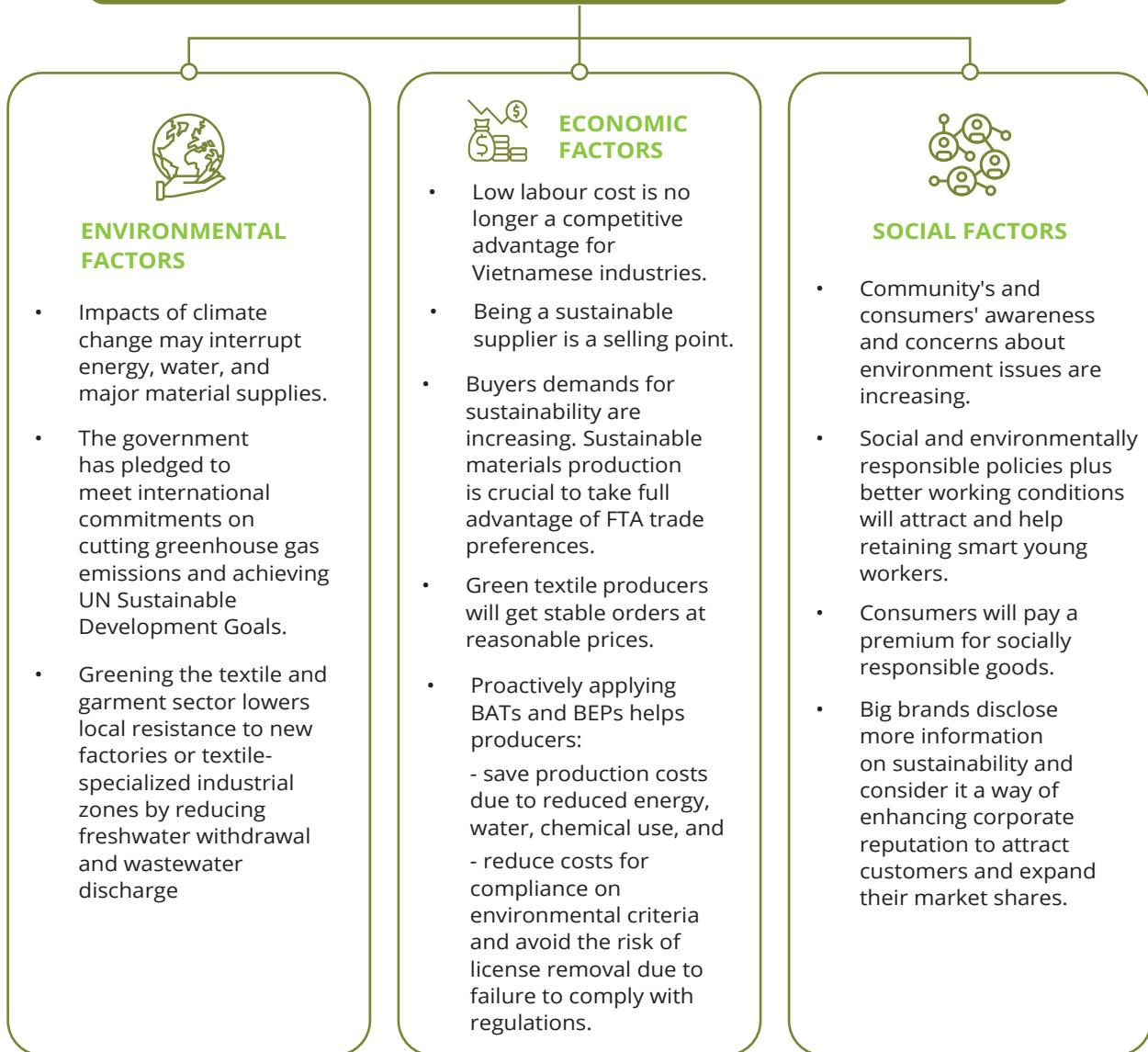
'Greening' the textile sector means working toward improving resource efficiency, reducing waste discharge, phasing out microfiber release, transforming the way clothes are designed, produced, sold and used to break free from their increasingly disposable nature, improving recycling by transforming clothing design, collection, and reprocessing, and moving to renewable inputs.

Greening the sector is not just about technology. Long-term, sustainable growth of the sector means taking into account environmental, economic and social factors, as depicted in Figure 1. Actions taken to green the textile sector will make a significant contribution to Vietnam's commitments to meeting many of the 17 Sustainable Development Goals.

<sup>1</sup> Book "Ngành công nghiệp Dệt May Việt Nam với cuộc CMCN lần thứ 4", VINATEX, July 2020

<sup>2</sup> <https://www.mckinsey.com/industries/retail/our-insights/survey-consumer-sentiment-on-sustainability-in-fashion>

## Long-term, sustainable growth of the textile and garment sector depends on



**Figure 1.** Three perspectives for securing long-term sustainable growth in the textile and garment sector.

## Section 2. Market requirements

**"The bottom line is, greening the textile and garment sector is not just 'good for the environment', it has tangible monetary benefits for everyone involved."**

### Multilateral Trade Agreements

Vietnam currently participates in 16 Free Trade Agreements (FTAs). FTAs offer favorable conditions for enterprises to expand their export markets. Certified corresponding origins, sustainable production, and transparency of production information are preconditions of tax relief for Vietnamese goods. Meanwhile, Vietnam is obliged to open its markets to high quality and diverse products from FTA partner countries and is gradually pressured to demonstrate fair and equal competitiveness or risk losing its domestic market to foreign products and companies. To take full advantage of FTA trade, businesses need to innovate all aspects of their operations.

To illustrate, here are some of the implications under the Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP). In Chapter 20 (para 6), "the Parties recognize that it is inappropriate to encourage trade or investment by weakening or reducing the protection afforded in their respective environmental laws." There are further obligations to protect the ozone layer and marine environments. Lest industry or government think they can shirk these obligations, Article 20.11: Voluntary Mechanisms to Enhance Environmental Performance stipulates that, "The Parties recognize that flexible, voluntary mechanisms, for example, voluntary auditing and reporting, market-based incentives, voluntary sharing of information and expertise, and public-private partnerships, can contribute to the achievement and maintenance of high levels of environmental protection and complement domestic regulatory measures. The Parties also recognize that those mechanisms should be designed in a manner that maximizes their environmental benefits and avoids the creation of unnecessary barriers to trade."

## Stricter buyer requirements

Buyers, especially those representing major brands and international chains, are restructuring their global supply chains to meet their strict sustainability targets. These requirements emphasize environmental performance, use of recycled materials, sourcing organic or sustainable raw materials, reducing energy consumption, and conservation of non-renewable resources such as water and fossil fuels.

## Increasing consumer awareness

A growing number of consumers are willing to pay more for sustainable textiles and clothing products and their increasing awareness on sustainable consumption for environmental protection is creating pressure on the sector to innovate and move towards green production.

***Companies are learning that consumer confidence in a company can be enhanced by increasing the transparency of their production and operation processes.***



### **35 Ethical & Sustainable Clothing Brands Betting Against Fast Fashion**

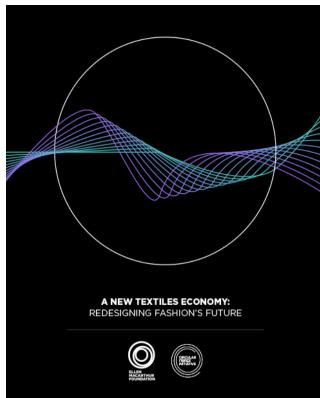
*Global fashion chains are launching organic collections and fairtrade products and international trading companies have established corporate sustainability strategies for their supply chains to manage the consumption of natural resources.*

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LEVI'S  
LEVI STRAUSS & CO.  
DESIGNED BY LEVI STRAUSS & CO.™

### SUSTAINABILITY GUIDEBOOK

#### **Levi Strauss & Co., Ltd.'s Sustainability Guidebook**





## A new textiles economy: Fashion's Future

*The Ellen MacArthur Foundation shows how the textile system operates through the use of large amounts of non-renewable resources to produce clothes "that are often used for only a short time, after which the materials are mostly sent to landfills or incinerated."<sup>3</sup>*



## Fixing Fashion: Clothing consumption and sustainability

**Author:** Environmental Audit Committee

### **Contents:**

- *The environmental cost of our clothes*
- *The social cost of our clothes*
- *Textile waste and collection*
- *New economic models for the fashion industry*
- *Conclusions and recommendations*

*In the UK, the Environmental Audit Committee under the House of Commons recommended the fashion industry trace the source of raw materials in garments to address social and environmental abuses in their supply chains.<sup>4</sup>*

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<sup>3</sup>The Ellen MacArthur Foundation, New Textiles Economy: Redesigning Fashion's Future, 2017

<sup>4</sup>House of Commons, Environmental Audit Committee; FIXING FASHION: clothing consumption and sustainability; 19 February 2019

### Section 3. Vietnamese Policies Concerning the Textile and Garment Sector

The existing legislation documents of Vietnam, which address directly the sector or general manufacturing industries is structured at different levels. The table below gives an overview of the existing legal doctrine legislating Viet Nam's textile industry.

Nr.	Document	Most concerned stages in the supply chain	Implications
<b>General Strategies</b>			
1	Law, 55/2014/QH13, Environmental Protection	All stages	Requirements for both investors and factories
2	Decree, 155/2016/NĐ-CP, Penalties for administrative violations against regulations on environmental protection	All stages	Requirements and legal compliance for factories
3	Decision, 622/QĐ-TTg 10/5/2017, National Action Plan for the Implementation of the 2030 Sustainable Development Agenda	All stages	Orientations for both investors and factories to move towards green production
4	Decision, 76/QD-TTg 11/1/2016, The National Action Plan on Sustainable Production and Consumption up to 2020, with a vision to 2030	All stages	Tasks and orientations for both investors and factories to move towards green production
5	Decision, 1393/QD-TTg (25/9/2012), National Strategy on Green Growth during the period 2011-2020, with a vision toward 2050	All stages	Tasks and orientations for both investors and factories to move towards green production
6	Resolution, 24-NQ/TW (03/6/2013), Proactive response to climate change, strengthening natural resources management and environmental protection	All stages	Orientations for both investors and factories to move towards green production

Nr.	Document	Most concerned stages in the supply chain	Implications
<b>Energy Efficiency</b>			
7	Decision, 280/QD-TTg 13/3/2019, Action Approval of the National Energy Efficiency Programme (VNEEP) for the period of 2019 -2030	All stages	Sector objectives for reducing the average energy consumption (minimum 5.00% by 2025 and 6.80% by 2030)
8	Decision, 2053/QD-TTg 28/10/2016, Action Plan to Implement the Paris Agreement on Climate Change	All stages	Tasks and orientations for both investors and factories to move towards green production
9	Decision No.2359/QD-TTg dated 22/12/2015 of Prime Minister on the National GHG Inventory	All stages	Annual energy consumption inventory to be carried out by the manufacturer
10	Law, 50/2010/QH12, Economical and Efficient Use of Energy	Wet processing	Requirements for both investors and factories
11	Decree 21/2011/NĐ-CP (March 29, 2011) Detailing the Law on Economical and Efficient Use of Energy for industries	All stages	Requirements and instructions for factories
<b>Industrial and Industrial park Development</b>			
12	Decree, 82/2018/NĐ-CP, Management of Industrial Parks and Economic Zones	All stages	Instructions and incentives for both investors and factories to move towards green production
13	Decision, 68/QD-TTg (18/1/2017), Development programme for supporting industries in the 2016-2025 period	Fiber, yarn and fabric production and wet processing	Orientations for both investors and factories
14	Decision, 1513/QD-TTg (3/9/2015), Promote Vietnamese enterprises' direct participation in foreign distribution systems period to 2020	All stages	Orientations for both investors and factories

Nr.	Document	Most concerned stages in the supply chain	Implications
<b>Industrial and Industrial park Development</b>			
15	Decision, 3218/QD-BCT (11/4/2014), master plan for Vietnam textile industrial development by 2020, with a vision to 2030	All stages	Tasks and orientations for both investors and factories
16	Decree, 111/2015/NĐ-CP, development of supporting industries	All stages	Orientations and policies incentives for both investors and factories
17	Resolution, 23-NQ/TW (22/3/2018), Orientation to develop national industrial development policies to 2030, with a vision to 2045	All stages	Orientations for both investors and factories
18	Circular, 35/2015/TT-BTNMT, providing for the environmental protection of economic zones industrial parks	Textile-centralized Industrial zone	Industrial zone developer
<b>Water exploitation, usage and management</b>			
19	Decree, 201/2013/NĐ-CP, Detailing the implementation of a number of Articles of the Law on Water Resources	Wet processing	Requirements for factories
20	Circular, 27/2014/TT-BTNMT, Registration of groundwater extraction	Wet processing	Requirements for factories exploiting groundwater
21	Decree, 54/2015/NĐ-CP, Regulating privileges for water saving and efficient practices	All stages	Orientations and privileges to both investors, factories and industrial zone developers
22	Decree, 167/2018/NĐ-CP, Limitation of groundwater extraction	All stages	Factories and industrial zones exploiting groundwater
23	Decree, 40/2019/NĐ-CP, Amendments to Decrees on guidelines for the Law on Environment Protection	Wet processing	Factories and industrial zone developer

Nr.	Document	Most concerned stages in the supply chain	Implications
<b>Chemicals usage and management</b>			
24	Law, 06/2007/QH12, Chemicals	Wet processing	Requirements for both investors and factories
25	Decree, 113/2017/NĐ-CP, specifying and providing guidelines for implementation of certain articles of the Law on Chemicals	Wet processing	Requirements and instruction for factories
26	Circular, 21/2017/TT-BCT, promulgation of National technical regulation on the content of formaldehyde in textile products	All stages	Requirements for factories
<b>Waste Management</b>			
27	Decree, 38/2015/NĐ-CP, Management of waste and discarded materials	All stages	Requirements and instructions for factories
28	Decree, 80/2014/NĐ-CP, the drainage and treatment of wastewater	All stages	Requirements and instructions for factories and industrial zones
29	National technical regulation, QCVN 13-MT:2015/BTNMT (01/12/2014), Effluent of textile industry	Wet processing	Requirements for factories
30	National Technical Regulation, QCVN 40:2011/BTNMT, Industrial Wastewater	Wet processing	Requirements for factories

It can be seen that, besides the legal requirements on environmental performance, to which manufacturing companies in the sector must comply, such as Laws and corresponding regulating documents, there have been some other legal documents providing instructions, orientations and incentives that support the sector starting its green transformation.

The background of the slide features a wide-angle photograph of a solar farm. Numerous blue solar panels are arranged in long rows, stretching across the frame. The panels are set against a backdrop of a bright, slightly overcast sky with scattered white and grey clouds. The perspective is from a low angle, looking up at the panels.

## Part 2.

# Best Available Technologies and Best Environmental Practices

## Section 1. What manufacturers are doing

Correctly applied, BATs and BEPs are a win-win from economic and environmental aspects through savings in production and compliance costs, help secure long-term clients and orders, improve the company's image and build trust in the community, and contribute to a cleaner environment.

A global compilation of BATs and BEPs is presented in Annex 3. Especially, practical BATs and BEPs experiences withdrawn from WWF's project in India, Turkey, China and Hong Kong, Viet Nam and Pakistan are summarized in Annex 4.

### Crystal Martin Vietnam Company Ltd.



*Built in 2019, Crystal Martin's rooftop solar energy system consisting of 1,800 PV panels is expected to save about 550,000 kWh and reduce factory emissions by approximately 500 tCO<sub>2e</sub> a year. (Sustainability Report 2019 by Crystal International Group Limited).*

**Crystal Martin** was established in 2004 as the Intimate Apparel Division of Crystal International Group Limited specializing in lingerie and swimwear products. In Vietnam, the company has over 10,000 employees and a site area of 132,967 square meters. Lean manufacturing is applied to production lines to optimize the efficiency.

As part of Crystal International Group Limited, the company complies with the Group's sustainability vision and

approach. The factory has adopted the Higg Facility Environmental Module and attained a self-assessment score higher than the industry median (see the section on textile manufacturing processes below for an explanation of Higg Index). Energy patterns and energy load control are closely monitored by the group's Real Time Energy Management System platform. The system helps the company analyze trends and abnormalities in energy use so it can identify opportunities to improve energy efficiency based on objective data and analysis.

## Saitex International Co., Ltd.

A sustainable denim manufacturer, Saitex International has a production capacity of 16,000 pieces/day at five locations in Vietnam. Employing a workforce of 3,000 people, the company is specialized in denim products of all types such as jeans, shorts, jackets, skirts, dresses, and jumpsuits. Its products bear tags of more than 15 brands including G-Star Raw, Ralph Lauren, Calvin Klein, Tommy Hilfiger, and GAP.

Saitex began in 2005 as a denim-producing factory with conventional facilities but moved towards sustainable manufacturing in 2010. Sanjeev Bahl, the CEO and founder, has said, "Sustainability is everyone's sons and daughters. It's the future we promised them and forgot to keep along the way to creating the advanced world they are going to live in.". As a member of the Sustainable Apparel Coalition since 2012, Saitex has Higg Index verified for 4 years continuously (see table below).

Year	2016	2017	2018	2019
Scored out of 100	83	83	85	90
Verifier	Elevate	Elevate	Bureau Veritas	Bureau Veritas



Ozone  
Bleaching



Air drying



Spraying  
robot



Laser  
cutting



Solar  
panels



Biomass  
fuel

© Saitex International

Saitex maintains a management system for sustainable certifications such as ISO 14000, Cradle-to-Cradle, bluesign, GRS, Oeko-Tex, GOTS, LEED, and B-Corp.

Saitex applies innovative technologies including laser cutting, E-flow, sanding robots, spraying robots, ozone bleaching, and auto dosing.

The company reports on wastewater and non-hazardous sludge against the ZDHC Wastewater Standards<sup>5</sup> twice a year.

By using renewable energy from solar and biomass, air-drying systems, green buildings, planting trees, and alternative transportation, Saitex has reduced its energy consumption by 13 million kWh/year.

By applying a closed water system and jet washing, the company is able to save 252 million liters per year. This results in only 1.5 liters of water consumption per pair of jeans at Saitex, compared to the industry standard of 80 liters.

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<sup>5</sup> ZDHC Wastewater Guidelines <https://www.roadmaptozero.com/post/zdhc-releases-wastewater-guidelines>

## Section 2. What brands are doing

Major brands are:



Promoting the use of recycled materials in fashion, such as polyester, glass, metals, and waste cotton.



Reducing CO<sub>2</sub> emissions from their entire supply chains.



Increasing the use of sustainable cotton and jointly supporting cotton farmers through the **Better Cotton Initiative**.



Innovating design and production technology to reduce water use.



Taking used products as inputs to creating new styles and for use in recycling.



Giving customers tips on how to best preserve their clothing.



Reducing single-use plastic in their stores.

Some examples on brand-leveled case studies in greening textile and fashion operations are indicated below.

# H&M



### Conscious Exclusive SS20: A journey towards circularity

Since 2010, H&M has been promoting its Conscious Exclusive style to promote the use of recycled materials, such as recycled polyester, recycled glass, recycled zinc and brass mix, using TENCEL™ X REFIBRA™ lyocell fabrics, which is partly made from waste cotton. Their sustainability report says that 57% of all materials used by H&M are recycled or derived from other sustainably sourced materials. 20,649 tons of textiles were reused or recycled in 2018 through H&M's garment collecting initiative. This represented 16% more than what achieved in 2017 and is equivalent of 103 million T-shirts.

The brand focuses on the reduction of CO<sub>2</sub> emission from its operation with 11% reduced in 2018. This is an important step in the pathway to achieving a climate positive value chain by 2040.

Regarding sourcing sustainable cotton, H&M ranked top three in Sustainable Cotton Ranking 2020. Every year, H&M gradually increases its sourcing of organic and recycled cotton, as well as cotton through the Better Cotton Initiative (BCI)<sup>6</sup>. In 2020, H&M achieved 100% BCI, organic and recycled cotton. By 2030, all materials used in all products will be certified sustainable, organic or recycled.

<sup>6</sup> Better Cotton Initiative <https://bettercotton.org/>

## GAP

GAP Inc.<sup>7</sup> prioritize its greatest opportunities for leadership to maximize impact on 8 core focus areas: Water, Climate, Waste, Raw Materials, Product Sustainability, Employees, Communities and Supply Chain.

Applying product life cycle thinking, GAP Inc. addresses environmental issues by minimizing the impacts of both direct operations and broader supply chain through the following actions:

**Improving manufacturing at mills and laundries:** Together with the suppliers, GAP Inc. achieved its 2020 goal to reduce water use in manufacturing by 10 billion liters.

**Doing its part on climate and waste:** GAP Inc. established its first science-based targets to reduce GHG emissions in its own operations and supply chains by 2030 and commit to being carbon neutral across the

value chain by 2050. The commitment was to divert 80% of waste from landfill for its U.S. operations by the end of 2020 and eliminate single-use plastics by 2030.

**Creating solutions for women and water:** The water strategy is focused on the intersection between GAP industry's significant use of water and the basic right people have to clean, safe water.

**Enhancing the product sustainability:** GAP Inc.'s integrated commitment to sustainability begins with its design teams and the development of products that look good, have a lower impact on the environment and bring confidence to customers. To scale up the work, GAP Inc. also leverage partnerships with organizations such as the Sustainable Apparel Coalition, Textile Exchange, Hong Kong Resource Institute of Textiles and Apparel and the Ellen MacArthur Foundation's Make Fashion Circular initiative, among many others.

<sup>7</sup> <https://www.gapincsustainability.com/environment/protecting-our-shared-environment>

## Levi Strauss & Co.

Levi Strauss & Co. uses a life cycle assessment (LCA)<sup>8</sup> framework to strategize their sustainability efforts.

**Design:** They launched Water products in 2011 to shift how decisions are made in the design process and help reduce the amount of water used in the finishing process. Some 67% of Levi's are made Water and that will increase to 80 percent by 2020. Wellthread products in 2015 address sustainability at every step of the supply chain.

**Sourcing:** Levi's works with BCI and other partners to help farmers grow cotton more sustainably, reducing water and chemical use and increasing yields and committed to using 100 percent more sustainable cotton from BCI growers, organic cotton farms, or recycled cotton suppliers by the end of 2020.

**Make:** The brand is making a Climate Commitment to reduce greenhouse gas emissions by 90 percent in their owned and operated facilities and 40 percent in their entire supply chain by 2025. They also have many partnerships and programs such as the 2025 Water Action Strategy.

**Use and re-use:** The company is increasingly designing products that are suitable for true circularity – with 100% recyclable materials – from the outset. The 'Our Planet' care tag provides tips on how to best preserve customers' clothing. The brand works with different organizations in different countries to collect used clothing. Levi's® Authorized Vintage is a product range with an authentic, everlasting vintage pre-owned or restored items on the market.

## UNIQLO

The UNIQLO<sup>8</sup> mission statement is "Unlocking the Power of Clothing", which means using ethically sourced materials to minimize environmental impacts. The company has a 'putting workers first' policy and develops new materials and technologies with better futures in mind.

**Promote a clothing's second life:** Through its Recycling Program, UNIQLO maximizes the use of clothing by providing recycling boxes at its stores. As of end of August 2019, 90.79 million items were collected from 22 countries and regions and 36.57 million items were donated to 72 countries and regions.

UNIQLO **applies new technology** for jeans production such as laser processing and nano-bubble ozone washing machines. Water in production is reduced by up to 99%. The technologies were applied for the entire line of UNIQLO jeans by end of 2020. Other new technologies like washing with eco-stones and distressing jeans with laser technology are being applied.

**Reduce single-use plastic** in its stores (initiated in September 2019). UNIQLO planned to reduce the amount of single-use plastics, such as shopping bags and product packaging at its stores worldwide by 85%, or around 7,800 tons annually by the end of 2020.

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<sup>8</sup> <https://www.uniqlo.com/>

## Section 3. What other countries are doing

At country level, a number of management practices and policies have been applied and enforced by top five textile exporter countries.

### Bangladesh



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*LEED Platinum certified denim industry Vintage Denim Studio Ltd, a sister concern of ABA Group.  
[- Bangladesh leading the world in sustainable green industrialization.](#)*

Textile industry of Bangladesh is more than 500 years old and is the largest manufacturing sector of the country. The growth is expected with an ambitious export target of USD 50 billion in 2021 and USD 66.25 billion by 2030<sup>9</sup>.

Bangladesh has concentrated on extending the value chain through stimulating R&D,

improving logistics, and producing labels for ready-made garments. The green technology<sup>10</sup> approach looks at energy strategies and non-toxic clean products. Some main points of the transition for greening the industry have been:

- Applying green technology to energy use, re-use of wastewater, green chemistry, green buildings, and green nanotechnology.
- Innovative applications of information technology.
- Promoting the application and certification of LEED (US Green Building Council) for all industries in Bangladesh to promote green buildings, safe workplaces and reduce the cost of doing business.
- Strengthening labor inspections and enhancing occupational health and safety.
- Promoting innovative design methods.
- Differentiating green and non-green textile industries to showcase economic and environmental benefits to producers.

<sup>9</sup>Water governance mapping report: Textile industry water use in Bangladesh - Phillia Restiani

<sup>10</sup>The Significance of Green Technology in the Textile Industries of Bangladesh, Paper ID: IE-181, International Conference on Mechanical, Industrial and Materials Engineering 2017 (ICMIME2017) 28-30 December, 2017, RUET, Rajshahi, Bangladesh

## China



The textile industry has long been a pillar of China's economy. The sector's trade volume has increased by 27 times during the past 25 years.<sup>11</sup> As the largest textile exporter, China is facing severe challenges relating to environmental constraints, such as the inefficient use of resources, high energy consumption and serious pollution.

The Government of China suggested these policies to put its textile industry on a sustainable footing.

**Construct textile industrial zones.** During 17 years of development, textile-specialized clusters increased from 38 pilot districts and towns to 185 cities by the end of 2016. The clusters now account for more than 80% of China's total textile production.

**Create policy to eliminate businesses using old, inefficient technology that consumes energy and discharges large amounts of waste.** The 13<sup>th</sup> China 5-Year Textile Development Plan emphasized innovation, coordination, greening, openness, sharing, and collective action to improve quality and efficiency, reform the supply chain structure and focus on diversity to take the industry to new heights with new power.

The Plan ***Made in China 2025*** and the ***Production Plan of the Chinese Clothing Factory until 2020*** set goals to reduce the use of energy and water resources per product unit by 18% and 20% of industrial value added, while also cutting the amount of polluted wastes by 10%. Furthermore, China's environmental tax law since 2016 set increasingly high taxes on air, water, and noise pollution.<sup>12</sup>

**Improve industrial competitive advantage through human resource strategies and innovation in science and technology.** Technical innovation capability is the soul of enterprise development and the basis of competitive advantage. For large firms and groups of firms, it is necessary to establish R&D centers. Equally, it is imperative to launch strategies for human resource management and establish an administrative mechanism for human resource training.

**Achieve more sustainability** within the supply chain and take steps towards a full circular production cycle.

<sup>11</sup> China's Textile Industry International Competitive Advantage and Policy Suggestion, YUAN, Tao & XU, Fu

<sup>12</sup> Book "Ngành công nghiệp Dệt May Việt Nam với cuộc CMCN lần thứ 4", VINATEX, July 2020

# European Union



[Textile Research Center 4.0 of the Textile Institute at RWTH Aachen University in Aachen, Germany.](#)

The clothing industry in 2018 realized a turnover of almost € 80 billion, with exports reaching almost € 27 billion<sup>13</sup>. The European clothing industry is the second biggest exporter after China, with 29% of the global market. There is widespread concern in Europe about environmental issues and a general belief in the value of more sustainable lifestyles.

The number of sustainable brands is growing and the leading labels and retailers are expanding their portfolios with clothing made with sustainable, fair trade materials. Much of the impact on sustainability happens during the use and disposal phases of a product's life cycle. With this in mind, the European apparel industry has been educating consumers on how their own habits can make a difference. "Buy better, buy less" is the current sentiment.

In 2012, Germany established a Task Force on Industry 4.0 with aims at i) standardization, ii) provide comprehensive broadband infrastructure to industries, iii) mechanisms and solutions to ensure information security and safety, iv) training, professional development, and resource efficiency. A model smart factory at the Textile Research Center 4.0 of the Textile Institute at RWTH Aachen University was built to serve as simulation center for smart textile factories and a facility for testing, piloting, and expanding new digital solution.

In 2014, the European Commission announced a Circular Economy Package, in which re-use, repair, and recycle is the new norm. Discarded used apparel from Europe is currently sorted to three routes, i) what is wearable gets sold to countries in Africa and, to a lesser extent, in Eastern Europe; ii) some waste is shredded to be used as insulation materials for the automotive industry; and iii) the remainder goes to landfills.

The European Green Deal<sup>14</sup> is one out of six priorities set by the European Commission for the period 2019 – 2024. It is Europe's new growth strategy towards being the first climate-neutral continent in the world by 2050. The European Green Deal provides an action plan, which focuses in particular on resource-intensive sectors such as textiles, construction, electronics and plastics to boost the efficient use of resources by moving to a clean and circular economy and to restore biodiversity and cut pollution.

<sup>13</sup> <http://www.s4tclfblueprint.eu/project/tclf-sectors/european-clothing-industry/>

<sup>14</sup> [https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal\\_en](https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_en)

## India



Tiruppur effluent treatment plant

The Indian textile industry is a global top-five producer and exporter with a large raw material base and manufacturing strengths across the value chain. The industry has a significant place in the national economy with regards to employment, income generation and export earnings and contributes about 14% to industrial production and about 4% to the GDP.

Tiruppur is an important knitted ready-made garment manufacturing cluster contributing to more than 70% of India's knitwear exports.<sup>15</sup> At present, the cluster has an export turnover of USD 353.2 million and domestic turnover of USD 271.7 million, providing employment to 600,000 people directly and 200,000 people indirectly.

Despite environmental legislation first enacted in the early 1970s, abating and controlling

pollution has been limited due to poor monitoring and enforcement of environmental laws by the Pollution Control Boards and a preponderance of small-scale units that lack technical, financial, and managerial capabilities to treat their effluents.

The change that India made for greening the textile production in Tiruppur included following actions:

- Installed common effluent treatment plants to treat the effluent from dyeing units. By 1999, eight common effluent treatment plants serving 278 units were operating in Tiruppur, and 424 units had set up independent effluent treatment plants.
- In 2005, the Court directed to immediately close all the Tiruppur units and common effluent treatment plants that had not taken steps to establish reverse osmosis plants.
- Today, Tiruppur has 700 dyeing houses<sup>16</sup> of which 100 are equipped with individual effluent treatment plants. The remaining units have collectively invested in common effluent treatment plants. Tiruppur now has 18 common effluent treatment plants with a collective total installed treatment capacity of 97.9 million liters per day.
- Zero Liquid Discharge is the norm for textile effluent treatment. Consequently, actors with a stake in promoting Tiruppur's green production claimed that 'zero' discharge was being achieved, though some non-compliance still happen.

<sup>15,16</sup> <http://www.tirupurknitwears.com/profile/>

A large, vibrant red roll of textile material is the central focus, positioned on the right side of the slide. The background is a dark, slightly blurred industrial interior, possibly a textile factory, with some equipment visible.

# Part 3.

# Global Textile Sustainability

# Trends and Platforms

Major global brands are adopting environmental certifications for their final products and materials and insisting their suppliers align with their policies and obtain the relevant certifications. Global certification schemes are driving good practices and standards that minimize environmental impacts of business and manufacturing processes.

## Section 1. Sustainable materials initiatives

Greening the textile sector begins with sustainable production of raw materials. In this section, readers will learn about some of the major initiatives in place.

### Global Recycled Standard (GRS)



**Global Recycled Standard (GRS)**<sup>17</sup> is a product standard for tracking and verifying the content of recycled materials in a final product, while ensuring strict production requirements. This standard applies to all companies that manufacture or trade GRS products. It covers processing, manufacturing, packaging, labelling, trading, and distribution of all products that are made with a minimum of 20% recycled material.

The GRS is an international, voluntary, full product standard that sets requirements for third party certification for:

- Identification and traceability of the recycled content in textiles along the entire chain of custody.
- Environmental requirements to avoid degradation by ensuring the use of recycled materials.
- The chemical restrictions ensure no hazardous chemicals are used that can adversely affect the environment or the health of the user.
- Social responsibilities according to International Labour Organisation conventions.

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<sup>17</sup> Global Recycled Standards <https://textileexchange.org/standards/recycled-claim-standard-global-recycled-standard/>



## Better Cotton Initiatives (BCI)

**The Better Cotton Initiative (BCI)**<sup>18</sup> is a global not-for-profit organization and the largest cotton sustainability program in the world. BCI exists to make global cotton production better for the people who produce it, better for the environment it grows in, and better for the sector's future. BCI aims to promote measurable improvements in cotton cultivation to make it more economically, environmentally, and socially sustainable. BCI activities include:

- Formulating production principles and criteria to provide a global definition of Better Cotton. At cotton farm level, the BCI principles embrace water efficiency, reduction of pesticide toxicity and energy use, soil health and carbon improvement,
- Providing support to farmers to promote enabling mechanisms from local to global levels, working with experienced implementing partners, and stimulating public-private partnership funds to implement these mechanisms.
- Encouraging farmers to continuously improve, through measuring results and seasonal learning cycles.
- Connecting supply with demand through an identifiable bale of 100% Better Cotton lint.
- Monitoring, evaluation, and learning mechanisms to measure progress and change and to ensure the Better Cotton System has the intended impacts on its direct beneficiaries.
- Facilitating the exchange of best practices and knowledge to encourage the scaling up of collective action.

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<sup>18</sup> Better Cotton Initiative <https://bettercotton.org/>

## Cradle-to-Cradle (C2C)



The C2C<sup>19</sup> philosophy is to redesign and reshape the traditional product design and manufacturing system into a closed system in which all materials go through a continuous cycle of use and re-use.

To achieve C2C certification, products are assessed for continual improvement of environmental and social performance against five sustainability criteria: sustainable materials; reusing raw materials, renewable energy, carbon and water management, and social fairness.

The C2C certificates are awarded based on an increasing level of performance and requires recertification every two years. The certification method includes following steps:

- Selects an Accredited Assessment Body for the testing, analysis, and evaluation of your product.

- Works with your assessor to compile and evaluate data and documentation.
- Receives certification and get your products posted on the product registry of C2C Product Innovation Institute.
- Updates your customers about your certification.
- Reports your progress every two years for recertification.

C2C is more than a recognized mark of product quality. Signed up for C2C means that the company is:

- Joining a community of innovative enterprises that make certified quality products and provide social and environmental benefits in the circular economy.
- Being able to use the C2C trademarks to indicate commitments to continuous improvement and quality statement.
- Becoming a 'product of choice' for numerous preferred environmental purchasing programs.

<sup>19</sup> Cradle-to-Cradle certification <https://www.c2ccertified.org/>

## Section 2. Textile manufacturing processes

There are numerous mechanisms and tools to help manufacturing companies improve their environmental performance and continuously 'go greener'. Some of the more common ones are described below.

### Zero Discharge of Hazardous Chemicals (ZDHC)



The **ZDHC Roadmap to Zero Programme**<sup>20</sup> was initiated in 2011 to "protect the planet" by reducing industry's chemical footprint along their supply chains. ZDHC assesses the severity of hazards resulting from the use of chemicals, identifies hazards, develops methods and tools, builds awareness and educates all the actors in the entire supply chain on the responsible handling and management of chemicals and how to replace hazardous chemicals with safer alternatives.

There are two modules in the ZDHC approach. For textile producers, the chemical module serves as an advance search tool for appropriate chemicals and chemical management practices. The wastewater module goes beyond legislative compliance to ensure wastewater discharge does not negatively affect the environment and the surrounding community.

Suppliers are assessed against uniform standards like the ZDHC Wastewater Guidelines. They can then test wastewater once and share the results simultaneously with all their clients. There were 86 provisional ZDHC Accepted Laboratories in the world by the end of 2019. Brands also benefit. They can see test results from multiple suppliers on a single platform, the ZDHC Gateway Wastewater Module.<sup>21</sup>

<sup>20</sup> ZDHC Roadmap to Zero Programme <https://www.roadmaptozero.com/>

<sup>21</sup> ZDHC Gateway Wastewater Module [https://academy.roadmaptozero.com/fileadmin/zdhc/gateway/Wastewater\\_Module\\_Demonstration\\_Suppliers\\_Brands\\_Labs\\_Oct\\_2019.pdf](https://academy.roadmaptozero.com/fileadmin/zdhc/gateway/Wastewater_Module_Demonstration_Suppliers_Brands_Labs_Oct_2019.pdf)

## Higg Index



The Higg Index<sup>22</sup> is a suite of sustainability self-assessment tools developed by the Sustainable Apparel Coalition to assess the manufacturing, branding, and product impacts of textile production. To achieve a Higg index certification, an enterprise needs to apply the following Higg Tools:

- Higg Product Tools help brands, retailers, manufacturers, and academics understand the environmental impacts of apparel, footwear, and textiles. There are two Higg Product Tools: the Higg Materials Sustainability Index and the Higg Product Module.
- Higg Facility Tools measure environmental and social sustainability impacts in manufacturing facilities around the world. There are two Higg Facility Tools: Higg Facility Environmental Module, and Higg Facility Social & Labor Module.
- Higg Brand and Retail Tool: Global brands and retailers use the tool to assess the sustainability of product lifecycles, the environmental performance, and social impacts across the value chain.

The Higg Index enables and encourages brands, retailers, and manufacturers to become more transparent by communicating clear, trustworthy, and meaningful sustainability information publicly. The Higg Index can create business value for an enterprise by:

- Focusing on the enterprises' sustainability strategy.
- Identifying opportunities to drive innovation while cutting costs and wastes.
- Avoiding time and cost by do-it-yourself approaches.
- Reducing data sharing time, cost and complexity.
- Driving improvement through industry benchmarking.
- Optimizing sourcing efficiency.
- Supporting stakeholder communications.

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<sup>22</sup> Higg Index website: <https://apparelcoalition.org/the-higg-index/>

## bluesign® Approved



bluesign<sup>23</sup> is an international standard established in 2000, with the aim of regulating the use of harmful chemicals in products, especially textile products. This certification represents a level of assurance to consumers that the product is produced in accordance with the responsible use of resources and the lowest possible impact on the environment and people. bluesign's stringent standards provide all relevant information and ensure consistent transparency and traceability of all processing steps for raw materials. Materials generated in the product chain or intermediate products are evaluated by bluesign and bear the 'bluesign® APPROVED' label. The management systems of bluesign standards include:

- **Input flow management:** to eliminate harmful substances and control the input source.
- **Production process management:** to ensure products are safe and environmentally friendly.
- **Output flow management:** to check output products in accordance with quality standards and customer requirements.

bluesign certification offers businesses an effective way to ensure compliance with the latest environment, health and safety standards without compromising on function, quality or design of the company's products by reducing resource waste and costs at every stage of the production process and by reducing the consumption of water and energy and the amount of chemicals in wastewater.

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<sup>23</sup> Bluesign website: <https://www.bluesign.com/en>

## Global Organic Textile Standard (GOTS)



**GOTS**<sup>24</sup> was developed with the aim of defining requirements recognized worldwide, ensuring the organic character of textiles from seeds to harvesting, and tracing the use of raw materials to ensure that products are produced as labeled.

Only textile products that contain a minimum of 70% organic fibers can be GOTS certified. All chemical inputs such as dyestuffs and auxiliaries used must meet environmental and toxicological criteria. Cotton is grown without the use of toxic and persistent pesticides and synthetic fertilizers. Benefits to manufacturers include:

- **Risk reduction:** GOTS is a comprehensive risk management instrument for supply chains, with strict and extensive environmental and social criteria.
- **Credibility:** Third party certification serves as independent external verification. It includes dual quality assurance and onsite inspection and product testing.
- **Efficiency and productivity:** GOTS wastewater management and other requirements result in improved eco-efficiency.
- **Facilitates the sustainable supply chain management** by cutting costs because a company does not need to trace the whole supply chain themselves.
- **Innovation and differentiation:** Access to new markets such as public procurement as GOTS is recognized by governments.
- **Sustainable market development:** GOTS enables companies to be market drivers.

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<sup>24</sup> GOTS website <https://www.global-standard.org/>

## Oeko-Tex



Standard 100 by **OEKO-TEX<sup>25</sup>** is one of the world's best-known labels for textiles tested for harmful substances. It stands for customer confidence and high product safety. The test is conducted by an independent OEKO-TEX® partner institutes on the basis of an extensive OEKO-TEX criteria catalog. The tests look for regulated and non-regulated substances which may be harmful to human health. The certification has following highlights:

- Evaluate the components and materials of the textile products according to the test criteria of Standard 100 Oeko-Tex.
- If a product successfully passes the laboratory test, the company receives the Standard 100 certificate.
- An Oeko-Tex expert visits the company site to confirm all the details. This may be before or shortly after certification.
- The criteria prohibit the use of azo dyes, formaldehyde, chemicals harmful to health, 100 other test parameters, and take into account the intended use of the textiles.

Manufacturers benefit because:

- Customers trust the labels on products and materials with the Standard 100 Label.
- The Standard 100 certificate helps gain access to buyers with stricter requirements.
- Companies can select new suppliers that meet their criteria.
- They can enhance processing and product quality without the cost of hiring independent assessors.

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<sup>25</sup> Oeko-Tex website: <https://www.oeko-tex.com/en/>

## ISO 14001



**ISO 14001**<sup>26</sup> is part of a set of international standards related to environmental management that can be used by all business organizations. It provides an assurance of environmentally friendly operations in the textile and apparel industry, leading to continuous, sustainable improvement and reducing the environmental impact of manufacturing processes. To be certified, an enterprise needs to follow these steps:

- Internal training on the standard and legal requirements.
- Documenting the company's environmental management system.
- Implementing and monitoring the environmental management system.
- Assessment and inspection.
- Acquire ISO 14001 certification.
- Maintain ISO 14001 certification.

Benefits to manufacturers include:

- Better environmental management by reducing waste and more efficient use of raw materials and fuels.
- Protect natural resources such as land and water.
- Productivity improvements to cut operating costs.
- Promoting the company image and increasing opportunities to access better markets.
- Meet the legal obligations needed to gain the trust of stakeholders.

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<sup>26</sup> ISO 14000 Environmental Management Standard <https://www.iso.org/iso-14001-environmental-management.html>

## Section 3. Eco-Tags on fashion products

Eco-tags or eco-labels and 'green stickers' are labelling systems for food and consumer products. They are a form of sustainability measurement directed at consumers and are intended to make it easy to take environmental concerns into account when shopping.

### bluesign® PRODUCTS



Consumers are becoming more aware of sustainability issues. They want to know where the product came from, how it was made and what the working conditions are. Brands, manufacturers, and chemical suppliers from the entire textile industry can use the bluesign system. The system allows users to analyze and certify raw materials, chemical ingredients, emissions and energy consumption, water emissions, and wastewater treatment. bluesign certification is based on five principles:

- Resource productivity
- Consumer safety
- Water emissions
- Air emissions
- Occupational health & safety

Overall, the process helps companies reduce the ecological footprint of their products. A product with a bluesign label shows that the product has eliminated harmful substances from the manufacturing process and ensures that the finished product meets the strictest and most comprehensive requirements for consumer protection.

## EU Ecolabel



**The European Ecolabel system**<sup>27</sup> allows manufacturers, retailers or service providers to use the EU flower label for marketing purposes throughout the 27 Member States of the EU. The system encourages the use of sustainable practices in textile manufacturing, including quantitative restrictions on wastewater emissions and hazardous substances. The use of sustainable fibers is strongly encouraged.

Achieving EU Ecolabel certification brings a number of benefits. It helps products stand out against their competitors, enhances the company's image, boosts sales, and minimizes costs for the enterprise. Additional benefits:

- Increase product advantages in public and private procurement and improve environmental efficiency.
- Raise awareness of the environmental impact of products with stakeholders including retailers, consumers, NGOs, and environmental public administrations.
- The EU ecolabel can be used in conjunction with its criteria as a basis for setting fiscal measures to promote green products.

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<sup>27</sup> EU Ecolabel Product Groups and Criteria <https://ec.europa.eu/environment/ecolabel/products-groups-and-criteria.html>

## FAIRTRADE



Fairtrade is a widely recognized ethical mark. It indicates that components or ingredients for products produced by small-scale farmer organizations meet Fairtrade's social, economic, and environmental standards. The criteria are environmental protection, workers' rights, and Fairtrade insurance premiums for investing in business or community projects. The main purpose is to help and support small-scale farms, one of the most disadvantaged groups in the world.

Fairtrade benefits:

- Protect farmers from market price fluctuations. This ensures farmers can earn a steady income and plan for their future. Fairtrade is the only certification scheme that offers a minimum price protection for farmers. Additional income from Fairtrade initiatives can also be introduced into communities to develop better, more efficient farming techniques and to increase the scale and the value of crop yields.
- Fairtrade regulations and standards help protect the environment by setting criteria for reducing greenhouse gas emissions, conserving wildlife species, and preventing the use of harmful pesticides.
- To be certified for Fairtrade, organizations must comply with strict environmental standards. It encourages farmers and growers to take training courses to help them better understand the environmental impact of farming activities and improve their productivity.
- Fairtrade promotes organic production, responsible waste management, avoidance of genetically modified organisms, and maintenance of solutions to reduce the environmental impact of processes and products.
- Fairtrade promotes equality. Producers of Fairtrade products have more control over their crops, work in safe, secure environments, and are shielded from discrimination or prejudice.

A photograph showing a woman in a blue shirt working at a sewing machine in a garment factory. She is focused on her work, with her hands on the machine. The background shows other workers and rows of sewing machines, with bright overhead lights illuminating the workspace.

## Part 4. Sector Outlook and Guidelines for Green Transformation

## Section 1. Sector Outlook for Green Transformation

### ***Environmental footprint of the sector***

The textile industry involves intensive water extraction, and high energy consumption for water heating and steam generation, which leads to a significant impact on water resources and greenhouse gas emissions. It uses a large quantity of chemicals, many of which are harmful and end up in wastewater.

Although, at present, there is no official data on energy inventory and water used in all textile companies, the following key concerning environmental footprints of the sector are described to be targeted for action:

- According to VITAS and USAID, Vietnam's textile and apparel industry spends an average of USD 3 billion per year on energy.<sup>28</sup> Studies show that the textile industry accounts for 8% of the total energy demand in the industrial sector and emits about 5 million tons of CO<sub>2</sub>.<sup>29</sup>
- Wet textile processing (yarn, fabric, garment production) has the most

harmful environmental footprint as it uses intensive freshwater abstraction for rinsing, washing, pretreatment, dyeing, and finishing.

- Large volumes of wastewater containing chemicals are generated after processing. Many chemicals involved in production, such as azo-containing dyes, PFOS and PFAS (per- and poly-fluoro-alkyl substances) used as water repellents, deca-BDEs as flame retardants, and chlorine for bleaching. All can cause serious impacts on the environment and human health.
- In dyeing enterprises, depending on the technology and production equipment, on average, each ton of product has the potential to save about 0.2 to 0.5 kg of dye; 100–200 kg of chemicals and auxiliary substances; 50–100 m<sup>3</sup> of water, and reduce consumption of about 150 kg of oil and 50–150 KWh of electricity.<sup>30</sup>

A green textile industry helps reduce production costs while also reducing dependency on natural resources and mitigating the adverse impacts of production processes on the environment.

<sup>28</sup> BUSINESS IN BRIEF 19/8. See the section on Low-emission energy technology: sole lifeline of textile and garment sector. <https://english.vietnamnet.vn/fms/business/186930/business-in-brief-19-8.html>

<sup>29</sup> Final report, Development of methodology and carry out sector research in garment sector and energy & water auditing to garment processing companies in Vietnam (PROJECT NUMBER: VN205300/VZ1420 & 40001601/510001, WWF/Enerteam)

<sup>30</sup> "Implementing cleaner production in Vietnamese textile and apparel enterprises", Consumption & Production News, posted date: 18 Oct 2018

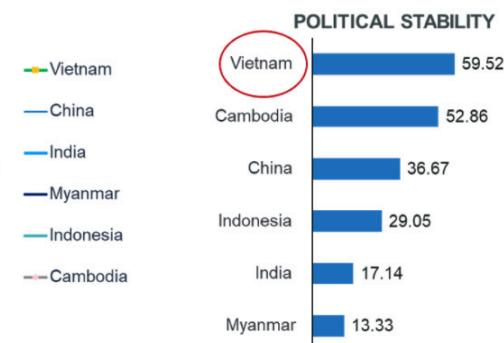
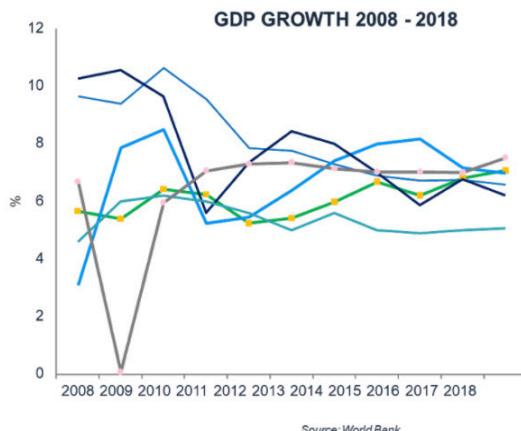
## **Opportunities for green transformation in Vietnam**

According to VITAS, at present, 70% of Vietnamese companies are sewing companies, 6% spinning companies, 17% weaving/knitting companies, 4% dyeing companies, and the remaining 3% are ancillary organization. 85% of garment/sewing factories are dedicated to cut, make and trim (CMT) processes and 15% of garment factories do free on board (FOB)<sup>31</sup> business for production including raw materials, equipment, labors and transportation.<sup>32</sup>

The following trends and facts offer great opportunities for the sector's green

transformation:

- There has been a shift of textile enterprises from China, Taiwan, and Hong Kong to Viet Nam. This is partly due to the recently signed CPTPP and EVFTA agreements that give tax advantages to Vietnam-originated textile products. Other significant factors are the current tension in US-China trade relations, Vietnam's favorable business environment and economic and political stability (see figure below).
- As discussed in Part 2, major brands are prioritizing their selection of business partners who perform well on social and environmental responsibilities. H&M, GAP, Levi Strauss, and UNIQLO are examples of where the industry is going. In order to stay competitive in the world market, manufacturers in Vietnam will have to adopt



<sup>31</sup> FOB is a shipment term used to indicate whether the seller or the buyer is liable for goods that are damaged or destroyed during shipping. "FOB origin" means the purchaser pays the shipping cost from the factory or warehouse and gains ownership of the goods as soon as it leaves its point of origin.

<sup>32</sup> Textile and Garment Sector in Vietnam: Water Risks and Solutions, WWF, 2018

- sustainable practices.
- In a wider and longer-term, the textile industry has embraced the idea that to achieve sustainable growth, it is essential to expand production to original design sales and original brand manufacturing.
- The banking sector in Vietnam is implementing green banking policies, green credit, and increasing funding for green projects in the textile and garment industry.
- There are continuous technology innovations in the sector. Information technology to create and manage data is making the dyeing process less dependent on recipe makers' technical skills and stabilizing dyeing quality and increasing the Right-First-Time (RFT) rate.<sup>33</sup> Many producers can achieve a 95–98% RFT rate instead of 70–80% without the use of information technology. With robots, fabrication and cutting reduces labor up to 80% and saves 3% on materials. Reduction of labor will have social consequences and these need to be considered.
- International Development Agencies are strongly supporting the sector technically, financially, and through

information and knowledge sharing. Some noticeable support programs and projects are listed out below:

- GIZ's Fabric project aims to promote sustainability production of the sector, especially with the focus on dyeing technologies and management, wastewater treatment practices and technologies, and Process management.
- Water Resources Group 2030 under the World Bank has been active in Vietnam since 2016. The first Textile Task Force was established in late 2019 co-chaired by Ministry of Planning and Investment, Vietnam Environment Administration and VITAS to promote wastewater treatment and recycling and reuse in plants and industrial parks in the contribution to the country's water security.
- The IDH Sustainable Trade Initiative "Race to the Top in Vietnam" is a collaborative effort between the Vietnamese government, the Vietnamese apparel and footwear industry, global consumer brands, international organizations, and civil society organizations for promoting and enabling embedded sustainable manufacturing practices.<sup>34</sup>

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<sup>33</sup> Right First Time (RFT): At each dyeing, the target shade must be achieved the first time, hence not requiring re-dyeing or re-correction by adding more dyes or chemicals.

<sup>34</sup> IDH Race to the Top

<https://www.idhsustainabletrade.com/project/rtt/#:~:text=Race%20to%20the%20Top%20in,enabling%20embedded%20sustainable%20manufacturing%20practices>

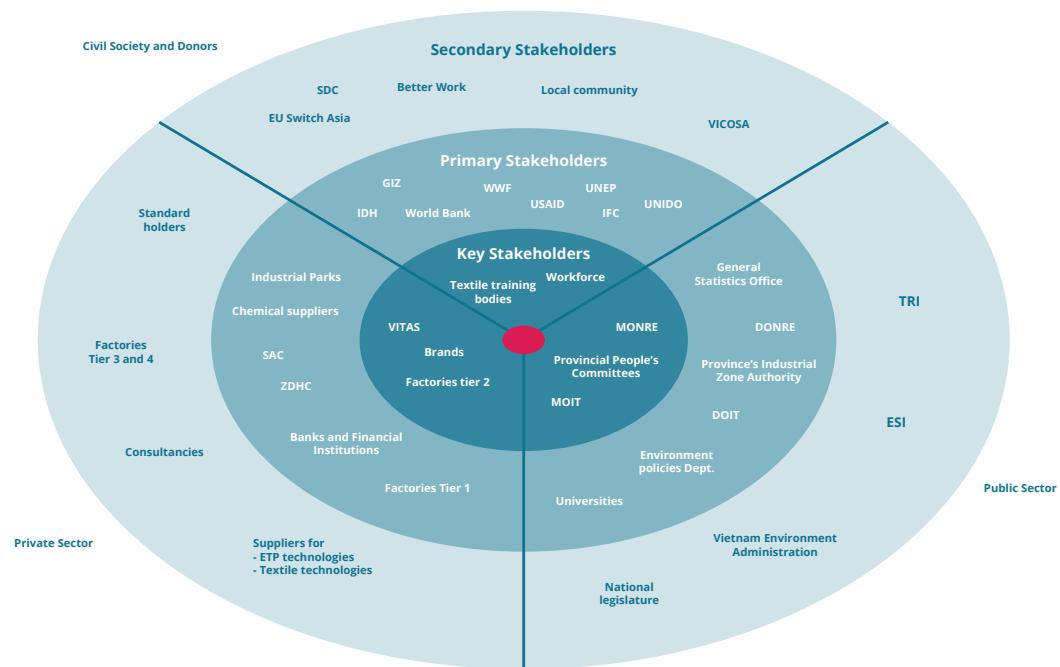
## Mapping textile value chain stakeholders and their roles

A stakeholder map helps identify the actors responsible for greening Vietnam's textile sector. The map is structured into different segments by their nature (public, private, civil society) and different layers of stakeholders (key, primary, secondary).

- **Key Stakeholders** are those who can use their mandate or position to exert significant influence.

- **Primary Stakeholders** are those who directly affect or are affected, positively or negatively, by the textile sector either as subcontractors, cooperation partners or designated beneficiaries.
- **Secondary Stakeholders** or 'intermediaries' are persons or organizations who have indirect influence on the textile sector.

The current map is a snapshot and will change over time as organizations can change their status, become more or less relevant, disappear, or new organizations appear.



A stakeholder map can help establish a multi-stakeholder platform for constructive dialogue between government, private sector and civil society to foster implementation of effective environmental

measures, in particular by SMEs. A similar platform at the regional level will help bring the private sector closer to the river basin management and governance decision making processes.

## Section 2. Green vision and goals for the Viet Nam textile sector to 2030

### ***Contributing to Vietnam's international and national commitments***

The textile green transformation will contribute to country's effort to meet its sustainable development, climate change, and environmental commitments, which are specifically addressed in 3 following remarkable legislation documents:

- ***2030 Agenda for Sustainable Development:*** mainly Goal 6 "Ensure availability and sustainable management of water and sanitation for all", Goal 12 on "Ensuring a sustainable production and consumption model" and Goal 13 "Take urgent action to combat climate change and its impacts"
- ***Paris Agreement on Climate Change:*** Undertake industrial GHG emission reduction to implement NDC in accordance with national context on

the basis of annual global effort assessment, including measurement, reporting and verification.

- ***National Strategy on Green Growth:*** Strategic task 1 on reducing the intensity of greenhouse gas emissions and promote the use of clean and renewable energy, and strategic task 2 on greening production.

### ***Textile Green Vision***

In 2019, Vietnam was among the world's top 5 countries and region exporting textiles. On the occasion of 20th anniversary of the Vietnam Textile and Apparel Association, the Prime Minister expressed a great expectation that the sector continuously maintains its position in the top 3 textile exporting countries; upgrade its position in the supply chain upstream at the fabric production stage and downstream with the target to have 30 fashion brands in the

world market by 2030; and fully embed the environment protection principles in the sector development.

To achieve the expectation, a green vision can be stated as: "By 2030, the textile and apparel sector in Viet Nam will become the number one destination for buyers searching for sustainable supplies of textiles and apparel products that do not harm the environment or people. The sector is more circular, efficient and sustainable in terms of use of water and energy, and adopts responsible wastewater discharge and solid waste management practices."

***Specific green goals for the textile sector have been formulated as below:***

- 40% water consumption reduction by applying water-free dyeing technology and reusing treated wastewater for rinsing, washing and cleaning purposes by 2025 and annually reduced water exploitation and consumption after 2025.
- At least 20% of recycled polyester fiber and 15% of organic cotton is used to minimize newly processed petroleum-derived materials and the use of

plant protection products (i.e. pesticides, fertilizers, chemicals).<sup>35</sup>

- Formation of 10 big textile-specific industrial zones (300–500 ha each) with environmentally friendly infrastructure and operations.<sup>36</sup>
- Increased the number of eco-labelled products (e.g. BCI, Oeko-Tex Standard 100, LEED) and year-on-year increased number of manufacturers who apply and maintain Higg Index, ZDHC, ISO 14001 and other certifications.
- Annually reduced resource consumption and textile wastes through conducting resource efficient and cleaner production method, BATs and BEPs, and industrial symbiosis practices.
- Increase the use of solar and other renewable energy sources and strive for 10% of electricity from renewable sources<sup>37</sup> by 2025 and year-on-year growths in the period of 2026 - 2030.
- Reduce energy consumptions of entire sector by at least 0.4 – 0.7% year-on-year from 2021 to 2030.
- Continuously reduce the use of hazardous chemicals and move towards zero discharge by 2030.

<sup>35</sup> [Developing sustainable value chains in the textile industry, Vinatex News, posted date: 24 Dec 2019](#)

<sup>36</sup> Book "Ngành công nghiệp Dệt May Việt Nam với cuộc CMCN lần thứ 4", VINATEX, July 2020

<sup>37</sup> [Developing sustainable value chains in the textile industry, Vinatex News, posted date: 24 Dec 2019](#)

## Section 3. Strategic workstreams toward green transformation

### Promoting green supply chain

Green transformation in textile industry aims at decoupling natural resources use and environmental Impacts from the sector's growth throughout the supply chain. Some strategic approaches are to be mainstreamed along different stages of the supply chain, including but not limited to the following:

#### Sustainable and efficient use of resources:

Reduce production costs while also reducing dependency on natural resources (water, energy, raw materials, chemicals) and mitigating the adverse impacts of production processes on the environment. Some appropriate methods include Resource Efficient and Cleaner Production, Waste Minimization and Industrial Symbiosis.

#### Circular economy practices:

"A circular textiles economy describes an industrial system which aims at phasing out substances of concern and microfiber release; transforming the way clothes are designed, sold and used to break free from their increasingly disposable nature; radically improving recycling by transforming clothing design, collection, and reprocessing; and making effective use of resources and moving to renewable input".<sup>38</sup>

#### Green product designs and eco-labels for textiles and apparel products:

Textile green product design and eco-labels can be achieved through the entire production process, starting with natural materials that go into the garments, and in designs which use organic fibers and natural dyestuffs, recycled materials, minimal use of chemicals (e.g., no bleaching) and strictly eliminating harmful chemicals.

#### Green logistics:

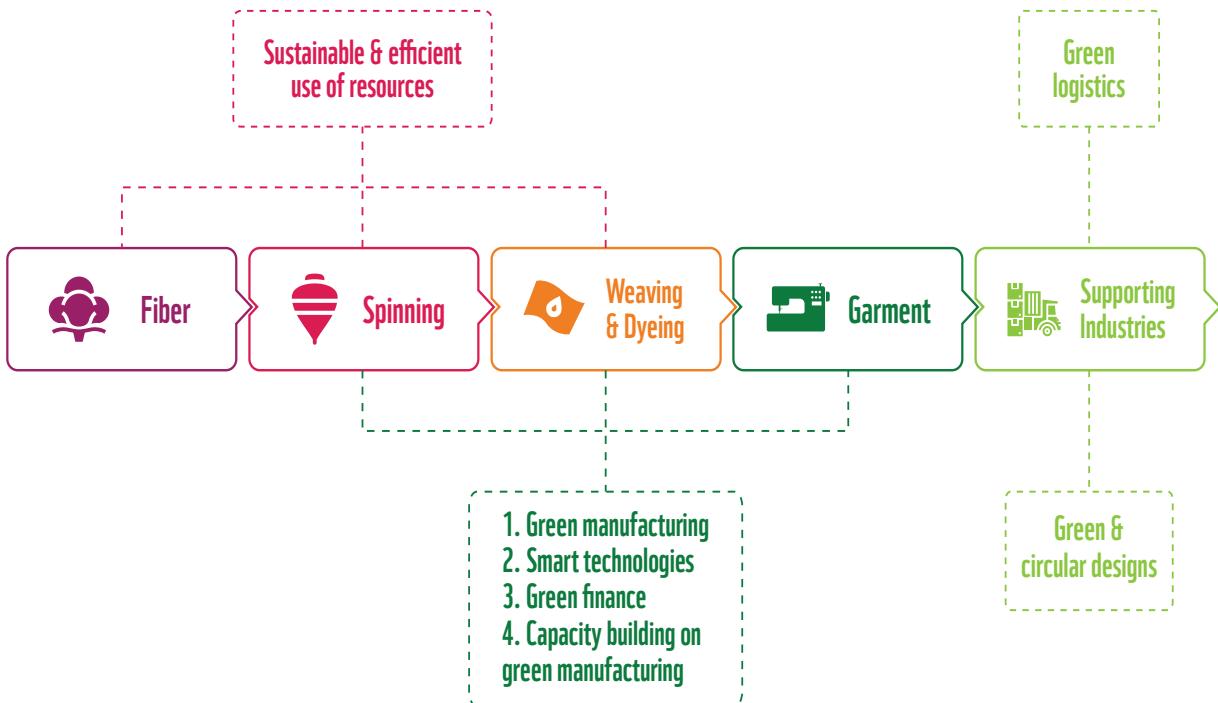
The aim of green logistics is to move and deliver raw materials and products at the lowest possible cost while maintaining the highest standards and minimizing environmental impact in the process. It implies innovation in all steps of the supply chain from product conception to the final use of products.<sup>39</sup>

<sup>38</sup> A new textiles economy: Redesigning fashion's future, (2017, <http://www.ellenmacarthurfoundation.org/publications>)

<sup>39</sup> Green Logistics: The Carbon Agenda. Alan McKinnon. Heriot-Watt University, Edinburgh, United Kingdom. [https://www.logforum.net/pdf/6\\_3\\_1\\_10.pdf](https://www.logforum.net/pdf/6_3_1_10.pdf)

## Smart technologies

Formation of industrial clusters which comply with international and national environmental legislation. Application of 4.0 technologies in yarn production and quality monitoring (e.g., SpinMaster, WeaveMASTER, KnitMASTER, ESSENTIAL-Rieter Digital Spinning Suite), production and performance management for textile finishing (e.g. OrgaTEX.MES), predictive maintenance (e.g., UPTIME, ESSENTIALmaintain) can be considered to ensure sector productivity.



## ***Taping green funds***

The more favorable credit conditions (e.g. preferential interest rates, supports for collateral deposits, grace periods)<sup>40</sup> that financial system offers, the more green investment projects are realized by textile and garment enterprises. This would accelerate green transformation at the company level. Some main tasks for promoting green investment include but not limited to the following:

- To diversify financial support sources for implementing environmental protection projects.
- To increase domestic fund sources for investment projects designed for specialization, modernization, and environmentally friendly production.
- To annually increase the number of enterprises achieving domestic or foreign support from funds and banks to implement sustainable green projects and programs.

## ***Capacity building for the sector human resource***

Inadequate human resource is one of the main obstacles for the current Vietnamese textile and apparel enterprises aiming at greening and sustainability. Therefore, human resource development is among the decisive factors for a green vision. Key tasks for capacity building include but not limited to the following:

- To increase the number of managers and supervisors who can apply modern management models such as LEAN production, just-in-time (JIT) management, enterprise resource planning systems, and environmental and energy management systems.
- To increase the proportion of specialized technical staff and skilled workers with specialized training on green subjects, best available practices and techniques, and who can apply 4.0 technologies to the production process thereby raising labor productivity and product quality.
- To set up skills development training via technical and vocational education training classes and support companies to adopt CSR targets for improving the knowledge and capacity of their employees regarding sustainable production.

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<sup>40</sup> Green financial opportunity for sustainable production in Vietnam's textile and apparel industry, Financial & Monetary Market Review News, posted date: 31 July 201

## Section 4. Collective Action Plan

This collective action plan is based on a 'map' of textile value chain stakeholders and has four components with corresponding actions:



**Institutional arrangements for green transformation**



**Capacity development**



**Policy advocacy**



**Communication and information**

The table illustrates the proposed actions with coordination needed between authorities and related organizations for realizing the green vision.

## Collective Action Plan Coordination

Action	Host organization	Cooperating organization
<b>Institutional Arrangements for Green Transformation</b>		
Review and refer to international standards and requirements for setting and periodically updating sector standards and benchmarks on waste discharge, energy consumption, water use, materials and chemical use applied to textile and garment companies (e.g., Manufacturing Restricted Substances List, health and safety compliance). The standards will need to be clearly communicated and guidance offered on how to meet the standards and fill capacity gaps.	<ul style="list-style-type: none"> <li>• Ministry of Industry and Trade</li> <li>• Ministry of Natural Resources and Environment</li> </ul>	Vietnam Textile and Apparel Association Brands
Strictly enforce compliance to legislation through inspection and punishment for violation of environmental legislation with close cooperation between the environmental authorities and local environmental management agencies.	<ul style="list-style-type: none"> <li>• Ministry of Natural Resources and Environment</li> <li>• Environmental Police Department</li> </ul>	Local Departments of Natural Resources and Environment
Promote the application of Industry 4.0 achievements such as automation and effective information technologies.	Vietnam Textile and Apparel Association	Ministry of Industry and Trade Ministry of Science and Technology
Provide support mechanism for research on new, renewable and natural-origin materials and chemicals substituted for unsustainable ones, and design for sustainability on the basis of life cycle assessment.	<ul style="list-style-type: none"> <li>• Ministry of Science and Technology</li> <li>• Ministry of Industry and Trade</li> </ul>	Vietnam Textile and Apparel Association

Action	Host organization	Cooperating organization
Based on demand forecasts and existing production capacity, plan the development and expansion of supporting industries with the integration of environmental and social standards and requirements at the design, planning and investment phases.	<ul style="list-style-type: none"> <li>Ministry of Industry and Trade</li> <li>People's Committees</li> </ul>	<ul style="list-style-type: none"> <li>Ministry of Natural Resources and Environment</li> <li>Ministry of Planning and Investment</li> </ul>
Enhance cooperation between textile management agencies and local authorities to address concerns and increase opportunities for sustainable growth investment project.	<ul style="list-style-type: none"> <li>Ministry of Industry and Trade</li> <li>Vietnam Textile and Apparel Association</li> <li>People's Committees</li> </ul>	Ministry of Natural Resources and Environment
Promote green credit lines in the banking system with clear criteria and schedules for supporting enterprises to adopt green production innovations.	<ul style="list-style-type: none"> <li>State Bank of Vietnam</li> <li>Commercial banks</li> </ul>	Vietnam Textile and Apparel Association
Develop tools and training for screening investments for environmental performance to help local authorities, banks, and investors make decisions (planning and investment departments, industry and trade departments, natural resources and environment departments).	<ul style="list-style-type: none"> <li>Ministry of Natural Resources and Environment</li> <li>People's Committees</li> </ul>	<ul style="list-style-type: none"> <li>Vietnam Textile and Apparel Association</li> <li>Commercial banks</li> </ul>
Capacity Development		
Strengthen the links between universities, colleges, and vocational schools with manufacturing companies and technology and chemical suppliers to improve the sector's capacity to attract students and trainees and better match the human resource supply with demand. Training programs should be developed and updated with inputs from enterprises in terms of course content and production practices.	<ul style="list-style-type: none"> <li>Vietnam Textile and Apparel Association</li> <li>Education and training bodies</li> <li>Enterprises</li> </ul>	Ministry of Industry and Trade Ministry of Labour, Invalids and Social Affairs

Action	Host organization	Cooperating organization
Strengthen international cooperation in terms of advanced technologies, materials and chemicals, greening production and Industry 4.0 practices.	Ministry of Industry and Trade	<ul style="list-style-type: none"> <li>Vietnam Textile and Apparel Association</li> <li>Enterprises</li> <li>Ministry of Natural Resources and Environment</li> </ul>
Develop human resources for building and promoting Vietnamese brands to help the sector be more proactive in sourcing raw materials, including local-origin materials and chemicals.	Ministry of Industry and Trade	<ul style="list-style-type: none"> <li>Vietnam Textile and Apparel Association</li> <li>Enterprises</li> </ul>
Support capacity building for enterprises and other sector stakeholders in terms of in-depth management and technical skills through professional sector information portals, study tours, trade fairs, and networking.	<ul style="list-style-type: none"> <li>Vietnam Textile and Apparel Association</li> <li>Manufacturers</li> </ul>	<ul style="list-style-type: none"> <li>Ministry of Industry and Trade</li> <li>Brands</li> </ul>
Organize capacity building activities for government and enterprise personnel about access to green financing to help enterprises take advantage of opportunities to get funding for investment in innovation and help government officers monitor progress and better enforce legislation.	<ul style="list-style-type: none"> <li>Vietnam Textile and Apparel Association</li> <li>State Bank of Vietnam</li> <li>Financial institutions</li> </ul>	<ul style="list-style-type: none"> <li>Enterprises</li> <li>Provincial People's Committees</li> </ul>
Create a catalogue of Best Available Technologies and Best Environmental Practices (BATs and BEPs) most relevant for the Vietnamese context.	<ul style="list-style-type: none"> <li>Consultancies</li> <li>International development agencies</li> </ul>	<ul style="list-style-type: none"> <li>Vietnam Textile and Apparel Association</li> <li>Enterprises</li> </ul>

Action	Host organization	Cooperating organization
Promote the application of BATs and BEPs in textile and garment enterprises through awareness raising, guidelines, training, study tours, and onsite technical support.	<ul style="list-style-type: none"> <li>Vietnam Textile and Apparel Association</li> <li>Manufacturers</li> </ul>	<ul style="list-style-type: none"> <li>Consultancies</li> <li>Brands</li> </ul>
Interventions to mitigate resource use and air, soil, and water pollution using the Higg Index and ZDHC as industry standards.	Vietnam Textile and Apparel Association	<ul style="list-style-type: none"> <li>Consultancies</li> <li>Brands</li> </ul>
Enhance the research and application of recover, recycle and re-use inputs to production between manufacturing enterprises as part of a circular textile economy.	<ul style="list-style-type: none"> <li>Ministry of Science and Technology</li> <li>Ministry of Natural Resources and Environment</li> </ul>	<ul style="list-style-type: none"> <li>Vietnam Textile and Apparel Association</li> <li>Enterprises</li> <li>Consultancies</li> </ul>
Establish an updated information system on energy, water, and chemical use of enterprises by integrating relevant indicators in the annual Enterprise Survey. This will help enterprises and sector management authorities track performance improvements.	<ul style="list-style-type: none"> <li>General Statistics Office</li> <li>Vietnam Textile and Apparel Association</li> </ul>	Enterprises
Policy Advocacy		
Planning and investment in textile industrial zones or clusters using clear and transparent standards on environment, construction, and social issues. Promote the development of eco textile IPs. Promote the implementation of resource efficient and cleaner production technologies at company zone/cluster level and offer privileges for accessing technical assistance and preferential financial support.	<ul style="list-style-type: none"> <li>Ministry of Planning and Investment</li> <li>Ministry of Industry and Trade</li> <li>People's Committees</li> </ul>	<ul style="list-style-type: none"> <li>Ministry of Natural Resources and Environment</li> <li>Ministry of Construction</li> <li>Ministry of Labour, Invalids and Social Affairs</li> </ul>

Action	Host organization	Cooperating organization
Promote public-private investment for science and technology development and transfer, so that manufacturers are capable to utilize environmentally sound technologies and practices.	<ul style="list-style-type: none"> <li>Ministry of Finance</li> <li>State Bank of Vietnam</li> <li>Ministry of Science and Technology</li> </ul>	<ul style="list-style-type: none"> <li>Vietnam Textile and Apparel Association</li> <li>Enterprises</li> <li>Consultancies</li> </ul>
Provide privileges in terms of site clearance, land rent exemptions and relief, tax incentives (corporate income tax, export and import duty), and loan interest rates for investment projects for raw and auxiliary materials production.	<ul style="list-style-type: none"> <li>Ministry of Finance</li> <li>People's Committees</li> <li>Banks</li> </ul>	Ministry of Industry and Trade
Provide guidelines and incentives regarding the use of domestic raw and auxiliary materials. (tax, access to financial and technical support).	<ul style="list-style-type: none"> <li>Ministry of Industry and Trade</li> <li>Ministry of Finance</li> </ul>	<ul style="list-style-type: none"> <li>Departments of Industry and Trade</li> <li>Departments of Finance</li> </ul>
Revise legislation to facilitate re-use and recycle industrial activities to manage solid wastes and wastewater.	<ul style="list-style-type: none"> <li>Ministry of Natural Resources and Environment</li> <li>Ministry of Agriculture and Rural Development</li> <li>Ministry of Construction</li> </ul>	Industrial Management Boards
Provide legal instructions and incentives regarding the application of best practices, cleaner technology and equipment (e.g., methodologies for improvement, tax privileges, guidelines for accessing financial and technical support).	<ul style="list-style-type: none"> <li>Ministry of Industry and Trade</li> <li>Ministry of Finance</li> </ul>	People's Committees
Establish a reporting scheme which is transparent about environmental performance of manufacturers.	<ul style="list-style-type: none"> <li>Ministry of Natural Resources and Environment</li> <li>General Statistics Office</li> </ul>	<ul style="list-style-type: none"> <li>Vietnam Textile and Apparel Association</li> <li>Brands</li> <li>Enterprises</li> </ul>

Action	Host organization	Cooperating organization
<b>Communication and Networking</b>		
Government and development organizations provide and assist the sector's manufacturing enterprises and workforce training organizations to keep up with new requirements in legislation, international trends, verification and certifications, privileges and corresponding conditions and procedures, and environmental risks. Set up a web portal for the sector or integrate this information into existing official web portals.	<ul style="list-style-type: none"> <li>Ministry of Industry and Trade</li> <li>International development agencies</li> </ul>	<ul style="list-style-type: none"> <li>Vietnam Textile and Apparel Association</li> <li>Brands</li> <li>Enterprises</li> </ul>
Create a dialogue mechanism for sector stakeholders through VITAS annual meeting activities and web-based forums so stakeholders are aware of and take appropriate responsibility for greening the sector.	Vietnam Textile and Apparel Association	<ul style="list-style-type: none"> <li>Ministry of Industry and Trade</li> <li>MInistry of Labour, Invalids and Social Affairs</li> <li>Brands</li> <li>Enterprises</li> </ul>
Integrate big data into Vietnam's textile and garment industry and link with the data from global buyers and supply chain operators.	<ul style="list-style-type: none"> <li>Ministry of Industry and Trade</li> <li>Ministry of Science and Technology</li> <li>Vietnam Textile and Apparel Association</li> </ul>	<ul style="list-style-type: none"> <li>Brands</li> <li>Enterprises</li> </ul>
Establish a networking mechanism involving key, primary and secondary sector stakeholders.	<ul style="list-style-type: none"> <li>Ministry of Science and Technology</li> <li>Vietnam Textile and Apparel Association</li> </ul>	<ul style="list-style-type: none"> <li>Ministry of Industry and Trade</li> <li>Brands</li> <li>Enterprises</li> <li>Consultancies</li> </ul>
Periodic forums to share technologies for environmental protection, learning from global best practices, green technology adoption, and update the list of applicable BATs and BETs for sharing experience.	<ul style="list-style-type: none"> <li>Ministry of Science and Technology</li> <li>Vietnam Textile and Apparel Association</li> <li>Ministry of Natural Resources and Environment</li> </ul>	<ul style="list-style-type: none"> <li>International development agencies</li> <li>Consultancies</li> </ul>

# Conclusions

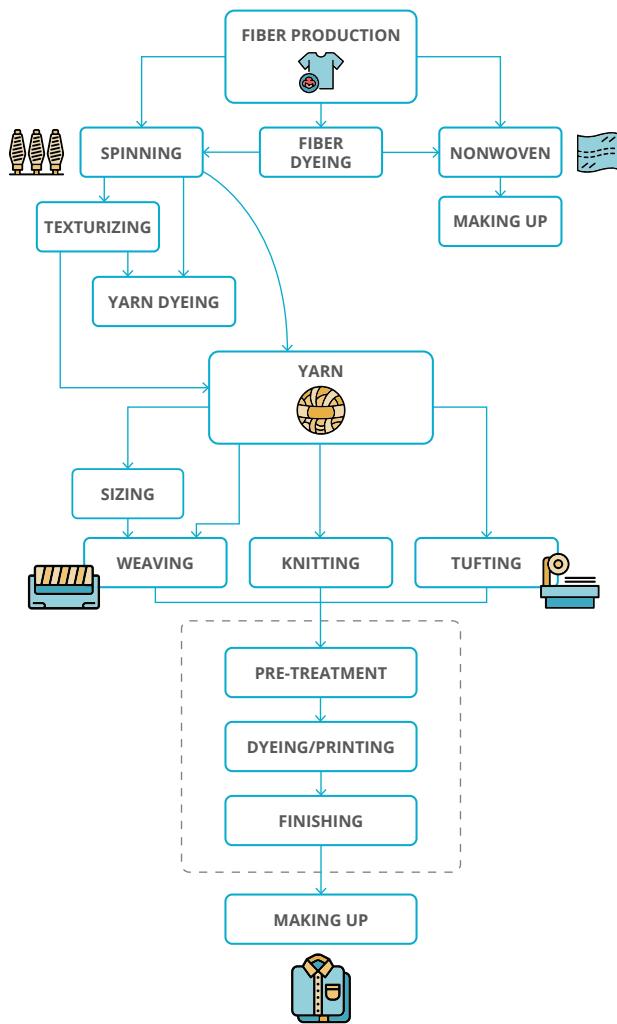
**T**extile and garment industry has been one of the most important export sectors in Vietnam since recent years. The sector also provides stable employment to a big proportion of the available workforce in Vietnam.

In the context of FTAs approved between Vietnam and partner countries and regions, the sector needs to take strong steps towards being more on its own initiative in raw materials supply, especially domestic fabric production development to meet these FTAs' rules of origin. The only way to set a sustainable development pathway for fabric and garment production is to truly embrace principles and best practices on environmental protection, green production, conservation of non-renewable resources such as water, electricity, using recycled materials and sound chemical management.

The guideline provides an outlook of the Textile Sector in Vietnam and highlights an overview of appropriate tools and certification mechanisms that can help in the green transformation of the sector. The case for green transformation is supported by evidences coming from companies that have already started implementing practices to reduce their environmental impacts. However, the only way to truly achieve a green transformation of the entire Textile sector is through a broad coalition of all the actors associated with the sector, all working towards a common goal of a 'green vision'. It is hoped that this guideline, prepared as a part of WWF's project "Greening the Textile sector", will assist the transition of Vietnam's textile and apparel sector towards sustainable development and actively support the achievement of national development goals.

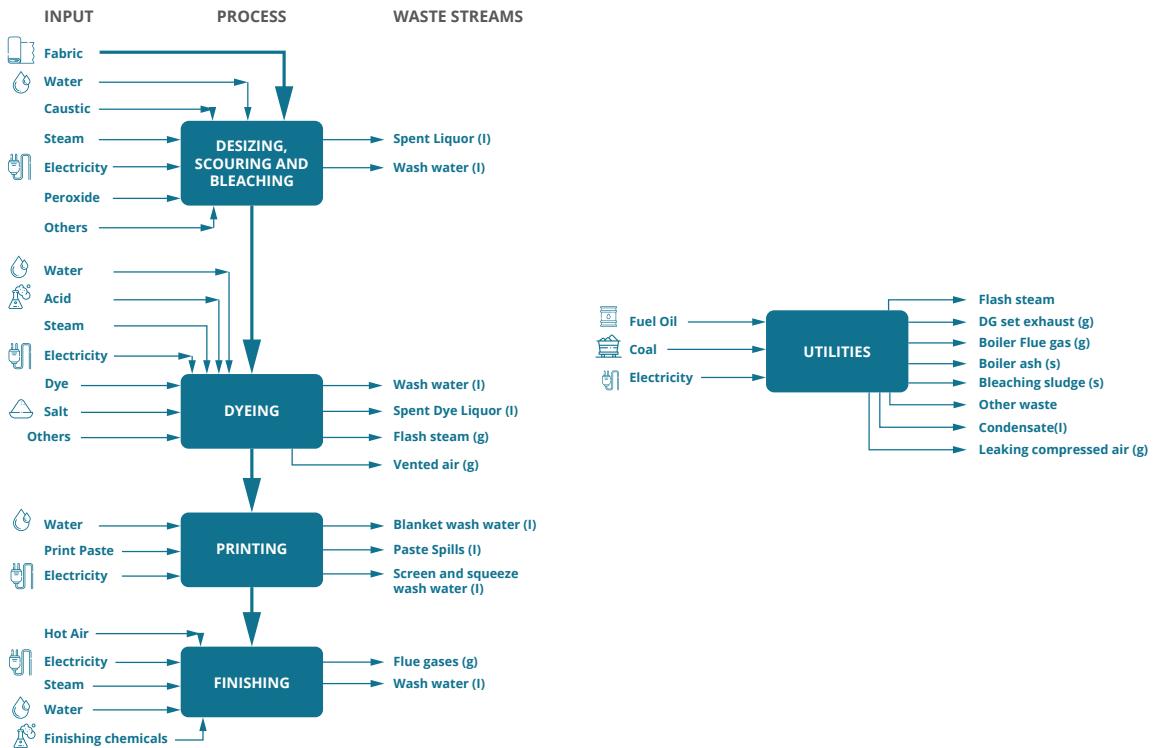
# Annex 1. Production chain

Textile and garment production is a long chain involving multiple processing steps and inputs to turn fiber into ready-to-wear products. The diagram below is an overview of the production chain.



## Annex 2. Inputs and waste streams

This diagram shows inputs and waste streams of an general textile wet processing stage. Waste streams cannot be eliminated but they can be reduced and cleaned before being used as inputs to another process or returned to the environment. There have been efforts from sector stakeholders to improve techniques, technologies, and management practices. Many such actions have had positive financial and environmental impacts that contribute to sustainable development.



### Annex 3. Best Available Technologies and Best Environmental Practices in the global textile and garment sector.

Nr.	BATs and BEPs	Actions
<b>Management and housekeeping practices</b>		
1	Education/training of employees	<ul style="list-style-type: none"> <li>Conduct internal or external training on resource-specific, process-specific and machinery-specific issues.</li> </ul>
2	Industrial maintenance	<ul style="list-style-type: none"> <li>Apply advance Industrial Maintenance Practices, such as Productive Maintenance, Total Productive Maintenance or Predictive Maintenance (e.g. UPTIME, ESSENTIALmaintain);</li> <li>Apply automatic lubrication system.</li> </ul>
3	Chemical storage, handling, dosing and dispensing	<ul style="list-style-type: none"> <li>Material Safety Data Sheet in place in understandable language;</li> <li>Toxic and dangerous chemicals should be stored separately;</li> <li>First aid facilities available, evacuation and emergency procedures in place and rehearsed regularly;</li> <li>Records of accidents and incidents (near-misses) must be kept;</li> <li>Automated chemical dosing and dispensing system.</li> </ul>
4	Minimization/optimization of chemicals used	<ul style="list-style-type: none"> <li>Regularly revising recipe to identify and remove unnecessary chemicals;</li> <li>Prioritize auxiliaries and chemicals with a high degree of biodegradability, low toxicity, low volatility and low smell intensity;</li> <li>Using high-quality water (where needed) in wet processes helps avoid/reduce chemicals usage, which needed to prevent side effects caused by the presence of impurities in the water;</li> <li>Avoiding the surplus chemicals and auxiliaries;</li> <li>Optimizing scheduling in production;</li> <li>Reusing solutions from dyeing/washing baths whenever possible;</li> <li>Filling of tanks with volatile compounds using properly precaution measures.</li> </ul>

Nr.	BATs and BEPs	Actions
5	Automated preparation and dispensing of chemicals	<ul style="list-style-type: none"> <li>Automated color kitchens and automated chemicals dosing and dispensing systems;</li> <li>Automated systems for just-in-time-preparations of liquors;</li> <li>On-line measurement of the liquor pick-up and of the quantity of processed fabric, the exact amount of liquor can be prepared and added. Liquor surpluses and wastewater pollution are therefore minimized;</li> <li>Using automated dosing systems where the chemicals are not premixed before being introduced into the applicator or dyeing machine. In this case, individual streams are used for each of the products.</li> </ul>
6	Optimize the use of water	<ul style="list-style-type: none"> <li>Use domestic water flow restrictor to keep water flow at 5-7 liter/minute for washing and 9-12 liter/minute for showering;</li> <li>Installation of flow control devices and automatic stop valves on continuous machine;</li> <li>Installation of automatic controllers to accurately control of fill volume and liquor temperature;</li> <li>Substitution of overflow-flood rinsing method (in batch processes) by smart rinsing method;</li> <li>Optimization of scheduling in production;</li> <li>Water re-use / recycle whenever possible.</li> </ul>
7	Optimize the use of energy	<ul style="list-style-type: none"> <li>Setup energy management system ISO 50001;</li> <li>Heat-insulation of pipes, valves, tanks, machines;</li> <li>Optimizing boiler houses;</li> <li>Segregation of hot and cold wastewater streams prior to heat recovery and recovery of heat from the hot stream;</li> <li>Replace normal transformer by Zigzag autotransformer;</li> <li>Replace normal lamp by LED lamp. Using automatic lamp sensor in suitable location;</li> <li>Replace standard motor by new high efficiency motor;</li> <li>Replace normal V-belt by High Torque Drive one;</li> <li>Installing frequency-controlled electric motors equipped with harmonic filter;</li> <li>Controlling moisture content in the circulating air and on the textile in stenters;</li> <li>Proper adjustment of drying temperature and time.</li> </ul>

Nr.	BATs and BEPs	Actions
8	Management of waste streams	<ul style="list-style-type: none"> <li>Separate capture of high-loaded waste streams from low-concentrated effluent to allow more efficient treatment;</li> <li>Separate collection of unavoidable solid waste;</li> <li>Reduction of packaging;</li> <li>Use of returnable containers;</li> <li>Recycling of textile wastes.</li> </ul>
9	Input/output streams inventory and evaluation	<ul style="list-style-type: none"> <li>Establish the internal system to measure and record the input/output streams of unit process steps;</li> <li>Evaluate the streams from time to time and to other sites or similar processes to find out room for improvement.</li> </ul>
10	Design based on product life cycle	<ul style="list-style-type: none"> <li>Designers compare several different product designs in terms of impact categories such as energy use, toxicity, acidification, CO<sub>2</sub> emissions, ozone depletion, resource depletion, etc. to have appropriate selection.</li> </ul>
11	Recycling and reuse	<ul style="list-style-type: none"> <li>Sorting collected textiles according to their condition and the types of fibers used;</li> <li>Textile materials are shredded or pulled into fibers and depending on the end use of the yarn, other fibers may be incorporated. The yard is re-spun ready for later weaving or knitting;</li> <li>Fibers sometimes can simply be compressed to create new textile fillings;</li> <li>Cotton and silk is used to manufacture paper and to wipe and polish cloths for a range of industries from the automotive to the mining sector;</li> <li>Other types of textiles can be reprocessed into fibers for upholstery, insulation, and even building materials.</li> </ul>
12	Smart technologies for management and monitoring the production	<ul style="list-style-type: none"> <li>Application of 4.0 technologies in yarn production and quality monitoring (e.g. SpinMaster, WeaveMASTER, KnitMASTER, ESSENTIAL-Rieter Digital Spinning Suite), production and performance management for textile finishing (e.g. OrgaTEX.MES).</li> </ul>

Nr.	BATs and BEPs	Actions
<b>Pretreatment:</b>		
13	Surfactants	Substitute alkylphenol ethoxylates and other hazardous surfactants with substitutes that are readily biodegradable or bio eliminable in the wastewater treatment plant and do not form toxic metabolites.
14	Complexing agents	<ul style="list-style-type: none"> <li>• Uses biodegradable or bio-eliminable complexing agents (enzymes);</li> <li>• Avoid or reduce the use of complexing agent in pre-treatment and dyeing processes by a combination of: <ul style="list-style-type: none"> <li>- Softening of fresh water to remove the iron and the hardening alkaline-earth cations from the process water;</li> <li>- Using a dry process to remove coarse iron particles from the fabric before bleaching;</li> <li>- Removing the iron that is inside the fiber using acid demineralization, or better, non-hazardous reductive agents before bleaching heavily contaminated fabrics;</li> <li>- Applying hydrogen peroxide under optimal controlled conditions.</li> </ul> </li> </ul>
15	Antifoaming agents	<ul style="list-style-type: none"> <li>• Minimize or avoid their use by: <ul style="list-style-type: none"> <li>- using bath-less air-jets, where the liquor is not agitated by fabric rotation;</li> <li>- re-using treated bath.</li> </ul> </li> <li>• Select anti-foaming agents that are free from mineral oils and that are characterized by high bio-elimination rates.</li> </ul>
16	Removing knitting lubricants	<ul style="list-style-type: none"> <li>• Select knitted fabric that has been processed using water-soluble and biodegradable lubricants instead of the conventional mineral oil-based lubricants. Remove them by water washing. With knitted fabrics made of synthetic fibers the washing step needs to be carried out before thermos-fixation (to remove the lubricants and avoid them being released in the form of air emissions);</li> <li>• Carry out the thermos-fixation step before washing and treat the air emissions generated from the stenter frame by dry electro-filtration systems that allow energy recovery and separate collection of the oil;</li> <li>• Remove the non-water-soluble oils using organic solvent washing. This technique is convenient when other non water-soluble preparation agents, such as silicone oils, are present on the fabric.</li> </ul>

Nr.	BATs and BEPs	Actions
17	Desizing	<ul style="list-style-type: none"> <li>Select raw material processed with low add-on techniques (e.g. pre-wetting of the warp yarn) and more effective bio-eliminable sizing agents combined with the use of efficient washing systems for desizing and low Food to Microorganism Ratio waste water treatment techniques to improve the bio-eliminability of the sizing agents;</li> <li>Adopt the oxidative route when it is not possible to control the source of the raw material;</li> <li>Combine desizing/scouring and bleaching in one single step;</li> <li>Recover and re-use the sizing agents by ultra-filtration.</li> </ul>
18	Bleaching	<ul style="list-style-type: none"> <li>Use <math>H_2O_2</math> as preferred bleaching agent;</li> <li>Limit the use of sodium hypochlorite only to cases in which high whiteness has to be achieved and to fabrics that are fragile and would suffer depolymerization. In these special cases, to reduce the formation of hazardous AOX, sodium hypochlorite bleaching is carried out in a two-step process in which peroxide is used in the first step and hypochlorite in the second. Effluent from hypochlorite bleaching is kept separate from the other streams and mixed effluents in order to reduce formation of hazardous AOX.</li> </ul>
19	Mercerizing	<ul style="list-style-type: none"> <li>Recover and re-use alkali from mercerizing rinsing water;</li> <li>Re-use the alkali-containing effluent in other preparation treatments.</li> </ul>
<b>Dyeing</b>		
20	Water-free dyeing	<ul style="list-style-type: none"> <li>Apply DyeCoo, the world's first 100% water and process chemical-free textile dyeing solution. DyeCoo disrupts the traditional dye system by using carbon dioxide as a solvent instead of water.</li> </ul>
21	Dosage and dispensing of dye formulations	<ul style="list-style-type: none"> <li>Reduce the number of dyes (one way to reduce the number of dyes is by using trichromatic systems);</li> <li>Use automated systems for dosage and dispensing of dyes, only considering the manual operation for dyes that are used infrequently.</li> </ul>

Nr.	BATs and BEPs	Actions
22	Batch dyeing processes	<ul style="list-style-type: none"> <li>• Use machinery fitted with automatic controllers of fill volume, temperature and other dyeing cycle parameters, indirect heating and cooling systems, hoods and doors to minimize vapor losses;</li> <li>• Choose the machinery that is most fitted to the size of the lot to be processed to allow its operation in the range of nominal liquor ratios for which it is designed. Modern machines can be operated at approximately constant liquor ratio whilst being loaded at a level as low as 60% of their nominal capacity (or even 30% of their nominal capacity with yarn dyeing machines);</li> <li>• Select machinery according as far as possible to the requirements: <ul style="list-style-type: none"> <li>- Low- or ultra-low liquor ratio;</li> <li>- In-process separation of the bath from the substrate;</li> <li>- In-process separation of process liquor from the rinsing liquor;</li> <li>- Mechanical liquor extraction to reduce carry-over liquid volume and improve rinsing efficiency;</li> <li>- Reduced duration of the cycle.</li> </ul> </li> <li>• Re-use rinse water for the next dyeing or reconstitution and re-use the dye bath when technical considerations allow.</li> </ul>
23	Continuous dyeing process	<ul style="list-style-type: none"> <li>• Using low add-on liquor application systems and minimizing volume capacity of the dip trough when using pad dyeing techniques;</li> <li>• Adopting dispensing systems where the chemicals are dispensed on-line as separate streams, being mixed only immediately before being fed to the applicator;</li> <li>• Using one of the following systems for dosing the padding liquor, based on measurement of the pick up: Measure the amount of dyeing liquor consumed by reference to the quantity of processed fabric (length of the fabric multiplied by its specific weight), the resulting values are automatically processed and used for the preparation of the next comparable batch; Use the rapid batch dyeing technique, where rather than being prepared for the whole batch before starting the dyeing batch, the dyestuff solution is prepared just in time, in several steps, based on on-line measurement of the pick-up;</li> <li>• Increase rinsing efficiency according to the principles of countercurrent rinsing and reduction of carry-over.</li> </ul>

Nr.	BATs and BEPs	Actions
24	PES and PES blended dyeing with disperse dyes	<ul style="list-style-type: none"> <li>Substitute sodium dithionite in PES after-treatment by applying one of the two proposed techniques: <ul style="list-style-type: none"> <li>- Replace sodium dithionite with reducing agent based on sulfinic acid derivatives. This should be combined with measures in order to ensure that only the strict amount of reducing agent needed to reduce the dyestuff is consumed (e.g. by using nitrogen to remove oxygen from the liquor and from the air in the machine);</li> <li>- Use of disperse dyes that can be cleared in alkaline medium by hydrolytic solubilization instead of reduction.</li> </ul> </li> <li>Use optimized dye formulations that contain dispersing agents with high degree of bio-eliminability.</li> </ul>
25	Dyeing with sulphur dyes	<ul style="list-style-type: none"> <li>Replace conventional powder and liquid sulphur dyes with stabilised non-pre-reduced sulphide-free dyestuffs or with pre-reduced liquid dye formulations with a sulphide content of less than 1%;</li> <li>Replace sodium sulphide with sulphur-free reducing agents or sodium dithionite, in that order of preference;</li> <li>Adopt measures to ensure that only the strict amount of reducing agent needed to reduce the dyestuff is consumed (e.g. by using nitrogen to remove oxygen from the liquor and from the air in the machine);</li> <li>Use hydrogen peroxide as preferred oxidant.</li> </ul>
26	Batch dyeing with reactive dyes	<ul style="list-style-type: none"> <li>Use high-fixation, low-salt reactive dyes;</li> <li>Avoid the use of detergents and complexing agents in the rinsing and neutralization steps after dyeing by applying hot rinsing integrated with recovery of the thermal energy from the rinsing effluent.</li> </ul>
27	Wool dyeing	<ul style="list-style-type: none"> <li>Substitute chrome dyes with reactive dyes or, where not possible, use ultra-low chroming methods that fulfil all the following requirements as defined: an emission factor of 50mg chromium per kg of wool treated is achieved, which corresponds to a chromium concentration of 5mg/l in the spent chroming bath when a 1:10 liquor ratio is used; and there is no chromium (VI) is detectable in the waste water (using a standard method able to detect Cr VI at concentrations &lt; 0.1 mg/l).</li> </ul>

Nr.	BATs and BEPs	Actions
		<ul style="list-style-type: none"> <li>• Ensure minimum discharge of heavy metals in the waste water when dyeing wool with metal complex dyes. BAT associated values are emission factors of 10 - 20 mg/kg of treated wool, which correspond to 1 - 2 mg/l of chromium in the spent dye bath when a 1:10 liquor ratio is used. These performances can be achieved by: <ul style="list-style-type: none"> <li>- Using auxiliaries that enhance dye uptake like;</li> <li>- Using pH control methods to maximize final bath exhaustion for other make-ups.</li> </ul> </li> <li>• Give preference to a pH-controlled process when dyeing with pH-controllable dyes (acid and basic dyes) so that level dyeing is obtained with maximum exhaustion of dyes and insect resist agents and minimum use of organic levelling agents.</li> </ul>
<b>Printing</b>		
28	General best practices in printing	<ul style="list-style-type: none"> <li>• Reduce printing paste losses in rotary screen printing by: minimizing the volume of printing paste supply systems; recovering printing paste from the supply system at the end of each run; recycling residual printing paste;</li> <li>• Reduce water consumption in cleaning operations by a combination of: start/stop control of cleaning of the printing belt; re-use of the cleanest part of the rinsing water from the cleaning of the squeegees, screens and buckets; re-use of the rinsing water from cleaning of the printing belt;</li> <li>• Use digital ink-jet printing machines for the production of short runs (less than 100m) for flat fabrics, when product market considerations allow.</li> <li>• Use digital jet printing machines for printing carpet and bulky fabrics, except for resist and reserve printing and similar situations.</li> </ul>
29	Reactive printing step	<ul style="list-style-type: none"> <li>• The one-step process with the controlled addition of moisture, where the moisture is applied either as foam or by spraying a defined quantity of water mist;</li> <li>• Or the two-steps printing method.</li> </ul>
30	Pigment printing step	<ul style="list-style-type: none"> <li>• Thickeners with low-emission of volatile organic carbon (or not containing any volatile solvent at all) and formaldehyde-poor binders. The associated air emission value is &lt;0.4 g Org.-C/kg textile (assuming 20m<sup>3</sup> air/kg textile);</li> <li>• Alkylphenol ethoxylate-free and high degree of bio-eliminability;</li> <li>• Reduced ammonia content (associated emission value 0.6g NH<sub>3</sub> /kg textile (assuming 20m<sup>3</sup> air/kg textile).</li> </ul>

Nr.	BATs and BEPs	Actions
<b>Finishing</b>		
31	General best practices in finishing	<ul style="list-style-type: none"> <li>Minimize residual liquor by: using minimal application techniques (e.g. foam application, spraying) or reducing volume of padding devices; re-using padding liquors if quality is not affected;</li> <li>Minimize energy consumption in stenter frames by: <ul style="list-style-type: none"> <li>- Using mechanical dewatering equipment to reduce water content of the incoming fabric;</li> <li>- Optimising exhaust airflow through the oven, automatically maintaining exhaust humidity between 0.1 and 0.15 kg water/kg dry air, considering the time taken to reach equilibrium conditions;</li> <li>- Installing heat recovery systems;</li> <li>- Fitting insulating systems;</li> <li>- Ensuring optimal maintenance of the burners in directly heated stenters.</li> </ul> </li> <li>Use low air emission optimized recipes.</li> </ul>
32	Easy-care treatment step	<ul style="list-style-type: none"> <li>Use formaldehyde-free or formaldehyde-poor (&lt;0.1% formaldehyde content in the formulation) cross-linking agents.</li> </ul>
33	Softening treatment step	<ul style="list-style-type: none"> <li>Apply the softening agents by pad mangles or better, by spraying and foaming application systems, instead of carrying out this treatment by exhaustion directly in the batch dyeing machine.</li> </ul>
34	Denim finishing	<ul style="list-style-type: none"> <li>Ozone Dynamic technology uses only electrical power and air to fabric finishing. Benefits: Uses no liquid chemicals; Saving of 67% water, 85% of chemical consumption; 62% of energy; Reduction of 55% in production time;</li> <li>Nanobubble "eFlow" technology (patented by Jeanologia): 3 different finishing options (softening/conditioning, functionalization and dyeing); Saving up to 50% of chemical products; 86% of water consumption and 44% of energy consumption; and eliminate 97% of wastewater.</li> </ul>

Nr.	BATs and BEPs	Actions
<b>Washing</b>		
35	Efficient wahsing	<ul style="list-style-type: none"> <li>• Substitute overflow washing/rinsing with drain/fill methods or “smart rinsing” techniques;</li> <li>• Reduce water &amp; energy consumption in continuous processes by: installing high-efficiency washing machinery; introducing heat recovery equipment;</li> <li>• When halogenated organic solvent cannot be avoided (e.g. with fabrics that are heavily loaded with preparations such as silicone oils that are difficult to remove with water), use fully closed-loop equipment. It is essential that the equipment fulfil the requirements and provisions be taken for in-loop destruction (e.g. by advanced oxidation processes) of the persistent pollutants in order to avoid any possible contamination of groundwater arising from diffuse pollution and accidents;</li> <li>• Install special filter (PlanetCare filter, coral filters, Lint LUV-R filter etc.) for washing/ rinsing machine on water drain pipes to trap microplastics/ microfiber before they could be released into the wastewater.</li> </ul>

## Annex 4. Lessons learned from WWF textile projects in different countries

Process	Without Change in the Technology or Process			Technology Change or Process Change	Practice Improvement
	Waste Reduction	Efficiency Improvement	Automation and Control		
Yarn Manufacturing And Spinning	—	—	—	—	—
Printing	—	—	—	—	Re-use the cooling water in drying oven of printing machine to wash the guiding belt of the printing machine
	—	—	—	—	Printing process optimization by reducing the number of curing lamps
Wet Processing	Heat recovery from wastewater	Re-use the wash water bath	Oxygen trim control at boiler	Caustic recovery plants	Compressed air leakage identification and rectification
	Installation of waste heat boiler	Proper insulation for steam pipelines and feedwater tank	Auto Dosing of dyes & chemicals	Use of solar water heating	
	Recycling balloon squeezing wastewater	Thermic fluid oil decarbonization for improved heating	Reverse osmosis optimization	Use of Low Liquor Soft Flow Machines	Provide better material handling at the grey fabric inward & dyeing section
	Re-use of final rinsing water	Fill-and-draw system		Upgrade the high MLR machines to low MLR machines	Recover condensate from dyeing machines, autoclave, bleaching machines, washing machines, dryers, singeing machine, sizing machines, printers

Process	Without Change in the Technology or Process			Technology Change or Process Change	Practice Improvement
	Waste Reduction	Efficiency Improvement	Automation and Control		
Wet Processing	Caustic recovery	Replacing steam traps in dyeing machines	—	Sand filter integration and system optimization in water softening system	—
	Desizing by enzyme instead of using chemicals	Steam recovery in sanforizing process	—	Airflow (air jet) dyeing machines	—
	Recovery of caustic from mercerizing	Utilizing waste heat from air compressors for drying rooms	—	Automated water softening system	—
	Re-use treated water or highly alkaline scouring wastewater for boiler gas treatment	—	—	Thermal oil heating instead of natural luster finishing machine heating	—
	Use biological detergent (probiotic) to remove excess dye on cotton fabric after dyeing	—	—	Thermosol IR dyeing machine with less water consumption	—

Process	Without Change in the Technology or Process			Technology Change or Process Change	Practice Improvement
	Waste Reduction	Efficiency Improvement	Automation and Control		
Wet Processing	Replace dye-cleaning chemicals alkaline form + Hydrobisulfite with dye cleaning chemicals acid form (only for polyester fabric)	—	—	CPB - Cold Pad Batch	—
	Using bioscouring agent to pretreatment of cotton	—	—	Liquid Indigo technology	—
	—	—	—	Applying E-flow technology	—
	—	—	—	Applying wet ozone technology	—
	—	Improve ironing boiler feed water temperature with solar power	Sewing machines equipped servo motors	—	—
Garmenting	—	Upgrade the sewing machines with direct drive motors	—	—	—

Process	Without Change in the Technology or Process			Technology Change or Process Change	Practice Improvement
	Waste Reduction	Efficiency Improvement	Automation and Control		
Entire Supply Chain	—	Upgrading the rewound motors with energy efficient one	Optimizing the Compressed Air Pressure Distribution	Install VSD for air compressor, boiler's fans	Install rainwater harvesting systems
	—	Optimizing the compressor with variable frequency drive	Transvector nozzle for cleaning guns	—	Energy saving reform for LED bulbs
	—	Upgrade to V belts	Use of water, gas and steam meters	—	—
	—	Installation of waste heat recovery systems from effluent	Automation of water pretreatment units	—	—
	—	Waste heat recovery in stenter	Use regulator valves and loop distribution pipe connection	—	—
	—	Optimize condensate recovery and insulate condensate tank	Use valve float instead of manual valves for automatic condensate discharge	—	—

Process	Without Change in the Technology or Process			Technology Change or Process Change	Practice Improvement
	Waste Reduction	Efficiency Improvement	Automation and Control		
Entire Supply Chain	—	Use steam traps for each iron	—	—	—
	—	Replace centralized boiler system by individual electric boiler	—	—	—
	—	Insulate steam valves & boiler feedwater tank	—	—	—
	—	Installation of waste heat recovery systems from effluent	—	—	—
	—	Use direct drive ventilation fans	—	—	—
	—	Aircon control to supply fresh wind into workshop through CO <sub>2</sub> signal	—	—	—

# Glossary of Terms

<b>EMS</b>	Environmental Management Systems	An Environmental Management System is a set of processes and practices that enable an organization to reduce its environmental impacts and increase its operating efficiency. The Higg Index and ISO 14001 are examples.
<b>ERP</b>	Enterprise Resource Planning Systems	Enterprise resource planning is business process management software that allows an organization to use a system of integrated applications to manage the business and automate many backoffice functions related to technology, services and human resources.
<b>JIT</b>	Just-in-time manufacturing	Just-in-time (JIT) manufacturing, also known as just-in-time production or the Toyota Production System (TPS), is a methodology aimed at reducing times within the production system as well as response times from suppliers and to customers. Its origin and development was mainly in Japan, largely in the 1960s and 1970s and particularly at Toyota.
<b>RFT</b>	Right the first time	Right-First-Time (RFT) production is a performance indicator for garment manufacturing. Manufacturers will check garments and measure the defective percentage in a lot and defects per hundred units in a lot. RFT is another measure of quality performance of a plant. By measuring RFT, a garment factory can figure out the quality level of the production process.
<b>CMT</b>	Cut, make, trim	Cut, Make, and Trim production is where an apparel factory takes your designs and produces them following three stages. 'Cut,' where the material is cut to your pattern, and made ready to sew, 'Make,' where the garments are sewn together and created, and 'Trim,' where the garments are finished, any threads and small imperfections are removed and final QC and packing occurs.
	Industry 4.0	Industry 4.0 is the digital transformation of manufacturing, production and related industries and value creation processes. Industry 4.0 is used interchangeably with the term 'fourth industrial revolution' and represents a new stage in the organization and control of the industrial value chain.

<b>LCA</b>	Life cycle assessment	Life cycle assessment is a cradle-to-grave or cradle-to-cradle analysis technique to assess environmental impacts associated with all the stages of a product's life, from raw material extraction through materials processing, manufacture, distribution, and use.
	Green supply chain	Green Supply Chain Management integrates environments concerns into conventional supply chain management practices. Environmental concerns are considered at every link in the chain: designing, procurement, processes, final product delivery, and end-of-life product management.
	Circular economy	A circular economy is an alternative to a traditional linear economy (make, use, dispose) in which we keep resources in use for as long as possible, extract the maximum value from them whilst in use, then recover and re-use parts or materials at the end of each service life.
<b>SDG</b>	Sustainable Development Goals	<p>The Sustainable Development Goals (SDGs) were formulated at the United Nations Conference on Sustainable Development in Rio de Janeiro in 2012. The SDGs replace the Millennium Development Goals (MDGs). Like the MDGs, the SDGs set targets for a global effort to eliminate poverty. There are 17 SDGs.</p> <ul style="list-style-type: none"> <li>Goal 1: No Poverty</li> <li>Goal 2: Zero Hunger</li> <li>Goal 3: Good Health and Well-being</li> <li>Goal 4: Quality Education</li> <li>Goal 5: Gender Equality</li> <li>Goal 6: Clean Water and Sanitation</li> <li>Goal 7: Affordable and Clean Energy</li> <li>Goal 8: Decent Work and Economic Growth</li> <li>Goal 9: Industry, Innovation and Infrastructure</li> <li>Goal 10: Reduced Inequality</li> <li>Goal 11: Sustainable Cities and Communities</li> <li>Goal 12: Responsible Consumption and Production</li> <li>Goal 13: Climate Action</li> <li>Goal 14: Life Below Water</li> <li>Goal 15: Life on Land</li> <li>Goal 16: Peace and Justice Strong Institutions</li> <li>Goal 17: Partnerships to achieve the Goal</li> </ul>





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