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A ROADMAP TOWARDS A GREENER APPAREL SECTOR

A SUSTAINABLE FINANCING STRATEGY FOR SRI LANKA

JUNE 2021

This publication was made possible by the Corporate Social Responsibility (CSR) funding from The Hongkong and Shanghai Banking Corporation (HSBC) in Sri Lanka. The views expressed in this publication do not necessarily reflect the views of HSBC, IUCN Sri Lanka, or other participating organizations.

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Published by: IUCN, Sri Lanka in collaboration with HSBC

Citation: HSBC and IUCN Sri Lanka (2021). *A Roadmap Towards a Greener Apparel Sector: A Sustainable Financing Strategy for Sri Lanka.* Colombo, Sri Lanka: IUCN Sri Lanka and HSBC. viii+116.

Available from: IUCN, International Union for Conservation of Nature, Sri Lanka
No 53, Horton Place, Colombo 7
Sri Lanka
www.iucn.org

A ROADMAP TOWARDS A GREENER APPAREL SECTOR

A Sustainable Financing Strategy for Sri Lanka

ABOUT SUSTAINABLE FINANCING STRATEGY:

Apparel sector in Sri Lanka plays a critical role in the economy. The sector plans to work with global brands and others to reduce energy, water and chemical footprints under the theme "Garments without Guilt." Covid-19 further connected the industry with the ecosystem sustainability and business as usual practices are no longer an option.

The intended greening can take advantage of the global best practices, technologies and partnerships and capitalize on the Government plans to support exports. In that context, Sustainable Financing and improved Coordination to achieve the economics of scale are critical elements towards achieving the anticipated transformation.

The overarching objective of this study is to summarize the global trends and opportunities for Sustainable Financing while providing the initial thinking towards a "holistic" and "multi-stakeholder" coordination approach to green the apparel sector, within the current and emerging global context.

Acknowledgement:

HSBC Sri Lanka and IUCN Sri Lanka teams would like to thank all of those who contributed to this publication. Special thanks go to Mr. Sharad Amalean, Past-Chair and Mr. A Sukumaran, Present Chair of the Board of Directors of Joint Apparels Association Forum (JAAF), Directors of the Board of JAAF, Mr. Tully Cooray, Secretary General of JAAF and Mr. Nikhil Hirdaramani, Chairman of the Committee on JAAF Sustainability Sub Committee and members for the inputs to make this study meaningful. We thank Mr Ravi De Silva, Secretary General of the Sri Lanka Banks' Association (SLBA) and the members of the Sustainability Team of SLBA for the feedback and inputs on potential financial tools. Mr. Sanjaya Mohottala, Director General of Board of Investment (BOI), Ms. Amara Beling, Director of the Environment Management Division of BOI, and the National Cleaner Production Centre (NCPC) who provided valuable guidance and technical direction. Dr. Ajith de Alwis, Professor of Chemical and Process Engineering, University of Moratuwa guided us from the inception. We wish to recognize the contributions provided by Mr. Sena Peris, Former Director of NCPC and Mr. Athula Samarasinghe, Independent Consultant at various stages of this study.

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Executive Summary

The global trends in apparels are intricately linked to the population growth and the rising purchasing power of the consumers. With business as usual practices, for an estimated global population of 8.5 billion by 2030, the Boston Consulting Group estimates the apparel consumption to increase by a staggering 63%, from 62 million tonnes per annum to 102 million tonnes per annum. This will accompany significantly high levels of emissions and discharges to the very ecosystem that support us unless the industry and consumers do not change significantly, due to the vast potential levels of greenhouse gas emissions, natural resource depletion, environmental pollution, and health hazards, among others. Further, the Covid-19 provided an additional momentum towards sustainability highlighting the need to safeguard ecosystems supported by the emerging ocean plastics and microplastics in food chains from the high use of synthetics. For example, the European Union (EU) is contemplating on introducing taxes and negative incentives for suppliers and countries that do not adhere to greening principles, starting 2021.

Understanding the need for timely green interventions, the United Nations (UN), Global Brands as well as National Governments along with Suppliers are taking steps to adopt Cleaner Production, Zero Waste Discharges, Scientifically Decided Targets, and many other innovative initiatives. Responding to these changing needs and emerging trends require access to financing at a time, the global economy is not doing well. Sustainable Financing coupled with innovation, foresight and championships could help to achieve the transformational shift that is expected by the individuals, corporates, countries, and global brands.

The Sri Lankan apparels contribute about 40% to the exports. The industry is at a unique juncture in terms of greening to meet the policies of Global Brands and export markets. Several leading suppliers have adopted high standards in their businesses, supported and coordinated by the Joint Apparels Association Forum (JAAF) and the Exporters Association Sri Lanka and has adopted innovative strategies that include 'Garments without Guilt', 'Responsible Fashion' and 'Green Buildings.' In addition to the large players, Small and Medium Enterprises (SMEs), especially needs support in terms of financing to meet the quality standards. All are affected by the Covid-19 economic downturn. Sustainable Financing in the Apparel Sector is one of the strategies that allow the Sri Lanka apparel sector to be in line with the modern greening demands while ensuring the global competitiveness and the long-term sustainability of the industry.

Sri Lanka is still not a textile/yarn producing country, therefore, at a disadvantage for not having "country of origin" support for exports where GSP concessions are connected. At the same time, opportunity exist for the country to work with brands in new areas such as "garment recycling" use of "natural fibre" in garments etc. These new areas may add more employment to the sector at a time the export earnings are declining.

This document, based on global experience have identified multiple areas where Sustainable Finance could transform the industry, such as energy efficiency, enhancing renewable energy use, innovative water, and wastewater management, chemical management, and environment stewardship, etc. Sustainable Financing would help Sri Lanka to capitalize on brand led programmes. The approach could be benefitted much by Government foresight and support on renewable energy, environmental governance, public-private partnerships on impact investments, among others. Some interventions demanding Sustainable Financing also require additional coordination and capacity building across the value chain and demand 'design centres', 'partnerships with global centres of excellence', 'university-industry partnerships' and 'public-private-partnerships' in terms of innovation and coordination. The proposed Innovative Business Integration and Coordination Centre (IBICC) could play a key role in promoting cleaner production, transparent monitoring, facilitation of technical assistance, standardization of suppliers, technology identification and piloting and sharing of global experience through exchanges of information and expertise.

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Abbreviations

3R	Reduce, Reuse, Recycle
ADB	Asia Development Bank
BGMEA	Bangladesh Garment Manufacturers and Exporters Association
BOD	Biological Oxygen Demand
BOI	Board of Investment
CAPEX	Capital Expenditure
CBD	Convention on Biodiversity
CBSL	Central Bank of Sri Lanka
CCD	Convention on Combating Land Degradation
CDP	Carbon Disclosure Project
CE	Circular Economy
CEA	Central Environment Authority
CEB	Ceylon Electricity Board
COD	Chemical Oxygen Demand
CP	Cleaner Production
CRIB	The Credit Information Bureau of Sri Lanka
DfE	Designing for the Environment
EBRD	European Bank of reconstruction and Development
EDB	Export Development Board
EIB	European Investment Bank
EIP	Eco-Industrial Parks
EPZ	Export Processing Zone
ESCO	Energy Service Company
ESG	Environment Social and Governance
ESMF	Environment and Social Management Framework
EU	European Union
G7	The Group of Seven
GBCSL	Sri Lanka Green Building Council
GCF	Green Climate Fund
GDP	Gross Domestic Product
GEF	Global Environment Facility
GHG	Greenhouse Gas Emissions
GIIN	Global Impact Investing Network
GSP+	Generalized Scheme of Preferences Plus
GTFP	Global Trade Finance Programme
GVC	Global Value Chain
IFC	International Finance Corporation
IBICC	Innovative Business Integration and Coordination Centre
IIBP	Innovative Industry Business Platform
IOT	Internet of Things
IPMVPs	International Performance Monitoring and Verifications
ITI	Industrial Technology Institute
IUCN	International Union for Conservation of Nature
IWMI	International Water Management Institute
JAAF	Joint Apparel Association Forum Sri Lanka
JICA	Japan International Cooperation Agency
LCA	Life Cycle Analysis/Assessment
LEED	Leadership in Energy and Environmental Design
LOLC	A finance institution in Sri Lanka
LS&Co	Levi's Strauss & Co
MASL	Mahaweli Authority of Sri Lanka
MEPA	Marine Environment Protection Authority
M&S	Marks and Spencer
MMF	Manmade fibers
NBF	Nature-Based Fabric
NCPC	National Cleaner Production Center
NGO	Non-Governmental Organization
NPD	National Planning Department
NRDC	Natural Resources Defense Council
NWSDB	National Water Supply and Drainage Board
OPEX	Operating Expenses
PaCT	Partnership for Cleaner Textiles Programme in Bangladesh
PPA	Power Purchase Agreement
PPP Mechanism	Public-Private-Partnership
PVH	One of the largest global apparel companies
R&D	Research and Development
REF	Resource Efficiency Financing
RESCO	Renewable Energy Service Company
RMG	Ready-Made Garments
SBT	Science-Based Targets
SBTi	The Science Based Targets initiative
SCF	Supply Chain Finance
SDG	Sustainable Development Goals
SEA	Sri Lanka Sustainable Energy Authority
SLBA	Sri Lanka Bankers' Association
SLSI	Sri Lanka Standard Institution
SME	Small and Medium Enterprises
SPV	Special Purpose Vehicles
SRI	Socially Responsible Investing
TOT	Trainer of Trainer
UK	United Kingdom
UN	United Nations
UNDP	United Nations Development Programme
UNEP	UN Environment
UNFCCC	UN Framework Convention on Climate Change
UNGC	United Nations Global Compact
UNIDO	United Nations Industrial Development Organization
USA	United States of America
VF Corp	An American worldwide apparel and footwear company founded in 1899 and headquartered in Denver, Colorado.
WRB	Water Resource Board
WRI	World Resources Institute
WTC	Water Treatment Company
WTO	World Trade Organization
WWF	World Wide Fund for Nature
WWTP	Wastewater treatment plants
ZDHC	Zero Discharge of Hazardous Chemicals
ZDHC MRSL	Manufacturing Restricted Substances List
ZLD	Zero Liquid Discharge


M

1 Introduction

It is increasingly clear that natural resource depletion and related ecosystem degradation pose threats to future economic development as well as to the sustainability of life forms. In that context, the corporate accountability of the businesses on social and environmental impacts is essential to complement environment governance.

The apparel sector market is worth trillions of dollars. It is a business that reaches and draws the attention of almost everyone, across nations and ages, including sustainability concerns. Therefore, the Global Brands with the support of local suppliers have taken steps to green the industry by addressing issues related to the use of harmful chemicals, greenhouse gas emissions and lack of emphasis on circular economic principles.

The Covid-19 epidemic further highlighted the need to revisit the sustainability aspects of the apparel industry, including the strategies important for Sri Lanka. The apparel industry is intricately linked to one natural resource —which is water, both in terms of quality and quantity. The sector also consumes a significant amount of energy based on grid power, which is, in turn, based on fossil fuels. The chemicals used in the industry are known to be hazardous. The conventional water treatment and water quality monitoring by the National Water Supply and Drainage Board (NWSDB) and Central Environment Authority (CEA) do not pay attention nor has the capacity to manage these potential hazardous discharges. Although not confirmed, the cancer rates and diseases with unknown etiologies are on the rise in Sri Lanka. Multiple Brands have started river basin level work as part of sustainability measures.

Being sensitive, Brands have advocated on the Zero Discharge of Hazardous Chemicals (ZDHC) approaches, the use of renewable energy, embracing Cleaner Production principles etc. Guidance and knowledge on technologies and approaches along with capacity-building opportunities for Governments, Factories and Communities are available and updated with the support of Brands and environment organizations, aiming towards a “responsible apparel sector” as correctly adopted by the Sri Lanka apparel sector.

Figure 1: The Strategic Framework

The main purpose of this publication is to provide the initial thinking towards a "holistic" approach on apparels that is suitable for the current global context and Government's export-oriented technology-intensive sustainable industrial development (Figure 1). The document articulates the need for a transformational change in the way we operate to meet the challenges in a climate affected post-Covid-19 era.

This document, therefore, reviews the status of the global and Sri Lankan apparel sector and articulate potential ways the industry can improve its practices, capacities and technologies to sustain the natural resource base in biologically diverse Sri Lanka. The report highlights the need for better coordination, international partnerships with "Centers of Excellence", investments in monitoring and cleaner production, innovative financing and incentives backed by Banks supported by the Government. Investments in greening opportunities to support the apparel industry while conserving the environment that other development and growth sectors also depend on could be a timely strategy for Sri Lanka.

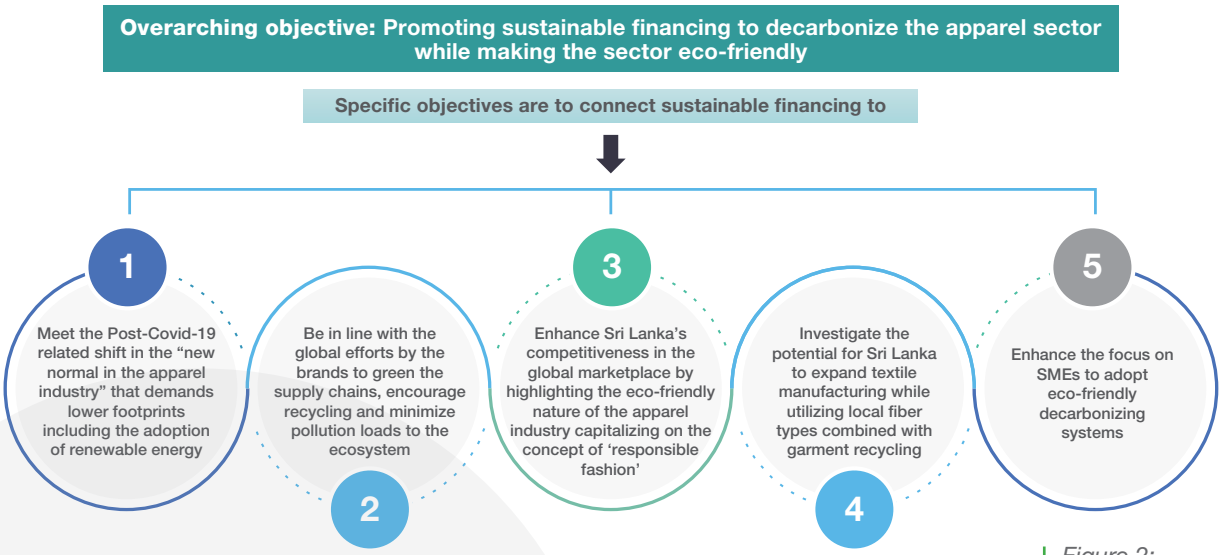


Figure 2: Objectives of the Strategy

2 Understanding the Apparel Sector & Emerging Concerns

2.1. GLOBAL CONTEXT

The global textile and apparel market in 2018, according to the World Trade Organization (WTO), was US$ 315 billion and US$ 505 billion, respectively. A growth of 6.4% and 11.1% respectively from the year before.[1] This was the fastest growth for the preceding six years.

Population increase and rising purchasing power of developing countries, especially China and India, is expected to drive the demand for clothing across the world. It is estimated that the global population will increase from 7 billion in 2015 to 8.5 billion by 2030.

The Boston Consulting Group estimates that if during this period, the Gross Domestic Product (GDP) of developed countries remains at 2% and developing countries at 4%, the global apparel consumption will increase by a staggering 63% from 62 million tonnes per annum to 102 million tonnes per annum. It is equivalent to the consumption of about 500 billion T-shirts.[2] During the same period, the annual retail value of apparel and footwear will increase from US$ 1.5 trillion to US$ 2 trillion, an increase of US$ 500 billion—a 30% increase.

China is the leading exporter of garments with a share of 32% (US$ 158 billion), followed by the European Union with a share of 10% (US$ 143 billion), Bangladesh with 7.3% (US$ 32.5 billion) and Vietnam with 7.1% (US$ 31.5 billion), respectively. Sri Lanka's apparel exports in 2018 accounted for US$ 5.05 billion[3]—1.1% of the total. Chinese apparel exports showed a decline in 2018 compared to 2017 given the structural changes (where the emphasis is on exporting more textile and less apparel) and due to the impact of the US-China tariff wars. During the same period, Bangladesh's and Vietnam's apparel exports increased by 11.1% and 13.4%, respectively. Figure 3 shows the apparel export earnings of selected major export countries in 2018.[4] Lately, East Africa, mainly Ethiopia, is fast becoming a sourcing country for the US market.

In terms of apparel consuming markets, due to the consumers' purchasing power and population size, the EU (US$ 203 billion), USA (US$ 92 billion) and Japan (US$ 30.3 billion) are the top three apparel markets, accounting for 61.5% of global apparel imports. McKinsey assesses that rapid urbanization will see that by 2020, a quarter of global wealth is concentrated in 60 mega-cities lying outside of Europe and North America, especially in China and India.[5]

For example, due to India's high GDP growth of 8%, which exceeds that of China, Brazil or Mexico, its fast-growing middle class with an expected growth of over 19% between 2018 to 2022, increasing use of smartphones and the internet, the Indian apparel market by 2022, will be worth about US$ 59.3 billion. It will make India the sixth-largest apparel market in the world and comparable to the UK (US$ 65 billion) and Germany (US$ 63 billion).[6]

[1] Dr Sheng Lu, Just Style, August 2019
[2] Boston Consulting Group, "The Pulse of the Fashion Industry", 2016.
[3] Joint Apparel Association Forum Sri Lanka
[4] World Trade Organization 2019
[5] McKinsey & Company, "Succeeding in Tomorrow's Global Fashion Market", September 2014.
[6] McKinsey & Company, "The State of Fashion",2019

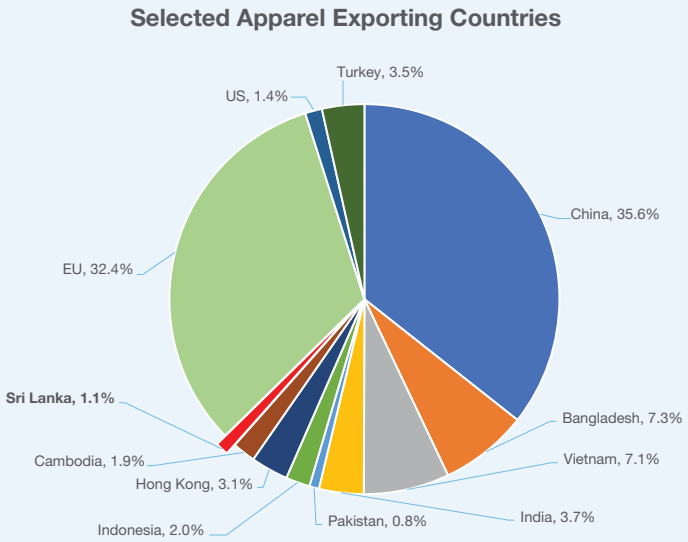


Figure 3: Apparel export earnings by country (Source: World Trade Organization 2019)

2.2. Sri Lankan Context

2.2.1. Historical Development

The Sri Lankan apparel sector dates back to the 19th Century. The first spinning and weaving mill was initiated in 1949 by Darley Butler & Co, which subsequently became Wellawatte Weaving and Spinning Mills Ltd. Primarily it was set up to meet the local demand. Import substitution became government policy in the late 1950s. Large scale public and private sector mills were established. With the help of East Germany and other donors, five government mills were established at Thulhiriya, Pugoda, Veyangoda, Minneriya and Mattegoda. The mill sector showed a clear division where the public sector concentrated on cotton textiles, and the private sector was assigned synthetic textile manufacturing. Parallel to the industrial production of fabric, handloom industry was given protection by reserving the production of towels and sarongs as an exclusive right through the Industrial Products Act. Garment manufacturing consisted of a few shirt manufacturers such as Hentley, Velona and lately Dasa Group.

The export sector started in 1977 at a time of trade liberalization when East Asian garment exporters relocated their operations to Sri Lanka attracted by the duty rebates and quotas under the multi-fibre Agreement.

2.2.2. The Present

The Sri Lankan apparel sector contributes about 40% to exports. From small beginnings where the total exports in 1977 were US$ 9.9 million, it has now reached US$ 4.8 billion alone. Sri Lanka also benefited from the Generalized Scheme of Preferences Plus (GSP+), an EU trading scheme, which was set up in 2006 until 2010. Through programmes such as “Garments without Guilt”, the industry has earned a reputation as an ethical supplier where no child labour or forced labour is used.

Given the high labour costs in Sri Lanka, the more innovative companies have shifted to producing high value, technically complex niche products such as women’s intimate apparel, trousers, swimwear, jeans and seamless athleisure wear rather than low-value high volume products like T-shirts. This has attracted brands such as Victoria’s Secret, Lululemon and Nike. Around 85% of Sri Lanka apparel is exported to the USA, EU and UK (Figure 4). Sri Lanka differs from other South Asian countries in that it is has a higher proportion of human-made fibres (MMF) accounting for 50% of imported yarn. Major brands purchasing from Sri Lanka are Levi’s, Nike, Lululemon, Tommy Hilfiger, PVH, Gap, L Brands, M&S, Lidl etc.

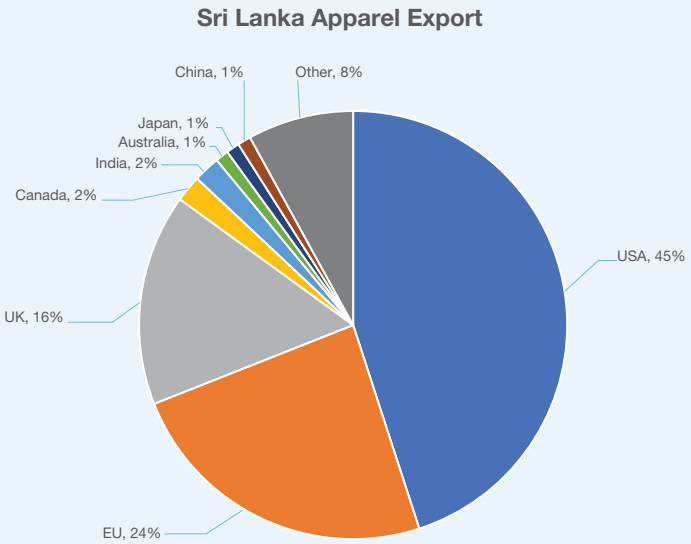


Figure 4: Sri Lanka apparel exports (Source: JAAF)

Currently, there are close to 300,000 people who are employed directly in the apparel industry in Sri Lanka while indirect employment is around 600,000. The high cost of labour, absence of GSP+, and labour shortages have forced manufacturers to expand production in Africa, Middle East, South Asia and East Asia. The apparel sector factories are concentrated in the Western Province, where labour shortages are high. The North and the East are potential areas for future factory locations. Another problem is falling female participation in the workforce due to lack of childcare facilities and the reputation of the sector.

In the garment sector, it is estimated that there are around 400 garment manufacturers, either domestic family-owned companies and joint ventures. The number of suppliers can be broken down into three groups, as shown in Table 1.

Table 1: Number of Garment Companies in Sri Lanka (Source: Mohan Seneviratne)

Number	Category (Number of Sewing Machines)	Number of Factories	Percentage
1	Small < 100	102	25%
2	Medium (100-300)	136	34%
3	Large > 300	166	41%

The largest suppliers, with revenues above US$ 500 million are MAS Holdings, Brandix and Hirdaramani Group. MAS Holdings with US$ 1.8 billion in revenue has factory locations in 16 countries and 53 manufacturing facilities. MAS also has its intimate apparel brand Amante, which focuses on the Indian and Sri Lankan markets. Brandix has a revenue of approximately US$ 800 million, 27 facilities in Sri Lanka, a 1,000-acre business park in Visakhapatnam, India and another 5-acre plant in Bangladesh. Brandix also became the first company to have a net-zero carbon facility in Batticaloa. Hirdaramani Group has 40 facilities in Sri Lanka, Bangladesh, Vietnam and Ethiopia.

Hela Clothing has factories in Sri Lanka and Kenya. Other companies include Tee Jay, Omega Line, Crystal Martin Garments, Orit, EAM Maliban, Polytex Garments, Trischel, Noyon Lanka etc.

The success of the larger companies lies amongst others in continuous innovation, environmental leadership and trying to capture more of the retail value (Figure 5). Companies who can create their brands can capture more of the retail value. Through commitment to R&D, design, procurement, marketing they can command a higher price than the rest.

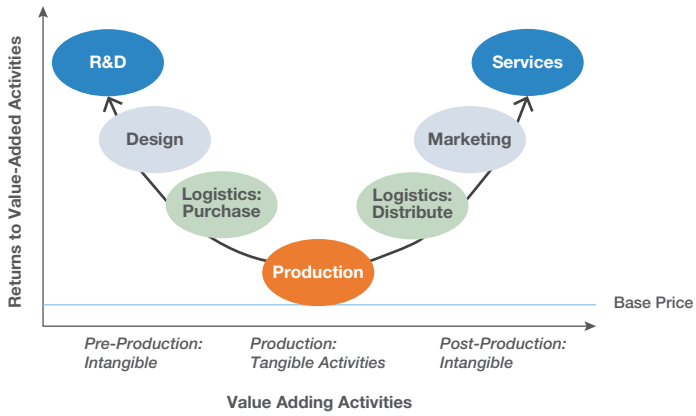


Figure 5: Creating high value through branding

Companies such as Hirdaramani Group, MAS Holdings and Brandix identified the need for environmental leadership at a very early stage and are considered as world-class. For instance, Hirdaramani is focused on reducing energy usage by the year 2020 by 20% per standard production minute.[7] Brandix is focused on water use and reduction, sponsoring many studies such as the collaboration with IUCN Sri Lanka. These initiatives also resonate with international buyers' sustainability drives. They also play a leading role in the global industry-wide environmental initiatives, such as the Sustainable Apparel Coalition, Zero Discharge Chemicals Initiative etc.

2.2.3. Apparel Sector Related Challenges

Global brands have identified challenges at the international level while also meeting obligations to crucial conventions. Conventions such as Paris Agreement on Climate Change under the UN Framework Convention on Climate Change (UNFCCC), Convention on Biodiversity (CBD), Convention on Combating Land Desertification (UNCCD) and others involving chemical handling and transport are some of the relevant areas for the apparel industry in terms of greening. Challenges documented by Global Brands on apparel and footwear are diverse and require to be addressed for the overall sustainability of the industry. The same challenges could help guide the future strategic direction for the Sri Lanka apparel sector, required sustainable financing and support to expand the initiative to cover textile manufacturing, significantly.

SRI LANKA IS WELL POSITIONED TOWARDS SUSTAINABILITY

- A highly literate population with literacy rates above 90% for males and females
- Government policy to invest in innovation, higher technologies, and export markets
- Targeted backward integration including value chain management
- Strategic relationships with international companies. For example, MAS has a strategic relationship with Nike. Similarly, Hirdaramani Group is a strategic supplier to Levi's.
- Ability to produce small volumes of niche products
- Adoption of advanced supply chain management and logistic approaches
- Going beyond compliance in social and environmental sustainability by leading brands
- Setting up of a 275-acre pilot "Fabric Park" as a strategic venture by the Government in Eravur
- Partnering for procuring sustainable Cotton. For example, Ocean Lanka partnership with Cotton made in Africa (CimA)

[7] Sustainable Apparel Coalition, *"Hirdaramani Group Energy & Greenhouse Gas Emissions"*, 2019.

While the industry has come a long way with the support of global demands, the Sri Lanka apparel industry is far from long-term sustainability.

CURRENT CHALLENGES IN THE GARMENT SECTOR

- Lack of geographical diversification in terms of overseas markets.
- Insufficient international and bilateral agreements to support the industry.
- Seasonal fluctuation resulting in lean periods during spring/summer.
- Dependence on "buying houses" for orders.
- Withdrawal of GSP+ facility by EU (recently restored).
- Relatively low backward integration resulting in heavy dependence on imported fabrics particularly in the woven sector.
- Comparatively long lead times.
- Relatively high utility costs.
- Loss of experienced middle management staff to neighbouring "competitor" countries.
- Increasing labour costs and unfavourable currency parity.
- Limited product design and development capabilities.
- Buyers short-term purchasing practices where they shift suppliers, not allowing smaller firms to address resource conservation as a long-term strategy.
- Suppliers are not keen on technologies with longer-term paybacks (greater than two years).
- Absence/insufficient importance placed by banks on ESG performance criteria when approving loans.
- Smaller firms do not have the capital to employ knowledgeable technical experts nor have the funds to engage external consultants.
- Lack of awareness of opportunities by the local financial sector (among bank staff) about conservation-related funds. Requires awareness training for financial institution relationship managers, possibly through trainer of trainer (TOT) approaches.
- Exchange rate risk acting as a disincentive to provide credit lines for long-term tenor.
- International buyers are not keen on financing resource conservation through their balance sheets or providing guarantees on sourcing and financing.
- The high cost of local borrowing rates acting as a barrier for suppliers to seek loans for sustainable financing initiatives voluntarily—this is changing in Asia to some extent.
- Lack of blended finance products from donors or development institutions to mitigate risk and high domestic interest rates.
- No process for banks to evaluate project proposals or document impact on the environment. Need the capacity to use carbon financing and other ecosystem tools to assess financial packages.
- Green finance still a niche market, and opportunities are to be explored.
- Development financial institutions may be constrained in offering local currency loans.
- Lack of ESCOs to undertake CAPEX projects.

These barriers are very much similar to the ones experienced by countries in the region and can be taken broadly as "Internal" and "External" challenges (Annexure 1).

2.2.4. Challenges in the SME Sector

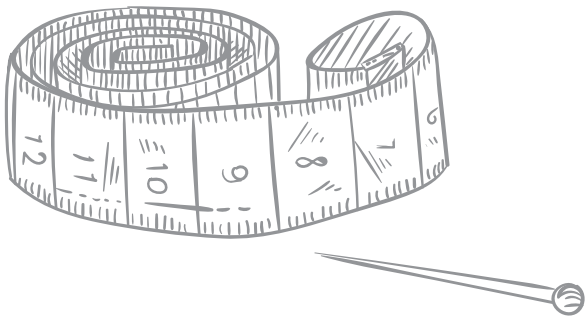
SMEs play a significant role in the growth of the apparel sector, provided they have access to credit and knowledge. SMEs has the potential to be green in the supply chain and provide inputs/ trims for the apparel industry—a problem well noted during the Covid-19 period with large apparels not having adequate intakes. Current credit schemes in Sri Lanka rely much on the collateral in the form of properties. Furthermore, financial institutions may not have an in-depth understanding of the SME sector and potential efficiency gains in SMEs through cleaner production etc.

SMEs differ from large corporates or brands and may face challenges/risks. Reported challenges in the SME credit in the "supply-side" include:

- Risks to banks originating from insufficient assets, low capitalization, high failure rate etc. World Bank[8] reported non-performing loans on SMEs to vary from 2.7%-11.5%. The banks find it costly to make and service loans to SME clients affecting lenders' margins (due to additional staff time, capacity, and costs).
- Lack of reliable information on SME clients when compared to large corporates partly due to the reason that SMEs do not require extensive reporting on finances by authorities. This makes the financial institutions' role in assessments difficult. Some SMEs do not have systems or have multiple procedures.
- Banks lack the technical capacity or willingness to service the heterogeneous SME sector. The SME related recoveries or court processes are relatively lengthy, making SME credit less attractive to banks.
- The longer-term credit lines available to banks to lend to SMEs do not match well with banks' deposits that are mostly short-term and not optimal to fund long-term lending on a large scale because of maturity mismatches.

Similarly, on the "demand-side", the SME related credit facilities are challenged with the following:

- Banks tend to make decisions mostly based on the collateral, but less on the projected cash flow, thereby providing fewer opportunities for innovators if they do not have collateral.
- The land is the standard collateral for SME loans. Lack of proper title prevents SMEs from offering them as collateral. Lengthy search for recorded history for 30 years etc. impacts the loan delivery time.
- SME operators give up the loan application process halfway through due to time constraints associated with the process and cost of processing the documents.
- Cost of finance is relatively high in Sri Lanka. The World Bank (2010) states that the average rate of interest for term loans charged by Sri Lankan banks were between 12-16%, while working capital loans have been granted at 13-19%. The Government is taking steps to reduce these rates by working with the Central Bank. However, process glitches are still the same.
- Banks have limited capacity to advice and support weak enterprises before the application of standard risk minimization or application of Loan Recoveries Act. There is significant potential to improve the consultative and advisory capacity of banks both in terms of financial and environmental aspects.



[8] World Bank. (2010), SME banking sector assessment for Sri Lanka, The World Bank, Washington, DC

2.3. RESOURCE CONSUMPTION

In the apparel industry, the critical steps involved are the Yarn Preparation, Fabric Production, Textile Processing and Garment Manufacturing. Out of the processes, the highest resource use occurs during the wet textile processing, where the efficiency gains could be the highest. For example, during the life cycle, over 80% of the water, over 75% of energy and nearly 60% of chemicals are used in wet textile processing. On the other hand, yarn spinning uses about 20% of the chemicals and fabric production is using about 10% of the chemicals in the life cycle.

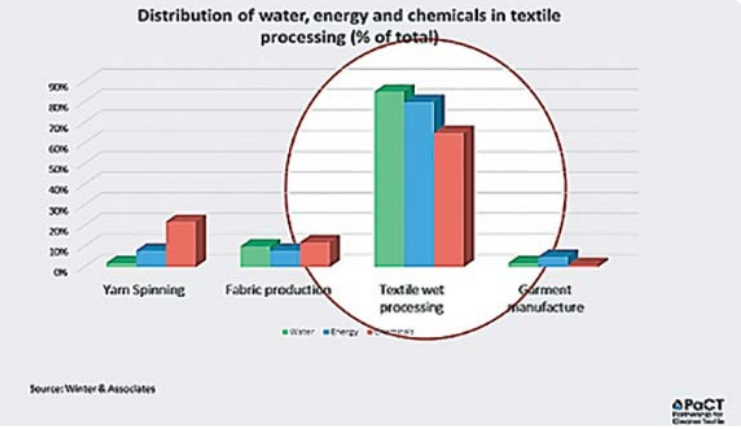


Figure 6: Comparison of resource use in apparel industry steps

2.3.1. Garment Manufacturing

Textile manufacturing includes a) Fabrication/weaving; b) Dyeing; and c) Finishing (stone washing) while the steps in garment manufacturing cover; a) Relaxing; b) Cutting; c) Sewing; d) Trimming and Finishing; and Ironing (Figure 7).

In comparison to wet dyeing and finishing, garment manufacturing uses less energy and negligible water usage. Garment manufacturing processes include all activities from the point when textiles are received at the factory, to when retail-ready garments are shipped to the distributor. Common operations in garment manufacturing industry include fabric relaxing, cutting, and sewing. Other optional functions may also be performed as specified by the customer, including such things as embroidering, screen printing, and laundering.

Depending on the size of the manufacturing facility, some garment manufacturers choose to subcontract those optional processes. The most energy-consuming areas are sewing (38.9%), lighting (23.9%) and air-conditioning (9.1%).

Figure 7: Main garment manufacturing processes

2.3.2. Water

The apparel sector uses a variety of water sources including surface water, groundwater, town supply water and occasionally recycled water from sewage treatment plant effluents or internal wastewater recycling. Most of the water is used in the garment manufacturing process. Most water-intensive operations are in the wet processing section, where over 70% of the water is used (Figure 8). Water consumption will vary depending on the dyeing equipment used and type of processing, whether continuous, semi-continuous or batch dyeing.

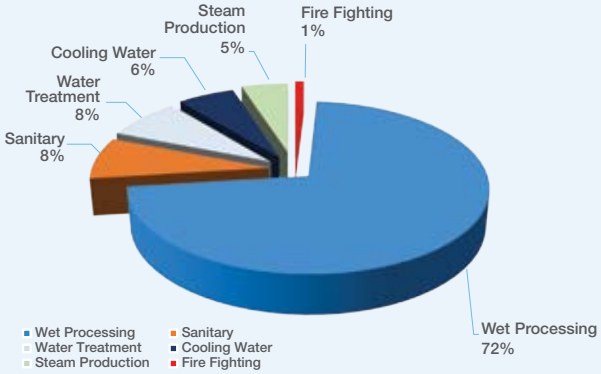


Figure 8: Percentage breakdown of water use (Source: Mohan Seneviratne)

Table 2: Water use by fibre type (L/Kg) (Source: Mohan Seneviratne)

Fabric	Range
Cellulosic fibre	100 - 120
Synthetic fibre yarn and fabric	25 - 70
Grey polyester (liquor ratio dependent)	30 - 180
Acrylic fibre	25 - 30
Grey viscose fibre	70 - 80
Grey cotton yarn	100 - 140
Grey polyester cotton fabric	65 - 180
Best available technology cotton dyeing using NOVACRON FN dyes	30 - 40
AVITERA dyes	15 - 20

Cotton processing uses more water than MMF due to the number of processes involved. Table 2 shows the approximate water use by different fibre types.

Given the low cost of water in most countries, water use is higher than what it needs to be. Water supply costs are just the "tip of the iceberg" ignoring the fact that there are other "hidden costs" of water ranging from water treatment of inlet water for boiler feedwater, extra chemicals required for processing due to higher dilutions, wastewater treatment costs, additional costs for steam generation and losses in distribution system etc.

Figure 9: Identifying the True Cost of Water (Source: Mohan Seneviratne)

For example, in a Chinese plant, whilst the water supply cost is only RMB 0.65 per m^3, the True value, which includes other charges, is RMB 18.03 per m^3. Almost 28 times the cost of municipal water.

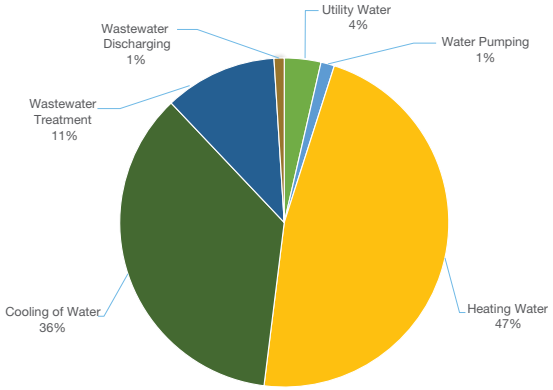


Figure 10: Identifying the "True Cost of Water" (Source: IFC, "China's Textile Dyeing and Printing Industry", June 2012)

2.3.3. Chemicals

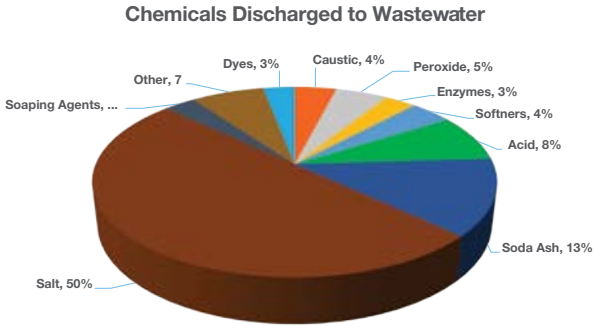


Figure 11: Chemicals in Textile Effluent (Source: Bangladesh PaCT)

The modern textile industry utilizes over 10,000 different chemicals with varying degrees of toxicity to the environment. Textile wastewater is a mixture of many other compounds consisting of fibre and lint, dyes and salts like sodium chloride and sulfate, acids and alkalis biodegradable organic compounds, recalcitrant compounds (persistent organic compounds) from aromatic and heterocyclic compounds, oil and grease, hydrocarbons, hazardous heavy metals, surfactants, anionic compounds and volatile compounds.

It is estimated that 280,000 tonnes of these materials have the potential to be discharged either to wastewater treatment plants or directly to the environment annually.[9,10] Typically, around 1 kg of chemical for 1 kg of fibre is required in some processes (Table 3). Aside from the dyes, finishing agents, binders and other auxiliaries, other chemicals are also released to the wastewater (Figure 11).

The use of chemicals such as wetting agents, acids, alkalis and dyes depends on the quality and desired refinement of the textile product, generally higher the quality, and subsequently the price of the fabric, the more chemically intensive the manufacturing process (Anguelov 2016).[11]

[9] Maya Radin, Saphira Radin Mohamed et al,"Colour Removal of Reactive Dye from Textile Industrial Wastewater using Different Type of Coagulants", Asian Journal of Applied Sciences, Volume 02, Issue 05, October 2014.

[10] R.G. Saratale et al, "Bacterial decolourization and degradation of azo dyes – A Review", Journal of Taiwan Institute of Chemical Engineers, Volume 42, 2011.

[11] Ilo.org. 2020. [online] Available at: <https://www.ilo.org/wcmsp5/groups/public/---asia/---ro-bangkok/documents/meetingdocument/wcms_579469.pdf> [Accessed 13 August 2020]

Table 3: Chemical Usage in Textile Processing (Source: German Federal Environment Agency, "Best Available Techniques in Textile Industry", 2003)

Types of Textile Finishing Industries	Dyestuffs [g/kg textile]	Textile auxiliaries	Percentage
Finisher of yarn mainly consisting of polyester	18	129	126
Finisher of synthetic knit fabric	52	113	280
Finisher of cotton knit fabric	18	100	570
Finisher of cellulosic woven fabric	11	183	200
Finisher of woven fabric mainly consisting of cellulosic fibres with relevant printing section	88	180	807

Wastewater treatment plants (WWTPs) are designed to remove these toxic chemicals. The process typically includes primary treatment by the manufacturing entity followed by a standard secondary treatment by a utility on a cost basis. Inefficiencies in this process result in pollution additions to the environment, mainly to surface water bodies and streams. In extreme cases, the discharge material to streams becomes putrid and black with no aquatic life due to the absence of dissolved oxygen.

In Sri Lanka, the Board of Investment (BOI) operates several industrial parks supporting apparels including Biyagama and Seethawaka in the Kelani River Basin where WWTPs take the factory treated wastewater and treat further before discharging to streams and waterways. Capacity and uneven loading issues have been reported requiring technological, coordination and financial solutions.

2.3.4. Sludge

The waste sludge requires a dedicated solution due to limited landfill space or lack of landfills. Textile sludge contains around 28% of water and includes heavy metals (Table 4). Disposal of sludge requires service providers with hazardous waste handling permits; therefore, a costly process.

The industries engaged in wet operations in the BOI operated zones are required to operate in-house wastewater treatment facilities to BOI recommended pre-treatment limits prior to discharging into common wastewater treatment plants.

Table 4: Sludge Contaminants (Source: Bangladesh PaCT)

Heavy Metals	Possible Sources
Lead (Pb)	Dyes and pigments though not contaminated in high-quality dues and auxiliaries
Mercury (Mg)	Low risk of containing mercury. Not included in high-quality dues and auxiliaries
Cobalt (Co)	Found in metal-complex dyes; blue, navy turquoise, green and grey shades; not released if correctly bound to textiles
Copper (Cu)	• Dyes and pigments. Found in metal complex dyes – blue, navy, turquoise, green and grey shades; not released if correctly bound to textile • Some copper compounds improve the light fastness of polyamide-based carpets
Zinc (Zn)	Preservatives, finishing chemicals
Nickel (Ni)	• Blue, navy, turquoise, green and grey metal complex dyes • Turquoise and brilliant green shades in reactive dues for cellulosic

2.3.5. Energy

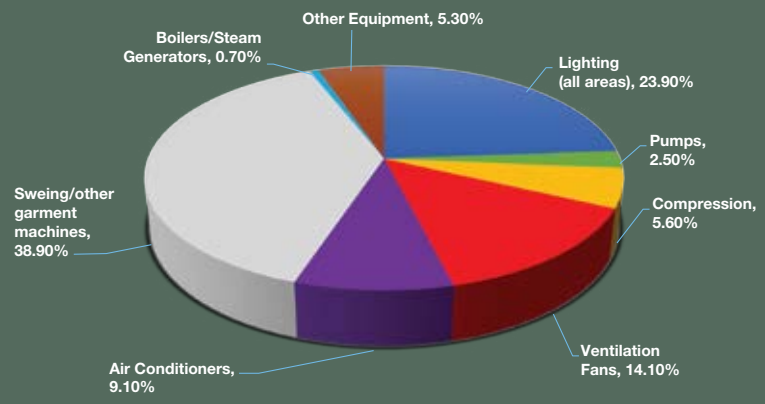
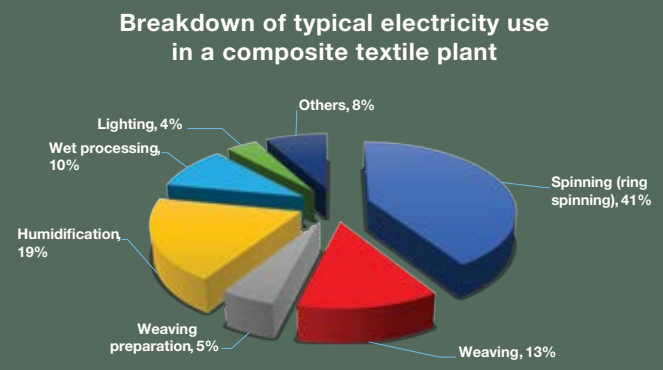


Figure 12: Energy consuming areas in garments (textiles) (Source: Mohan Seneviratne)

Electricity supply is mainly the grid with standby diesel generators as backup. Fuel for steam generation uses a mixture of heavy fuel oil, biomass (wood chips) or natural gas. Waste heat is also recovered from some machinery. Weaving, knitting, and wet processing are the primary energy users with high amounts of thermal energy in the forms of steam and heat (Figure 12). The energy usage depends on several factors such as:

- Form of the product being processed (fibre, yarn, fabric, cloth)
- Machine type and process type
- The state of the final product

In a composite plant, the bulk of the electricity usage is in spinning (41%), followed by dehumidification (19%) and weaving (18%). The thermal energy usage in the wet processing operations of bleaching, de-sizing and finishing is followed by steam distribution losses (Figure 13). Percentages for Sri Lanka may be slightly different as the country has more manufacturing.



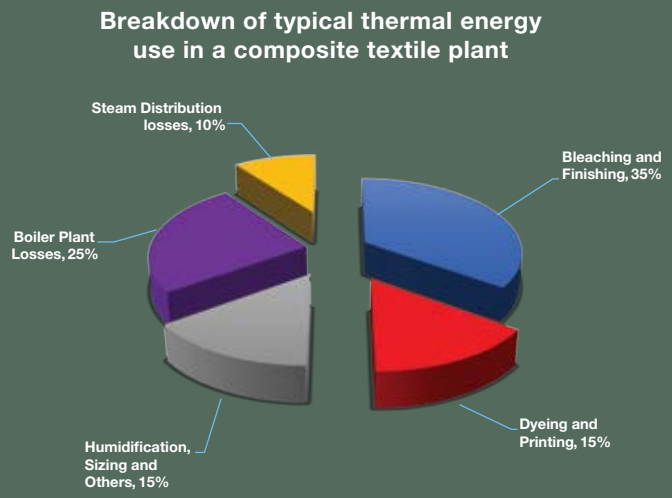


Figure 13: Breakdown of electricity and thermal energy use in a composite plant (Source: NREL)

Usually, grid-based electricity cost is the largest cost component (42%) with a total value amounting to US$ 1.5 million per annum (Figure 13).

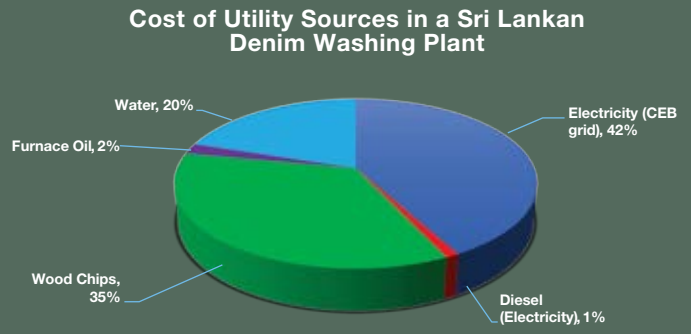


Figure 14: Distribution of Grid based electricity (Source: Mohan Seneviratne)

2.4. EXPORT PROCESSING ZONES IN SRI LANKA

Export processing zones (EPZ), industrial parks or special economic zones (SEZs), have been at the heart of successful export-led development strategies of many South Asian/South East Asian countries including Sri Lanka (Figure 15). In the ASEAN region, there are more than 1,600 EPZs.

Whilst export processing zones no doubt play a critical role in the industrialization of the country, they can have significant drawbacks in terms of industrial pollution, lack of infrastructure planning leading to adverse outcomes, air emissions, lack of waste management policies etc. and little interaction between the factories within the zone.

The Central Environment Authority (CEA) is in charge of the overall industrial pollution control while the Board of Investment (BOI) is entrusted with the environmental management in EPZs. Due to the differences in legislation, the CEA has no monitoring powers over the BOIs.[12]

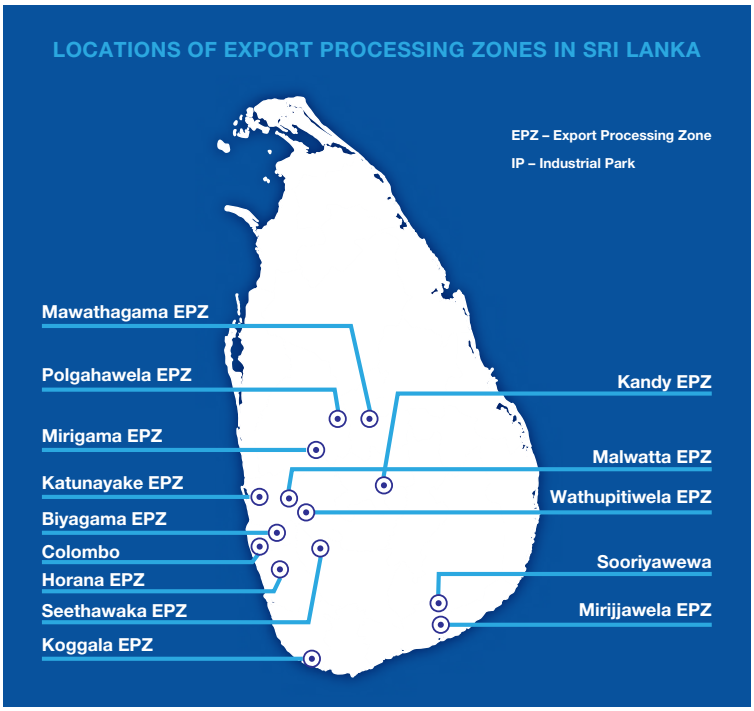


Figure 15: Sri Lanka Export Processing Zones (Source: Mohan Seneviratne)

Zones managed by the BOI have challenges related to liquid and solid waste management. Generation of solid waste vary depending on the process, namely, Knitting, Dyeing and Bleaching, Sewing, Garment Washing, Printing etc. Manufacturing of accessories such as buttons, elastics, zippers and padded materials also contribute to the waste (Figure 16).[13]

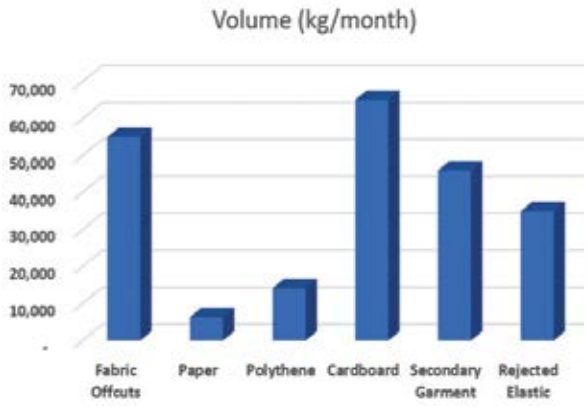


Figure 16: Types of waste generated by selected BOI garment factories (Source: Mohan Seneviratne)

[12] G. Karunasena and Awanthi Kannangara, "Industrial Waste Management and Free Trade Zones in Sri Lanka",

[13] Gamini Gunasinghe. 2018. Waste information from leading apparels - Brandix, Chiefway, Crystal, Martin, Dial Tex, Hirdaramani, Star Garment, MAS Active, Smart Shirts, Regal Image and Stretch Line

Recycling of polythene and cartons are carried out by private contractors/buyers such as Nithya Papers & Boards Lanka Pvt Ltd., Nalaka Papers Pvt Ltd. and local collectors. Material Receiving Centre (MRC) in each BOI zone is the interface between the waste generation and collectors. Waste is picked by collectors at no-cost, and the trash that is not disposed of, are given to INSEE Eco-Cycle Pvt Ltd—an affiliated company of INSEE cement, where waste fabric, paper offcuts and other trash are burned. INSEE recover heat value in the cement kiln at Puttalam.

Demand for Nylon 6 and Nylon 66 materials for pelletizing and making threads is high. The manufacturing of garment accessories such as elastics, buttons and padded materials generate are disposed of through INSEE Eco-Cycle Pvt Ltd. Segregation of waste at the source is not optimal, presently. As the imported materials are duty-free materials and there are legal barriers to dispose of waste for secondary uses and re-use due to potential leakages. The Eco Cycle Pvt Ltd. charges Rs. 7,200 per tonne plus a transport fee, which is considered a high amount by the companies and BOI to be economically sustainable. For off-cuts, the cost is Rs.15,000 per tonne.

The wet operations involved in the apparel sector at the BOI zones are dyeing and bleaching, printing and garment washing activities. BOI provides the water at a rate of Rs.75 per cubic meter. Information collected by BOI in 2019 in seven projects totalled about 6,400 cubic meters per day ranging from 10 cubic meters to about 5,000 cubic meters with three companies ranging between 250 to 600 cubic meters. During the drought period, when the water is scarce in the Kelani River Basin, industries opt for browser supplies at a higher cost.

Most of the industries do chemical treatment in the pre-treatment of wastewater to meet pre-treatment limits, before sending to the BOI operated common wastewater treatment plant. The cost of pre-treatment is about Rs. 45 per litre of wastewater. For secondary treatment, the BOI charges Rs. 12 per metre cube. The coagulation and flocculation processes generate sludge that is about 55% inorganic and 45% organic on a dry basis. This sludge is categorized as hazardous waste under the National Environmental Act of Sri Lanka. To burn this sludge in their cement kiln, INSEE Eco Cycle charges about Rs. 40,000 per tonne.

MOST OF THE **INDUSTRIES DO CHEMICAL TREATMENT** IN THE **PRE-TREATMENT OF WASTEWATER** TO MEET PRE-TREATMENT LIMITS, BEFORE SENDING TO THE **BOI OPERATED COMMON WASTEWATER TREATMENT PLANT**

2.5. Global Value Chains

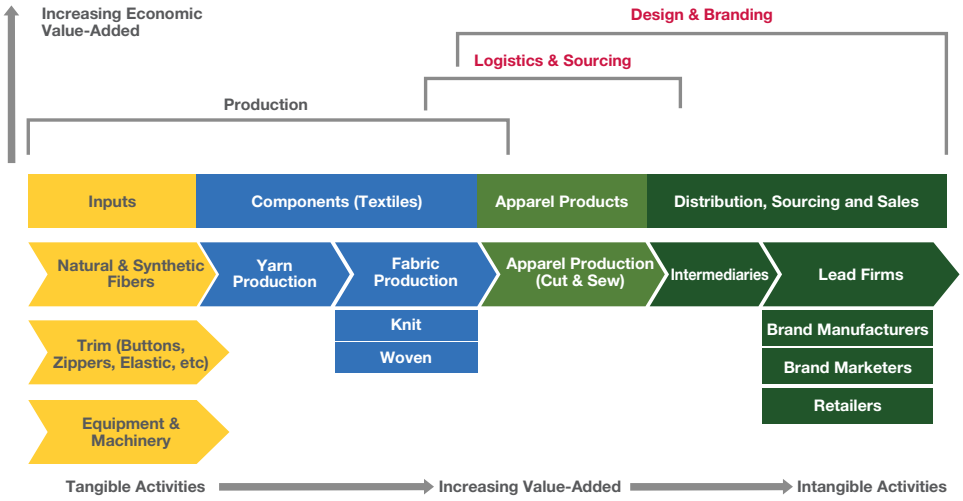


Figure 17: Global Value Chain for Apparels (highest value-added activities in red)*

The Apparel sector Global Value Chain (GVC) ranges from conception to end-use characterized by decentralized, globally dispersed production networks, coordinated by international brands that control the highest value yielding activities related to design, marketing, branding and retailing.

The production function involves a network of suppliers, primarily in developing countries. The structure of the Global Apparel Value Chain comprises of yarn production, wet dyeing and finishing known as fabric production, apparel production also known as cut and sew and retailing with the highest value-added (Figure 17). As the production process moves from left to right, the value addition increases with the activities in red, indicating the highest value-added. Global brands capture much of the retail value. Textile production is more capital intensive than garment production and is highly automated mostly in developed countries.

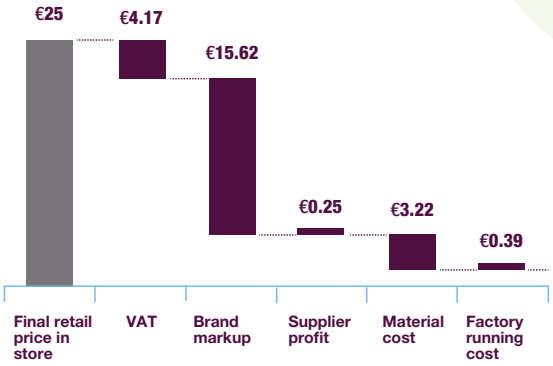


Figure 18: Value Chain of a T-Shirt (Source: Pulse of Fashion 2017)

Table 5: Apparel Exports as a Percentage of Total Exports (Source: Mohan Seneviratne)

Country	Apparel as a % of Total Exports in 2018
Bangladesh	84%
Cambodia	72%
Sri Lanka	44%
Vietnam	16%

Backward integration is more problematic for countries lacking textile production such as Sri Lanka. For instance, India and Pakistan have access to good quality cotton yarn and Pakistan is famed for its denim fabrics and therefore vertically integrated textile mills are more common.

The value chain on a T-Shirt with a total value of €25 consists of a high Brand Markup percentage (Figure 18). The top three globally traded apparel product categories by export value are trousers, knit shirts, and sweaters/sweatshirts—which together account for 46% of traded apparel. However, "fast fashion" and athletic wear knowns as "athleisure" are fast-growing sub-segments. Other trends include 3D, digitalization, artificial intelligence, internet-of-things, new retailing opportunities through e-commerce and social media platforms, sustainable materials, recycling business models and addressing waste through circular economy innovations.

Apparel is the most prominent labour intensive globalized sector in many developing countries employing approximately 48 million people.[14] The export-oriented apparel industry with relatively low skill requirements and low cost of work has been the bulwark of many South Asian countries in terms of trade, GDP and employment (Table 5).

The share of female employment in South Asia is relatively higher in the apparel industry ranging from 5% in Pakistan to 75% in Sri Lanka.[15] The value chain also links suppliers to international markets, facilitating knowledge spillovers and skill acquisition to workers. The initial challenges in developing countries were facility conditions and safety of workers and related social issues. Brands such as VF Corp have identified water and energy use as one of the significant supply chain risks. With business, as usual, the fashion industry stands to lose 3% of its profitability, according to the projections.

Leading multinational buyers have recognised these risks to the apparel sector supply chain unless proactive steps are taken to minimize the adverse use of resources, moving away from the practice of shifting from one low-cost sourcing destination to another.

Resource efficiency is highlighted as the most significant and vital area to improve the sustainability in the McKinsey survey[16] of industry players. Fashion companies who address environmental sustainability and social issues will gain a competitive advantage, and the global economy stands to earn an extra €160 billion. VF Corp, one of the world's largest companies, owning brands such as Wrangler jeans, Timber Corp and North Face has prioritized their sustainability issues in order of low to high priority.

[14] Baptist World Aid Australia, "2019 Ethical Fashion Report – The Truth behind the Barcode".

[15] Gladys Lopez-Acevedo and Raymond Robertson, "Stitches to Riches", World Bank, 2016.

[16] McKinsey in partnership with Global Fashion Agenda. 2020. Fashion on Climate - Roadmap for decarbonisation of the fashion industry, accessed September 01, 2020. https://globalfashionagenda.com/initiatives/fashion-on-climate/#/

2.6. Emerging Concerns

2.6.1. Global Outlook Before Covid-19

GLOBAL TEXTILE SECTOR IMPACT PROJECTIONS

	2015	2030
Global population (billion)	7+	8.5
GDP incease (%)		2 (developed countries) 4 (developing countries)
Apparel consumption (million tonnes/year)	62	102 63% incease = 500 billion T shirts
Water consumption (billion m^3/year)	79 = 32 million Olympic sized swimming pools	118 50% increase
GHG emissions (billion tonnes/year)	1.8	2.8 55% increase = 230 million cars/year
Waste creation (million tonnes/year)	92	118 28% increase

Figure 19: Global level projections of apparel sector resource use

Brands have evaluated and projected the outlook for the apparel sector, considering the world population growth and if the sector practices continued as business as usual (Figure 19). Given the complexity of the value chain, it is difficult to calculate the "true costs." The Boston Consulting Group estimated the footprints if production increases to 102 million tonnes in terms of water consumption, greenhouse gas (GHG) emissions and waste generation. Results indicated a 50% increase in water consumption to 118 billion m^3/annum that is compared to filling 32 million Olympic sized swimming pools. Similarly, GHG emissions projection stated an increase of 55% that equates to 2.8 billion tonnes of CO_2 equivalent/annum, which is comparable to about 230 million cars on the road (Figure 19). However, these projections were made prior to the Covid-19 epidemic, and the post-Covid-19 perception of customers and strategic directions of brands may have an impact on the projected numbers.

Overall, the sustainability of the apparel sector requires the industry to address several critical challenges that require the collaboration and participation of multiple stakeholders, both within the sector and outside, as indicated by VF Corporation (Figure 20).

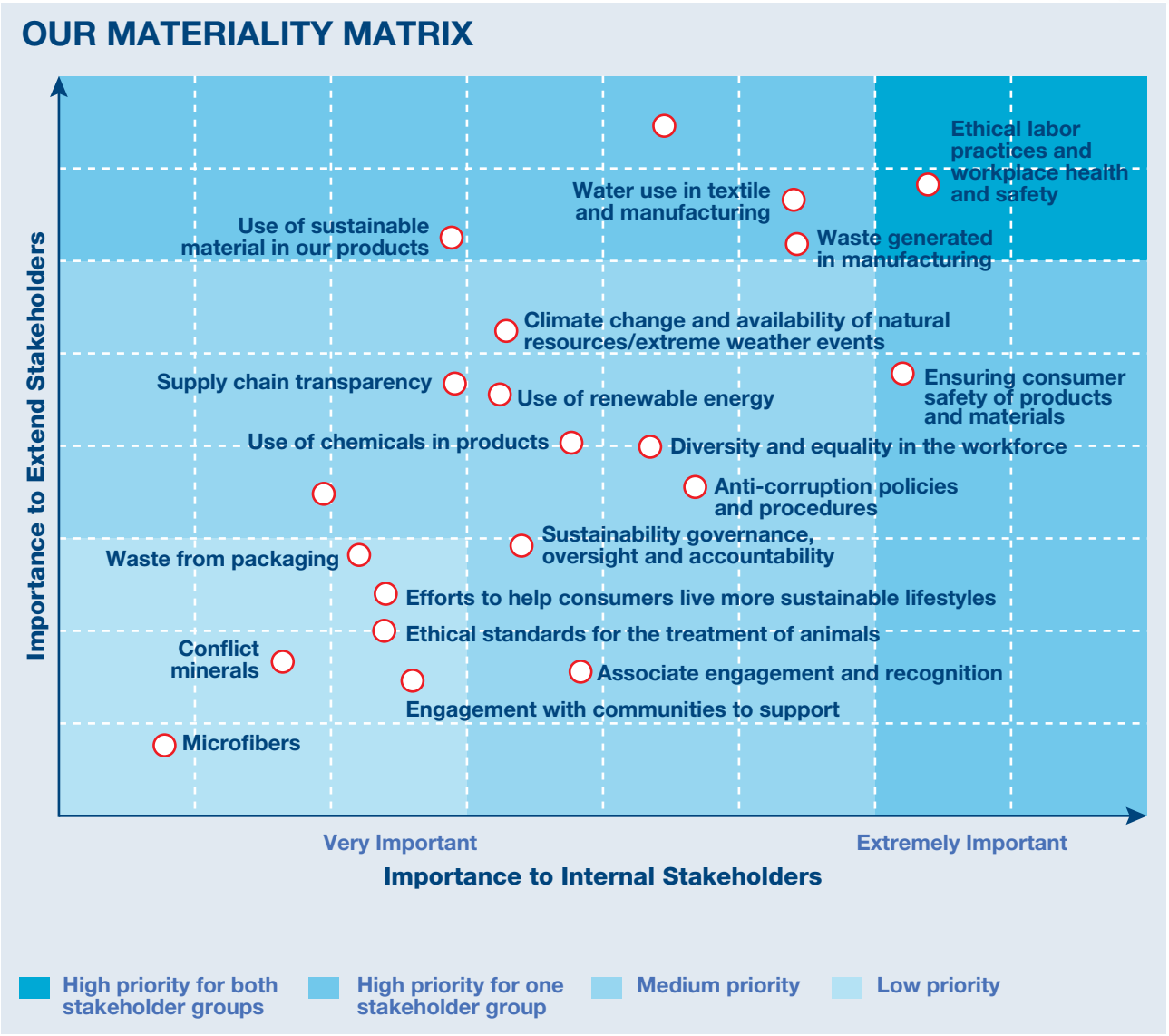


Figure 20: VF Corp prioritization of sustainability issues

2.6.2. Post-Covid-19 Context in Decarbonization

Covid-19 is having a significant effect on the fashion industry as well in terms of the way brands are thinking, partly influenced by consumer thinking. Some 50% of fashion executives in a recent opinion poll indicated that sustainability has moved up the list in recent months.[17]

Consumers are becoming increasingly engaged with sustainability topics, including biodiversity, climate change, land degradation and human-wildlife connections, among others. Before Covid-19, the decarbonization agenda focused much on global emission reductions. The Covid-19 pandemic that swept the globe since early 2020 has had a disproportionate economic impact on several sectors, including the fashion sector, triggering a dramatic and painful economic pause, with a significant drop in emissions expected for 2020 as a result.

[17] Participant poll: GFA. 2020. McKinsey Sustainability in Fashion' Apparel, Fashion & Luxury Executive Webinar n >300.

The Post Covid-19 environment introduced additional sustainability aspects by the global community, mainly focusing on the role of sustainability of ecosystems to prevent pandemics globally[18] where the ecosystem destruction led by increased human-wildlife species contact was highlighted as a critical factor. Covid-19 has shown us the immense potential cost of an epidemic where the world may lose at least US$ 5 trillion in GDP in 2020.

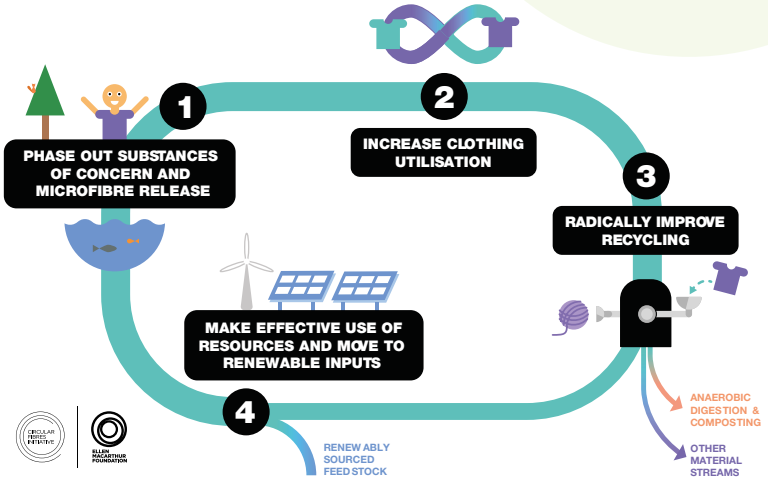


Figure 21: Ambitions for a new textile economy (Source: Ellen MacArthur Foundation, 2017)

With scientists warning that global emissions must be cut in half by 2030, along with a rapid phase-out of coal, it was increasingly critical that 2020 be the year that significant apparel brands turn broad sector commitments to action. With Covid-19 and other epidemics, it may be necessary for global brands to address the decarbonization agenda along with ecosystem conservation, because of the impact to the industry due to the pandemic. Further, the customers are now interested in consuming less and are placing a greater value on those brands that are environmentally and socially responsible.

As such, fashion brands seeking to reconnect with their customers has the ability and potential to demonstrate that their "responsible fashion" approach not only includes climate change but also the ecosystem sustainability as a significant part of their post-Covid-19 recovery strategy.

The post-Covid-19 situation will further enhance the potential for sustainable financing covering multiple aspects related to the Triple Bottom Line as well as other areas of SDGs and conventions (Figure 22).

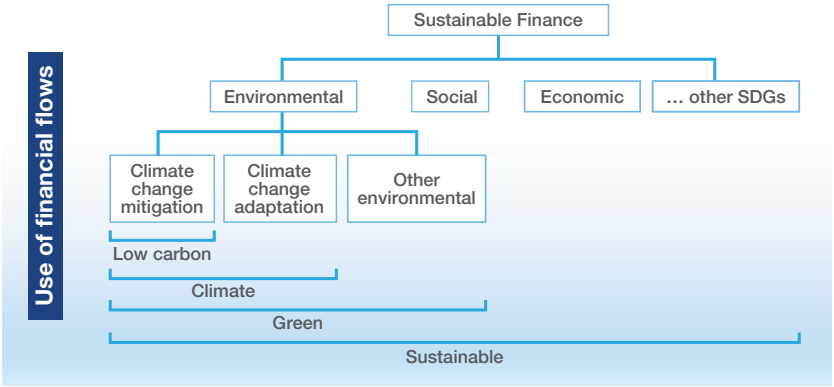


Figure 22: UN Environment and World Bank Sustainable Financing Framework

[18] Nowak, Patrick R. Roehrdanz and Mariana M. Vale Busch, Peter Daszak, Jens Engelmann, Margaret F. Kinnaird, Binbin V. Li, Ted Loch-Temzelides, Thomas Lovejoy, Katarzyna, Andrew P. Dobson, Stuart L. Pimm, Lee Hannah, Les Kaufman, Jorge A. Ahumada, Amy W. Ando, Aaron Bernstein, Jonah. 2020. Ecology and economics for pandemic prevention. DOI: 10.1126/science.abc3189. Science 369 (6502), 379-38

2.6.3. GHG Emissions

The new outlook of the global Apparel sector operations is intricately linked to the potential Green House Gas (GHG) emission reductions. Research shows that the global fashion industry produced around 2.1 billion tonnes of GHG emissions in 2018, equaling to 4% of the global total.[19] About 70% of the fashion industry's emissions are from upstream activities such as materials production, preparation, and processing. The remaining 30% is from downstream retail operations covering use-phase and end-of-use activities.

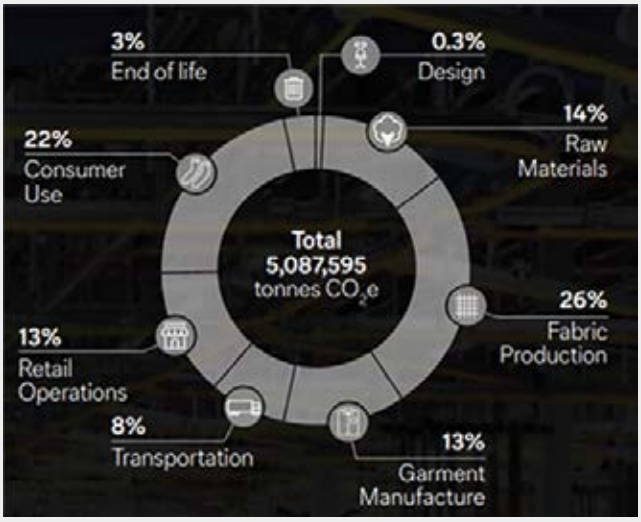


Figure 23: Distribution of emissions in value chain (Source: C&A sustainability report)

It is estimated that the industry will emit 2,800 million tonnes of CO_2 equivalent by 2030.[20,21] For the industry to survive and thrive, business-as-usual is no longer an option. Studies indicate that the industry may miss the 1.5-degree climate target by 50%, if serious action is not taken (Figure 23).

For this reason, many brands are mapping their GHG contribution from the entire value chain. C&A has mapped GHG emissions (Figure 24) from its global value chain.[22]

The carbon footprint of garments largely depends on the type of garment used. Synthetics such as Nylon, Acrylic, Polyester and Viscose have lower water consumption kg for kg but higher GHG emissions than natural fibres as seen in Table 6.[23]

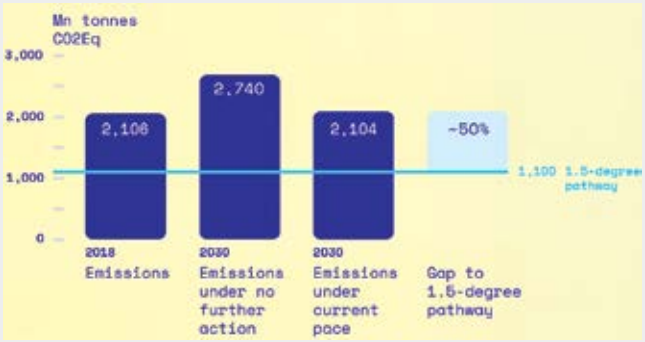


Figure 24: Business as usual and missing the target by 50% (Source: Fashion on Climate – 2020)

[19] McKinsey in partnership with Global Fashion Agenda. 2020. Fashion on Climate - Roadmap for decarbonisation of the fashion industry, https://globalfashionagenda.com/initiatives/fashion-on-climate/#/

[20] Boston Consulting Group, "The Pulse of the Fashion Industry", 2017.

[21] World Bank, "How Much Does Our Wardrobes cost the Environment", 23 September 2019

[22] C&A, "Sustainability Report" 2015.

[23] Sohel Rana et al, "Carbon Footprint of Textile and Clothing Products", www. ResearchGate.net

Table 6: Energy Use and Emission Potential in Different Fibres (Source: Mohan Seneviratne)

Fibre Type	Energy use kWh/kg Fibre	CO_2 Emissions in kg/kg Fibre
Nylon	69	37
Acrylic	49	26
Polyester	35	19
Polypropylene	32	17
Viscose	28	15
Cotton	15	8
Wool	13	5
Hemp	7	3

According to the World Resource Institute (WRI), polyester production for textiles released about 706 billion kg of GHG in 2015, equivalent of 185 coal-fired power plants' annual emissions.[24]

The potential reductions in GHG emissions come from different stages of the value chain. Fossil fuels are a part of the entire apparel supply chain including fabric production, manufacturing, shipping, consumer retail trade and in waste management. Ocean shipping is projected to increase to 17% of global GHG emissions if no action is taken. Apparel and textiles were among the largest market segments in both ocean and air shipping in 2019, with 8% of ocean cargo freight volume, and 6% of air cargo.

Figure 25: Energy Use in different steps in the apparel value chain

This provides an opportunity for innovation in packaging, changing consumer demands on how the material is being packaged or how the promotional material is being developed (ex: paper with higher recycled content, etc.).

[24] D. Drew and G. Yehounme, "The Apparel Industry's Environmental Impact in 6 Graphics", https://www.wri.org/blog/2017/07/apparel-industrys-environmental-impact-6-graphics - accessed on March 24, 2020.

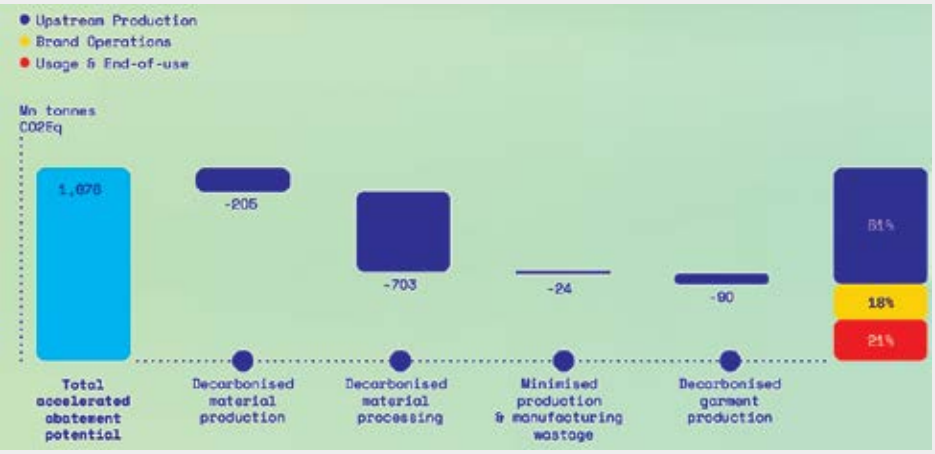


Figure 26: Potential reduction by 2030 by accelerated efforts (Source: Fashion on climate)

Brand operations are aiming at a potential reduction accelerated decarbonization strategy for a 61% reduction from upstream; 18% in brand operations; and 21% in usage and end operations (Figure 26). The GHG emissions also correlate with the source of grid-based electricity. Reliance on coal or heavy furnace oil increases GHG emissions.

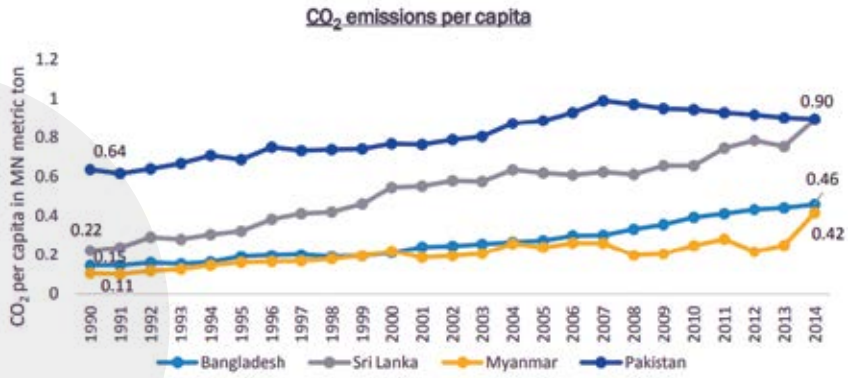


Figure 27: GHG per capita emissions is increasing rapidly (Source: World Bank, Energy Infrasap Assessment, April 2019)

In Sri Lanka, the source of energy has been changing from renewable-based energy to oil and lately, coal. Due to purchases of expensive oil-based electricity, Sri Lanka's per capita GHG emissions are equal to that of Bangladesh at 0.90 million metric tonnes (Figure 27).

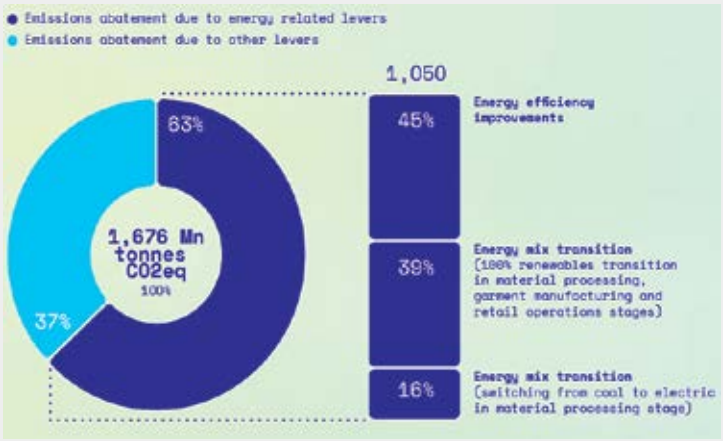


Figure 28: Potential GHG reductions via energy

THE **30% REDUCTION BY 2030** OUTLINED IN THE UN FASHION CHARTER FALLS FAR SHORT OF THE CUTS CLIMATE SCIENTISTS SAY ARE NEEDED IN THE NEXT TEN YEARS **TO STAY WITHIN THE 1.5°C—55% REDUCTION—AS A PLANET IN ABSOLUTE TERMS**

2.6.4. Green Energy and Coal-Based Supplies

The creation of the G7 "Fashion Pact"[25] and the UNFCCC Fashion Charter generated broader momentum to adopt more aggressive clean energy and set targets for the apparel sector supply chain. However, the 30% reduction by 2030 outlined in the UN Fashion Charter falls far short of the cuts climate scientists say are needed in the next ten years to stay within the 1.5°C—55% reduction—as a planet in absolute terms. The recent UNEP Emissions Gap report and analysis of a timeline for phasing out coal made it abundantly clear that the world needs a rapid phasedown of coal in the next ten years to stay within 1.5°C.

While coal is experiencing significant declines in the USA and parts of the EU, in much of Asia, significant new generation capacities are being proposed, including in Sri Lanka, which generates considerable revenue from the fashion supply chain. With the global brands threatening to minimize purchases from countries where the energy source include coal, in a substantial manner, without a clear strategy and action to convert to renewables as demonstrated in Cambodia, Sri Lanka may also face challenges in the export of apparel products.

The Government of Sri Lanka has a clear policy to change the energy generation to "renewables" and appointed a separate "State Ministry" to lead the effort. The decline in solar energy generation costs and the technologies available may help to use more solar in the daytime. Other renewables can be promoted for night use addressing the challenges posed by the market demand for green energy.

2.6.5. Microplastics and Consumer Choice

Microplastics, tiny plastic fibres and fragments not only pollute the oceans but are also found in drinking water. According to research by Orb and the University of Minnesota's School of Public Health, more than 80% of the samples collected on five continents tested positive for the presence of plastic fibres in drinking water.[21] Studies show particles of that size can migrate through the intestinal wall and travel to the lymph nodes and other bodily organs.

The information on ocean plastics and plastics in drinking water will lead the world to focus more on cotton-based or natural-based (ex: banana or bamboo fibre) material as the preferred fibre moving into the future.

[25] The fashion pact by G7 - https://thefashionpact.org/?lang=en
[26] Invisibles. https://orbmedia.org/stories/Invisibles_plastics/multimedia Last accessed September 08, 2020

3 Reducing Footprints: The Road to a Greener Apparel Sector

3.1. CAPITALIZING ON GLOBAL INITIATIVES

3.1.1. Brand Led Green Initiatives

In response to the Paris Agreement and global conventions, brands have adopted a number of global initiatives. These interventions expect and help the suppliers and associated stakeholders to access technology, best practices and financing towards green growth. In return, brands intend to capitalize by the extent of greening and success stories to market their products. Further, the brands have started funding innovative research, garment recycling, minimizing the use of synthetics and encouraging countries to adopt green energy sources in the industry.

Snapshot: PATAGONIA

A producer and retailer of high-performance outdoor clothing and equipment, Patagonia has a hefty price tag that is mostly attributed to their strong dedication towards environmental sustainability. Patagonia's journey for environment consciousness initiated in 1985 where the organization donated 1% of its sales to environmental organizations through its NGO '1% for the planet'.

Sustainability related activities carried out by Patagonia include:

- In the 1990s, the Company commissioned a study into the environmental impact of its products, which highlighted the resource intensiveness of water, energy and chemicals.
- Patagonia phased out Durable Water Repellents on their clothing that was made from long-chain fluorocarbon, which produced toxic and persistent byproducts.
- A US$ 20 million investment fund was set up to invest in responsible and disruptive start-ups in the food, water, energy and waste sectors.
- Investments in Beyond Surface Technology, a Swiss based chemical company, that explores the use of chemicals and finishes based on renewable raw materials that are also cost-competitive.
- Patagonia, empowered through their B-Corporation status, share proprietary information and best practices with other businesses, including direct competitors when there is a material, positive environmental impact.

The company's sustainability strategy includes (Patagonia 2016):

- Sourcing strategies that emphasis on long term partnerships, suppliers with operations in multiple countries, and being a more prominent presence in these facilities (although capped at 25%).
- Sustainability goals are decentralized and integrated within the business, so unit directors, designers, often champion new technologies or materials.
- They are focused on minimizing water use in production, through water-free dyeing and bio-based technologies that give PFC-free finishes.

Source: International Labour Organisation, 2017. Environmental Scoping Study: Decent Work in The Garment Sector Supply Chains in Asia. ILO.

BRANDS HAVE STARTED **FUNDING INNOVATIVE RESEARCH,** GARMENT RECYCLING, MINIMIZING THE USE OF SYNTHETICS AND ENCOURAGING COUNTRIES TO **ADOPT GREEN ENERGY SOURCES** IN THE INDUSTRY

Snapshot: NIKE

Nike's sustainability strategy includes board-level commitments, sourcing and production teams and third-party suppliers. In meeting these commitments, Nike has created several internal tools to help identify weaknesses in terms of social and environmental performance in their supply chain and collect data to provide metrics for measuring improvement and impact.

Sustainability related activities carried out by Nike include:

- Integrating sustainability into the product creation process: tracking the impact of a product looking at the average carbon footprint of a unit of development through the Material Sustainably Index (MSI), Apparel Sustainability Index (ASI) and the Footwear Sustainability Index (FSI).
- Development of Sustainability Performance Dashboard that provides product teams timely sustainability metrics combining the ASI, FSI, and MSI.
- The MSI was shared with the Sustainable Apparel Coalition, which led to the development of the Higg Index.
- Development of the mobile app MAKING: an app that allows measuring the sustainability performance of materials consistently while facilitating designers to understand the sustainability implications of materials they choose to design with (Nike 2016).
- Development and sharing a list of restricted substances that helped to create an industry-wide standard manufacturing restricted substance list (MRSL). Currently, measures are taken by Nike to be 100% compliant with the ZDHC manufacturing restricted substance list (MRSL).
- Shared water-based solvent formula to enable the industry to eliminate some toxic chemicals in an essential footwear process.
- Made available 400 utility patents under creative commons license enabling others to use them
- Increased the use of more sustainable material in footwear and apparel: In the years 2016-17, Nike utilized more sustainable cotton, recycled rubber and recycled polyester.
- Performance targets of Nike include reducing water use in the textile dyeing and finishing processes by 20% and enabling zero discharge of hazardous chemicals by 2020.
- Commitment to reach 100% renewable energy in owned and operated facilities by 2025 and reduction of waste across the value chain.
- Nike Grind: a suite of premium, recycled, and regenerated materials used by Nike to reduce waste and deliver performance products. Revenues from the sale of Nike Grind sports and play surfaces funded additional sustainable innovations at NIKE.

Source: FY16/17 Sustainable Business Report, NIKE, Inc.

NIKE'S SUSTAINABILITY STRATEGY INCLUDES **BOARD-LEVEL COMMITMENTS,** SOURCING AND PRODUCTION TEAMS AND THIRD-PARTY SUPPLIERS

Snapshot:
H&M GROUP

H&M, a leading fast-fashion brand in the world, as its strategy to deal with industry-related challenges, have become involved in several initiatives to scale up the transformation of standards across the industry.

Sustainability Drive at H&M:

- Launch of Sustainability Commitment (SC) in 2016, to move beyond compliance to promote sustainability performance at suppliers and further down the supply chain. The sustainability commitment has two components; essential compliance with minimum standards, and rewards for suppliers that went beyond compliance.
- Supplier Impact Partnership Programme (SIPP): a programme developed to support suppliers to improve sustainability performance. It is linked with the Higg Index and provides a framework for H&M to monitor supplier compliance and to ensure compliance with minimum standards. The SIPP process for suppliers also includes access to training, workshops and management systems to enhance skills.
- Adoption of a circular economy perspective to address the material intensity of H&M's production. H&M has partnered with the Ellen Macarthur Foundation and is currently one of their Top 100 Circular Economy businesses. This has led to some focus on material efficiency within the supply chain, but mostly on recycling and garment collecting.

Source: International Labour Organisation, 2017. Environmental Scoping Study: Decent Work in The Garment Sector Supply Chains in Asia. ILO.

3.1.2. Mainstreaming Life Cycle Assessment Approach

The Life Cycle of apparels comprises of multiple stages from the preparation of raw material (natural or synthetic) to the disposal of the clothing to recovering fibre/energy or disposing of in a landfill. Life Cycle Analysis (LCA) cover energy and water as main items but extend to cover many additional areas—mostly elements in the ecosystem. With climate change and interest in ecosystems increasing, especially in the post-Covid-19 era, LCA would have a range of features that are of interest and will come into the calculation and quantification efforts. For example, the LCA of apparels may involve several critical areas such as:

1. Climate impacts leading to air pollution by particulates, acids and other chemicals, ozone depletion, air temperature changes etc.
2. Terrestrial impacts such as air pollution, water availability and water quality, use of wood in biomass to energy etc.
3. Freshwater related impacts from ground and surface water depletion and deterioration of the quality of water due to pollution.
4. Marine environments including near-shore, inland and oceans impacted by discharges of wastewater that potentially include a range of harmful materials, the addition of plastics and microplastics etc.

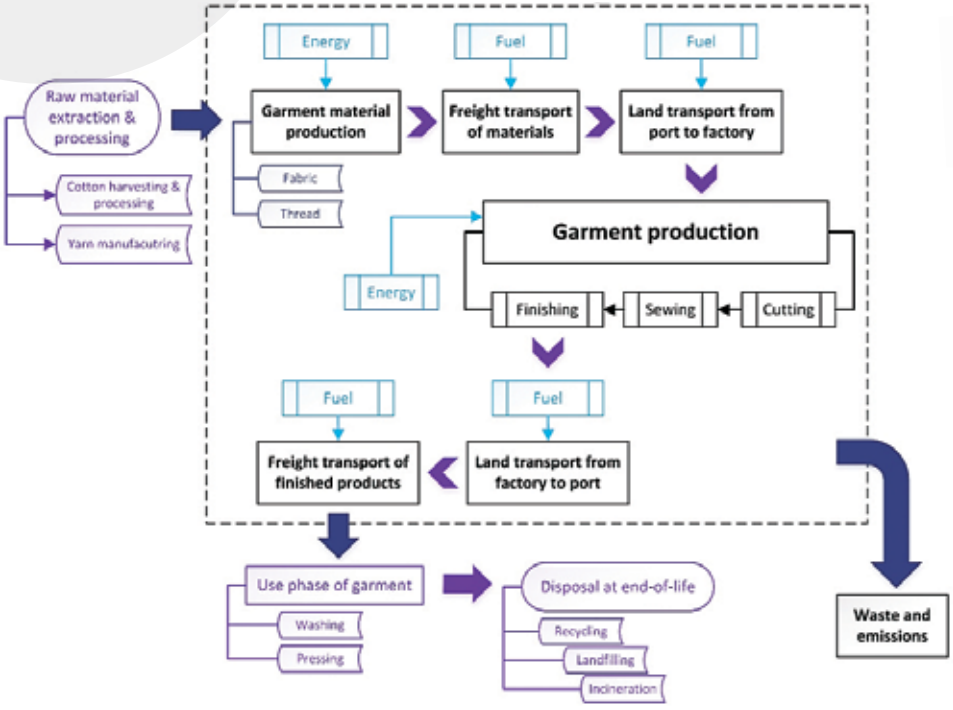


Figure 29: Illustrative example of energy use in the Life Cycle in Apparels (Source: Muthukumarana et al., 2018)

3.1.3. Cleaner Production

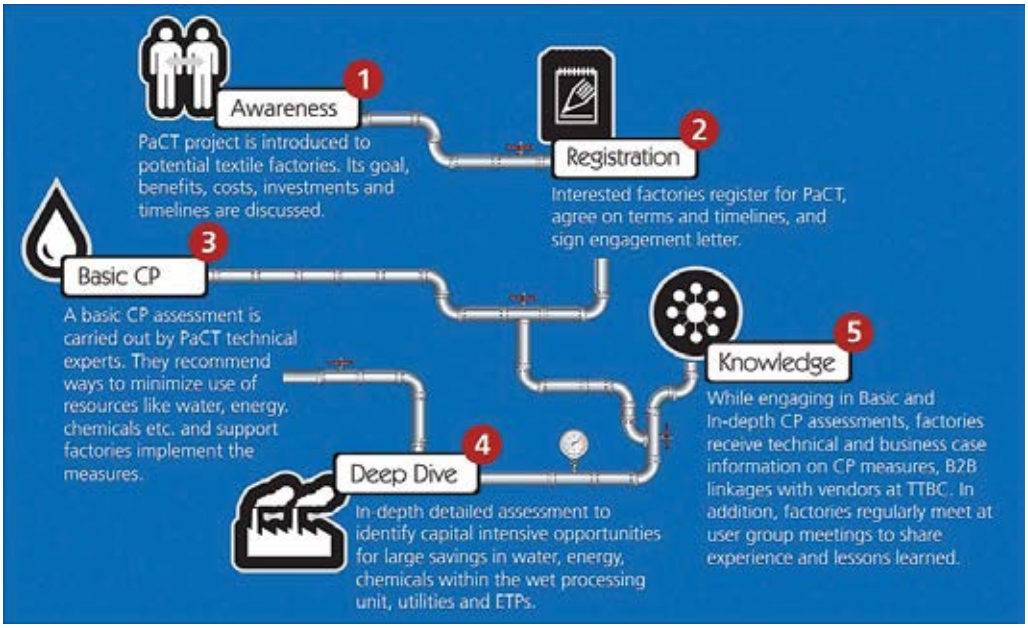


Figure 30: Cleaner Production (CP) approach used in PacT Programme in Bangladesh

Cleaner Production (CP) is defined by UN Environment as "the continuous application of an integrated environmental strategy to processes, products, and services to increase efficiency and reduce risks to humans and the Environment."

Cleaner Production (CP) approaches typically start with awareness, followed by in-depth auditing towards technology and best practice improvements along with capacity development. The aim is to improve the water and energy use efficiencies significantly.

For example, IFC's Partnership for Cleaner Textiles programme (PaCT) in Bangladesh was able to improve the water use efficiency by 22% in 55 companies highlighting the value of participating in CP approaches and investing in CP (Figure 30).

PaCT CP effort, by working with the top 200 export-focused apparel suppliers, reduced the water use by as much as 20-25% (www.texxtilepact.net) with a payback period of less than five year.

Convincing senior management to pay attention to CP and invest in improvements, especially in SMEs, is challenging. Therefore, it is essential to combine CP promotion with a strong awareness effort, to be successful. However, the factories can make substantial savings on resources including water, energy and chemicals while reducing the effluents and emissions.

Cleaner Production insists that factories track consumption and wastage, carryout maintenance timely, and adopt improvements continuously through in-house capacity as well as by using outside auditors and service providers. The National Cleaner Production Center (NCPC)[27] is one candidate organization that is well placed to perform such a function.

Awareness aspects of CP capture the "low-hanging fruit" of the potential efficiency gains from water, energy and chemical use by identifying-cost/no-cost measures, and then advances to best practices through in-depth audits and management decisions on investments. For example, The Bangladesh PaCT related cleaner production initiatives for factories involved:

[27] National Cleaner Production Centre - http://www.ncpcsrilanka.org/

- Cleaner Production workshops and best practice demonstrations where factories can build their understanding of CP. When they are ready to undertake a Basic Cleaner Production assessment, factories can join PaCT through a partner brand or BGMEA. The necessary assessments focused on no-cost/low-cost measures such as the installation of metres, efficient lighting options as well as improved operations and maintenance. They also helped factories operate effluent treatment plants efficiently and in line with local regulations.
- Basic CP assessment also covers the basics of Occupational Health and Safety, and Water, Sanitation and Hygiene.
- Factories hoping to reach global best practice levels can request an In-depth Cleaner Production assessment that includes recommendations on investments in process changes that lead to world-class efficiency. These process changes may consist of changes in liquor ratio, operation condition (temperature, pressure), etc. Process changes can have significant additional benefits, such as reduced processing times and savings in money, so that a factory can increase production without adding new capacity.
- As a sign of its engagement, the factory's senior management designates an in-house CP Team with regular reporting requirements. This critical step anchors CP within senior management, empowers the production team, and sets the stage for continuous improvement.

Snapshot: PaCT Bangladesh

Led by the International Finance Corporation (IFC), PaCT is working in partnership with NGO Solidaridad, the Embassy of the Kingdom of the Netherlands, 13 global apparel brands and two technology suppliers, textile factories, and the Bangladesh Garment Manufacturers and Exporters Association (BGMEA). To date, PaCT has partnered with 200 textile factories to support them to implement sustainable, resource efficiency projects. These projects have not only led to considerable savings in resources but are also realizing cumulative cost savings of USD 16.3 million/year for participating factories.

PaCT builds on four unique pillars that collectively address critical issues in the entire textile supply chain:

1. Working with leading global brands to adopt environmentally sustainable buying practices
2. Promoting best practices in textile factories
3. Addressing sector transformation and regulatory policy gaps
4. Financing resource efficiency projects in textile factories

PaCT incorporates several cutting-edge innovations to address the environmental and sustainability challenges related to the textile sector with the development of the Decision Support Guidance for the right product formula, conducting water footprint assessments in textile clusters, establishment of the one-stop knowledge hub-Textile Technology Business Center (TTBC), implementation of resource efficiency management tool-PaCT Advantage in partner factories, and a Textile Sustainability Platform (TSP) for national dialogue.

PaCT aids factories to reduce their water, energy, and chemical consumption, and also reduce their pollution load to the environment, leading to the environmental sustainability of the sector. The programme directly supports factories in setting and achieving Cleaner Production objectives. Factory level support is typically delivered in three steps. They are, i) awareness building on CP; ii) Basic CP Assessment; and iii) In-depth CP Assessment.

3.1.4. Designing for the Environment

The current manufacturing and consumption pattern of apparels is often described as a 'take, make, dispose' model or a 'linear model/system.' Globally, it is estimated that more than half of fast fashion produced is disposed within a year—a short period before being disposed of in landfills or by other means. As a result, the untapped usage of the product is significantly high while the linear pattern puts pressure on resources, pollute ecosystems and add to climate change.[28]

Designing for the environment (DfE) is articulated as "an approach to reduce the overall human health and environmental impact of a product, process or service, where impacts are considered across its life cycle." DfE practices are intended to develop environmentally compatible products and processes while maintaining or improving price, performance and quality standards. In that context, the apparel sector provides multiple entry points to improve the designs or processes using greening principles.

Snapshot:
Hirdaramani Discovery Lab

Hirdaramani Discovery Lab is the group's true product innovation and technology centre. The focus of this centre is to develop and implement products, processes and technical innovations to achieve higher levels of sustainability and productivity. The facility was launched in September 2019.

HIRDARAMANI GROUP

Source: Hirdaramani, n.d.

3.1.5. Science Based Targets for the Apparel Sector

Science Based Targets can be introduced at the national, regional, river basin or individual facility scales, using the pioneering work done by the Brands.

These targets at the facility level provide companies with a clearly defined pathway to change by specifying how much and how quickly they need to reduce their greenhouse gas emissions and discharges.

Targets adopted by companies to reduce GHG emissions are considered "science-based" if they are in line with what the latest climate science says is necessary to meet the goals of the Paris Agreement—to limit global warming to well-below 2°C above pre-industrial levels and pursue efforts to limit warming to 1.5°C.

The Science Based Targets initiative (SBTi)—a collaboration among the CDP (formerly the Carbon Disclosure Project), the United Nations Global Compact (UNGC), World Resources Institute (WRI), and the World Wide Fund for Nature (WWF)—champions SBT setting to boost companies' competitive advantage in the transition to a low-carbon economy. Through developing and meeting SBTs, companies may receive benefits, such as increasing business resilience and competitiveness, thereby driving innovation and transforming business practices, building credibility and reputation, and influencing and preparing for shifts in public policy.

As of June 2019, five apparel and footwear companies have approved SBTs. They are ASICS, H&M, Kering, LS&Co, and Skunkfunk. In addition to these companies, four multiline retailers that sell apparels, Marks & Spencer, Target Corporation, Tesco and Walmart, have also approved SBTs. Furthermore, more than 20 other companies in the apparel and footwear sector have committed to setting SBTs. The most recent list can be found on the SBTi website.

[28] Ellen MacArthur Foundation, A new textiles economy: Redesigning fashion's future, (2017, http://www.ellenmacarthurfoundation.org/publications).

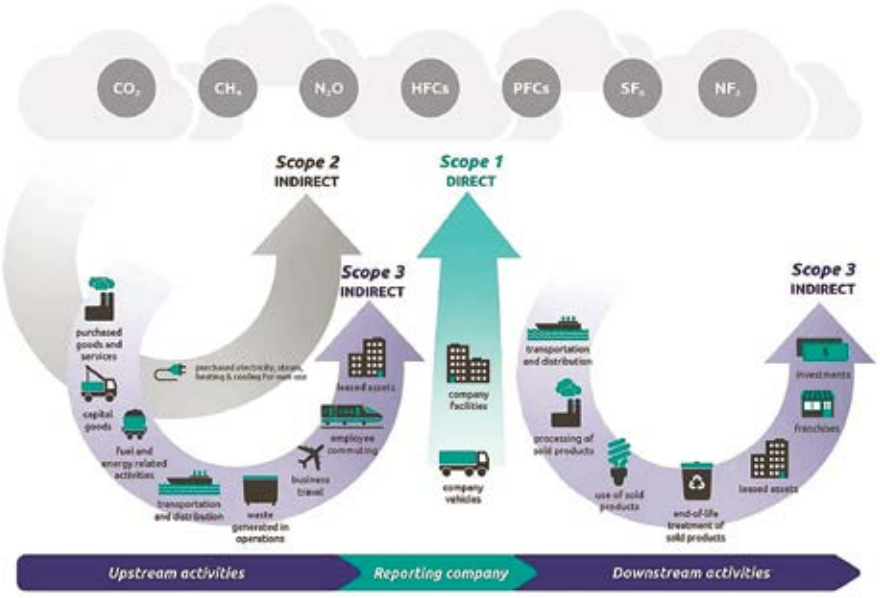
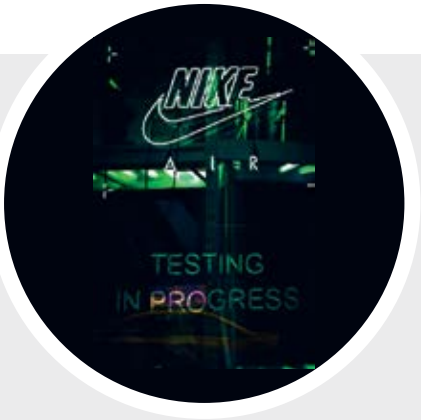


Figure 31: Total footprint consisting of scope 1, 2 and 3 emissions

CASE STUDY: Nike's Energy and Carbon Programme



Initiated in 2008, the Energy and Carbon Programme of Nike is currently active in more than 15 countries across Nike's contracted manufacturing supply chain. Employees of Nike, coach and consult directly with their suppliers and management on how to reduce energy use and carbon emissions. According to Nike, there is roughly a 50% reduction in the energy usage intensity between 2008-2015 in the manufacturing supply chain.

In the year 2016, Nike launched its 2020 Targets, and with the maturing of the Energy and Carbon programme, there is more emphasis to adopt renewable energy by contract manufacturers further.

Nike's approach to accelerating renewable energy with its suppliers has three components:

- Supporting factories in installing solar photovoltaic (solar PV) systems on factory rooftops to provide up to 45% of the electricity use of factory operations.
- Engaging with governments and policymakers to advocate for policy that allows manufacturing factories directly source renewable electricity from local power utilities.
- They are expanding Nike's responsibly sourced biomass renewable energy programme with a focus on material manufacturers.

Source: WRI (N.D.). Apparel and Footwear Sector Science-Based Targets Guidance

CASE STUDY:
Levi Strauss & Co.

Levi Strauss & Co. (LS&Co.) in July 2018 revealed the company's target (with the base year of 2016) to reduce

- scope 1 and 2 emissions by 90% and
- scope 3 emissions from purchased goods and services by 40% by 2025

When developing scope 1 and 2 targets, LS&Co., to begin with reviewed peer targets and initiatives along with the company's efforts on energy efficiency and renewable energy. To achieve the ambitious target set forth by LS&Co., the company plans to prioritize on-site renewables for its largest properties, while asking suppliers to make similar investments and demonstrating its commitment to customers, employees, and peers.

Scope 3 target was derived, taking into account the importance of setting an ambitious and industry-leading target that decoupled business growth from GHG emissions. To determine the scope 3 target, LS&Co. conducted a life-cycle analysis of three essential products along with a survey of select suppliers. LS&Co. hopes to achieve the stipulated goal by expanding and capitalizing on the PaCT partnership of IFC.

Source: WRI (N.D.). Apparel and Footwear Sector Science-Based Targets Guidance

3.1.6. Zero Discharge of Hazardous Chemicals (ZDHC)

Zero Discharge of Hazardous Chemicals (ZDHC) is a global programme supported by Brands. The initial work on ZDHC has indicated the need for uniform, international guidance of wastewater discharge quality, as well as testing and reporting, to enable a more sustainable industry. The resulting ZDHC wastewater guidelines go beyond regulatory compliance, not only for conventional wastewater parameters but also for hazardous chemicals.

The first step to prevent wastewater contamination is to avoid the use of restricted chemical substances and to ensure facilities to treat wastewater before discharge where the chemicals are removed physically, chemically, or biologically. These chemical groups have been peer-reviewed by independent third-party technical experts and industry associations involved in the production of critical raw materials, and include:

1. Alkylphenol (AP) and Alkylphenol Ethoxylates (APEOs), including all isomers
2. Chlorobenzenes and Chlorotoluenes
3. Chlorophenols
4. Dyes
5. Azo (Forming Restricted Amines) and Dispersing (Sensitising) agents
6. Flame Retardants
7. Glycols
8. Halogenated Solvents
9. Organotin Compounds
10. Perfluorinated and Polyfluorinated Chemicals (PFCs)
11. Ortho-Phthalates – Including all orthoesters of phthalic acid
12. Polycyclic Aromatic Hydrocarbons (PAHs)
13. Volatile Organic Compounds (VOCs) and
14. Others identified as harmful to the ecosystems as well as to humans.

Hazardous Chemicals show intrinsically harmful properties (persistent, bio-accumulative, and toxic – PBT), and can be very persistent and very bioaccumulative (vPvB); carcinogenic, mutagenic and toxic for reproduction (CMR); while acting as endocrine disruptors (ED).

Zero discharge is defined as not intentionally using hazardous chemicals or being a net contributor of dangerous chemicals to the environment. ZDHC brands monitor zero discharge by testing the concentration of dangerous chemicals in wastewater and taking into consideration any background concentrations of those chemicals.

A ZDHC MRSL (Manufacturing Restricted Substances List) has been developed by the ZDHC Programme. Intentional use of substances on the MRSL is forbidden. The process uses a ZDHC Data and Disclosure Platform at a national level for storing and reporting water and wastewater test results for the value chain of ZDHC contributors.

The guidelines, as per the Bangladesh PaCT programme[29] apply to industrial wastewater discharges and sludge cover:

a. Textile dyeing and finishing

b. Yarn dyeing

c. Fabric mills

d. Laundry, washing and finishing facilities

e. Printing facilities

f. Vertical finished goods manufacturing facilities where any of the above-wet processes occur

These Guidelines apply to suppliers with direct discharge, indirect discharge and on-site Zero Liquid Discharge (ZLD) treatment plants.

Where a supplier combines its industrial wastewater with domestic wastewater, the combined wastewater is classified as industrial wastewater, to which these guidelines would apply.

In Sri Lanka, the implementation of the ZDHC programme requires a phase-in approach where the regulators and apparel industry agree on a potential roadmap and a monitoring scheme supported by an ICT dashboard system.

The implementation also requires the support of an agency structure for sampling, testing, and reporting, as per the guidelines established like in the case of Bangladesh PaCT programme.

Reporting is required for facilities that directly or indirectly discharge wastewater to maintain their wastewater discharge permit. Facilities discharging directly or indirectly will be required to submit a copy of their discharge permits to the proposed ZDHC Programme. Essential information may include:

1. Name and location of the receiving centralized or common wastewater treatment plants.
2. Parameters and limit values agreed between the facility in question and the receiving centralized or common wastewater treatment plants.
3. Test results for the wastewater parameters that are included in the wastewater permit.

[29] PaCT ZDHC programme related wastewater guidelines. 2019. - https://www.dropbox.com/s/tbfp54hq5pqf41x/ZDHC_WastewaterGuidelines_V1.1_JUL19%20%281%29.pdf?dl=0

Snapshot:
ZDHC – A Brief Overview

The ZDHC Roadmap to Zero Programme, established in 2011, is a collaborative initiative of fashion brands, chemical suppliers, manufacturers and laboratories working to reduce the chemical footprint of apparel and footwear.

At the inception, the programme consisted of six brands. However, as of today, the Programme has 30 signatory brands, 101 value chain affiliates and 19 associates—comprising of organizations active in the textile, apparel, leather and footwear industries. Together, they drive the global implementation of ZDHC's sustainable chemical management framework and empower the global value chain to substitute or phase out hazardous chemicals.

They are advancing the apparel and footwear industry towards zero discharge of hazardous chemicals by:

a. Creating aligned, industry-endorsed guidelines and tools for sustainable chemical management.

b. Driving the effective implementation of these standards on the ground.

c. Engaging a network of relevant stakeholders to empower every point of the supply chain to manufacture a safer product.

The impact of the programme so far includes:

- 100% of signatory brands are committed to using the ZDHC MRSL by the Signatory Brand Leader Programme.
- 82% of signatory brands have implemented the ZDHC wastewater guidelines.
- Eighty-two testing labs around the world have been approved by ZDHC to conduct accurate wastewater testing.
- 47certification standards and testing labs around the world have been approved by ZDHC as MRSL Conformance Indicators.
- In the last 18 months, the number of wastewater test reports published on ZDHC Gateway–Wastewater Module has increased from 100 to 4,000 pieces.

Source: www.roadmaptozero.com/impact-report

3.1.7. Higg Index

The Higgs suite of tools is a global industry-wide effort to lead the industry towards a "shared vision of sustainability" built upon a "common approach for measuring and evaluating" the sustainability performance of the apparel and footwear products.

In Sri Lanka, JAAF promotes the use of Higgs approach as a means towards identifying priorities for action and opportunities for technological innovation. Higgs Index uses the Life Cycle Analysis as a primary tool and measures environmental and social impacts. It employs three evaluation modules at different levels in the value chain: namely, the Facility, Brand, and Product.

At the Facility level, the environmental performance of material, packaging, and manufacturing facilities along with social and labour account in each category is tracked. At the Band level, it assesses the "environment" for different products along with practices covering both environmental and social areas. At the Product level, The Higg Index uses a "Rapid Design Module" to guide designers on sustainable product design with directionally correct information and streamline decision support framework. The "Materials Sustainability Index" is an online platform that allows users to understand the data and methodology behind the Materials Sustainability Index Base Material Scores. It also serves as a data submission platform to improve the quality of material scores or add new materials.

Snapshot: Experience of Hirdaramani Group

Hirdaramani Group has 19 apparel manufacturing facilities across Sri Lanka. The Environmental Sustainability team at Hirdaramani uses the Higg Facility Environmental Module (Higg FEM) to baseline and continuously measure environmental management across seven key impact areas: environmental management systems, energy use, greenhouse gas emissions, water use, wastewater, emissions to air, waste management and chemical service and management. The Higg Index helped the Hirdaramani Sustainability Team to identify areas needing improvements.

Setting reduction targets using the Higg Index, Hirdaramani calculated a normalized energy reduction target. A normalized target represents a reduction relative to a set production unit, which allows the company to measure real reduction progress, even if production levels fluctuate year to year, affecting total energy consumption. To set its 2020 goals, Hirdaramani examined past energy-saving initiatives and extrapolated possible reductions for future endeavours. The company set targets holistically, creating targets for its entire group of Sri Lankan facilities. Each site received a unique target requirement based on its potential.

Some of those investments include swapping fluorescent bulbs in facilities with energy-efficient LEDs and installing skylights. Such changes led to the development of worker awareness programmes for energy conservation, reducing unplanned overtime, and operations. Hirdaramani also began conducting energy audits and preventative maintenance on machines. When implementing sustainability projects, Hirdaramani Group relies on in-house experts and supplements its expertise with third-party energy auditors. The company also works closely with machinery manufacturers to identify energy-efficient options for future purchase. The team turned to third-party experts, such as with solar power generation, for larger projects.

The teams see the business value through the return on investment of numerous initiatives, from reduced operational costs to a decline in risk associated with fossil fuel dependency. The manufacturer's relationships with business partners are also stronger following the success of these projects.

Source: Sustainable Apparel Coalition and Higg Index (n.d.). Hirdaramani Group Energy & Greenhouse Gas Emissions

3.1.8. Apparels and the SDG Agenda

SDG 12 on ensuring sustainable consumption and production and its eight targets focus on the potential impacts on natural resources by the industry, namely, the chemical waste, fossil fuels and promote the integration of sustainable practices into the industry and supplier practices.

Specifically, Target Eight promotes the consumers' right to be informed on the associated sustainability concerns related to the product they buy, working conditions of the industry, and other social norms used by the industry in line with full and productive employment and decent work for all which SDG is connected to.

The most related sustainability goal for the apparel sector could be the SDG 6 that relates to water pollution, the release of hazardous chemicals and materials, treatment of wastewater and water-use efficiency.

SDG 13 on combatting climate change drives the apparel production plan in terms of technologies and best practices. The emphasis is on adopting ways to minimize greenhouse gas emissions that covers the entire value chain.

SDG 14 relates to the marine pollution that extends to microfibres and microplastics released into the oceans from waste management, wastewater treatments and cloth washing. The selection of nature-based materials is connected to the land health, soil quality, etc., which is relevant to SDG 15.

The social dimension of the fashion industry is linked to SDG 5 on gender equality and SDG 1 on eradicating poverty, which is connected to employment and salaries paid to workers in the supply chain.

Overall, the health and wellbeing related SDG 3 could extend to the health impacts of chemicals used in the production process on workers as well as communities affected by environmental pollution where recycling of clothing and water governance etc. are relevant.

Figure 32: Sustainable Development Goals

THE MOST RELATED SUSTAINABILITY GOAL FOR THE APPAREL SECTOR COULD BE THE SDG 6 THAT RELATES TO WATER POLLUTION, THE RELEASE OF HAZARDOUS CHEMICALS AND MATERIALS, TREATMENT OF WASTEWATER AND WATER-USE EFFICIENCY

3.2. Efficient Resource Consumption and Renewable Energy

3.2.1. Water and Wastewater

Water is central to human consumption and multiple socio-economic sectors including apparels. Given the high use of water in the garment industry, it is considered as unsustainable prompting some international brands like Levi Strauss & Co, VF Corp and Gap etc., suppliers, equipment providers like Jeanologia and NGOs such as NRDC, Sustainable Apparel Coalition and IFC to initiate programmes to reduce water use through efficiency measures, improvements to chemicals, use of waterless dyeing techniques, lowering of liquor ratios, equipment upgrades, benchmarking and wastewater recycling etc.

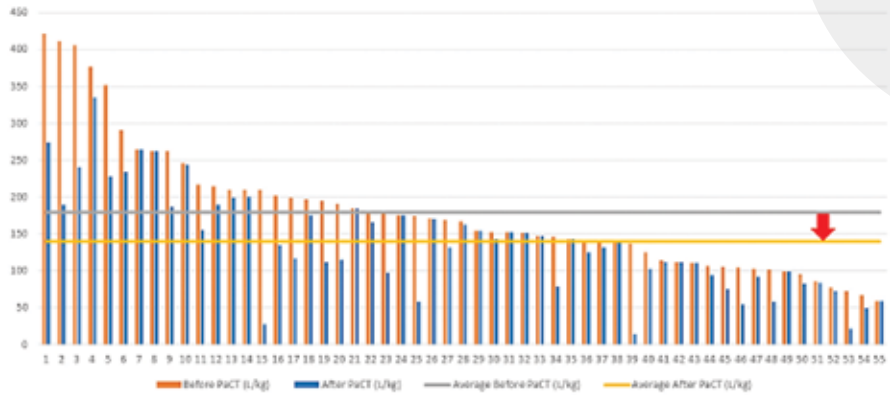


Figure 33: Water efficiency before and after participating in PaCT CP programme

CASE STUDY:
Replacing High Liquor Ratio Dyeing Machines with Low Liquor Ratio Dyeing Machines - Jiacheng Textile Company, China

The dyeing and finishing factory have an annual capacity of 15,000 tonnes per annum of knitted fabric. Through IFC's China Water Programme, Jiarong carried out a technical audit of its processes. The key recommendations were to:

1. Replace traditional dyeing machines with airflow machines
2. Replace high energy-consuming heat setting machines
3. Replace the wastewater treatment system

The expected environmental and financial benefits are shown below.

Expected Environmental Benefit

Water-Saving	843,000 m^3/year
Energy Saving	18,079 MWh/year
CO_2 Emissions Reduction	5,772 tonnes CO_2 equivalent/ year
Other Resources Conserved	Industrial salt, dyes and other chemicals

Expected Financial Benefit

Total Project Investment	21.2 million yuan
Operation Cost Saving	5.19 million yuan/year
Payback Period	2-5 years

Source: IFC China Water Programme

Inside factories, wastewater reuse can be achieved through pressure-driven membrane technologies such as Ultrafiltration (UF) and Reverse Osmosis (RO). However, given their significant CAPEX and OPEX costs, pilot trials are required to ascertain their performance. The characteristics of the membrane in removing dissolved and suspended contaminants are shown in Figure 34.

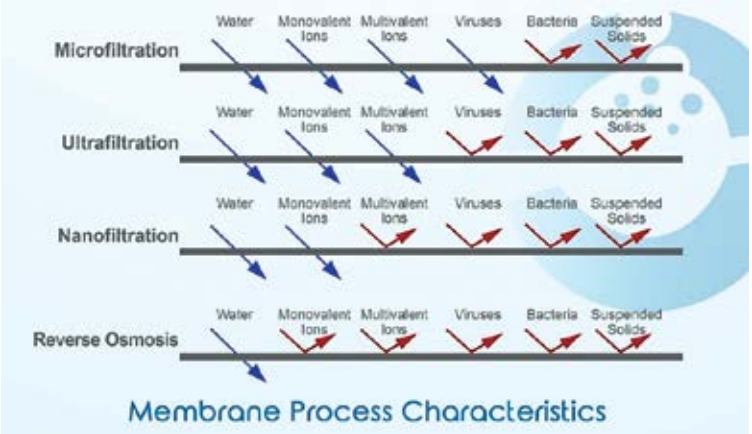


Figure 34: Membrane characteristics in removing contaminants

CASE STUDY:
Wastewater Reuse - YQD, Foshan City, Guandong Province, China

YQD identified that the plant could minimize its water use if it reused the treated wastewater. Accordingly, it segregated the lightly contaminated streams from the more massive, contaminated streams. The result was it could reuse 528,000 m^3 at an investment cost of 3.45 million Yuan.

Source: IFC China Water Programme

3.2.2. Chemicals

Chemicals used in the apparel industry are known to harm the environment and create health issues. The emphasis is to use only the required quantity of a chemical and separate the residual amounts in waste to prevent them getting into the ecosystem. A case in point is caustic, which is used in mercerizing. Caustic recovery is very cost effective. Another way to reduce hazardous chemicals is to use enzymes. Enzymes are used in bio scouring processes eliminating the need for more hazardous chemicals.

CASE STUDY: Caustic Recovery at Zaber and Zubair Fabrics, Bangladesh

Zaber and Zubair Fabrics Limited is a Bangladeshi supplier of home and fashion textiles to IKEA, H&M, Lidl, and other global brands for over two decades.

Mercerization is a process used in fabric processing to increase luster and strength by treating it with caustic soda and other wetting agents. At the end of the mercerization process, excess caustic is rinsed off with water generating a weak caustic solution waste stream. If discharging to a wastewater treatment facility without the separation of caustic, will require large amounts of acid for neutralization of high pH solution resulting in the creation of copious amount of chemical sludge.

Zaber and Zubair decided to recover the caustic. Caustic recovery plants concentrate weak alkaline solutions (7%) to concentrated solutions (22%), which can be reused in the process. The environmental and financial benefits are shown in the table below.

Environmental Benefit		Financial Benefit	
Caustic soda saved	6.5 million L/year	Total Investment	USD 2,300,000
Hot water generated	28 million L/year	Cost Savings	USD 3,800,000 /year
Sulfuric acid saved	400,000 kg/month	Payback Period	< 1 year
Other benefits: reduced steam consumption in bleaching units; reduced consumption for boiler feed water			

Source: PaCT, Bangladesh

CASE STUDY: Use of Enzymes in Bio-Scouring and Biopolishing at Textown, Bangladesh

Scouring is a pre-treatment process to remove waxes and pectins in fabric before dyeing. Conventional scouring processes use energy-intensive high temperature (90-100^{0}C), and require high pH alkaline solutions increasing BOD and COD loads in the wastewater treatment facility and along with a timeframe of 45 minutes. Enzymes provide a better solution in that they operate at low temperatures, do not need high pH and are biodegradable polymers.

Textown, a supplier of fabric to many brands, concerned at the increasing resource usage partnered with DuPont Chemical to use their Prima Green enzyme in the bio-scouring process. The results are shown below.

Results

The benefits identified by Textown for the fully enzymatic process have resulted in significant savings in resource use and processing time, improved product quality and the working environment:

- Reduced water use by 11 million litres/year by eliminating additional caustic stages
- Reduced steam use by 140 tonnes/year due to lower heating requirements
- Reduced batch time by 60 minutes for pretreatment and dyeing of darker shades
- Reduced caustic soda use in pre-treatment
- Reduced acid use as a result of effects of the products at neutral pH
- Reduced BOD level of wastewater by approximately 30%
- Reduced wastewater treatment requirements and improved effluent quality
- Improved fabric strength, by eliminating caustic use
- Reduced fabric weight loss from around 8-10% to less than 5%
- Reduced dyestuff consumption due to improved efficiency in removal of pectins from fabrics

Source: PaCT, Bangladesh

3.2.3. Sludge Treatment

Waste sludge is an unavoidable product in wastewater treatment. The viable solution is on-site sludge drying using solar energy and using the dried sludge material in eco-brick manufacturing. Figure 35 shows dried sludge being manufactured as eco-bricks in China. An advantage of this process is that it traps the contaminants within the bricks and prevent leakage. In India, research has been conducted to use sludge for non-structural applications such as hollow blocks with 30% sludge incorporated meeting Indian Standards as well as fine aggregate in concrete.[30,31]

Figure 35: Textile sludge to eco-bricks facility in China

Following ingredient ratios are used for manufacturing of cement blocks at present, as it complies with the compressive strength standards stipulated by the SLSI; Cement: Chips: Quarry Dust=1:2:5.

Research had been carried out to replace quarry dust with sludge, which also has inorganic components. It will reduce the consumption of quarry dust and assist for the betterment of the environment. To discover a better combination of ingredients, several trials were performed.

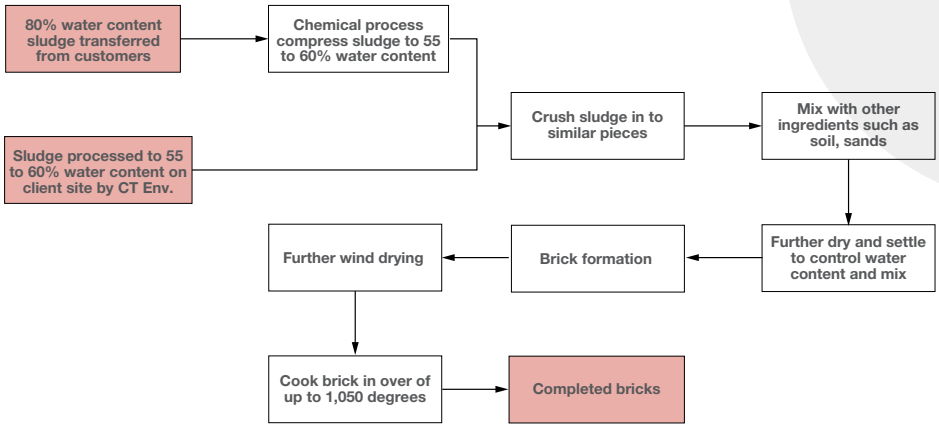


Figure 36: A global example of brick making using sludge (Source: Macquarie Research, January 2015)

[30] J. Balasubramanian, "Reuse of Textile Effluent Plant Sludge in Building Materials", Elsevier, 2005
[31] G.J. Kulakrni et al, "Textile Mill Sludge as Fine Aggregate in Concrete", Global Journal of Research in Engineering, Volume 12, 2012

Thermal evaporation of sludge to solids has been trialed to produce a shallow reliable content, with success in Sri Lanka.[32] Generally, after dewatering the sludge (filter press), it has about a 40% moisture. There could be waste-derived heat production (recovering the heat value of sludge) that will also reduce the sludge weight. The ash produced during this operation is purely inorganic matter and can be co-processed as a construction material. The estimated financial needs required for the wastewater and sludge management indicates a potential sustainable financing use.

Table 7: Sri Lanka Financial Estimates on Sludge Management (Source: Gamini Gunasinghe, 2020)

Financial Input	Activity	Cost (SL Rupees)	Benefits/output
Investment on new dyeing machine with low liquor ratio.	Reduction of water consumption in dyeing and bleaching activity.	32 Mn/per machine	Reduction in water
consumption and wastewater volume	Medium (100-300)	136	34%
R&D work on online reuse applications of wastewater	Check the possibility of reuse application of fewer contamination streams.	5 Mn per application	Reduction of water consumption
Advanced wastewater treatment	Reuse of treated wastewater.	15 Mn	Reduce the water footprint.
Promote the use of sludge as a construction material	Implement the use of sludge as a construction material in cement bricks.	1 Mn	Sustainable and economical disposal of sludge.
Promote waste heat boilers	Recover the heat from the sludge and reduce the quantity.	70 Mn	Reduce the cost involved in sludge management

CASE STUDY: CTEG Environmental Group - Leader in Textile Effluent Treatment in China

CTEG Environmental Group is a Chinese company that specializes in wastewater treatment of textile effluent and sludge processing. Besides six industrial wastewater treatments with a total capacity of 300,000 m^3/d, it operates four solid waste sites ranging from 200 to 820 tonnes/day. Sludge treatment is a lucrative business for CTEG since it earns revenue from two sources.

The revenue streams from sludge processing are:

i. Treatment fees of RMB 230 per tonne.

ii. Treatment of solid MSW and power generation through incineration.

iii. Resale fees for end products. The company composts sludge and sells bioorganic fertilizer at RMB 450 per tonne from the municipal sludge. At the YongHe plant, this accounts for 700 tonnes/d. Besides fertilizer, the company is embarking on the production of green bricks from textile sludge.

iv. Hazardous waste treatment.

v. Biofuels and Refused derived fuel (RDF).

[32] Personal communication Report by Mr. Gamini Gunasinghe

3.2.4. Energy

Energy is one of the most critical areas for the sustainability of the apparel industry in Sri Lanka due to multiple reasons.

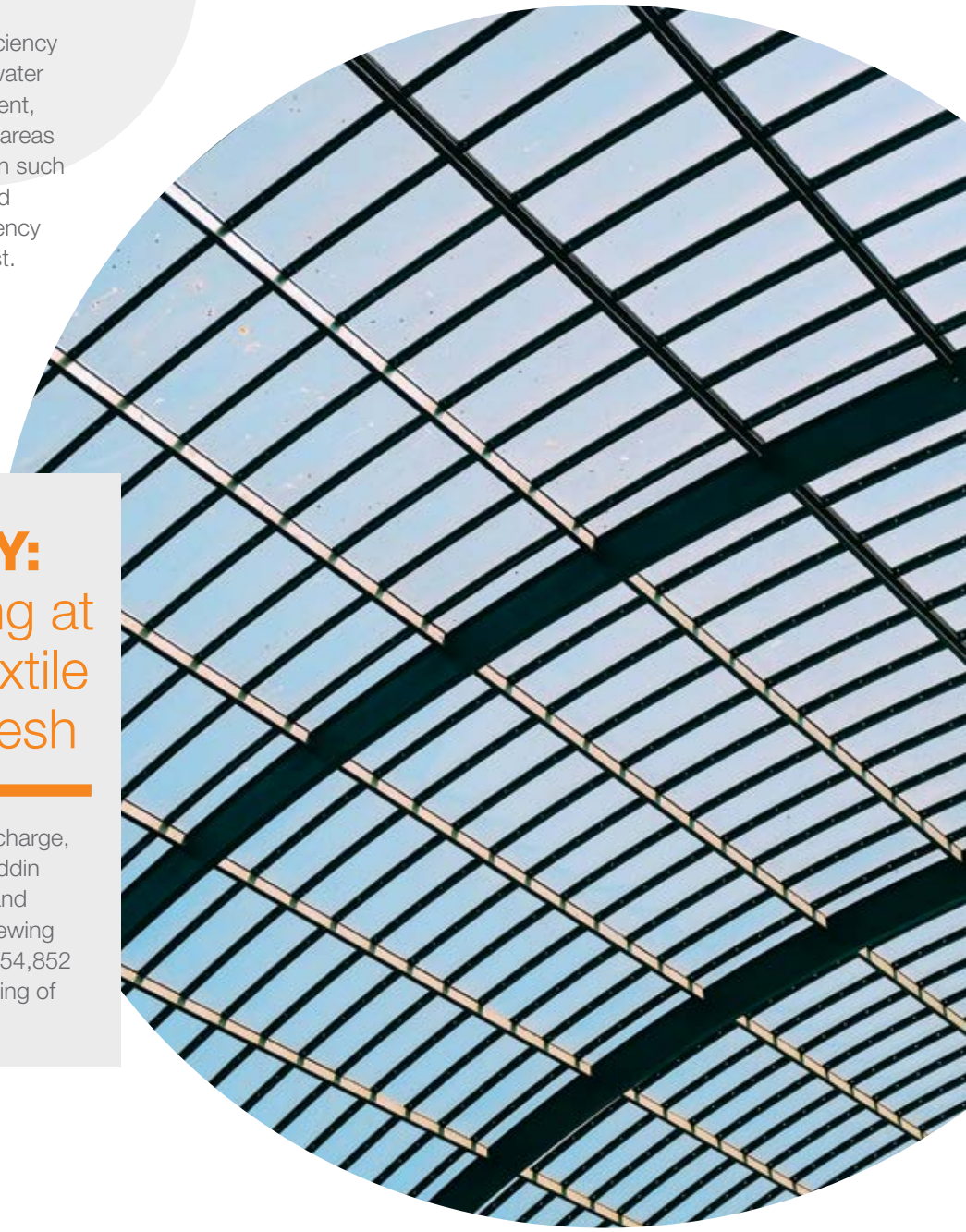
- Cost of production is related to energy costs
- The relationship between energy use efficiency with GHG emissions
- Type of energy source when the global brands and countries importing apparels are against dirty forms of energy

The energy-related potential abatement is one of the critical areas Sri Lanka can capitalize on in addition to the improvements in the energy source.

Around 45% of savings are in efficiency improvements in raw material production, preparation, and processing, while 39% could be generated by transitioning to renewable energy. The remaining 16% is expected to be from switching from coal energy boilers to electric boilers for synthetic material production.

i) Energy Efficiency

Typical processes where energy efficiency gains are possible include lighting, water heating, cooling, wastewater treatment, and air conditioning. Also, there are areas connected to the apparel value chain such as transportation, utility services, and goods procured where energy efficiency is a significant contributor to the cost.



CASE STUDY: Natural Lighting at Fakhruddin Textile Mills, Bangladesh

Skylights provide lighting free of charge, thus saving on electricity. Fakhruddin Textiles, a supplier to Lidl, M&S and K Mart, installed skylights in its sewing section. The supplier is holding 154,852 kW equating to a natural gas saving of 46,456 m^3.

CASE STUDY: Waste Heat Recovery at Fakir Apparels Ltd, Bangladesh

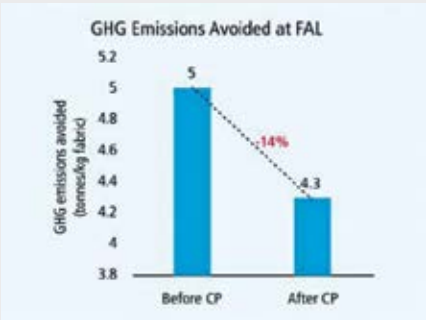
Fakir Apparels is a pioneer in resource recovery initiatives in Bangladesh. A supplier to H&M, Primark, C&A etc, Fakir Apparels partnered with PaCT Bangladesh to reduce resource use. Their consumption of water condensed from 208 L in 2013 to less than 52 L in 2016—a 75% reduction. One area Fakir Apparels focused on was wet processing, which is a highly energy-intensive process. However, a significant fraction of 20-50% of the fuel also gets wasted to the environment via exhaust gases from boilers and dryers, steam condensate, cooling water, wastewater effluent, and more. This waste heat, which is either low grade (<100°C), medium grade (100°C–400°C), or high grade (>400°C), is an expensive resource that can be recovered and reused.

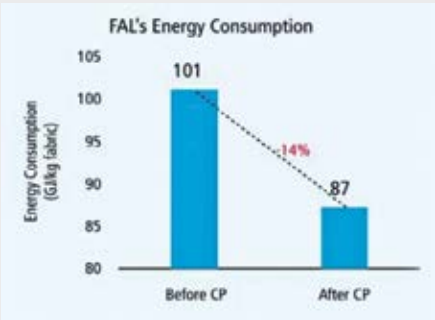
Waste Heat Recovery (WHR) offers textile industries an economical and green solution to save valuable energy. WHR system works by extracting and reusing waste energy from industrial processes, which otherwise is dissipated to the environment. The recovered heat can either be used for on-site power generation, to preheat combustion air, or to generate steam. Potential sources for waste heat recovery in textile factories include:

- Exhaust gas from generators (high-grade heat)
- Boiler blowdown flash steam (high-grade heat)
- Condensate flash steam (high-grade heat)
- Wastewater (low-grade heat)
- Jacket cooling water (low-grade heat)

Fakir Apparels invested in exhaust gas recovery boilers. The environmental and financial benefits are shown below.

Environmental Benefit		**Financial Benefit**	
Inlet Temperature Outlet Temperature	4700C 1250C	Investment	USD 177,000
Energy Savings	27,460 kWh/year	Cost Savings	USD 208,620 /year
Natural Gas Savings	2,595,840 m³/year	Payback Period	Ten months
Additional Steam generated	3.5 tonne/hr		





| *Source: PaCT Bangladesh*

ii) Renewable Energy

Popular renewable energy sources include solar photovoltaics (Solar PV) and solar thermal, steam generation from biomass and biogas from kitchen waste usage. Given that net metering is available, excess electricity can be exported to the grid. However, a more optimal solution is to use it for internal use known as the captive off-grid model that may require additional storage mechanism to obtain the optimum benefit.

Companies such as MAS Holdings, Brandix and Hirdaramani Group have already installed Solar PV within their facilities. Financing of such facilities is typically through self-financing, debt facility or a Power Purchase Agreement (PPA) with a Renewable Energy Service Company (RESCO), as outlined which the section on sustainable financing could provide a transformational model for apparels as well as to the country.

CASE STUDY: Brandix - Commitment to Renewable Energy

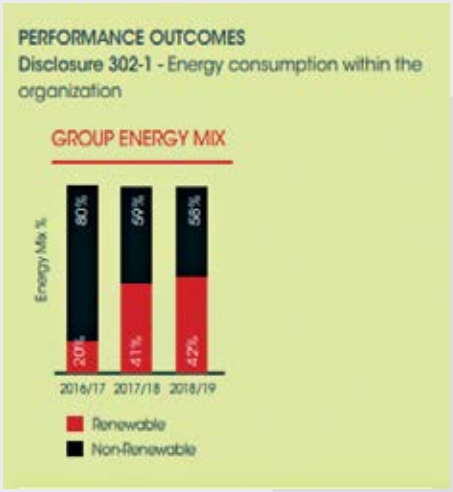
Environment

	2017/18	2018/19
Reduction in emissions intensity ($tCO_2(e)$/US$)	617	578
Renewable share of energy	40%	41%
Solar Energy (GJ)	5,690	11,515
Water Recycled (m^3)	236,691 (12%)	258,586 (21%)
Rainwater Harvested (m^3)	113,015 (6%)	69,223 (6%)
Waste Recycled	85%	80%
Waste diverted from Landfill	91%	91%

Brandix initiated their focus on sustainability in 2008 with the opening of the Green Factory in Seeduwa, which was the first apparel manufacturing facility in the world to be rated Platinum under the LEED Green Building rating system. More recently, the Group's Batticaloa factory was named the world's first Net Zero Carbon certified manufacturing facility. With a sustainability strategy that emphasizes on Air, Water and Earth, the renewable share of the energy consumption of Brandix has increased steadfastly to comprise a notable 41% as of 2019.

The Group consistently strives to improve its energy intensity parameters by migrating from non-renewable to renewable energy sources. The current group-wide commitment stands as achieving a Net Zero Energy building standard by 2023, using onsite generated renewable energy sources.

The Solar Energy Project of Brandix was launched in 2015, and as of March 2019, the total number of solar-powered facilities under the Group is 11, contributing 9 MW to the national grid. Furthermore, the Group continued their efforts in phasing out the use of furnace oil boilers and shifting to biomass boilers that supported to lower Brandix's non-renewable energy footprint and improve the efficiency of the steam generation process.



Source: Brandix Apparel Limited (2019a). Brandix Apparel Limited: Sustainability Report 2017 – 2019

3.2.5. Efficiency Benchmarking

Benchmarks for water use for the different subsegments such as knit processing, weaving and denim washing depend on the sample size and how the standard is calculated. Most only provide an arithmetical average, which is not very helpful. The PaCT Programme in Bangladesh did a statistical analysis of the data and developed the 75th percentile. The 75th percentile shows that 75% of the sample size overuse the utility.

Whereas 25% underuse or are more efficient. Therefore, the goal is to be below the 75th percentile. The size of the processing unit may also influence these figures. Smaller units will naturally have higher consumption figures. Typical benchmarks for water and energy use for wet dyeing and finishing plants that underwent a very detailed assessment is shown below in Table 8. The Table shows that the 75th percentile is much lower than the arithmetical average for before and after interventions. The reduction or savings can be calculated from the difference as a percentage. The summary results of 73 factories that implemented an in-depth CP in the PaCT programme in Bangladesh demonstrate significant benefits.

Table 8: Benchmarks for Water and Energy

	Dyeing and Finishing		Denim		Knit Composite		Washing	
WATER (m^3/tonne)	Before	After	Before	After	Before	After	Before	After
Average	152	124	94	83	200	170	124	106
75% percentile*	113	92	69	63	139	126	86	77

*75% of factories have consumption amounts above the benchmark and 25% have consumption amounts below the benchmark

	Dyeing and Finishing		Denim		Knit Composite		Washing	
Total Energy Consumption (MWh/tonne)	Before	After	Before	After	Before	After	Before	After
Average	19.81	17.59	22.11	18.94	19.28	18.22	10.10	8.97
75% percentile*	13.32	10.00	18.90	13.79	15.52	14.17	7.25	5.28

*75% of factories have consumption amounts above the benchmark and 25% have consumption amounts below the benchmark

	Dyeing and Finishing		Denim		Knit Composite		Washing	
GHG (Tonne/tonne of production)	Before	After	Before	After	Before	After	Before	After
Average	3.76	3.43	3.50	3.28	3.55	3.15	1.87	1.60
75% percentile*	2.13	1.72	3.46	2.29	2.59	2.39	1.26	1.04

*75% of factories have consumption amounts above the benchmark and 25% have consumption amounts below the benchmark

	Dyeing and Finishing		Denim		Knit Composite		Washing	
Wastewater (m^3/Tonne of production)	Before	After	Before	After	Before	After	Before	After
Average	115	93	61	52	149	109	85	73
75% percentile*	79	70	47	20	101	101	51	42

*75% of factories have consumption amounts above the benchmark and 25% have consumption amounts below the benchmark

Source: IFC, "Benchmarking Study for Resource Consumption in Wet Dyeing and Finishing Facilities", 2018.

CASE STUDY: Tarasima Apparel Bangladesh Invests in Water and Energy Efficiency Upgrades

Tarasima Apparel (TAL), part of the Bitopi Group, is a 100% woven fabric supplier that specializes in trousers to VF Corp, Benetton, H&M and Decathlon. They identified a series of energy conservation measures including:

- Replacing a steam dryer with a thermal oil heater: steam is a major utility accounting for 50-60% of energy use. TAL depended heavily on steam for washing, ironing, and drying. In order to reduce their dependency on steam dryers, TAL replaced 20 steam dryers with more efficient 12 thermal oil heaters which also led to a 72% reduction in water use (40,560,000 L/y), 54% saving in steam (21,840,000 kg/y) and 52% savings in natural gas consumption. The investment was paid back in eight months.
- Natural lighting system: TAL replaced 400 W electric lights with a natural lighting system (skylight) in their cutting, washing and finishing units with an annual saving of 104,000 kWh of electricity.
- 400 kg/d food waste biogas generation producing 59 m^3/d, waste incineration boiler, replacement of 5,000 T8 40W fluorescent tube lights to 15 W LED lights with an annual electricity saving of 75,900 kWh, and 125 kW solar PV investment.

Investment and return period

Area of Investment	Investment USD	Saving/year USD	Payback Period (Year)
125 KW Solar System	102,564	14,994	6.8
Incineration Boiler 2 Tonne/hr	123,000	26,628	4.6
Biogas Plant	35,000	1,495	23
Sky Light	95,474	22,681	4.2
Condensate Recovery System	32,000	3,500	9.1
Thermo-Oil Heater	374,000	576,000	0.65
LED Tube Lights	72,350	46,000	1.57
Servo Motor	35,000	53,933	0.65
BMS	87,200		

Source: Misami Apparels, Bangladesh

3.2.6. Voluntary Benchmarking

The advantage of an industry level self-evaluation is that individual companies can go through a set of questions and understand the potential improvements. This approach may have two stages. The first stage is to go through the items and report to a shared database that will confidentially compile scores. Secondly, the company reporting could compare their performance against others.

Once the individual performance against others is known or benchmarked, the same database can provide information on industry standards, best practices, contacts or support available to access technologies or finances.

The areas to monitor, report and find solutions could be diverse. Typical places to track are the energy, water, chemical use etc. (ex: energy used for wastewater treatment, lighting, air conditioning etc.).

The key is that the output may not have names, but the position of the company will be highlighted (Figure 37 on energy efficiency in lighting) for the given topic. The areas to be monitored could be agreed, and the system can be facilitated under the proposed coordination structure titled Innovative Business Integration and Coordination Centre (IBICC).

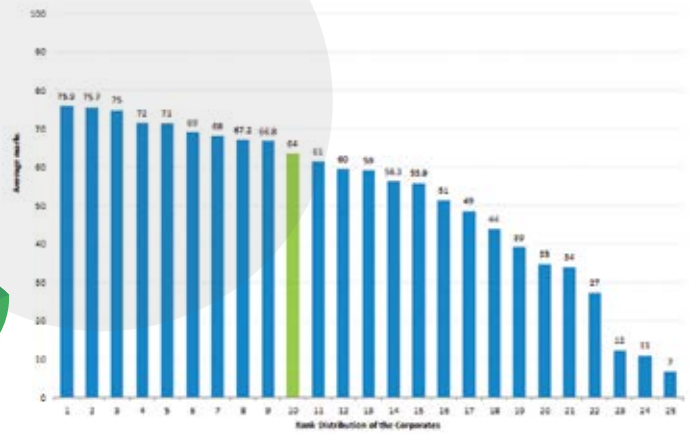


Figure 37: Relative performance of a given company (ex: energy efficiency in lighting)

3.3. Circular Economy and Waste Management

3.3.1. Circular Economy in the Apparel Value Chain

The Circular Economy (CE) in an industrial system is a restorative or regenerative approach or design that uses and reuses natural capital as efficiently as possible and finds value throughout a product's life cycle. It could comprise of concepts such as sustainable designs, zero-waste designs, product-life extensions, resource recovery, repair and remanufacturing services, etc. The CE framework is shaped by the 3R (reduce, reuse, recycle) principles, and the circular model requires the engagement of all market participants.[33]

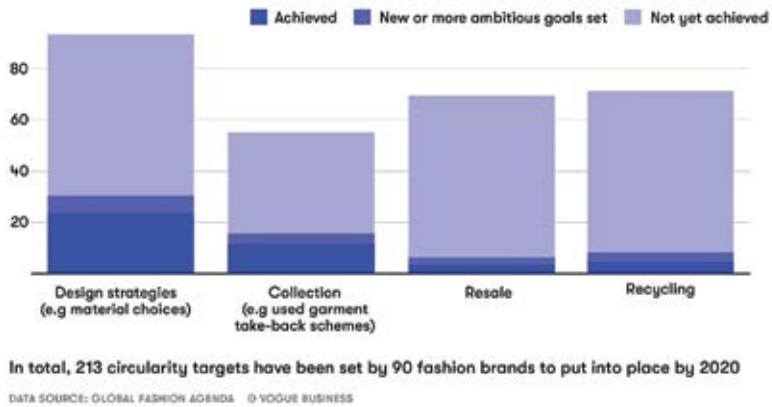


Figure 38: Status of targets set by companies in 2017 for 2020

[33] Koszewska, M., 2018. Circular Economy — Challenges for the Textile and Clothing Industry. Autex Research Journal, 18(4), pp.337-347.

With the strong workforce in Sri Lanka, the country could help, especially in the recycling stage of the targets by bringing the used clothes collected by brands and dismantling them creating an additional avenue of recycling beyond the recycling of the dress itself.

It involves the reverse of assembling by expanding into disassembling and spinning the material again as recycled. Currently, the benchmark is how fast one can produce a garment. We can also focus on how fast we can disassemble. This area could be further strengthened by local design and research teams and the use of cutting-edge techniques based on spectroscopy, automated separations, artificial intelligence and Internet of Things (IOT).

The overall purpose is to minimize the textile waste reverting back to the production cycle without being discarded in landfills.

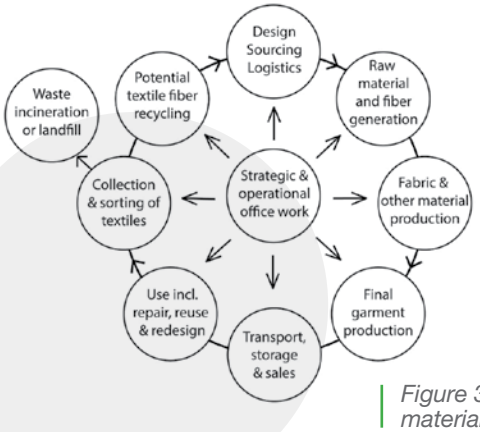


Figure 39: Minimizing textile material to incineration/landfill

Snapshot: C&A – Designing of Cradle to Cradle Gold Certified T-Shirts

C&A, a Belgian-German-Dutch chain of fast-fashion retail clothing stores, in 2017 collaborated with Fashion for Good, a global initiative, to introduce the world's first Gold level Cradle to Cradle (C2C) Certified fashion garments—a collection of two styles of ladies' T-shirts. Cotton Blossom and Pratibha Syntex, two garment-manufacturers based in India produced the garments.

C2C Certified is a third party verified certification scheme that is globally recognized as a measure of safer, more sustainable products made for the circular economy. The certification system is used by future-focused designers, brands, retailers and manufacturers across the value chain to innovate and optimize materials and products according to the world's most advanced science-based measures for material health, product circularity, renewable energy and climate, water and soil stewardship, and social fairness. [34]

The T-shirts by C&A achieved an overall C2C Gold level–the second highest, and the highest Platinum requirements for material health, renewable energy, and water stewardship. The Platinum Requirement for Material Health endorsement indicated that there were no substances of concern present in the T-shirts or used in the final stages of production, including in the dyeing process. The products, including labels and threads, were made from certified pure organic cotton—indicating that no synthetic pesticides or fertilizers were used during its growth. As such, if the T-shirts are to be recycled, there was no need to separate the different materials. The use of renewable energy and the reuse of water in the factories further reduced the overall environmental impact of production.

C&A worked together with Dystar, a dye manufacturer, to develop a colour palette of over 100 different shades from eight primary C2C Certified dyes, so that they would be in line with the C2C Certified material health standards. At the end of its life cycle, when recycling is not a viable option, the T-shirt can be composted in home-composting units and will decompose in less than 12 weeks.

Source: Ellen Macarthur Foundation (2017). A New Textiles Economy: Redesigning Fashion's Future

34 https://www.c2ccertified.org/about/about

3.3.2. Recycling Fibre and New Fibres

A new area for Sri Lanka could be in recycling fibre. Currently, Sri Lanka recycles PET from packaging to clothes. The niche could be further expanded to recycled fibres and the country can move in the direction of being defined as masters in this segment.

For example, H&M has recently initiated a programme to provide 15% off the bill value if consumers return old clothes. These used clothes are then housed in their warehouses while they are in the process of figuring out new methodologies to utilize the fibres. Sri Lanka could capitalize on this opportunity by enhancing the capacity to process recycled garments.

A significant component of the solid waste generated from the apparel industry is fabric off-cuts. Re-use of this material is possible through spinning as practiced in China.

The technology and innovation required for this shift can be found within Universities and through global and local industry partnerships. Several illustrative costs involved in decarbonizing waste management are as follows (Table 9).

Table 9: The Financial Needs in Solid Waste Management (Source: Gamini Gunasinghe, 2020)

Financial Input	Activity	Cost involved	Expected output
Investment on fibre separation machine	Separation of fibre from fabric waste and re-use	20 Mn	Reduce the cost of disposal as to greening the industry
Technology advancement in button manufacturing	Use of injection moulding machine	15 Mn	Save the resource and solve the problem of disposal
Process improvement in elastic manufacturing	Study the process and make necessary improvements	5 Mn	Save the raw material while eliminating the disposal cost
Technology advancement in padding manufacturing	Change the methodology of production	25 Mn	Save the raw material and the disposal cost

The research could expand to find ways to capitalize on the use of recycled cotton and other materials, not only on clothing but also in other high-value products ending with industrial and economic sectors such as in noise reductions, separations etc. as the last option.

There are unutilized or underutilized fibre types such as banana fibres and bamboo in Sri Lanka. While the banana fibre is a byproduct that is mostly left unutilized currently in the country, the bamboo can be expanded in Sri Lanka due to the favourable climate and the possibilities of using bamboo in stream bank restoration with scientific harvesting.

These fibres could be promoted as a standalone industry that can join the export market while supplying to the Sri Lankan apparel industry.

Snapshot:
Renewcell

Renewcell was founded by a group of scientists at KTH, the Royal Institute of Technology, in Stockholm in January 2012. The company opened their first plant in Kristinehamn, Sweden in 2017. They pioneered a method to decompose the cellulose in cotton and viscose. As such, Renewcell's recycling technology dissolves used cotton and other natural fibres into a new, biodegradable raw material, Circulose pulp. It can be then turned into textile fibre, be fed into the textile production cycle and also meets industry specifications. As such, they have managed to successfully close the loop.

The process at Renewcell is as follows:

1. Receive used garments with high cellulosic content (cotton and viscose).
2. The textiles are shredded, de-buttoned, de-zipped, de-coloured and turned into a slurry.
3. Contaminants and other non-cellulosic content are separated from the slurry.
4. The slurry is dried to produce a pure, natural Circulose branded pulp, which is packaged into bales and fed into the textile production cycle.
5. Using this process, the Kristinehamn plant produces thousands of tonnes of biodegradable Circulose pulp per year.

Source: Re:newcell, 2020

3.3.3. Future of Plastics to Textiles

Several leading brands in Sri Lanka are successfully engaged in creating apparels using recycled plastic material. While the initiatives are being recognized and valuable to minimize the plastics in the environment, eventually, the use of synthetic fibre in garments could be questioned due to the microplastic issue.

However, there are options to utilize synthetic material in the industry to ensure that the endpoint of the garment's lifecycle is environmentally friendly. For example:

a. Corporate gifts of Hirdaramani consist of recycled material. Leftover fabric is used to create artisanal shawls and others.

b. Clothing that is made from recycled fabric such as the partnership between MAS Intimates and Eco-Spindles or Coca Cola and Eco Spindles. PET recycling can be promoted as artisanal and high-end products can be produced with more creative inputs.

c. Hirdaramani worked with Eco Spindles to create a more sustainable jean, which has 11% of ocean plastic.

Therefore, the opportunity exists to enhance further research and development and to expand the "design centre" and "youth engagement" approaches in the apparel sector with appropriate sustainable financing to improve the plastics to textiles aspect.

3.3.4. Textile Manufacturing and Eco-Industrial Parks

Sri Lanka is dependent on fabric made outside of the country. Commercially, the country is losing from the EU GSP+ benefit as it is unable to meet the country of origin rule.

Most of the raw materials of the apparel industry are sourced from outside of Sri Lanka. The Covid-19 situation highlighted the need to be more independent and to find ways to source more materials from within the country. As such, there is a need to create textile mills. This will also lead to job creation.

The country imports fabric worth over US$ 2 billion annually.[35] The proposal to set up a textile development park through the BOI, to accommodate at least three manufacturing plants, in Eravur, Eastern Province is progressing.

"A community of manufacturing and service businesses located together on a common property. Member businesses seek enhanced environmental, economic, and social performance through collaboration in managing environmental and resource issues. **By working together, the community of businesses seeks a collective benefit that is greater than the sum of individual benefits each company would realize by only optimizing its individual performance."**

– UN Environment

This zone would be exclusively for textile manufacturing. An opportunity exists to develop the proposed textile zone as a green zone by planning it from the start with green practices, benefiting from global and local past experiences.

The setting up of the textile manufacturing zone will help the country to minimize the costs of fabric imports while meeting the country of origin requirement for preferential benefits such as GSP+. For example, in 2019, the country exported products to Europe worth €1,555 million, but only about 47% were eligible for GSP+.

The new facilities in the form of Eco-Industrial Parks including the one proposed in Eastern Sri Lanka as well as the upgrades to the existing BOI managed parks will benefit from a healthy Environment and Social Management Framework (ESMF) in line with what is being recommended by the UNDP, IUCN, and World Bank.

Key benefits of EIPs are:

- Better planning and siting of factories
- Reduced water use
- Reduced material flows
- Reduction in solid waste, reuse of water within the facility or export to neighbouring facilities
- Reduced energy use and use of waste heat
- Reduced environmental footprint
- Better access to finance
- The improved reputation of the EIP attracting sustainably focused companies
- Improved management of chemical and hazardous waste leading to greater worker safety

[35] Mr. Tuly Cooray. August 23, 2020 in Sunday Observer - http://www.sundayobserver.lk/2019/12/29/business/local-apparel-industry-keen-set-textile-manufacturing-plants

Sri Lanka could develop the proposed industrial zone in Eravur as an EIP rather than another industrial area. It could also consider converting the existing 12 EPZs to EIPs. This could be done with the assistance of UNIDO, World Bank, Global Environmental Facility and Public-Private Partnerships. BOI could develop the guidelines for the EIP and call for the private sector to operate and manage the EIPs as done in other countries like Vietnam (see case study).

Case Study: : Vietnam – a success story in EIPs

Starting with one industrial park in 1991, as of 2018, a total of 328 IZs, out of which 230 in operation, were located in 56 Vietnamese provinces. The economic value of IZs for Vietnam is substantial, with a total turnover exceeding USD 165 billion, increasing by around 15% year-on-year. The total export sales stood at close to USD 119 billion, comprising 55% of the full export figure for Vietnam. As of the end of 2017, the full employment in the industrial parks nationwide was 3.12 million.

UNIDO, Global Environmental Facility and Vietnam Ministry of Planning and Development collaborated in converting some of the parks into EIPs by working with 73 companies residing in the parks.

Results were: more than 730 resource-efficient and cleaner production opportunities were identified and of which 96% were implemented, including 18 industrial symbiosis opportunities and 2,360 employees were trained.

In the four provinces, the participating industries invested US$11 million and had an annual return of US$9.6 million.

The figure below shows these benefits.

Projected lifetime environmental benefits and targets at project endorsement

Pollutant or resource	Current and approved investments (per year)	Pipeline investments (per year)	Total projected to life of investments	Targets at project endorsement
CO2eq	32,361 t	128,300 t	2,901,681 t	1,273,000 t
COD reduction	75,118 kg		225,354 kg/y	76,900 kg/y
Water use reduction	2,705,333 m3		8,115,999 m3/y	6,000,000 m3/y
UPOPs	6,754 µg		20,262 µg/y	810 mg/y
Solid waste	5,750 t	82,440 t	669,774 t/y	

Investments on RECP opportunities by participating enterprises (2016-2018) USD

Province	RECP Investment	Annual Returns
Can Tho	3,257,281	5,403,967
Da Nang	3,213,404	1,959,610
Ninh Binh	4,599,875	2,284,524
Total	11,070,561	9,648,102

3.4. INNOVATION, INFORMATION AND COORDINATION

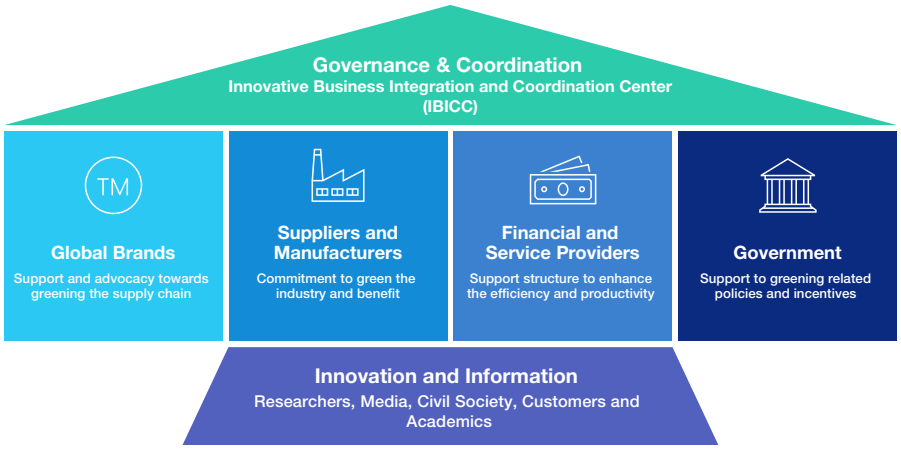


Figure 40: The proposed coordination mechanism and the pillars of support

Sustainable Financing needs for the apparel sector could be better identified and facilitated by enhanced multiple stakeholder participation, which also includes service providers, financiers, government environment regulators and customs etc., going beyond the brands and suppliers. Also, there could be considerable efficiency gains in decarbonization and reducing footprints while minimizing the time for policy and advocacy required for the future advancements especially in the post-Covid-19 era.

Presently, the primary coordination for the apparel sector is provided by JAAF. The role played by JAAF could be strengthened much by having an information-driven facilitation platform as a public-private-partnership, in a complementary manner. Aside from the above-noted stakeholders, it is essential to engage with stakeholders such as the Export Development Board (EDB), BOI, CEA, Central Bank, Sustainable Energy Authority, State Ministries and Line Ministries and other regulatory bodies, Universities and Training institutes required for the future needs; and other agencies with interest in supporting the growth of the apparel sector.

It is proposed to establish a national-level coordinating entity with international linkages in the line of an "Innovative Business Integration and Coordination Centre (IBICC)" where the governance will involve multiple stakeholders. One such example in the South Asian region is the PaCT programme in Bangladesh supported by the International Finance Corporation (IFC).[36] Over 15 major brands have participated in the programme, and the PaCT initiative is working towards the implementation of best practices in the textile sector, with a focus on reducing resource consumption and wastewater pollution.

It is essential that the proposed IBICC enlists the support of like-minded brands willing to contribute financially and in-kind to achieve resource conservation in the Sri Lankan apparel sector. There are over thousand brands internationally including brands such as Lululemon, Levi's, H&M, C&A, VF Corp, Gap and others who are keen to reduce their supply chain risks and to reduce their environmental footprint by working with suppliers proactively to meet their internal sustainability targets.

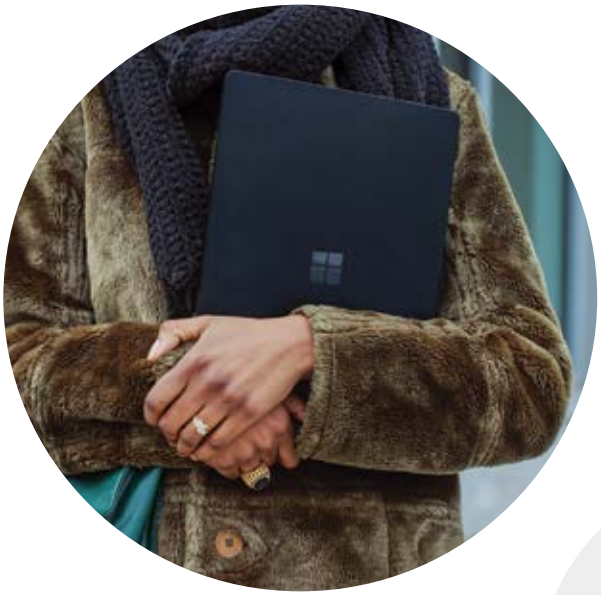
[36] Partnership for Cleaner Textiles – PaCT - https://www.textilepact.net/

The brands can also provide financial support to a well-structured programme coordinated by an entity such as the proposed IBICC mechanism. It must be noted that brands generally shy away from financing resource conservation projects directly.

Knowledge and creating awareness are key focus areas, especially for the apparel and the finance sectors. Setting up of a world-class knowledge centre where suppliers can access information on industry trends, cutting edge developments and world-class technologies through a supplier database and direct contact will be essential. Training on resource conservation approaches, lean management, case studies, best practice guidelines and bankable audits should be performed. As part of the efforts, resource conservation calculators can also be developed to showcase the opportunities available. With time, exhibitions, workshops and seminars could be organized to bring the suppliers together and to learn from each other. The knowledge centre or IBICC can also help to certify internal energy efficiency auditors and service providers to the industry, thus creating a pool of professionals within the industry.

The proposed initial Terms of Reference of the National Steering Committee and the IBICC includes, among others.

1. Act as the overall driving force and partner to JAAF to promote the decarbonization agenda in the apparel sector
2. Use a technical sub-committee structure to bring in services, technologies, design, research, advocacy, media, financial entities, and others together
3. Work as the facilitating body for data management, analysis and feedback, monitoring, technical assistance, training, global and local partnerships, and sustainable financing
4. Identify policy, institutional and operational gaps for the sector and provide/advice to promote corrective measures
5. Provide direction and leadership in resource mobilization efforts to support capacity building and research while ensuring that the industry capitalize on funding and other benefits through conventions and SDG related sources



3.4.1. Energy Technology Information

One of the significant challenges for the financing of resource conservation projects is that the financial sector does not have a database to compare the equipment being proposed to that of conventional equipment. EBRD (European Bank of Reconstruction and Development) set about addressing this problem by benchmarking the equipment in terms of GHG saved, the investment required, paybacks etc. in all of the countries they operate in. Each state has a dedicated website with relevant information. This approach has been an enormous success. JICA also developed a similar system in India for the Small Industries Development Bank of India.

3.4.2. Water Stewardship

In section 4.7.12 on financing tools “Impact Investments” promotes an “Alliance” approach for the Sri Lanka apparel sector in the form of a “Water Stewardship” in line with the global initiative to shift the industry from being “water users and polluters” to “responsible water stewards ” focusing on protecting and enhancing freshwater resources for all the stakeholders that use them, coordinated by the proposed IBICC.

3.4.3. Emerging Technologies and Practices

Towards Hydrogen

The world's first hydrogen-powered domestic boiler was put into operation in Rozenburg, the Netherlands in 2019, as a smart thermal solution by BDR Thermea Group.[37] This process produces heating and hot water solutions with virtually no CO_2 emissions by burning pure hydrogen that has been created by wind or solar energy, which will be a way to decarbonize heating in Sri Lanka where over 5,500 Megawatts of wind power are available in easily developable locations (with a total of 24,000 MW available around the country).

Sustainably produced hydrogen is an essential and exciting energy carrier for the future. Power to gas (hydrogen) is an unavoidable and necessary technology to store sustainably generated energy over a more extended period, as abundant wind and solar energy is not always immediately available at times when needs are the greatest. With a new hydrogen boiler, along with hydrogen fuel cell appliances, there would be a paradigm shift in renewable energy.

The operating principle of the hydrogen boiler is the same as that of a boiler running on natural gas. In the future, it may be possible to exchange conventional gas boilers for hydrogen boilers, that are supplied with hydrogen. In the United Kingdom, it is expected that over 400 hydrogen boilers will be installed over the next two years.

3.5. INTEGRATING SUSTAINABLE FINANCING OPTIONS

Barriers to financing are multiple and different in their nature and context. Larger brands are aware of the tools and approaches, but the SMEs lack awareness of the opportunities and access to innovation processes, partly due to the lack of experience and technical expertise. The capacity of financial institutions and perceptions on collateral led lending are additional challenges the banks face.

Most of the challenges require multi-sector and multi-stakeholder approaches to understand, create an enabling environment, apply innovative tools and to evaluate and influence policy measures. Better understanding helps to develop and implement investments and incentives to promote green financing covering the apparel value chain. Overall, the assets and infrastructure available to the apparel industry need a transformational shift along with the world trends in Environment Social and Governance (ESG) criteria.

ESGs are a set of standards for a company's operations that socially conscious investors use to screen potential investments. Environmental criteria consider how a company performs as a steward of nature. Social measures examine how it manages relationships with employees, suppliers, customers, and the communities where it operates. Governance deals with a company's leadership, executive pay, audits, internal controls, and shareholder rights, among other things.

Environmental criteria (E) covers corporates' energy use, waste, pollution, natural resource conservation, and treatment of animals etc. and the way the company is managing hazardous waste and toxic emissions while

[37] World's First Hydrogen-Powered Boiler Installed. (2020, January 6). Retrieved September 06, 2020, from https://www.contractormag.com/hydronics/article/ 21119787/worlds-first-hydrogenpowered-boiler-installed

complying with government environmental regulations. Social criteria (S) involves relationships related to management including the type and quality of interactions with suppliers, community/employee relations, employees' health and safety etc. In terms of Governance (G), investors or brands are interested in the extent of accurate and transparent accounting and management processes, demonstrated conflict management, quality and composition of the board and how the company interact with political entities while avoiding illegal practices. Adopting and maintaining ESGs require the apparel sector to work with the Government and SMEs more and adopt several resource conservation practices in the process.

3.5.1. Financing Resource Conservation

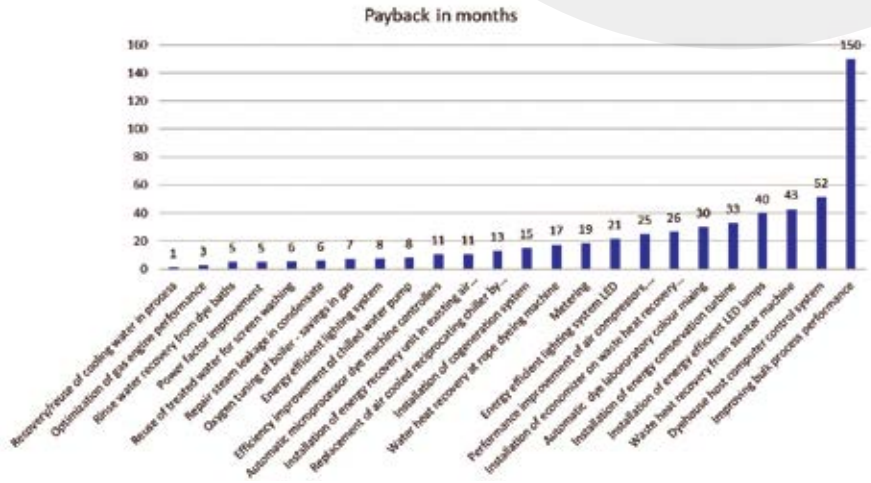


Figure 41: Savings potential in months (Source: Mohan Seneviratne)

Gains due to resource efficiencies are reflected in Financial, Operational and Environmental areas of the companies. For example, in terms of finances, higher efficiencies reduce operational costs, energy bills and improve cash-flow and profit margins in companies allowing easy loan repayments. Operationally, improved resource efficiency contributes to improved management facilities, equipment reliability and availability, enhanced productivity, and product quality, among others. Environmental gains include lower emissions and better waste management.

Global banks such as HSBC and development finance institutions such as IFC have well-developed supplier financing programmes available to value chains based on "factoring". For instance, IFC's Global Trade Supplier Finance programme has partnered with a handful of global multinational buyers such as LS&Co, Nike and Puma to offer solutions for suppliers to manage their working capital and reduce the payment delays from buyers by processing purchase orders within two days subject to specific criteria. However, these financing modalities do not consider resource conservation as a significant factor.

Only a handful of buyers have incorporated this offering as part of their package, but the finance is limited to a small number of countries and generally to larger suppliers. Some financial institutions such as IDLC in Bangladesh offer similar programmes taking resource efficiency as the main factor for financing.

Cost-effectiveness of the interventions is typically expressed as payback. Lower the payback, quicker the return. Figure 41 shows the most cost-effective interventions in months. It must be noted that the list is no means exhaustive and there may be other measures as well. One can see that many of the opportunities are below a 24-month (2-year payback) period and very feasible.

3.5.2. Resource Efficiency Financing

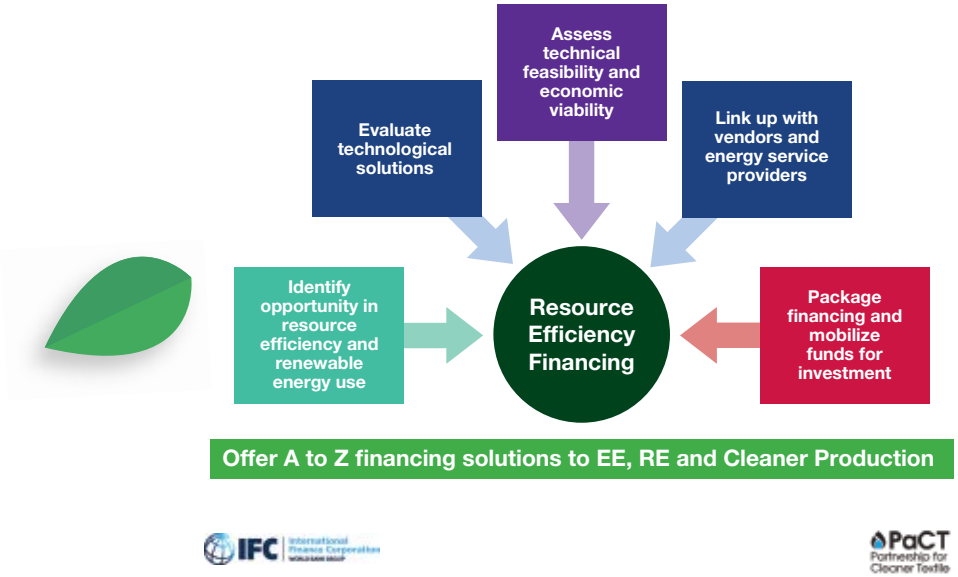


Figure 42: Resource Efficiency Financing

Resource efficiency financing is an evolving area that the apparel industry is well-positioned to capitalize. The process could be comprehensive and include identification of opportunities, matching technical solutions, support to feasibilities and pre-feasibilities, strengthening and networking of service providers and integration of benefits (financial, operational and environment) to justify the investments.

There are multiple approaches to suit different situations where information, training and the enabling environment related to policy advocacy could play a key role in promoting financial solutions. Some solutions could be low risk involving well-proven equipment/ technologies and strengthening company or country capacity to carry out "International Performance Monitoring and Verifications (IPMVPs)" to monitor performance. Some interventions could be long-term such as the use of energy-efficient equipment and technologies.

REF APPROACH **BENEFITS BOTH THE CLIENT AND FINANCIAL INSTITUTE** IN THE LONG-TERM. THE CLIENT WILL HAVE **EASIER ACCESS** TO FUNDS AND **LOWER COST** OF FUNDS, AND THE PERFORMANCE OF THE BUSINESS WILL IMPROVE WHILE **ENHANCING THE REPUTATION**

The capacities of financial institutions/ banks play a key role in promoting Resource Efficiency Financing (REF) requiring capacity building of bank staff etc. to identify and engage clients, propose appropriate REF tools and closely monitor, advise and support the implementation as a partner in progress.

REF approach benefits both the client and financial institute in the long-term. The client will have easier access to funds and lower cost of funds, and the performance of the business will improve while enhancing the reputation that in turn will help to be competitive in the market.

On the other hand, the REF will benefit the financial institutions financially while enhancing the technical knowledge of staff and the intelligence of the bank on businesses, improve the reputation and value as a development partner ensuring sustainability (sustainability awards) and expand the portfolio of the bank for green companies—paving the way for possibly a new area in bank expansions and investments.

As reported by IFC,[38] the lessons learned from RFC projects include mixed experiences. For example, the most energy intensive industries are content with the status quo of their core business and do not care about power; strong commitment from project owner and senior management is essential; return on a sustainable energy project is most often higher than the recovery from the core business and avoided energy cost is sufficient to pay the sustainable energy investment (loan).

Further, a guarantee from an experienced energy service provider is critical to obtain financing against guaranteed saving schemes while a strong technology supplier is a must to procure high-quality energy-saving products at an affordable price. Similarly, for wastewater management, potential financial approaches can be configured, combining the strengths and objectives of multiple partners.

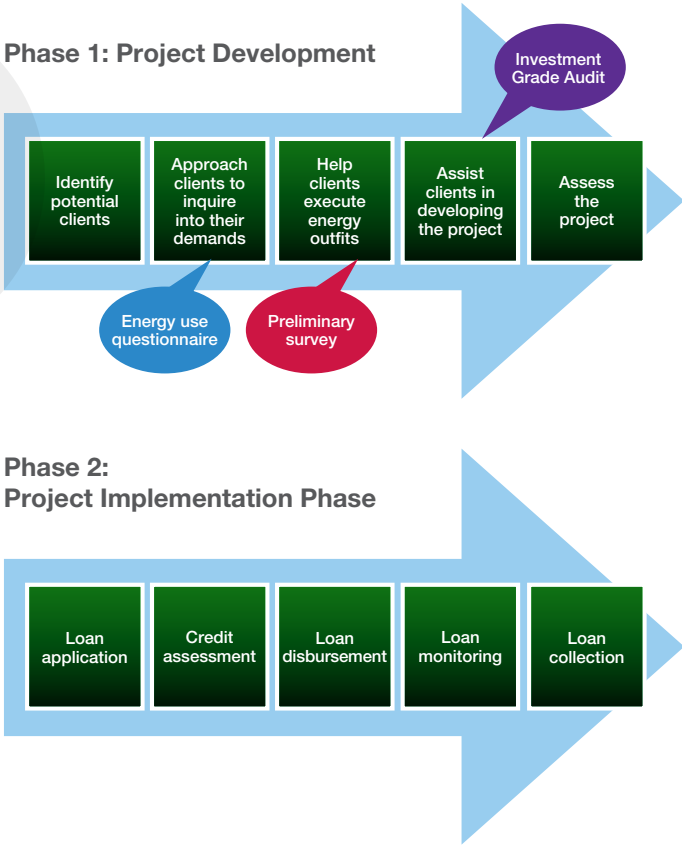


Figure 43: Typical successful approach on a REF energy project (Source: PaCT)

[38] Brahmanand Mohanty. 201. Workshop on Reducing Water and Recovering Heat - https://www.textilepact.net/pdf/publications/reports-and-award/presentation-on-resource-efficiency-financing-opportunities-in-the-textile-sector.pdf

CASE STUDY: Ready-Made Garment (RMG)

RMG is an export-oriented company that focuses on the production of textile and garment, dyeing and processing of fabrics. The company sought to improve its energy efficiency in the factory with the support of the PaCT programme. As a result, an in-depth cleaner production assessment was carried out, highlighting high water consumption and potential resources and energy-saving potential in the dye house. The following measures were identified to improve the facility through an investment-grade energy audit with the support of USAID.

Online efficiency monitoring system for boilers with oxygen trim

- Insulating steam valves/flanges/fittings
- Replacing vacuum tables with start-stop tables
- Replacing T8 tubes with LED tubes
- Installing steam traps and utility flow metre monitoring system

The Bank identified four types of credit facilities to meet RMG's requirements

- A foreign currency term loan
- BDT commercial term loan
- BDT term loan under the Bangladesh Bank green banking refinancing scheme
- USAID energy grant

The loan offered to RMG included

- Simplified loan application process and management approval within a week
- Structured blended model of financing that facilitated finance at attractive terms
- Loan repayment secured only using personal and corporate guarantees, no need for any collateral

The total investment of the measures was US$ 139,350, where the bank financed US$ 126,580. The estimated simple payback period is around four years while the loan tenure is five years. The expected annual benefits include.

Source: Mohanty, B. (n.d.). Resource Efficiency Financing Opportunities in The Textile Sector Workshop on Reducing Water and Recovering Heat

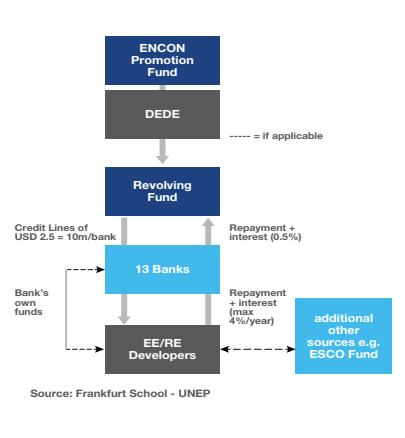
3.5.3. Revolving Funds and Credit Facilities

Governments have resorted to developing revolving funds. It is possible to create a revolving fund to finance resource efficiency and renewable energy projects. In Sri Lanka, a government entity such as the Sustainable Energy Authority has the mandate to facilitate such models. Based on experts,[39] the setting up of a revolving fund with a bank's guarantee to finance energy/water efficiency projects would require a government investment of about US$ 150-200 million, as a starting point. Such schemes could be complemented by credit facilities. For example, the Japan International Cooperation Agency (JICA) supported Sri Lanka to improve industrial technologies by offering credit under the title "e-friends." Through the National Development Bank, "e-friends" facility supported resource efficiency and cleaner production.

Continuation of the e-friends model is available as e-friends II that can be strengthened further to cover the apparel sector. For example, presently LOLC [40] extends credit under two schemes; namely, the General Loan Scheme with a maximum loan amount of LKR 30 million with an interest rate of 6.5% and a repayment period of 10 years, including a grace period of two years, and a technical assistance programme named Technical Transfer Assistance Loan Scheme to obtain consultancy services for investigating environmental problems consisting of a maximum loan amount of LKR 1.0 million with a 2% interest and a repayment period of five years including a grace period of two years. These schemes need promotion and facilitation to be expanded to the SME sector where most of the needs exist.

CASE STUDY: The Energy Efficiency Revolving Fund (EERF), Thailand

EERF was launched in 2003 to stimulate investments in large-scale industrial projects by increasing the availability of debt financing for EE and RE projects while minimizing the borrowing costs to project developers. The fund loans to local banks at 0% interest rate and with 7-year final maturity. In return, banks lend to EE projects' owners/developers and ESCOs at a maximum interest rate of 4%. For instance, during 2002-2008, the total investment was around US$ 500 million, of which US$ 150 million was from the government's revolving fund; and Energy Savings of US$ 120 mn per year.



Source: WRI (N.D.). Apparel and Footwear Sector Science-Based Targets Guidance

[39] Mohan Seneviratne. IFC expert on wastewater treatments in apparel industry. 2020. Personal Communication
[40] Lanka Orient Leasing Company (LOLC) Finance – E-friends II scheme - https://www.lolcfinance.com/loans-and-leasing/efriends/

3.5.4. Financing of Green Buildings

In terms of benchmarks for electricity usage, the National Cleaner Production Center (NCPC) has carried out 15 assessments. The average standard is 1.25 kWh/kg.[41] The Sustainable Energy Development Authority (SEDA) has also produced a benchmark of 1.31 kWh/clock hour. Another commonly used benchmark is kWh/1000 pieces. Table 10 shows the electricity usage in the garment sector in Sri Lanka compared to India and Bangladesh. While the data is somewhat dated, it gives a guideline.

Table 10: Electricity Usage Benchmarks kWh/1,000 Pieces (Source: TertaPak, Green Garments Guidebook, 2006)

Country	Average Electricity Usage	Benchmark
India	388	310
Bangladesh	453	362
Sri Lanka	362	336

IFC has identified that the market potential for Green Buildings is forecast to be US$ 24.7 trillion by 2030.[42] The Green building trend is getting traction in the industry. The US green building certification system, LEED (Leadership in Energy and Environmental Design) is the market leader, and new buildings are designed to achieve a gold or platinum standard. Examples are MAS Intimates Thulhiriya and Brandix Eco Centre Seeduwa factories. Innovative features include Solar PV, hydroelectricity, earth compressed bricks, heat blocking paving to minimize air-conditioning, rainwater harvesting, LED lighting controls and extensive gardens. Brandix claims to have reduced its carbon footprint by 77%.[43]

Figure 44: Brandix Eco Center, Seeduwa (Source: Brandix)

IFC has a similar product to LEED known as EDGE. The EDGE system requires that a building achieves a minimum projected reduction of 20% in energy and water use, and embodies energy in materials as benchmarked against a standard building.

[41] National Cleaner Production Center, "Water, Energy and Chemicals Usage", 2020
[42] International Finance Corporation, "Green Buildings a Finance and Policy Blueprint for Emerging Markets", 2019
[43] Anukshi Jayasinghe, "Five of Sri Lanka's Best Green Buildings", Roar Media, 26 November 2016.

The proposed business coordination system could partner with LEED and IFC to market their respective certification systems to a far greater audience than what is currently available. Factories or developers undertaking LEED/EDGE certifications could get reduced interest rates known as 'green mortgages' from the financial sector given the reduced climate risk of the buildings.

Tools such as the EDGE calculator (Figure 45) is a starting point. In this context, the Sri Lanka Green Building Council (GBCSL) comprised of architects, engineers, structural engineers, town planners, quantity surveyors, university academics, construction industry leaders, environmentalists and business leaders may play a key role. The aim of GBCSL is to transform the Sri Lankan construction industry with green building practices and to fully adopt sustainability as depending on how our environment thrives, the economy prospers, and society grows to ensure the future wellbeing of our motherland.

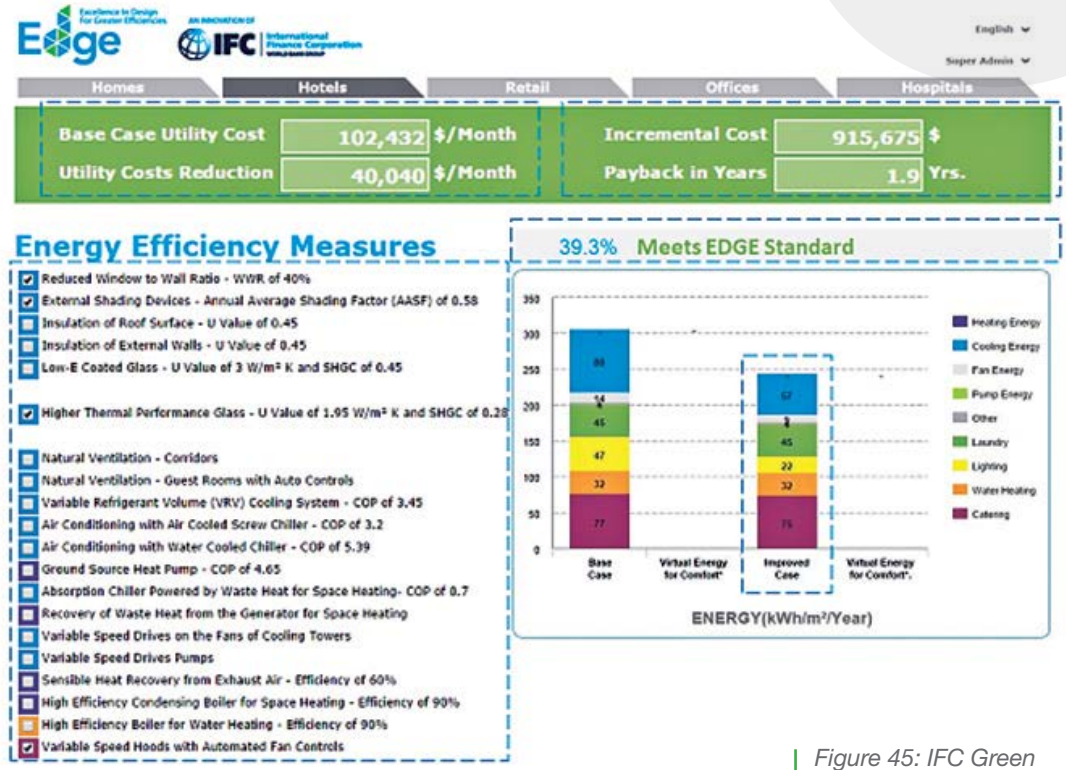


Figure 45: IFC Green Building Calculator

When choosing LEED/EDGE certification, banks have a verification instrument on hand for their green real estate investments, with access to projections on carbon emissions at the asset and portfolio levels. Projections are vital for comparing certified to non-certified assets and evaluating the risk exposure of poorer-performing buildings to make more strategic decisions in the future. The idea is to develop stronger real estate investment portfolios that are resilient to financial, regulatory, and reputational risks associated with the transition to low-carbon economies.

3.5.5. Renewable Energy Integration and Empowering RESCOs

Power Purchasing Agreements (PPAs) involve developer investing in capital costs (CAPEX) for Solar PV systems located at the client's site or for the benefit of the client. Client (national utility or a corporate) or the end-user pays the developer an agreed price for the energy provided. These contracts are valid for about 10-25 years. In Sri Lanka, rooftop solar systems are increasingly popular with the Government initially pledging to buy the power through "net metering" systems, allowing any entity to use and sell power to the grid.

For instance, in India, there are Renewable Energy Service Companies (RESCOs) such as Clean Max Solar with 470 completed projects and contracts with many global companies such as Nestle, Diageo, Tata and Mahindra Group. If the consumption is higher than self-generated, then the end-user can purchase from the grid.

However, the enabling environment in Sri Lanka can be improved as the Government utility provider, the Ceylon Electricity Board (CEB), is indicating difficulties in accommodating day-time solar energy to the national grid. There could be technical reasons that are not demonstrated. With solar energy costs on the decline due to new technologies on panels, etc., promotion of solar energy and the enabling environment would be beneficial to industries as well as for RESCOs. Large scale RESCOs are also to be promoted with incentives in Sri Lanka where they could even run decentralized grids with adequate local storage.

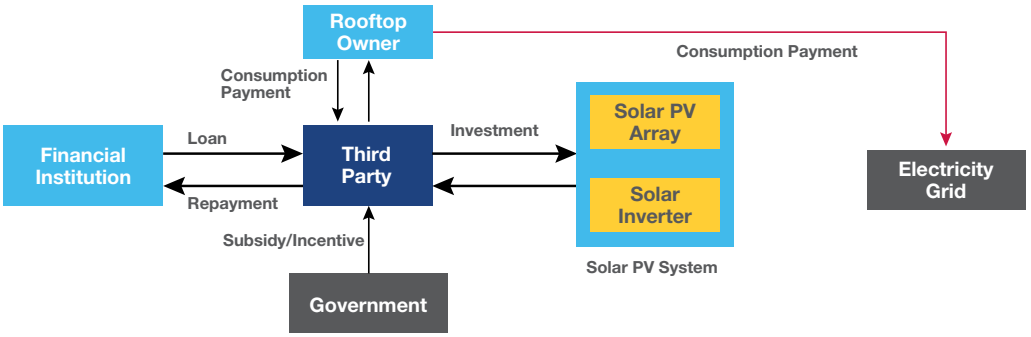


Figure 46: PPA Structure for solar PV

The PPAs could extend beyond Solar PV. For example, wind power is widely available along with several wind power connected models such as "Hydrogen." The Sri Lanka Wind Map[44] has identified over 5,000 MW of easily developable wind power that can be developed as a resource towards energy security through a large scale PPA. Benefits of a PPA are:

- PPA price is guaranteed for 10-25 years shielding the end-users from grid tariff increases.
- Lower price than grid tariffs, thus increasing profits of end-user, especially with solar and wind as the price of production is on the decline.
- Multi-lateral financial institutions and private equity can finance the ESCOs. IFC invested Clean Max Solar through a US$ 15 million equity investment.
- The RESCO owns the Solar PV system, operates, and maintains it, thus freeing The end-user from the issues and hassles of procurement, installation, operation and maintenance of the unit.

[44] USAID, 2003. Wind and solar resources in Sri Lanka - https://www.dropbox.com/s/ro07kvyi3i3wr14/Wind%20and%20Solar%20Study%20USAID%202003.pdf?dl=0

- Reduce the risk of grid outage to the end-user if the decentralized storage is adequate

The risks are:

- Long-term contracts
- Financial viability of the end-user is a risk to the RESCO
- Government regulations
- Subsidies are required to defray the initial cost to the RESCO

3.5.6. Innovative Instruments Guarantees

Some multinational brands like VF Corp have provided guarantees to finance safety equipment upgrades of suppliers in Bangladesh. A similar approach can be used, in Sri Lanka too, where the brands will provide the guarantees for upgrading resource efficiency equipment or renewable energy. The negative is that most brands are not keen on taking liabilities on their balance sheets, thereby, limiting the use.

Fluctuating cash flows in small to medium enterprises require loan guarantees from donors/multilateral development banks to commercial banks. It has been the accepted practice in the past. Loan guarantees by a multilateral development bank certifying a loan made by a commercial bank for resource conservation would satisfy commercial banks.

Select Purpose Vehicles (SPVs) is most appropriate for financing a project such as a wastewater recycling project, which requires a high CAPEX. The SPV is formed by the participation of four or more parties, and their roles are described in Figure 48 below covering a wastewater recycling envisaged in a Board of Investment (BOI) zone. The wastewater treatment plant accepts partially treated or pre-treated wastewater, treats it to remove contaminants and then supplies the wastewater back to the end-users. The end-users will benefit from the reduced price compared to urban water supplies. The project related Water Treatment Company (WTC) assumes all responsibility of treating the wastewater according to agreed parameters. It is essential for the strategic technology partner to have equity in the project so that the interests of all stakeholders are aligned.

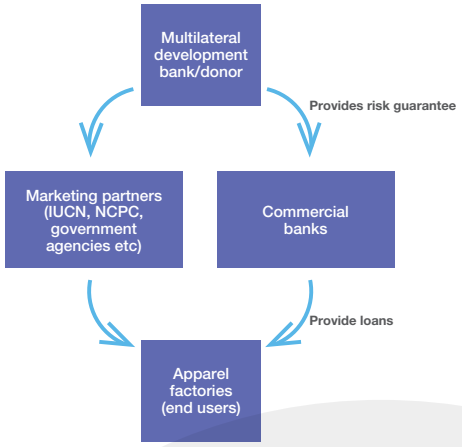


Figure 47: Loan guarantees to mitigate risk

SELECT PURPOSE VEHICLES (SPVS) IS MOST APPROPRIATE FOR **FINANCING A PROJECT** SUCH AS A **WASTEWATER RECYCLING** PROJECT, WHICH REQUIRES A HIGH CAPEX. THE SPV IS FORMED BY THE **PARTICIPATION OF FOUR OR MORE PARTIES**

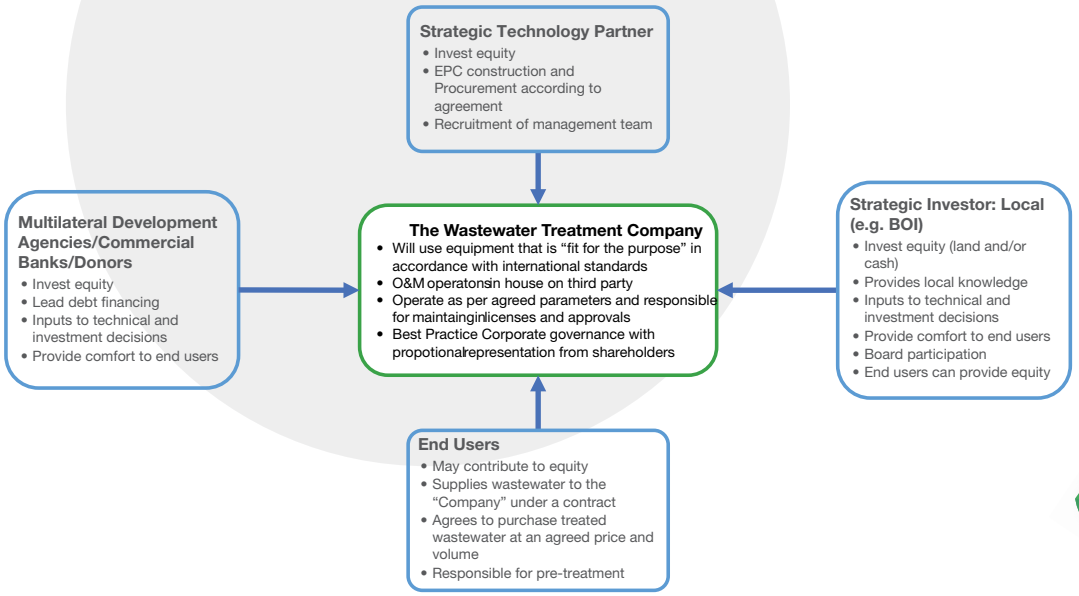


Figure 48: SPV stakeholders and roles

3.5.7. Sustainable Supply Chain Financing

Sustainable supply chain finance involves finance practices and techniques that support trade transactions, in a manner that minimizes negative impacts and creates environmental, social, and economic benefits for all stakeholders involved in bringing products and services to markets. Suppliers are provided with access to working capital, stronger relationships with their customers, and the ability to quantify the value of their sustainability efforts. Suppliers should invest in their labour, human rights, environmental, and governance performance to gain access to working capital solutions and financial incentives.

Sustainable supply chain provides an additional benefit of rewarding, incentivizing, and funding sustainable behaviours in the supply chain, with a reasonable direct cost to the buying company, if any. This type of financing reinforces a company's commitment to sustainability, strengthens the sustainability expectations for suppliers, and can contribute to a company becoming a buyer of choice and improving the security of supply. It also puts a value on the sustainability efforts of suppliers, providing them with an internal business case for more sustainable improvements.

Supply chain finance closes this financing gap and provides the suppliers with financing, also called working capital, before the buyer's payment is due. Although there are various forms to structure such funding, they usually involve two to four parties:

1. **The Supplier** can reach out directly to financial service providers and take up short-term financing, typically in the form of selling its invoices. Alternatively, the buyer has arranged a supplier-financing programme that the supplier can access, drawing on pre-defined financial service providers.
2. **The Buyer** provides the payment at the due date. Depending on the structure of the programme, the cost will be made either directly to the financial service provider to reimburse the financing taken up by the supplier or is made to the supplier, who in turn pays for the funding obtained by the financial service provider.
3. **The Financial Service Provider,** usually a bank, factoring house, or investment fund, makes available "bridge financing" to the supplier either upon the supplier's direct request or via the buyer's SCF programme, taking a small fee, and utilizing the buyers' credit rating.

4. **The Technology Platform** is an IT system that brings together the supplier, the buyer, and the financial service provider. The platforms can be developed by the finance provider or provided by a third party. They replace paper-based processes formerly and increase the efficiency of transactions.

Sustainable supply chain finance takes regular supply chain finance and integrates ESG considerations, using consistent methodology and data to rank supplier sustainability performance, either by the buyer or a third party. The sustainability performance information must be consistent and robust for a financial service provider to factor it into its calculations.

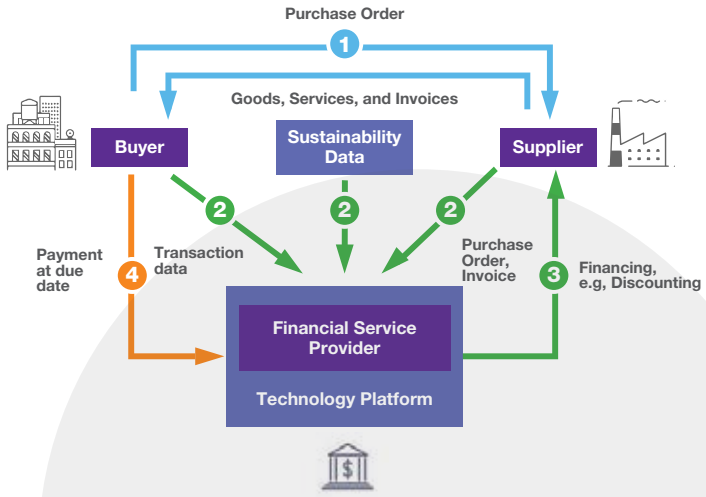


Figure 49: Integrating Sustainability into Supply Chain Finance

As part of an overall trend of integrating ESG factors into their investment decisions and product offerings, financial service providers are developing and piloting innovative solutions to offer sustainable supply chain finance products to their clients and investors. For example, Barclays launched its Green Product Framework to create a suite of "Green Products" across different product lines such as bonds and loans. The framework was developed in collaboration with Sustainalytics and identified qualifying environmental themes and activities. Another example is a programme designed by Deutsche Bank and the Asian Development Bank to provide more than US$ 200 million per year in supply chain finance to suppliers of Emirati retailer Landmark Group. The programme is designed to benefit SME suppliers mainly located in Bangladesh, China, India, Sri Lanka, and Vietnam.

Benefits to buyers include good sustainability performance in line with companies' sustainability goals and attracting suitable suppliers. On the other hand, the suppliers get benefitted by actual cash for better sustainability performance through improvements and demonstrate improved footprints on energy, water, chemicals etc. and different ESG norms.

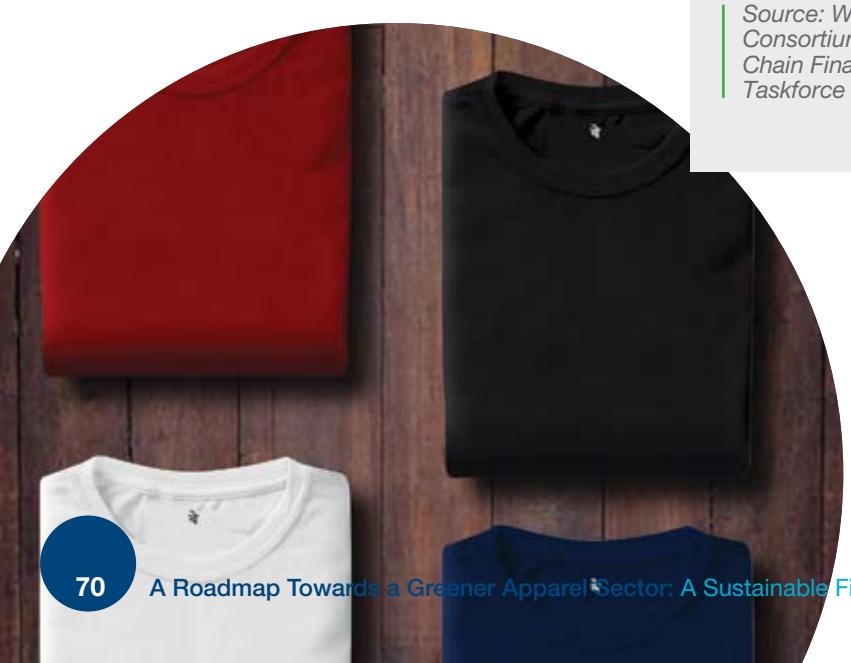
Key barriers to scale

Apart from a few early movers such as PUMA or LS&Co (see also the case study - in page 78), the uptake of sustainable payables finance has been modest so far. Some of the primary barriers for buyers contributing to this situation include:

- **Limited awareness among buyers that sustainable SCF solutions exist. Also, setting up a sustainable SCF scheme requires alignment across a diverse set of internal stakeholders at buyer companies.** The often-complex structure of large international companies—the buyers—can make it challenging for departments such as supply chain, procurement, accounts payable, treasury, sustainability, and logistics to create shared goals. This can result in long decision-making processes before sustainability is finally incorporated into (existing) SCF programmes.
- **Selecting the metric against which suppliers' sustainability performance is measured.** In this case, the wealth of audits and (self-)assessment schemes is a substantial challenge. There is a lack of consistency and comparability of supplier assessment data. For instance, the apparel industry has adopted numerous standards, certificates, assessments, and audit approaches.

However, this gets even more complicated for buyers purchasing from several industries, e.g., retail companies; they might need to select a metric for each specific supplier group.

- **In many cases, larger suppliers have access to these programmes, while there is less appetite to onboard suppliers with smaller receivables.** This is due to the cost of onboarding suppliers and performing the necessary KYC and compliance checks. One bank said the general rule of thumb is that costs outweigh benefits for suppliers that have less than US$ 350,000 in receivables, depending on the duration and the composition of the account receivable. However, some programmes do target all suppliers, including the smaller ones.
- **Criticism that conventional SCF is the buyers' attempt to "sweeten the pill."** The trend toward longer payment terms has been apparent for at least a decade now. To avoid such criticism for sustainable SCF, buyers should refrain from changing payment terms once suppliers are onboarded.
- **A risk that smaller suppliers who are invited to participate in (sustainable) SCF perceive their onboarding to the system and contractual terms as being "locked in."** Especially with large international buyers, small suppliers might fear that they will not be able to expand to other markets or grow their supplier base, as a significant share of their future financing comes from the buyers' agent, i.e., a buyer-designated financial service provider.



Case Study: Walmart's Supply Chain Financing Programme

In 2019, Walmart together with HSBC developed and launched a sustainable supply-chain financing programme that provides preferential credit rates to Walmart's suppliers based on their performance against Walmart's Sustainability Index programme and Project Gigaton. In this unique programme financing rates are pegged to suppliers' environmental and social ratings where suppliers that improve their sustainability credentials will have access to improved financing from HSBC. The two programmes at Walmart are:

1. Sustainability Index: In 2009, Walmart partnered with the Sustainability Consortium (TSC) and launched the Sustainability Index. It gathers data and information across the life cycle of Walmart's products, identifies key social and environmental hot spots, and provides an agenda for improvement. Each supplier is scored, ranked against others, and presented with improvement opportunities. By 2017, 70% of Walmart's goods were provided by suppliers who participated in the Index, covering 300 buyers in over 125 categories and representing 3,000 unique products.
2. Project Gigaton: Project Gigaton was launched in 2017, as an initiative to avoid one billion tonnes of greenhouse gas (GHG) emissions by 2030. Over 1,000 suppliers have joined the project, conserving 93 million tonnes of emissions.

Source: Walmart, The Sustainability Consortium, HSBC (n.d.). Walmart's Supply Chain Financing Programme. Blended Finance Taskforce

Case Study: PUMA, BNP Paribas, IFC Supply Chain Finance Programme

The drive for a sustainable SCF programme came from PUMA's Environmental Profit and Loss Account, and the finding that 94% of its environmental impact happens in its supply chain, beyond the company's operations.

The limited leverage on its suppliers through traditional supplier engagement led PUMA to investigate SCF as a new tool to drive sustainability.

PUMA, BNP Paribas, and the IFC launched their SCF programme in 2016, providing tiered pricing of short-term financing based on PUMA's credit standing—offering lower financing costs for suppliers that achieve a high sustainability score according to the company's internal rating system. During the first year, PUMA provided more than US$ 100 million in the financing, covering 15% of its supplier base.

Support from two financial institutions for specific market segments

The two banks involved both provide financing, but for different target groups. BNP Paribas finances suppliers in developed markets, mainly Europe, and the IFC provides funding for PUMA's business partners in developing countries, i.e., apparel sourcing hubs including Bangladesh, Vietnam, and Pakistan. This complementary geographic spread makes it possible to offer SCF to a larger segment of PUMA's suppliers.

Connecting the Parties: the IT Platform

The SCF programme makes use of the GT Nexus supply chain management platform, a system to arrange transactions and provide suppliers with easy access to finance from BNP Paribas and IFC. With both banks using the same venue, it became easy for suppliers to obtain financing: their financing is just one click away, regardless of which of the two banks they are receiving funding.

Foundations of success: Reliable Performance Data and Assessment Approach

While the apparel and footwear sector is known for its abundance of audit approaches and assessment data, the coverage, quality, and consistency of PUMA's supplier data was a critical success factor. IFC and BNP Paribas' ability to offer financing terms that reflect suppliers' sustainability performance depends primarily on the sustainability data available.

Another contributing factor to the success of the PUMA programme is the fact that the company has a lean supplier base. IFC and BNP Paribas still perform KYC checks for all suppliers that apply for financing.

Sources: The Economist Intelligence Unit, 2017; BNP Paribas, 2016; BNP Paribas, 2017; PUMA, 2016; and SCF Briefing, 2017

3.5.8. Sustainability Trade Loans

Sustainable trade loans support the financing of sustainable goods, services, or activities. A supplier can obtain a sustainable trade loan for the working capital requirement of the eligible good or service, in line with the bank's requirements. Also, banks can provide preferential rates to the suppliers for sustainable trade loans.

For example, the IFC has a list of eligible goods under its Global Trade Finance Programme, Climate Smart Trade. Barclays developed its Green Product Framework in collaboration with Sustainalytics to identify qualifying environmental themes and activities. Eligible goods can range from renewable energy and energy-efficient goods to certified crops (e.g. Rainforest Alliance, Fairtrade, etc.). In addition to identifying sustainable goods, the bank can also ask suppliers to set improvement targets to increase their share of sustainable goods such as certified crops year-on-year.

Benefits to the supplier include more opportunity to fund ESG improvements, improve the brand reputation of the supplier and to attract better buyers. Also, the supplier may receive better rates from the bank, possibly through the bank's sustainable programmes. Buyers, on the other hand, will benefit from the trade loans associated traceability elements such as Rainforest certified crop or products.

Snapshot: Green Trade Loans by Barclays Corporate Banking

Barclays launched a Green Trade Loan, which is a dedicated 'green trade' working capital product, in the year 2018 in the UK to help companies secure working capital for activities such as renewable energy, energy efficiency and waste management projects. Barclays' Green Product Framework, developed in 2017, with specialist research firm Sustainalytics, defines whether a financing proposal qualifies for green funding. Under the scheme, the bank provides facilities of minimum £250,000 to eligible green initiatives. Other activities supported by the loan scheme includes eco-friendly transport, sustainable food, agriculture and forestry.

Source: www.barclayscorporate.com, n.d.

3.5.9. Sustainability Linked Loans

Sustainability linked loans are developed to facilitate and support environmentally and socially sustainable economic activity and growth. Based on "The Sustainability Linked Loan Principles (SLLP)", the objective is to promote the development and preserve the integrity of the sustainability linked loan product by providing guidelines which capture the fundamental characteristics of these loans. The sustainability linked loans enable lenders to incentivize the sustainability performance of the borrower. The SLLP are intended for broad use by the market, providing a framework within which the flexibility of the loan product can be maintained, and will be reviewed on a regular basis.

Sustainability linked loans are any types of loan instruments and/or contingent facilities (such as bonding lines, guarantee lines or letters of credit) which incentivize the borrower's achievement of ambitious, predetermined sustainability performance objectives. The borrower's sustainability performance is measured using sustainability performance targets (SPTs), which include key performance indicators, external ratings and/or equivalent metrics and which measure improvements in the borrower's sustainability profile. Sustainability Linked Loan Principles – Core Components The SLLP set out a framework, enabling all market participants to clearly understand the characteristics of a sustainability linked loan, based around the following four core components:

1. Relationship to Borrower's Overall Corporate Social Responsibility (CSR) Strategy
2. Target Setting – Measuring the Sustainability of the Borrower
3. Reporting
4. Review[45]

Advantages of a Sustainability Linked Loan includes

- Linking the interest rate of the bank loan (cost of capital), to meet pre-agreed sustainability performance targets
- Assessing borrower's sustainability performance against key ESG measures.
- Offer your clients the flexibility to use the funds for any aspect of their business.
- Get a visible indicator of borrower's sustainability commitment using an ESG Rating.[46]

[45] Loan Market Association, Asia Pacific Loan Market Association, Loan Syndications & Trading Association (2020). Sustainability Linked Loan Principles (SLLP). [online] LSTA. Available at: https://www.lsta.org/content/sustainability-linked-loan-principles-sllp/.

[46] Sustainalytics (n.d.). Sustainable Lending - Sustainability Linked Loan and ESG Rating. [online] Sustainable Finance Solutions. Available at: https://www.sustainalytics.com/sustainable-finance/sustainable-lending-sustainability-linked-loan-and-esg-rating/.

3.5.10. Smart Contracts

A smart contract is a self-executing agreement between a buyer and seller, directly written into lines of computer code. The code and the deals contained in them exist across a distributed, decentralized blockchain network. Smart contracts allow for trusted transactions and agreements to be carried out among parties without the need for a central authority or external enforcement mechanism. They make transactions traceable, transparent, and irreversible.

The "Blockchain" technology provides secure and incorruptible information about the sustainability conditions in which goods are produced, including sustainability data such as data about working conditions or environmental metrics. Suppliers provide sustainability data on the distributed ledger and in return, get preferential payment terms through supply chain finance. The data requirements on attributes such as sustainability need to be standardized by working with companies and industry bodies, or by using pre-existing data standards. The goods flow through the supply chain together with a range of secure information such as invoicing, logistics, packaging, materials, and sustainability attributes. The data remains intact regardless of a change in ownership. Buyers approve the receivables, conditional to compliance with its sustainability requirements, releasing financing through the supply chain. A further step could be envisioned in the system to allow suppliers to access preferential discount rates relative to their ESG performance.

Benefits to buyers in "smart contracts" include knowledge on verified information about the sustainability attributes of goods purchased along the supply chain, such as producer or manufacturer involved, production methods used, sustainability data, materials, allergy and dietary information, packaging information, etc. This solution has great potential to reinforce the transparency of global supply chains. Further, the suppliers will have access to supply chain finance programmes, such as raw commodity producers, have access to working capital solutions through supply chain finance, at a lower cost than in specific local markets, including the participation in rewards for sustainable performance, automatically calculated through the blockchain mechanism.

3.5.11. Global Trade Financing Initiatives

The IFC, the European Bank for Reconstruction and Development (EBRD), and the Asian Development Bank (ADB), all trade finance programmes, through which they provide guarantees to confirming banks to cover commercial payment risks or political risks for trade transactions in designated emerging markets. For example, the IFC's Global Trade Finance Programme (GTFP) has already covered more than 54,000 trade transactions and supported over US$ 60 billion in emerging market trade.

Going one step further, EBRD and IFC provide preferential terms or mechanisms to spur uptake of environmentally friendly technologies. The EBRD's Green Trade Finance Programme combines trade finance guarantees with medium or long-term loans. In its first year, the Green TFP has supported 220 foreign trade transactions for green technologies with a total volume of €198 million. The IFC's Climate Smart Trade initiative offers price incentives or longer tenors for equipment and projects guaranteed under its GTFP that have clearly defined climate resilience or mitigation benefits.

The Green Climate Fund (GCF) is the world's largest dedicated fund helping developing countries reduce their greenhouse gas emissions and enhance their ability to respond to climate change. GCF, serving the Paris Agreement, aims to catalyze a flow of climate finance to invest in low-emission and climate-resilient development, driving a paradigm

shift in the global response to climate change. GCF with over US$ 10 billion in funding aims to achieve maximum impact by multiplying the effect of its initial financing by opening markets to new investments, where the apparel sector could develop projects to improve climate sustainability.

The Global Environment Facility (GEF) is another source of funding addressing the needs of three Rio Conventions, on land degradation, climate change and biodiversity. The apparel sector could jointly work with development agencies to tap into GEF funds. Some funds are allocated to work on chemicals as well.

Snapshot: In Pursuit of GCF Funding- Promoting Private Sector Investment Through Large Scale Adoption of Energy-Saving Technologies and Equipment for The Garment Sector of Bangladesh

The Programme on "Promoting private sector investment through large scale adoption of energy-saving technologies and equipment for Garment sector of Bangladesh", currently in the project preparation period with GCF funding, is set to be the largest scale up programmes in energy efficiency in the garment sector in Bangladesh. The National Designated Authority(ies) (NDA) of the project is Economic Relations Division (ERD), Ministry of Finance, Bangladesh while the Accredited Entity is the Infrastructure Development Company Limited (IDCOL). The total estimated cost of the programme is US$ 250 million, funded by a GCF loan of US$ 150 million with a co-financing budget of US$ 100 million. The GCF loan scheme will have a disbursement repayment period of 20 years with a 5-year grace period.

It has been noted that the Ready-Made Garments (RMG) industry in Bangladesh is most energy-intensive where the Government of Bangladesh has identified that together the RMG and the textile sector has Energy Efficiency and Conservation (EE&C) potential of 1,159 TOE/year 4. However, due to many bottlenecks such as financing, especially to overcome high upfront costs and more extended payback periods, the industry has a slow rate of commitment and progression. Furthermore, market information on the subject is limited along with the service to eliminate the private sector's perceived risk, when evaluating such potential investments.

The proposed programme aims to support entrepreneurs and business establishments in the garments sector, with financial and market resources to avail investment opportunities for energy-saving technology upgrades and equipment.

> *Source: Application Title Promoting private sector investment through large scale adoption of energy saving technologies and equipment for garment sector of Bangladesh Country/ Region Bangladesh Accredited Entity Infrastructure Development Company Limited (IDCOL), 2019*

3.5.12. Enabling Environment for SME Credit

Improving or developing "credit scoring systems" for SMEs using innovative analytical models could identify the level of risks in the pre-screening. This same methodology can be expanded to the use of statistical models to reduce the information gaps in the SME sector as tried in the Planters Development Bank in the Philippines and Bank Rakyat Indonesia to facilitate lending programmes.[47] With matured SMEs, financial needs are more dynamic as they try to diversify or expand, requiring innovative support from financial institutions. Therefore, it may be necessary to design and implement credit or finance schemes focusing on different elements in the value chain, which require significant amounts of detailed information on the client's business. Therefore, the development of such a database on SME operations as an initiative on Sustainable Financing may be beneficial. Such data may also be useful for monitoring different segments of the bank's client base and developing credit scoring models. Chambers of Commerce or any other dedicated platform could play this role with active participation by SMEs, Banks, and the Government.

Training of banks to handle SME clients is an equally critical aspect to promote "cash flow-based" lending moving away from collateral-based processes. This also requires knowledge on Government-led credit guarantee schemes. Under the credit guarantee scheme, the government agrees to indemnify the bank up to a certain proportion of its loan to a borrower without collateral to motivate banks to lend to borrowers. This makes the lending process less risky to the bank and more market-friendly to the client.

Sri Lankan banks follow the BASEL II standards; therefore, their risk weight for lending is 75%. If the risk weight would be lower, it will allow banks to grant more loans to the SME sector. Risk reduction could be made through information on clients, including SMEs. It may require expanding the 'Secured Transaction Registry' of the CRIB of Sri Lanka. Expanding this collateral registry makes it easier for SMEs to obtain financing even without traditional mortgages such as land or property.

Legislatively, a well-developed "Secured Transactions Act" may enhance financing against movable assets such as inventory and equipment. Having a reliable SME rating agency with the support of international rating agencies could add value in rating corporate and listed instruments also covering SMEs. This could be facilitated by the Central Bank and the Ministry of Finance with the support of the Ministry of Industries. For example, the Government of India introduced the SME Rating Agency (SMERA), focusing on the micro, small and medium enterprise sectors providing comprehensive ratings for the use of financial institutions in the assessment of credit. The lack of a mechanism to collect data on SME financing is a significant challenge in evaluating the needs of the sector and in assessing the progress of the instruments introduced. Thus, it is necessary to develop a mechanism to gather data on this critical area through a government establishment such as the Department of Census and Statistics and the Ministry of Industries affiliated agencies supported by Chambers of Commerce.

Capacity building of SMEs on financial statements and business plans is critical to generate the information needed for credit and credit guarantees. Banks already have specialized SME units in this context to support the SMEs, possibly coordinated by an entity such as the Chamber of Commerce. An extension for the Apparel sector may involve clustering the banks and SMEs using the needs and strengths to enhance the opportunities to both.

[47] Gamage, Pandula. 2015. Bank finance for SMEs in Sri Lanka: Issues and policy reforms. Studies in Business and Economics no. 10(2)/2015. DOI 10.1515/sbe-2015-0018.

Snapshot: SMART Myanmar - SMEs for Environmental Accountability, Responsibility and Transparency

Funded by the European Union under the Switch Asia Programme, the project provided financial support to garments in Myanmar from 2016-2019 as an expansion of the first phase of the programme. SMART Myanmar actively promoted and supported the sustainable production of garments "Made in Myanmar" and strove to increase the international competitiveness of SMEs in the sector. Key activities carried under the programme included:

- MGMA capacity building to offer business services to garment factories and increase interest representation.
- Run factory improvement programmes to increase sustainable production in Myanmar for 200 garment factories.
- SMART phone Apps on labour and OHS law.
- Increase access to (green) finance for small and medium-sized enterprises, run an advocacy campaign with the Central Bank.
- Branding and communication initiative "Made in Myanmar" targeting consumers in Europe and Myanmar.
- Trade fair visits in Europe and matchmaking (B2B) in Europe and Myanmar.
- Sourcing mission of EU businesses to Myanmar.
- Elaborate criteria for sustainable public procurement and train procurers.
- Increase cooperation among stakeholders to increase compliance with international social and environmental standards

Source: SMART Myanmar, n.d.

3.5.13. Impact Investing Beyond Business

Impact investing aims to generate specific beneficial social or environmental effects in addition to financial gains. Impact Investing is a sub-set of Socially Responsible Investing (SRI) or green investing. While the SRI is focused on avoidance of harm, the impact investing actively seeks to make a positive impact via its investments.

Global Brands have taken multiple approaches including in river basins where discharges occur, under impact investing considering long-term benefits. Impact investing, therefore, has the potential to attract individuals as well as institutional investors including hedge funds, private foundations, banks, pension funds, and other fund managers, beyond the apparel sector brands, provided a good coordination.

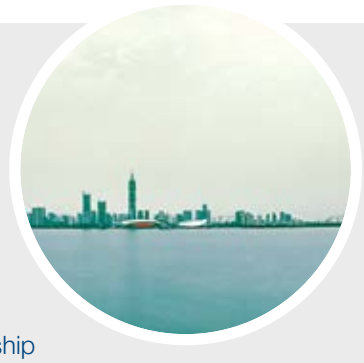
Figure 50: Multiple level actions to reduce shared risks

In impact investments both financial returns and investor's priorities are matched and most investors who choose impact investing look for market-rate returns.[48] Since the fundamental goal of impact investing is to help reduce the adverse effects of business activities on the social environment.

Most textile processing plants have an on-site wastewater treatment plant. Primarily these are chemical or biological treatment plants to reduce the toxic contaminants. Some suppliers who are located within industrial zones only do minimum pre-treatment as per the zone requirements. The industrial zone takes on the responsibility of treating the wastewater. However, the zones in Sri Lanka are not operating optimally and managing the industrial wastewater well although they do handle domestic level wastewater. This fact leads many pollutants to leave the plant untreated and contaminate the receiving waters.

Since the year 2011, WWF has been promoting the adoption and implementation of Water Stewardship in the textile sector in several countries, including China, India, Vietnam, and Turkey. The programme in China focuses on influencing the national level and Yangtze region by targeting sector transformation, delivering conservation outcomes in priority ecosystems, and demonstrating the business benefits of impact reduction activities.[49]

CASE STUDY: China - Taihu Lake Basin (An Initiative of the WWF Water Stewardship Programme)



Taihu Lake Basin covers an area of 36,900 km^2 while Lake Tai, the third-largest freshwater lake in China, is spread across 2,338 km^2. Bordering the provinces of Jiangsu and Zhejiang, the lake provides water to 30 million residents and contributes 9.8% to China's GDP. Furthermore, the lake basin is home to 37% of China's textile production, 23% of its electronic output and 8% of its chemical production.

Hundreds of international and domestic brands are headquartered or source their products from the region, nearly 10,000 textile printing and dyeing facilities are also based within Jiangsu Province alone. The main achievements of the programme so far include:[50]

1. Increased awareness and capacity through Innovative Water Stewardship Training with more than 100 textile mills participating, since 2017. Post-training surveys indicated 80% reported improved understanding on business and related environmental impacts.
2. Resource efficiency improvements at the Weill Dyeing mill in the Xixiashu Industrial Park through the water stewardship practices with a total investment of about US$ 179,000. Several tools were applied to establish water balance, improve water use efficiency, and reduce wastewater generation. The annual reductions and savings from the investment are:
   a. Industrial water saved: 118.9 Million Litres
   b. Reduction in wastewater: 113.7 Million Litres
   c. Electricity saved: 3,329,000 kWh of electricity saved
   d. Production cost savings: USD 448,000 USD

Source: Panda.org, 2019

[48] Global impact investing network. 2020. Annual investor impact survey - https://thegiin.org/impact-investing/need-to-know/#how-do-impact-investments-perform-financially
[49] https://wwfeu.awsassets.panda.org/downloads/wwf_china_stewardship_web.pdf
[50] https://wwf.panda.org/our_work/our_focus/freshwater_practice/freshwater_news/?352012/Transforming-the-textile-sectors-approach-to-water

In the Kelani River Basin where most of the apparel sector facilities are located, the water is scarce during the dry season. Shortages of water requires the industries to bring water externally using bowser supplies as opposed to taking water from the Kelani River. Part of the water shortages are connected with the land degradation in the upper catchment of the river basin where cloud capture and ground level infiltration of rainwater occur.

Future Impact: Potential Impact Investment – Kelani River Basin

Kelani River Basin is home for several apparel facilities including the three industrial zones managed by the BOI, namely, Seethawaka, Biyagama and Pugoda. Some of the discharges end up in the streams of the basin. The 145 km long Kelani River is the fourth largest river in Sri Lanka and supports 6.6 million people.[51] It supplies 80% of the water supply to Colombo residents and 6,000 industries. Newspaper reports indicate increasing pollution of the river.[52] The average daily point source discharge is estimated to be 414,600 m^3, creating a Biological Oxygen Demand (BOD5) of 11,600 kg per day. The existing WWTPs in the zones are designed to remove domestic contaminants.

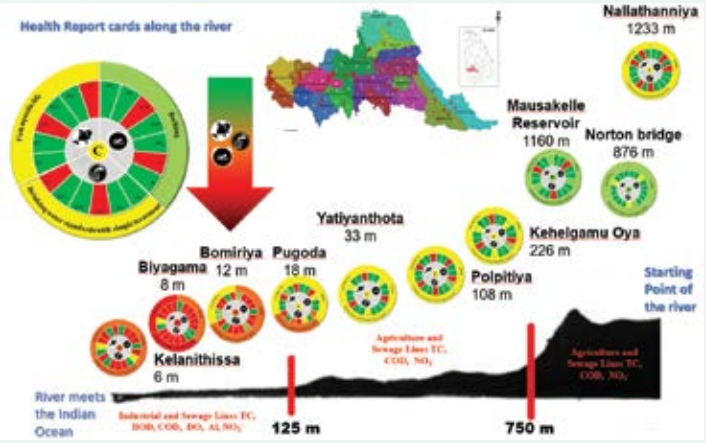


Figure 51: Pollution gradient along the Kelani River

As a prerequisite for impact investment, IUCN, in partnership with Brandix summarized the degree of pollution in the Kelani River Basin (Figure 51). The extent of pollution (BOD, COD, Metals, Nitrogen, Suspended Solids, Phosphorus, etc.) in the Kelani River increases as it reaches the ocean by Colombo. The initial plan that can be used as a base for impact investment is outlined in the long-term plan for the basin developed by IUCN with the support of UNICEF and Central Environment Authority (CEA).[53]

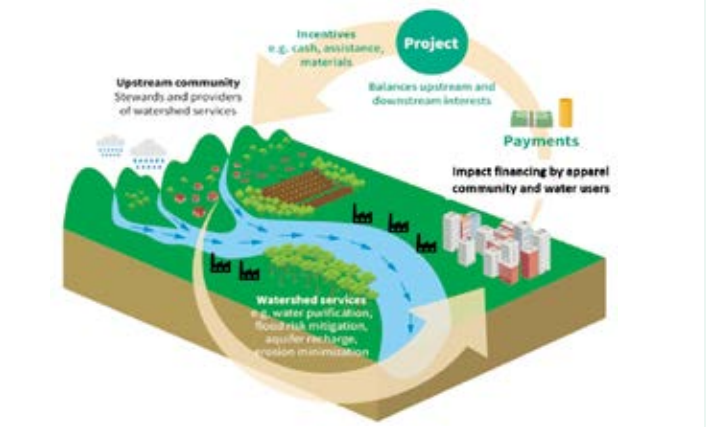


Figure 52: Impact investment towards a clean Kelani River Basin

The Kelani River Basin—home for most of the apparels in Sri Lanka—could be used as an impact investment by the apparel sector jointly with the other millions of water users, drinking water users in Colombo.

[51] T. Surasinghe et al, "Challenges in Biodiversity Conservation in a Highly Modified Tropical River Basin in Sri Lanka", January 2020.

[52] The Island" Authorities turn blind eye to fouling of Kelani River", 23rd December 2019.

[53] IUCN and CEA. 2016. Medium to long-term multi-stakeholder partnership approach to manage and conserve Kelani River Basin. - https://www.dropbox.com/s/yuw8bh42gsbdl3o/KRMP%20Final%20Report%20for%20downloads.pdf?dl=0

4

A Roadmap Towards a Greener Apparel Sector

Environmental Sustainability, Climate Change and Circular Economy are global challenges that the apparel industry is trying to address. Sri Lanka is well-positioned and has taken the initial steps under the "responsible fashion" agenda. Multinational brands are also piling up pressure for suppliers to become more responsive to these trends while the importing countries are enhancing tax benefits to countries where environmental performance and governance are exemplary.

Sri Lanka has been established as a high quality, ethical and sustainable manufacturing destination. The post-Covid-19 scenario and changing customer priorities combined with developments in the global business has made it necessary for the country and the industry to aggressively follow greening strategies. Successfully managing the Covid-19 epidemic within the country, the industry can quickly bounce back and enhance the current offerings of design, product development, manufacturing and adopting technology, innovation and new approaches including energy and raw materials for textiles to serve the end consumer expectations through decarbonizing methods. In that context, targeting Sustainable Financing mechanisms in line with the following strategies may help the industry.

Whilst it is acknowledged that some larger manufacturers are aware of the benefits, the vast majority may not have the same depth of knowledge nor the financial resources to undertake these expected changes. Currently, in Sri Lanka, there is no single agency, apart from the valuable service provided by JAAF that has the capability to carry out the necessary coordination to meet the new challenges in the post-Covid-19 environment. This document highlights the cost-effective opportunities to save water, energy, and chemicals, giving examples from global brands and countries, including the Asian experience, mostly from Bangladesh and China. It also highlights the many ways to finance these initiatives using direct loans, blended finance options to PPP structures for intra industry projects.

Taking from the "vision" of Responsible Apparels and Brand led strategies that are useful for Sri Lanka, the following "Sustainable Financing Strategies" have been developed for the consideration of the Government, apparel community, and stakeholders including the service providers, financial agencies and others.

01

Greening
the Energy Sources

Products based on dirty power sources, including coal may carry negative incentives by the brands and importing countries. Recent declining trends in the cost of renewable power (solar, wind and hydrogen) and high wind and solar availability in Sri Lanka may provide opportunities to green the energy inputs to reap export benefits.

Funding to expand solar installations within factory premises and assistance towards decentralized grids based on renewable energy could be supported through a series of financial instruments. These sustainable financing tools may also include government incentives to promote green apparels and renewable energy.

Public Private Partnerships and Financing to shift the percentage of renewable energy use in the industry is in line with global trends to minimize dirty energy footprints by suppliers.

At the National level, a continued shift towards renewable energy may reduce the country dependency on fossil fuels, providing multiple socio-economic and health benefits, especially considering the excess wind capacity available in the country.

	Activity	Institution
S1.1.	Developing a database on energy needs in the apparel sector using a web tool along with the present sources of energy to estimate the potential conversion	SEA, JAAF, IBICC, Private Providers
S1.2.	Mapping of service providers and technology transfer options to increase renewable power through solar, wind, hydrogen, etc.	SEA in partnership with IBICC
S1.3.	Developing multiple mechanisms to access renewable energy—through providers, investments by companies, as part of PPP mechanisms including pre-feasibilities	SEA, CBSL, ADB, EIB, Sri Lanka Financial Institutions
S1.4.	Policy dialogue to encourage the Government to adopt renewables in the grid in the medium to long-term as baseload while changing hydro and thermals for peaking	SEA, Ceylon Chamber of Commerce, JAAF
S1.5.	Further explore the promotion of solar roof-top systems combined with decentralized storages	SEA, JAAF, IBICC, Banks
S1.6.	Investigating international programmes and options to support the promotion of cleaner fuels in the energy mix (eg: climate funds such as Green Climate Fund, EU and others)	JAAF, IBICC, IUCN
S1.7.	Monitoring results of the transformation for promotional as well as for certified carbon, net metering, and other incentive programmes	SEA, JAAF, Universities, Banks, IUCN

Greening
the Buildings

The apparel sector has been adopting green building concepts and LEED standards to improve the energy efficiency and quality of life of workers.

Adoption of green building concepts require professional inputs in designing buildings, technologies, and materials, supporting green standards and training and innovative investments.

The sector could develop multiple programmes to promote green buildings and seek support of the government, universities, and financial institutions. Green buildings among SMEs probably need more incentives due to their working capital difficulties.

	Activity	Institution
S2.1.	Mapping the opportunities to introduce green buildings in the sector: web or a manual survey	Green Building Council of Sri Lanka, JAAF, Universities, Brands
S2.2.	Training and information to promote green buildings	IBICC
S2.3.	Exchanging knowledge with global entities to transfer knowledge on Green Building Standards	IBICC
S2.4.	Advocacy for opportunities for applying Green Buildings in the apparel sector	IBICC
S2.5.	Tracking the progress of implementing Green Building Standards including LEED in the apparel sector	Green Building Council of Sri Lanka, JAAF, IBICC
S2.6.	Capturing carbon and other benefits	Universities, Consultants

03

Towards Zero Discharge
of Hazardous Chemicals

Clients demand certain qualities of the finished products, which requires that suppliers use these chemicals. However, they are toxic with potential impacts to humans and ecosystems. For example, the wet processes used in Sri Lanka are known to be less efficient in terms of chemical use. All chemicals are imported as well.

The global trend is to develop less harmful chemicals while adopting principles of Zero Discharges.

Discharge reductions to water bodies are based on agreed science-based targets. This requires audits, monitoring, best practices, and technology combined with extensive human resource development.

Sustainable financing through joint mechanisms implemented by individual companies and BOI zones in partnership with financial institutions, supported by the government, is needed to meet the technology advancements and setting up of the required monitoring systems.

Government is adopting the clean river programming approach in this line.

	Activity	Institution
S3.1.	Benchmarking of discharge patterns from WTP and individual facilities in line with global norms by Brands	BOI, JAAF, International Multilateral Banks (ADB, EIB etc.)
S3.2.	Developing discharge guidelines for individual facilities and WTPs based on international knowledge and experience	BOI, CEA, NWSDB, WB, ADB, Universities
S3.3.	Identifying technological needs to improve the present level of discharges	BOI, CEA, NWSDB, Universities
S3.4.	Setting agreed discharge levels and time horizons to achieve the targets by stakeholders including BOI and companies	CEA, NWSDB, MEPA, JAAF
S3.5.	Transferring technologies and best practices to meet targets	NCPC, ADB, EIB etc., Universities, Consultants
S3.6.	Establishing a monitoring and reporting system to track the progress, report and take corrective actions – includes remote (Internet of Things operated) systems	CEA, NWSDB, NCPC, MEPA, JAAF, IBICC
S3.7.	Recording the experience and rewarding champions towards zero discharges	IBICC
S3.8.	Sharing best practices on National Zero Discharge of Hazardous Chemicals (NZDHC) and the Science Based Targeting process from leading brands to SMEs	NCPC, JAAF, IBICC, IUCN
S3.9.	Advocating government supported sustainable financing systems to promote technology adoption	Ministry of Industries, CBSL, SLBA, Financial Institutions
S3.10.	Building the capacity of service providers to improve systems, technologies, and processes	CEA, NCPC, IBICC

Cleaner Production
and Quality Service Providers

Decarbonization and the introduction of eco-friendly systems revolves around the transparent application of Cleaner Production (CP) principles. CP includes audits, awareness, technology adoptions and human resource development towards enhancing the overall health and economy of the industry.

CP requires investments for equipment, modifications to processes and practices while focusing on research and technology transfers. Investments for CP could be a mix of government incentives and use of financial instruments towards improving process efficiencies.

CP models can be replicated and upscaled. Adoption of Cleaner Production, Discharge Limits in line with Global Standards, Energy related Improvements etc., require a high level of trained expertise. It is expensive and unrealistic to maintain such expertise within each company.

Availability of trained and certified service providers who could provide such services on contract is an accepted global practice. The proposed IBICC mechanism could provide the database, training, and quality assurance aspects in this regard.

	Activity	Institution
S4.1.	Understanding the true costs of water, energy, and chemicals at firm level. Using web-based industry level calculator for self-evaluations with technical links developed to promote CP (Annexure 2)	BOI, CEA, NCPC, JAAF, IBICC, Universities, Consultants
S4.2.	Cleaner Production (awareness, basic CP, CP mainstreaming and enhancing inhouse capacity). Summarizing technologies and process improvements in water, energy and chemical efficiency	BOI, CEA, NCPC, IBICC, Universities of Moratuwa and Peradeniya, IUCN
S4.3.	Identifying CP training needs and developing programmes and certifications including capacity building of consultants and service providers	BOI, CEA, IBICC
S4.4.	Developing a database of service providers and a coordinated mechanism to access certified service providers in energy, water, chemicals, and other processes	BOI, CEA, NCPC, IBICC, Universities
S4.5.	Developing a Technical Assistance Programme at the national level to help the apparel sector	CEA, NCPC, IUCN
S4.6.	Establishing a funding mechanism to access finances to implement CP recommendations and other efficiency enhancements	SLBA, JAAF, IBICC

05

Mainstreaming Life Cycle Assessment (LCA) and EPR

LCA helps to quantify areas for improvement in product value chains considering the entire production and disposal processes (cradle to grave).

Mainstreaming LCA encourages circular economic, and polluter pay principles, along with waste exchange etc. to minimize the waste quantity for final disposal. Higg Index is the main monitoring tool for LCA effectiveness.

LCA findings and related investments are known to attract less attention by the management due to financial constraints. This also provides an opportunity for sustainable financing.

Financial systems could also involve government approaches such as the polluter pay principle, adopted through programmes like the Extended Producer Responsibility (EPR). The apparel sector could use the EPR process to improve the packaging and participate in Government incentives, in line with the “Garments without Guilt” strategy.

	Activity	Institution
S5.1.	Benchmarking the life cycles of components/products including the packaging, buttons, fiber, waste/sludge etc. towards improving circularity (recycle and reuse)	JAAF, Universities, Design Centres, Local and Global Brands, SMEs
S5.2.	Identifying technological and research needs to expand or alter the life cycle of apparel processes associated products	JAAF, IBICC, Universities, Design Centres, Leading Brands, SMEs
S5.3.	Carrying out a pre-feasibility on the potential to recycle products or materials in line with LCA and opportunities to participate in Extended Producer Responsibility (EPR)	CEA, JAAF, IBICC, Universities, Design Centers, Brands
S5.4.	Developing innovative financial and management systems to operationalize the identified initiatives/product development including sludge and waste disposal	CEA, JAAF, IBICC, Universities, Centers of Excellence
S5.5.	Adopting Higg Index as a tracking tool for LCA and EPR and aligning the reporting with Global Brands	CEA, NCPC, JAAF, IBICC, IUCN
S5.6.	Developing innovative incentive schemes to support and finance LCA and EPR processes in the industry	Ministry of Finance, NCPC, EDB, CBSL, JAAF, IBICC, Banks

06

Enhancing Sector Capacity
for Designing for Environment

Apparel sector has invested in centers of excellence related to design and innovation. These centers can partner locally and internationally on designs and innovation to minimize duplications and leapfrog towards future innovations in line with 'designing for environment'.

"Design Centres" – a form of centers of excellence, could facilitate innovative research and development and absorb IT savvy youth to adopt foresight principles and technical advances to address emerging demands.

Further, the Global Conventions, such as the Paris Agreement on climate and similar biodiversity and land degradation reduction can be explored for knowledge and funding such as impact financing by the industry.

The proposed IBICC may identify potential opportunities and develop proposals on behalf of the sector and help identify co-financing or leverage funds from sector entities.

Key areas to focus, but not limited to, could be in wastewater management, circular economy, research on recycled and local raw materials for yarn development.

	Activity	Institution
S6.1.	Identifying and summarizing the potential partnership options with local and international centers of excellence as well as global initiatives. Eg: Bangladesh Partnership for Cleaner Textiles (PaCT) and India's emerging centers such as Arvind Center for wastewater	JAAF, IBICC, Brands
S6.2.	Coordinated effort identifying areas for design related innovations and solutions to challenges, to formulate work plans in collaboration with different centers of excellence to share knowledge and best practices and joint research	JAAF, IBICC, Universities, Brands
S6.3.	Summarizing global funding opportunities and working with Accredited Entities (UNDP, IUCN, UNIDO etc.) to access the Green Climate Fund, Global Environment Facility, and other resources mainly in climate and chemicals	JAAF, IBICC
S6.4.	Conducting local training in proposal writing and accessing global funds while engaging Government resources	NPD, JAAF, IBICC, Centres of Excellence IUCN
S6.5.	Establishing a fund mechanism (green fund) to support research and development of a fund management system possibly through the IBICC Board	JAAF, IBICC
S6.6.	Knowledge management through periodic seminars/workshops, briefing papers and documenting lessons learned	JAAF, IBICC

07

Minimizing Synthetics
and Enhancing Material Recovery

Microplastics (synthetics) in oceans, drinking water and food chains are emerging as priority issues in health, pollution, and life quality.

Garments are also blamed for contributing to plastic pollution, mainly through packaging and synthetic fabrics. This opens additional opportunities for sustainable financing to support textile manufacturing and packaging using non-synthetic materials.

Export incentives for garments may depend on overall use of synthetics. Therefore, sustainable financing will help to provide for required research, alternate packaging development and promote circular systems.

The high cost of fiber and associated water, energy, and chemical footprints may promote recovering fiber from used garments, as a green approach. In this context, the garments that are seldom used and old garments are two sources, especially for non-synthetic fiber.

The application of sustainable financing to encourage the collection of used clothes and recovering fiber could be a future opportunity. Sri Lanka with a high labour availability and the need to increase Sri Lankan content in apparel expor' favours engagements in fiber recovery.

	Activity	Institution
S7.1.	Understanding the Sri Lanka context and opportunities towards non-synthetic apparel products and identifying plastic components in packaging that can be substituted with non-synthetics	BOI, CEA, MEPA, NCPC, JAAF, IBICC, Universities, Innovation Centers
S7.2.	Studying the circularity in each item in the apparel product chain and developing initiatives to do away with plastics or to bring the products back to circular systems	JAAF, IBICC, Universities, Sector Experts
S7.3.	Developing an industry cluster that will be involved in recycling and initiating a set of programmes covering technical assistance, partnership development and incentives	CEA, MEPA, JAAF, IBICC, Banks, Brands
S7.4.	Engaging the national budget process to develop local Incentives to invest on circularity, alternatives and support to research and development including innovation centers	Ministry of Finance, Ministry of Environment, CBSL, JAAF
S7.5.	Establishing a national level monitoring system for microplastics in streams and incentives to develop alternatives and technologies to trap microplastics	CEA, NWSDB, MEPA, JAAF, IUCN
S7.6.	Documenting lessons learned and success stories to support the industry	JAAF, IBICC

08

Enhancing Sri Lankan Content in Exports with Local Fibre

Currently, Sri Lanka imports a high percentage of materials as inputs into a garment—therefore, at a disadvantaged position in terms of Sri Lankan content.

Increasing the Sri Lankan content by adding nature-based fiber generated using banana, bamboo, kithul etc. is a potential mechanism.

This would require significant changes to equipment, machinery, technical know-how and skills. To encourage the intended shift, it is necessary to develop a joint programme that involves the apparel sector, government agencies responsible for exports, trade and economic development where sustainable financing plays a key role.

Also, the support of brands in adopting new raw materials and research, both international and local, are key success factors in developing local material as fiber for garments.

	Activity	Institution
S8.1.	Conceptualizing the options to use local fibre materials from banana, kithul, bamboo etc. in yarn making beyond PET	EDB, JAAF, IBICC, Universities, Centres of Excellence, Nano Technology and other research
S8.2.	Identifying research and development needs, technology aspects and financial requirements	Ministries related to Exports, Industry, Agriculture etc., IBICC, Universities, Brands
S8.3.	Developing a business model to integrate local fibre to the apparel sector using global experience	NCPC, JAAF, IBICC, Brands
S8.4.	Investigating industry partnerships and investments to mobilize the business model as a unique green business proposition	IBICC
S8.5.	Recording the experience and developing promotional materials	JAAF, IBICC

09

Empowering SMEs

SMEs play an important role in providing inputs and services to the apparel industry. Their efficiency and effectiveness contribute to the overall costs and footprints of the industry. Although, the major sector companies are operationally sound, the financial and technical needs for SMEs differ from established companies.

In that context, a dedicated effort is required to understand and provide the support for SMEs in order to obtain their inputs in an efficient manner.

SMEs can be empowered and promoted to participate in new areas and the proposed IBICC is expected to coordinate with multiple agencies including the Central Bank, ministries, and brands to enhance the support to SMEs.

	Activity	Institution
S9.1.	Surveying the special needs of SMEs due to their scale of production and less opportunities to access finance and technology	Ministry of Finance, CBSL, SME related Chambers of Commerce, JAAF, IBICC, Brands
S9.2.	Summarizing the opportunities provided when SMEs are clustered including the participation in circular economy, recycling, and fibre generation	NCPC, JAAF, IBICC, Universities, Consultants
S9.3.	Evaluating the policies and procedures that hinder the growth opportunities for SMEs in the apparel sector	CBSL, Chambers, JAAF, IBICC
S9.4.	Promoting sludge treatment and waste management through SMEs with quality assurance	BOI, CEA, JAAF, IBICC
S9.5.	Providing incentives and improved access to technology and finance for SMEs	Ministry of Finance, CBSL, SME related Chambers of Commerce, JAAF, IBICC, Brands

10

Environmental Governance
through ESMS and Monitoring

Environment and Social Management Systems (ESMS) is a part of Governance that helps to highlight potential socio-economic and environmental implications.

ESMS includes mitigation actions to be incorporated into investments. The WTPs and emissions to air by sector operations, among other things require extensive monitoring equipment. Monitoring also require real-time reporting to central systems and corresponding institutions in order to be effective and transparent.

Adoption of ESMS requires investments in human capacity and strengthening monitoring and reporting systems in the country. Financing automated and manual monitoring systems at facility-level is the most essential requirement in the process where companies find it difficult to invest on their own.

This is an area the government active involvement and support is helpful to create the enabling environment. The apparel sector would cost share in operating the systems and related capacity building. There is room for service providers in this area.

	Activity	Institution
S10.1.	Developing guidelines and manuals for different stakeholders to adopt ESMS based on IFC and other global literature through a technical team to promote ESMS	Ministry of Environment, BOI, CEA, Banks
S10.2.	Identifying the opportunities in ongoing and upcoming facilities including in the proposed 275-acre BOI Eravur textile village facility in the Eastern Province	BOI, CEA, MEPA, Universities, Banks
S10.3.	Providing access to common technologies, best practices, and information to improve Environment Performances and creating a help desk/panel	BOI, CEA, IFC, IBICC, Universities
S10.4.	Designing training and certification systems on ESMS at different levels in institutions	NCPC, IBICC, Universities, IUCN
S10.5.	Identifying the parameters to monitor through a technical dialogue while agreeing on the frequency, accuracy, and reporting mechanism. Developing a digital platform that will allow companies and BOI facilities to report ensuring the privacy of data	BOI, CEA, NWSDB, NCPC, IBICC, Universities, IUCN
S10.6.	Developing a financing mechanism and a technical support system as a public-private initiative	IBICC

11

Water Stewardship
and River Basin Impact Investments

Water is one of the critical inputs towards the success of the apparel industry where both quality and quantity of water matters. Global brands are keen to reward those countries where conservation of water resources is given the adequate attention. Water is also been used by multiple economic sectors and related to human health and well-being.

Stakeholders including service providers, local governments, BOI, and community should ensure long-term sustainability and "stewardship" in water. A dialogue on water stewardship would promote impact investments and multi-sector approaches.

Financial support for such an initiative is a responsibility of stakeholders benefitting from the long-term ecosystem services.

Impact investments (or green investments) support multiple economic sectors. In the apparel sector, sustainability of ecosystem services related to water supply and quality at river basin scale can be considered as a long-term impact investment to attract the interest of global brands. In this context, the Kelani River Basin can be the focus where most apparel sector facilities are located.

	Activity	Institution
S11.1.	Conducting a detailed assessment on conjunctive water use and the share of the apparel sector	CEA, MASL, NWSDB, WRB, JAAF, Universities, IWMI, IUCN, Brands
S11.2.	Conducting a summary of water quality (from other initiatives on river basin monitoring, industry discharges and WTP releases) based on CEA, NWSDB and IUCN work on the Kelani River Basin and others	BOI, CEA, NWSDB, Universities, IUCN, Brands
S11.3.	Carrying out a national expert and industry dialogue on water uses related to the apparel industry, others and opportunity costs of water focusing on Kelani River Basin and other important areas	Ministry of Water Resources, Ministry of Irrigation, Ministry of Environment, Ministry of Agriculture, NWSDB, IBICC, IWMI, IUCN
S11.4.	Identifying a set of initiatives to improve the water quality and quantity as an impact investment and the role of each economic sector to ensure the sustainability of water sources	JAAF, IBICC, IUCN, Sector Experts
S11.5.	Mainstreaming the findings in national planning, budgets and operationalizing the roles identified for each sector based on natural capital accounting and assessment approaches	Ministry of Finance, Ministry of Environment, CBSL, other Govt. Agencies
S11.6.	Monitoring the improvements to the river basin ecosystem and highlighting the contributions of the impact investment	CEA, NWSDB, JAAF, Universities, IUCN

12

Digital Leadership
and Multi-Stakeholder Coordination

Digital approaches have made great successes in the Covid-19 period. Enhanced adoption of digital advances may help the apparel sector operations, significantly in terms of coordination and knowledge management.

Sustainability of the sector also requires responding fast to global needs and complying with standards in order to maintain the market share. In addition, to disseminate local and global best practices and benchmark local industry partners to improve their operations, digital technology can be used as an educational, monitoring and advocacy tool.

This sustainability initiatives in the apparel sector may need dedicated coordination and facilitation support to ensure that the industry works as a unified cluster. A mechanism such as the IBICC is proposed to coordinate information and facilitate the innovative fast-track developments in the apparel sector. The new entity can add value to the present coordination by JAAF and fast-track implementation of greening approaches.

	Activity	Institution
S12.1.	Preparing a database of key stakeholders (brands, banks, IFIs, corporates, service providers etc.) and who is doing what and where, including contact points	JAAF, IBICC
S12.2.	Developing a set of questions on services required including technical, process and financial based on a web-interface system using the webpage already developed following the example of IFC sponsored PaCT in Bangladesh, Vietnam, and other countries	JAAF, IBICC
S12.3.	Grouping the service providers, financial agencies and others based on the type of service for training/certifications and to integrate with the apparel sector joint work programme	SLBA, JAAF, IBICC
S12.4.	Improving the adoption of Higg Index and carrying out required training and certifications to facilitate audits and monitoring	CEA, NWSDB, NCPC, IBICC
S12.5.	Developing a dashboard system to monitor the implementation of the agreed work programme, benchmarking the sector companies for technology adoptions and recording lessons	IBICC

5 Conclusion and Way Forward

Greening the apparel sector led by the Global Brands require the collaboration of local brands and supply chains associated with the industry. The Government policy agenda, "Vistas for Prosperity and Splendor" provides direction and support for the anticipated transformation of the energy sources to renewables and targeted assistance to export trade, where Garments is one of the key sectors.

Sri Lanka's apparel industry has taken steps to green the sector under the theme "Garments Without Guilt." It is primarily led by the major local brands, yet, and requires the support of multiple players outside the industry, including the Central Bank of Sri Lanka, Ministry of Finance etc., to provide the necessary support. Further, the SMEs in the supply chain and waste management systems operated by the industry and BOI needs significant support to achieve overall greening objectives. For example, the strategies to improve Environment and Social Management Systems (ESMS), improve waste and wastewater management, coordinate impact investments to ensure adequate water to the industry through the river basin environmental services etc. are sometimes beyond the direct control of the industry. However, on the other hand, these actions have far reaching positive contributions, when supported.

This document identifies 12 key strategies, if adopted, that would transform not only the apparel sector but also the circularity and environment governance in Sri Lanka. For example, the coordination system proposed, the "Innovative Business Integration and Coordination Centre" (IBICC), financial tools, global practices such as "Zero Discharges" and "Science based Targets" etc., would be relevant to other economic sectors as well. The Cleaner Production, Life Cycle Analysis, Improving the Local Content in Garments by enhancing local fibre and yarns and doing away with dirty energy sources are concepts that would help the overall competitiveness of the country in the global marketplace.

The preparation of this document involved a significant amount of consultations with the apparel sector, bankers, and other stakeholder entities. However, the operationalizing of the strategies may require in depth feasibilities, which was not in the scope of this study. Operational success would depend on the coordinated synergy among the apparel and financial sectors and the commitment of relevant Government counterparts such as CEA, BOI, Ministries in charge of Finance, Industries, Exports, Environment, Export Development etc. These strategies and the proposed coordination would provide a sound platform to obtain support through the programmes of international agencies such as UN, IUCN etc., Multilaterals such as IFC, World Bank, ADB, European Union and the Bilateral development partners.

Strong and consistent partnerships with the Global Brands are a must for the success. Partnerships with "Centres of Excellence" of different disciplines could help the industry transform fast avoiding re-invention, especially to improve the circularity and designing for environment. At the same time, these initiatives should not be taken as "Green Washing" the sector.

The Covid-19 resulted changes in the attitudes and behavioural practices of the clients and consumers of the apparel trade could be used as an entry point to join hands with the brands to transform the industry. This industry effort towards a greener sector may prove to be a win-win proposition for the Government as well as for the industry, not to mention the consumers, employment seekers and the public at large.


“It all seems impossible until it is done”
– Nelson Mandela

Glossary of Items

Acids	A substance with particular chemical properties including turning litmus red, neutralizing alkalis, and dissolving some metals; typically, a corrosive or sour-tasting liquid of this kind.
Air Flow Machine	Airflow machine is used when liquor ratio was reduced to minimum level of 1:3 and mist were used to move the fabric. Unlike Jet dyeing machine, fabric is opened by the flow of air reducing the creases.
Alkalis	A compound with particular chemical properties including turning litmus blue and neutralizing or effervescing with acids; typically, a caustic or corrosive substance of this kind such as lime or soda.
Anionic Compounds	A compound characterized by an active anion. An anion is a negatively charged ion, i.e. one that would be attracted to the anode in electrolysis.
Aromatic Compounds	Any of a large class of unsaturated chemical compounds characterized by one or more planar rings of atoms joined by covalent bonds of two different kinds. The unique stability of these compounds is referred to as aromaticity.
Artificial Intelligence	The theory and development of computer systems able to perform tasks normally requiring human intelligence, such as visual perception, speech recognition, decision-making, and translation between languages.
ASEAN Region	The Association of Southeast Asian Nations (ASEAN) is a regional grouping that promotes economic, political, and security cooperation among its ten members: Brunei, Cambodia, Indonesia, Laos, Malaysia, Myanmar, the Philippines, Singapore, Thailand, and Vietnam.
Athleisure	Casual, comfortable clothing designed to be suitable both for exercise and everyday wear.
Automated	Carried out by machines or computers without needing human control
Backward Integration	Backward integration is a process in which a company acquires or merges with other businesses that supply raw materials needed in the production of its finished product. Businesses pursue backward integration with the expectation that the process will result in cost savings, increased revenues, and improved efficiency in the production process. Companies also use backward integration as a way of gaining competitive advantage and creating barriers to entry to new industry entrants.
BASEL II Standards	Basel II is an international business standard that requires financial institutions to maintain enough cash reserves to cover risks incurred by operations. The Basel accords are a series of recommendations on banking laws and regulations issued by the Basel Committee on Banking Supervision (BSBS).
Biological Oxygen Demand (BOD5)	The BOD55 indicates the amount of oxygen which bacteria and other microorganisms consume in a water sample during the period of 5 days at a temperature of 20 °C to degrade the water contents aerobically.
Blended Finance	Blended finance is the use of catalytic capital from public or philanthropic sources to increase private sector investment in sustainable development.
BOI (Board of Investment Sri Lanka)	The Board of Investment of Sri Lanka (BOI) was established in 1978 as the Greater Colombo Economic Commission (GCEC), with the mandate to generate development in the surrounding vicinity of the Colombo city limits. Later in 1992, the GCEC was reconstituted as the BOI with a mandate encompassing the entire country. Today, in our 40th year of operations, the BOI is proud to have assisted over 1,700 enterprises which have contributed to Sri Lanka's economic development and growth. The BOI is structured to function as a central facilitation point for investors, offering convenience, easy access and information. When an investor signs an agreement with the BOI, the provisions embodied in this agreement remain valid for the lifespan of the enterprise which is guaranteed by the constitution of Sri Lanka. This is a significant plus point for working with the BOI as we are able to ensure a degree of stability that few other countries can offer or match.
CAPEX	Capital expenditures (CapEx) are funds used by a company to acquire, upgrad and maintain physical assets such as property, plants, buildings, technology equipment.

Capital Intensive	Capital Intensive refers to those industries or companies that require large upfront capital investments in machinery, plant & equipment in order to produce goods or services in high volumes and maintain higher levels of profit margins and return on investments.
Caustic	Caustic soda, otherwise known as sodium hydroxide or lye, is a chemical that was first prepared and used by soap makers. Today, it is widely used in the textile industry for processes such as scouring, mercerization and dyeing, integral parts of the textile manufacturing process.
CDP (Formerly the Carbon Disclosure Project)	The CDP (formerly the Carbon Disclosure Project) is the largest climate change focused data collection and assessment programme. Each year the programme requests Information on greenhouse gas emissions, energy use and the risks and opportunities from climate change from the world's largest companies.
Centers of Excellence	A center of excellence (COE) is a team, a shared facility or an entity that provides leadership, best practices, research, support and/or training for a focus area.
Chemical Oxygen Demand (COD)	The chemical oxygen demand (COD) is a measure of water and wastewater quality. The COD test is often used to monitor water treatment plant efficiency. This test is based on the fact that a strong oxidizing agent, under acidic conditions, can fully oxidize almost any organic compound to carbon dioxide. The COD is the amount of oxygen consumed to chemically oxidize organic water contaminants to inorganic end products.
Circular Economic Principles	A circular economy is based on the principles of designing out waste and pollution, keeping products and materials in use, and regenerating natural systems. The CE framework is shaped by the 3R (reduce, reuse, recycle) principles that should be applied throughout the whole cycle of production, consumption and return of resources and the circular model requires the engagement of all market the participants.
Circular Economy	An industrial system that is restorative or regenerative by intention and design, uses and reuses natural capital as efficiently as possible, and finds value throughout products' life cycles. It also involves the introduction of principles such as sustainable design strategies, zero-waste design, product-life extension, resource recovery, repair and remanufacture services.
Cleaner Production	Defined by UN Environment as "The continuous application of an integrated environmental strategy to processes, products, and services to increase efficiency and reduce risks to human and the Environment."
Convention on Biodiversity (CBD)	The Convention on Biological Diversity (CBD) is the international legal instrument for "the conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of the benefits arising out of the utilization of genetic resources" that has been ratified by 196 nations.
Cotton	Significant environmental impacts because of its high reliance on water and chemical inputs. Cotton production represents approximately one third of global pesticide use, and this in turn can have other damaging effects on the environment when pesticides are badly managed (Pan et al 2008).
Credit Information Bureau of Sri Lanka (CRIB)	The first Credit Bureau in the South Asian region established in 1990. The disciplining mechanism provided by a Credit Information Bureau is expected to improve the country's overall credit culture. CRIB is a public-private partnership, with the Central Bank holding the majority of equity while the rest is held by lending institutions regulated by the Central Bank. CRIB currently has 94 shareholders, including all licensed Commercial banks, Specialized banks, Finance companies, Leasing companies, few other institutions which have been declared as lending institutions for the purpose of the Act and the Central Bank. The chairman of the Board is always a deputy governor of the Central Bank and the remaining board seats are shared between the lending institutions.
Decarbonization	The term decarbonization literally means the reduction of carbon. Precisely meant is the conversion to an economic system that sustainably reduces and compensates the emissions of carbon dioxide (CO_2). The long-term goal is to create a CO_2-free global economy
Designing for the Environment (Dfe)	An approach to reduce the overall human health and environmental impact of a product, process or service, where impacts are considered across its life cycle

Eco-Industrial Parks (Eips)	An eco-industrial park involves a network of firms and organizations, working together to improve their environmental and economic performance. Some planners and researchers of EIPs have used the team "industrial ecosystem" to describe the type of symbiotic relationships that develop amongst participating firms.
E-Commerce	E-commerce is the activity of electronically buying or selling of products on online services or over the Internet.
EDGE	An innovation of IFC, EDGE ("Excellence in Design for Greater Efficiencies") provides market leaders with the opportunity to gain a competitive advantage by differentiating their products and adding value to the lives of their customers. IFC created EDGE to respond to the need for a measurable and credible solution to prove the business case for building green and unlock financial investment. EDGE includes a cloud-based platform to calculate the cost of going green and utility savings. The state-of-the-art engine has a sophisticated set of city-based climate and cost data, consumption patterns and algorithms for predicting the most accurate performance results. A global network of certifiers and accredited EDGE Experts support the collective ambition to mainstream green buildings and help fight climate change.
E-Friends	The Revolving Fund under the Environmentally Friendly Project II Loan Scheme was implemented from the year 2004 up to the year 2010 under the financial assistance provided by the Japanese International Cooperation Agency (JICA) and through several financial institutions. In its second phase, the purpose of the loan scheme is for waste minimization, energy saving and assisting the industrialists in the environment pollution control and also for formulating a suitable mechanism to ensure that the most suitable beneficiaries identified are provided with loans to achieve the objectives.
Environment Social and Governance (ESG)	Environmental, social and governance (ESG) criteria are a set of standards for a company's operations that socially conscious investors use to screen potential investments. Environmental criteria consider how a company performs as a steward of nature. Social criteria examine how it manages relationships with employees, suppliers, customers, and the communities where it operates. Governance deals with a company's leadership, executive pay, audits, internal controls, and shareholder rights.
ESCO	An energy service company is a business that provides a broad range of energy solutions including designs and implementation of energy savings projects, retrofitting, energy conservation, energy infrastructure outsourcing, power generation and energy supply, and risk management.
Export Processing Zones (EPZ)	Export Processing Zones (EPZs) are areas within developing countries that offer incentives and a barrier-free environment to promote economic growth by attracting foreign investment for export-oriented production.
Fast Fashion	Inexpensive clothing produced rapidly by mass-market retailers in response to the latest trends.
Finishing (Fabric Production)	Textile finishing is a very diversified sector due to the processed raw materials, manufacturing techniques and finalized products. Trends in fashions cause a continuous change in coloring and functional finishing. In the textile industry, finishing is the last step in fabric manufacturing and is when the final fabric properties are developed. As a result of which the textiles gain several functional characteristics. Novel finishes providing high value addition to textile fabrics are greatly appreciated by a more demanding consumer market.
G7	The Group of Seven (G7) is an international intergovernmental economic organization consisting of seven major developed countries: Canada, France, Germany, Italy, Japan, the United Kingdom and the United States, which are the largest IMF-advanced economies in the world.
G7 "Fashion Pact"	Signed by 32 companies—including some of the biggest names in luxury, activewear, fast fashion, and retailing—the G7 Fashion Pact marks the first serious broad-based push by a coalition of private-sector companies to help reduce global warming, replenish the planet's biodiversity, and curtail the dumping of plastics in the world's oceans.

Garments Without Guilt	Under the umbrella of the Joint Apparel Association Forum (JAAF) clothing and fabric manufacturers in the Sri Lanka apparel industry keen to demonstrate their commitment to ethical working conditions are able to apply for Garments without Guilt certification. The initiative gives certified companies the right to promote themselves as responsible businesses and reassure international buyers about working conditions in the country. It enables JAAF to demonstrate the social responsibility of their members thereby improving public perception of the industry and reassuring customers.
GCF	The Green Climate Fund (GCF) is the world's largest dedicated fund helping developing countries reduce their greenhouse gas emissions and enhance their ability to respond to climate change. It was set up by the United Nations Framework Convention on Climate Change (UNFCCC) in 2010. GCF has a crucial role in serving the Paris Agreement, supporting the goal of keeping average global temperature rise well below 2 degrees C. It does this by channeling climate finance to developing countries, which have joined other nations in committing to climate action.
GEF	The Global Environment Facility (GEF) was established on the eve of the 1992 Rio Earth Summit to help tackle our planet's most pressing environmental problems. Since then, the GEF has provided close to $20.5 billion in grants and mobilized an additional $112 billion in co-financing for more than 4,800 projects in 170 countries. Through its Small Grants Programme, the GEF has provided support to nearly 24,000 civil society and community initiatives in 133 countries. The GEF Partnership recently agreed to a new direction in its work to achieve greater results and help to meet rising challenges. This agreement is set out in the Summary of the Negotiations of the Seventh Replenishment of the GEF. In combination with its traditional investments under the Conventions, the GEF is: 1. Strategically focusing its investments to catalyze transformational change in key systems that are driving major environmental loss, in particular energy, cities and food; 2. Prioritizing integrated projects and programmes that address more than one global environmental problem at a time, building on the GEF's unique position and mandate to act on a wide range of global environmental issues; and 3. Implementing new strategies and policies to enhance results, including stronger engagement with the private sector, indigenous peoples, and civil society, and an increased focus on gender equality.
Generalized Scheme of Preferences Plus (GSP)	GSP+ stands for Generalised Scheme of Preferences Plus. The scheme allows eligible developing countries to pay no duties on some exports to the European Union. It is part of the EU's wider GSP regulation with the Standard GSP and Everything But Arms (EBA), but offers additional trade incentives.
Global Brands	Brands that are recognized throughout much of the world.
Global Impact Investing Network (GIIN)	The Global Impact Investing Network ("GIIN") is a nonprofit 501c(3) organization dedicated to increasing the scale and effectiveness of impact investing. The GIIN builds critical infrastructure and supports activities, education, and research that help accelerate the development of a coherent impact investing industry.
Global Trade Supplier Finance programme	A programme by IFC, The Global Trade Supplier Finance (GTSF) Programme provides short-term financing to suppliers selling to large domestic buyers or exporting to international buyers, by discounting invoices once they are approved by the buyer.
Global Value Chains	Global value chains (GVCs) refer to international production sharing, a phenomenon where production is broken into activities and tasks carried out in different countries. They can be thought of a large-scale extension of division of labour dating back to Adam Smith's time.
Green Buildings	A 'green' building is a building that, in its design, construction or operation, reduces or eliminates negative impacts, and can create positive impacts, on our climate and natural environment. Green buildings preserve precious natural resources and improve our quality of life.
Green Finance	Green finance is a broad term that can refer to. financial investments flowing into sustainable development projects and initiatives, environmental products, and policies that encourage the development of a more sustainable.

Green Product Framework	Mainly refers to the Green Product Framework of Barclays. It set out underlying eligible qualifying environmental themes and activities. This framework was developed in collaboration with Sustainalytics and Version 1.0 has been reviewed and approved by Sustainalytics.
Green Products	Green products may be defined as products that contain recycled materials, reduce waste, conserve energy or water, use less packaging, and reduce the amount of toxics disposed or consumed
Green Supply Chains	A supply chain that takes into account its impact on the natural environment, and employs best practices to protect it.
Greenhouse Gas Emissions	Greenhouse gas, any gas that has the property of absorbing infrared radiation (net heat energy) emitted from Earth's surface and reradiating it back to Earth's surface, thus contributing to the greenhouse effect (Greenhouse effect, a warming of Earth's surface and troposphere (the lowest layer of the atmosphere) caused by the presence of water vapour, carbon dioxide, methane, and certain other gases in the air).
Gross Domestic Product (GDP)	Gross Domestic Product (GDP) is the monetary value of all finished goods and services made within a country during a specific period. GDP provides an economic snapshot of a country, used to estimate the size of an economy and growth rate. GDP can be calculated in three ways, using expenditures, production, or incomes.
Hazardous Chemicals	A hazardous chemical, as defined by the Hazard Communication Standard (HCS), is any chemical which can cause a physical or a health hazard.
Heterocyclic Compounds	Heterocyclic compounds are organic compounds with a ring structure that contains in the cycle at least one carbon atom and at least one other element, such as N, O, or S. The most common cycles contain five or six atoms, with the stability of these rings being higher than that of three, four, seven, or larger rings.
Higg Index	Developed by the Sustainable Apparel Coalition, the Higg Index is a suite of tools that enables brands, retailers, and facilities of all sizes — at every stage in their sustainability journey — to accurately measure and score a company or product's sustainability performance. The Higg Index delivers a holistic overview that empowers businesses to make meaningful improvements that protect the well-being of factory workers, local communities, and the environment.
Hydrocarbon	A hydrocarbon is an organic chemical compound composed exclusively of hydrogen and carbon atoms. Hydrocarbons are naturally-occurring compounds and form the basis of crude oil, natural gas, coal, and other important energy sources.
IDLC	IDLC Finance Limited, formerly known as Industrial Development Leasing Company of Bangladesh Limited, is a multi-product Non Banking Financial Institution with headquarters in Dhaka, Bangladesh.
IFC's Climate Smart Trade Initiative	Through the Climate Smart Trade initiative, IFC may provide a price incentive or longer tenors for equipment and projects guaranteed under the Global Trade Finance Programme (GTFP) that have clearly defined climate change benefits. Banks may be asked to provide additional information to ensure that the goods qualify under international protocols.
Impact Investing	Impact investing refers to investments "made into companies, organizations, and funds with the intention to generate a measurable, beneficial social or environmental impact alongside a financial return".
Industrial Parks Or Special Economic Zones (SEZs)	Geographically delimited areas within which governments facilitate industrial activity through fiscal and regulatory incentives and infrastructure support
International Finance Corporation (IFC)	IFC, a member of the World Bank Group, is the largest global development institution focused exclusively on the private sector in developing countries. An international financial institution that offers investment, advisory, and asset-management services to encourage private-sector development in less developed countries.
International Performance Monitoring and Verifications (IPMVPs)"	Since 1997, Efficiency Valuation Organization (EVO) develops, maintains, improves and publishes the International Performance Measurement and Verification Protocol (IPMVP). The IPMVP was originally developed to help increase investment in energy and water efficiency, demand management and renewable energy projects around the world. The IPMVP promotes efficiency investments through several activities. (https://evo-world.org/en/products-services-mainmenu-en/protocols/ipmvp)

Internet of Things	The interconnection via the Internet of computing devices embedded in everyday objects, enabling them to send and receive data.
JAAF	Joint Apparel Association Forum is the apex body which guides Sri Lanka apparel towards its ultimate goal of being the world's number one apparel sourcing destination. In the year of 2002 the entire Apparel Industry came under the aegis of Sri Lanka Apparel forming its core activity as to promote Sri Lanka as a "Preferred Sourcing Destination" in the region through implementing strategic plans.
Knitted Fabric	Knitted fabric is the second major type of fabric used following the woven. It has a characteristic of accommodating the body contour and provided the ease of movement. It is particularly a comfortable form of fabric structure for sports, casual wear, and undergarment. Knitted fabrics include weft types and the warp types, raschel, and tricot.
LEED	Leadership in Energy and Environmental Design (LEED) certification provides independent verification of a building or neighborhood's green features, allowing for the design, construction, operations and maintenance of resource-efficient, high-performing, healthy, cost-effective buildings.
Life Cycle Analysis/ Assessment (LCA)	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, which is from raw material extraction through materials processing, manufacture, distribution, and use.
Linear Model/ System	A linear economy traditionally follows the "take-make-dispose" step-by-step plan. This means that raw materials are collected, then transformed into products that are used until they are finally discarded as waste.
Liquor Ratio	Used in the textile dyeing process. The liquor ratio is the ratio of the weight of the dry material being dyed to the water weight of the dyebath. Example, a liquor ratio of 1:10 implies 1 kg fibre is dyed in 10 L water
Metals	The most common heavy metal pollutants are arsenic, cadmium, chromium, copper, nickel, lead and mercury.
MMF	Man-made fibre, fibre whose chemical composition, structure, and properties are significantly modified during the manufacturing process. Typical examples are cotton and wool, which are mainly used in textile clothing but there are many often natural fibres produced in smaller quantities such as e.g. silk, flax or hemp. MMF can be organic or inorganic.
Multi Fibre Agreement	The Multifibre Arrangement (MFA) was an international trade agreement on textiles and clothing in place from 1974 till 2004. It imposed quotas on the amount of clothing and textile exports from developing countries to developed countries.
National Cleaner Production Center	National Cleaner Production Centre of Sri Lanka (Sri Lanka NCPC) is the foremost Cleaner Production solutions provider in Sri Lanka. NCPC Sri Lanka has successfully built global partnerships with international agencies such as UN Environment, UNIDO, European Union Switch Asia, GIZ, GEF and many more to facilitate a stronger sustainability exposure and knowledge sharing locally.
Net Metering	Net metering is an electricity billing mechanism that allows consumers who generate some or all of their own electricity to use that electricity anytime, instead of when it is generated. This is particularly important with renewable energy sources like wind and solar, which are non-dispatchable.
Net Zero Carbon Facility	The WorldGBC (World Green Building Council) definition of a net zero carbon building is a building that is highly energy efficient and fully powered from on-site and/or off-site renewable energy sources.
OPEX	Operating expenses are the costs a company incurs for running their day-to-day operations.
"Partnership for Cleaner Textiles" (Pact)	PaCT is playing a leading role in driving the long-term competitiveness and environmental sustainability of the textile wet processing sector, by addressing high water, energy, and chemical use through the adoption of best practices in the textile sector. These best practices lead to declining resource consumption, soaring profits, and an enhanced image in the global apparel market. Led by the International Finance Corporation (IFC), PaCT is working in partnership with NGO Solidaridad, the Embassy of the Kingdom of the Netherlands, 13 global apparel brands and 2 technology suppliers, textile factories, and the Bangladesh Garment Manufacturers and Exporters Association (BGMEA). To date, PaCT has partnered with 200 textile factories to support them to implement sustainable, resource efficiency projects.

Plastic Entering the Ocean through Apparel	A growing concern because of the associated negative environmental and health implications. It has been estimated that around half a million tonnes of plastic microfibres shed during the washing of plastic-based textiles such as polyester, nylon, or acrylic end up in the ocean annually.
Power Purchase Agreement (PPA)	A power purchase agreement (PPA) is a contractual agreement between energy buyers and sellers. They come together and agree to buy and sell an amount of energy which is or will be generated by a renewable asset. PPAs are usually signed for a long-term period between 10-20 years.
Pre-Treatment Process	Include a) Removing the undesired content from the fibre mass including dust, colouring matters, undesired oils, lint, trash, etc. and b) imparting the required level of fibre property for subsequent processing of textile substrate. The required fibre property may include fabric whiteness, absorbency, softness, strength, weight, width, etc. The pre-treatment processes performed in conventional textile industry are sizing, de-sizing, scouring, bleaching, mercerization, washing, and heat setting. One or more of any of these processes are required for the textile substrate depending upon the end use of the textile.
Public-Private-Partnerships	A public–private partnership is a cooperative arrangement between two or more public and private sectors, typically of a long-term nature. In other words, it involves government and business that work together to complete a project and/or to provide services to the population.
Purchasing Power	Purchasing power is the value of a currency in terms of the goods or services that one unit of it can buy.
Recalcitrant Compounds (Persistent Organic Compounds)	In environment any compound or molecule that persists in nature for long time and resist degradation. New synthetic compounds that are slowly biodegradable or non-biodegradable are known as recalcitrant compounds and range from simple halogenated hydrocarbons to complex polymers.
Renewable Energy Service Company (RESCO)	A Renewable Energy Service Company (RESCO) is an ESCO Energy service company which provides energy to the consumers from renewable energy sources, usually solar photovoltaics, wind power or micro hydro. RESCOs include investor owned, publicly owned, cooperatives, and community organisations.
Renewables	A natural resource or source of energy that is not depleted by use, such as water, wind, or solar power.
Reoxygenation	Oxygenate is to supply, treat, charge, or enrich with oxygen. Reoxygenation is to oxygenate something again.
Resource Efficiency Financing	Resource efficiency essentially means doing more with less, as it allows us to create more value using fewer natural resources.
"Responsible Fashion" Approach	The definition of a movement is the act of people working together from one position to another. The Responsible Fashion Movement is that action. Like minded individuals, in Sri Lanka and globally in the fashion and design industry, have come together to bring about a change in consciousness and awareness in the industry. It's a move towards a New Normal. It's time to move to create a new future. Responsibility, Responsiveness and Accountability are the desired action points. The Responsible Fashion Movement has a global agenda to shift this thinking, where mindsets are changed, practices implemented, and fashion consumers made aware of their choices. (http://responsiblefashion.org/)
Retailing	The selling of merchandise and certain services to consumers. It ordinarily involves the selling of individual units or small lots to large numbers of customers by a business set up for that specific purpose.
Reverse Osmosis (RO)	Reverse osmosis is a water purification process that uses a partially permeable membrane to remove ions, unwanted molecules and larger particles from drinking water.
Revolving Fund	A revolving fund is a fund or account that remains available to finance an organization's continuing operations without any fiscal year limitation, because the organization replenishes the fund by repaying money used from the account. Revolving funds have been used to support both government and non-profit operations.
Salts	Salt has an extremely high affinity for water. Broadly speaking, Salt is necessary in three ways, firstly, to drive dye into textile during the dyeing process in textile. Secondly, use of salt leads to maximum exhaustion of dye molecules during dyeing process in textiles.

Science Based Targets initiative (SBTi)	Science-based targets provide companies with a clearly defined pathway to future-proof growth by specifying how much and how quickly they need to reduce their greenhouse gas emissions. Targets adopted by companies to reduce greenhouse gas (GHG) emissions are considered “science-based” if they are in line with what the latest climate science says is necessary to meet the goals of the Paris Agreement – to limit global warming to well-below 2°C above pre-industrial levels and pursue efforts to limit warming to 1.5°C.
Science Based Targets Initiative (SBTi) Scopes	The Greenhouse Gas Protocol categorizes direct and indirect emissions into three broad scopes: • Scope 1: Direct GHG emissions occur from sources that are owned or controlled by the company, for example, emissions from combustion in owned or controlled boilers, furnaces, vehicles, etc.; emissions from chemical production in owned or controlled process equipment. • Scope 2: Indirect greenhouse gas emissions from consumption of purchased electricity, heat or steam. • Scope 3: Other indirect emissions, such as the extraction and production of purchased materials and fuels, transport-related activities in vehicles not owned or controlled by the reporting entity, electricity-related activities (e.g. T&D losses) not covered in Scope 2, outsourced activities, waste disposal, etc. For specific guidance on what to include in Scope 3, please refer to GHG Protocol Scope 3 Guidance For additional guidance on what to include in each scope, please refer to the GHG Protocol Corporate Standard. For guidance in setting targets please see https://sciencebasedtargets.org/.
Secured Transaction Registry	The Secured Transactions Register is a database, either electronic or in hard copy, in which Secured Creditors (Financial Institutions, Leasing Companies and Private Lenders) can give notice of their security interests in the movable goods of an enterprise or individual.
Secured Transactions Act	An act to provide for the securing of obligations in respect of movable property, maintenance of a secured transactions register; and for matters connected therewith or incidental thereto.
Smart Contracts	A smart contract is a computer programme or a transaction protocol which is intended to automatically execute, control or document legally relevant events and actions according to the terms of a contract or an agreement.
SME	Small and mid-size enterprises (SMEs) are businesses that maintain revenues, assets or a number of employees below a certain threshold. Each country has its own definition of what constitutes a small and medium-sized enterprise
SME Rating Agency India (SMERA)	Conceptualized by Ministry of Finance, Govt. of India and the Reserve Bank of India to help Indian MSMEs grow and get access to credit through independent and unbiased credit opinion that banks can rely on. SMERA offers SME Ratings, New Enterprise Credibility Scores, SME Credit Due Diligence and SME Trust Seal to Indian MSMEs to help lenders take informed decisions.
Socially Responsible Investing (SRI)	Socially responsible investing, social investment, sustainable socially conscious, "green" or ethical investing, is any investment strategy which seeks to consider both financial return and social/environmental good to bring about social change regarded as positive by proponents.
Special Purpose Vehicles	A special-purpose entity is a legal entity created to fulfill narrow, specific or temporary objectives. SPEs are typically used by companies to isolate the firm from financial risk. A formal definition is “The Special Purpose Entity is a fenced organization having limited predefined purposes and a legal personality”.
Sri Lanka Green Building Council	The Green Building Council of Sri Lanka (GBCSL) is the Sri Lanka’s leading authority on implementing green concept and green building practices. Established in 2009 with a joint effort by the professional institutions of architects, engineers, structural engineers, town planners, quantity surveyors, university academics, construction industry leaders, environmentalists and business leaders, the aim of GBCSL is to transform the Sri Lankan construction industry with green building practices and to fully adopt sustainability as the means by which our environment thrives, economy prospers and society grows to ensure the future wellbeing of Sri Lanka.

Surfactant	Surfactants are compounds that lower the surface tension between two liquids, between a gas and a liquid, or between a liquid and a solid. Surfactants may act as detergents, wetting agents, emulsifiers, foaming agents, and dispersants. The word surfactant is a blend of surface-active agent.
Suspended Solids	Suspended solids (SS) is the amount of tiny solid particles that remain suspended in water and act as a colloid. The measurement of suspended solids is one way of gauging water quality.
Sustainable Energy Development Authority	Governing body responsible for pioneering the sustainable energy revolution in Sri Lanka, with an aim to facilitate the development of our nation's rich energy resources, including solar, wind, water and bioenergy.
Sustainable Materials	Sustainable materials obtained from renewal resources and which have minimal impact on the environment during their production and recycling are considered favourably.
Sustainable Supply Chain Financing	Supply Chain Financing the use of financing and risk mitigation practices and techniques to optimize the management of working capital and liquidity in supply chains. Sustainable supply chain finance takes regular supply chain finance and integrates ESG considerations, using consistent methodology and data to rank supplier sustainability performance, either by the buyer or a third party. The sustainability performance information must be consistent and robust for a financial service provider to factor it into its calculations.
Sustainable Trade Loans	Essentially a sustainability-linked loan links the terms of a loan, often the pricing, to the borrower's performance against specific sustainability targets. These targets are typically negotiated and agreed between the borrower and lender group for each transaction.
Sustainalytics	Sustainalytics is a company that rates the sustainability of listed companies based on their environmental, social and corporate governance performance.
Synthetic Fibre	Any of various man-made textile fibers including usually those made from natural materials (such as rayon and acetate from cellulose or regenerated protein fibers from zein or casein) as well as fully synthetic fibers (such as nylon or acrylic fibers). The synthetic and semisynthetic fiber manufacturing is diversified with the utilization of monomer, chemical agent, precursor, catalyst, and a variety of auxiliary chemicals resulting in the formation of fibre or yarn
Tariff Wars	A tariff war is an economic battle between countries where they levy additional tax on each others exports.
Technical Textile	Any technical textile is a fibrous structure or a textile product that is produced for technical performance rather than fashion or aesthetic requirements. Currently, technical textiles occupy strong market consumption. It is significantly an important sector for industrial development in industrialized and developing countries. There are 12 types of technical textile with example product application which may be outlined as a) Meditech—sanitary diapers, bandages, sutures, mosquito nets, heart valves, ligaments, etc.; b) AgroTech—crop protection net, bird protection, water tank, etc.; c) BuildTech—ropes, tarpaulin, concrete reinforcement, window blind, wall covering, etc.; d) MobileTech—car airbags, aircraft seats, boat, seat belt, etc.; e) ProTech—protective gloves, knife and bulletproof vest, flame-retardant and chemical-resistant clothing, etc.; f) InduTech—conveyor belts, cordage, filtration media, etc.; g) HomeTech—sofa and furniture fabric, floor covering, mattresses, pillow, etc.; h) ClothTech—sun shade, parachute fabric, sewing threads, interlinings, etc.; i) SportTech—sports shoe, swimsuit, sports nets, sleeping bags, sail cloths, etc.; j) PackTech—tea bags, wrapping fabrics, jute sacks, etc.; h) EcoTech (textiles in environment protection)—erosion protection, air cleaning, prevention of water pollution, waste treatment/recycling, etc.; and Geotech—nets for seashore and geo structures, mats, grids, composites, etc.
Textile Manufacture	Textile fabric is at least a two-dimensional structure produced by fibre/yarn interlacing. The interlaced fibrous structure mainly used is woven, nonwoven, and knitted. Traditionally, the weaving technology was the principal source for fabric production. Textile manufacturing include a) Fabrication/weaving; b) Dyeing; and c) Finishing (stone washing)
Textile Wet Processing	Textile wet processing employs a huge amount of water, dyes and chemicals, and other materials for processes such as dyeing, printing and finishing. In other words textile wet processing normally includes pretreatment (or preparation), coloration (dyeing or printing), and finishing.
The Blockchain Technology	Blockchain technology is most simply defined as a decentralized, distributed ledger that records the provenance of a digital asset.

The Boston Consulting	Founded in 1963 and headquartered in the USA, The Boston Consulting Group (BCG) is a global management-consulting firm. BCG helps corporations and other organizations innovate and achieve sustainable competitive advantage.
Trade Liberalization	Trade liberalization is the removal or reduction of restrictions or barriers on the free exchange of goods between nations. These barriers include tariffs, such as duties and surcharges, and nontariff barriers, such as licensing rules and quotas.
Ultra Filtration (UF)	Ultrafiltration is one membrane filtration process that serves as a barrier to separate harmful bacteria, viruses, and other contaminants from clean water.
UN Framework Convention on Climate Change (UNFCCC)	The UNFCCC entered into force on 21 March 1994, is one of three Rio Conventions. Today, it has near-universal membership. The 197 countries that have ratified the Convention are called Parties to the Convention. Preventing "dangerous" human interference with the climate system is the ultimate aim of the UNFCCC along with the stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous interference with the climate system.
UNEP	UNEP is the global champion for the environment with programmes focusing on sustainable development, climate, biodiversity and more
UNEP Emissions Gap Report	For a decade, UNEP's Emissions Gap Report has compared where greenhouse gas emissions are heading against where they need to be, and highlighted the best ways to close the gap. The latest report presents the latest data on the expected gap in 2030 for the 1.5°C and 2°C temperature targets of the Paris Agreement. It considers different scenarios, from no new climate policies since 2005 to full implementation of all national commitments under the Paris Agreement. For the first time, it looks at how large annual cuts would need to be from 2020 to 2030 to stay on track to meeting the Paris goals.
UNFCCC Fashion Charter	During 2018, fashion stakeholders, under the auspices of UN Climate Change, worked to identify ways in which the broader textile, clothing and fashion industry can move towards a holistic commitment to climate action. They created the Fashion Industry Charter for Climate Action, which contains the vision to achieve net-zero emissions by 2050. The Fashion Industry Charter for Climate Action contains a series of principles addressing climate change. These principles go beyond previous industry-wide commitments. The centerpiece of the document consists of a target of 30% GHG emission reductions by 2030 and a commitment to analyze and set a decarbonization pathway for the fashion industry drawing on methodologies from the Science-Based Targets Initiative. These targets, as well as the other principles, are a clear demonstration that fashions leaders are serious about urgently acting on climate change and is keen to set an example to other industrial sectors.
United Nations Global Compact (UNGC)	A special initiative of the UN Secretary-General, the United Nations Global Compact is a call to companies everywhere to align their operations and strategies with ten universal principles in the areas of human rights, labour, environment and anti-corruption. Launched in 2000, the mandate of the UN Global Compact is to guide and support the global business community in advancing UN goals and values through responsible corporate practices. With more than 10,000 companies and 3,000 non-business signatories based in over 160 countries, and more than 60 Local Networks, it is the largest corporate sustainability initiative in the world.
United Nations Industrial Development Organization (UNIDO)	The specialized agency of the United Nations that promotes industrial development for poverty reduction, inclusive globalization and environmental sustainability.
Vertically Integrated Textile Mills	In vertically integrated mills production is managed from start to finish with mills conducting the yarn prep such as carding, drawing and spinning, all the way through weaving/knitting and the dying and finishing of apparel.
Volatile Compounds	Volatile organic compounds are organic chemicals that have a high vapor pressure at ordinary room temperature.

Wastewater Treatment Plants (WWTPS)	A wastewater treatment plant is a facility in which a combination of various processes (e.g., physical, chemical and biological) are used to treat industrial wastewater and remove pollutants
Wetting Agents, Acids, Alkalis and Dyes	Depends on the quality and desired refinement of the textile product, generally the higher the quality, and subsequently the price of the fabric, the more chemically intensive the manufacturing process (Anguelov 2016).
World Resources Institute (WRI)	World Resources Institute (WRI) is a global research organization that spans more than 60 countries, with international offices in Brazil, China, India, Indonesia, Mexico and the United States, regional offices in Ethiopia (for Africa) and the Netherlands (for Europe), and programme offices in the Democratic Republic of Congo, Turkey and the United Kingdom. Our more than 1,000 experts and staff turn big ideas into action at the nexus of environment, economic opportunity and human well-being.
World Trade Organization (WTO)	The World Trade Organization (WTO) is the only global international organization dealing with the rules of trade between nations. At its heart are the WTO agreements, negotiated and signed by the bulk of the world's trading nations and ratified in their parliaments. The goal is to help producers of goods and services, exporters, and importers conduct their business.
World Wide Fund for Nature (WWF)	WWF is the world's leading independent conservation organisation. Our mission is to create a world where people and wildlife can thrive together.
Woven Fabric	The important types of woven fabric produced are the basic weaves, such as plain or tabby, twill, and satin, and the fancy weaves, including pile, jacquard, dobby, and gauze.
Yarn Manufacture	Comprises a series of processes involved in converting the fibre into yarn. Example in cotton yarns yarn manufacturing starts from fibre bale opening, followed by the series of continuous operations of blending, mixing, cleaning, carding, drawing, roving, and spinning
ZDHC MRSL (Manufacturing Restricted Substances List)	The ZDHC Manufacturing Restricted Substances List (ZDHC MRSL) is a list of chemical substances. These substances are banned from intentional use in facilities processing textile materials, leather, rubber, foam, adhesives and trim parts in textiles, apparel, and footwear. Using chemical formulations that conform to the ZDHC MRSL allows suppliers to assure themselves, and their customers, that banned chemical substances are not intentionally used during production and manufacturing processes. The ZDHC MRSL goes beyond the traditional approaches to chemical restrictions, which only apply to finished products (Product Restricted Substances List - PRSL). This approach helps to protect consumers while minimising the possible impact of banned hazardous chemicals on production workers, local communities, and the environment.
Zero Discharge of Hazardous Chemicals (ZDHC)	ZDHC is a group of apparel and footwear brands and retailers working together to lead the industry towards zero discharge of hazardous chemicals by 2020. ZDHC was started in 2011, mostly as a response to the Greenpeace DeTox campaign. Part of the initial work established a Joint Roadmap that demonstrated the collaborative efforts and steps needed to lead the apparel and footwear industry towards zero discharge of hazardous chemicals for all products across all pathways by 2020. Membership has grown from six brands in 2011 to approximately twenty today. The group is diverse and includes: • Brands from Europe and the U.S. • Sportswear, Luxury and Fashion brands • Multi-billion dollar companies as well as small niche brand More information can be found at https://www.roadmaptozero.com/
Zero Liquid Discharge (ZLD) treatment plants	Zero Liquid Discharge is a treatment process designed to remove all the liquid waste from a system. The focus of ZLD is to reduce wastewater economically and produce clean water that is suitable for reuse, thereby saving money and being beneficial to the environment.

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Annexures

Annexure 1: General challenges faced by the apparel sector

Internal Barriers

1. Financial

i. Misconception about being expensive: Companies are not aware of the longer-term savings that could be derived through green practices.

ii. Unable to foresee or financially unable to factor in the potential benefits of greening early: The initial investment required to implement green aspects such as design, manufacturing, labeling etc. is not affordable as individual companies. For example, the added investments are in IT, Technology, skilled employees, motivation, training etc.

iii. Viewing initiatives as cost centers within same company thereby failing to assess the greening options business opportunities required for the transformative shift essential for future.

2. People related

i. Management support is critical in adopting and implementing innovative measures and to get the concurrence for investments. It is even more difficult in upgrading systems to improve environmental related aspects. Building the capacity of employees to communicate the greening related proposals in a convincing manner to the management is also important.

ii. Lack of capacity and skills: Lack of technical experts and masons qualified to construct Green factories.

iii. Lack of awareness programmes conducted locally: though there are a few seminars conducted yearly, many do not attend due to the lack of awareness, effectiveness, or reach.

iv. Lack of Management Initiatives for Transport and Logistics: The impact of green logistics involvement on supply chain strategies should be a focus.

v. Negative attitudes towards sustainability concepts and less support from the employees: Garment industry employees are paid lesser salaries and wages. They generally lack awareness and willingness to indulge in Green initiatives. No additional bonus or appraisal is provided to employees if they perform towards sustainability.

vi. Discouragement to designers: Sites often discourage designers who try to incorporate green features, precisely due to the lack of green planning.

vii. Green manufacturing is viewed as a luxury market: Many view greens manufacturing a luxury market which companies undertake to attract more customers. Since they are hardly able to meet their targets, they hesitate to invest in Green manufacturing.

viii. Lack of awareness on sustainability concepts: there is no definition of a green garment factory and as such organizations can interpret the word according to their needs even if they do not abide by the expected standards.

3. Organizational

i. Lack of Internal Sustainability Audits within the Organization:

ii. Organizational Reluctance and Lack of managerial knowledge: There is a reluctance from the organizational side due to various reasons which may be lack of support, commitment, budget, managerial knowledge, or unwillingness to take extra efforts.

iii. Lack of training in sustainable supply chain methods: Training and education are the prime requirements for achieving successful implementation of Green garment factory. Lack of training in Sustainable production is one of the essential barriers to developing Green garment factory. Apart from the issue of shortage of workers, the training capacity of the country is also inadequate.

iv. Difficulty for operation and maintenance: Incorporation of green features in manufacturing requires a huge commitment to operation, maintenance, updating and, innovation.

v. Poor Organizational Culture in Green Factories: Informal linkages and improved communication help the organizations to adopt Green practices. Training and education are the prime requirements for achieving successful development of Green factory. Management may encourage employees to learn green information. Organizations may provide rewards for green employees. Employees may be helped when they face green problems and may be provided support to learn green information.

vi. Drawback of Small Organization: Developing green garment factory is demanding on financial and human resources which smaller organizations might not have sufficient resources for

4. Administrative

i. Capabilities within purchasing and supply function and Reliance on traditional accounting methods: Lack of understanding of how to incorporate in purchasing and reliance on traditional accounting methods which results in difficulties for companies to justify their investments in implementing Green supply chain.

ii. No performance measurement methods: Although there are few sets of rules and regulations required to be followed to achieve green factory label, no measurement tool provides the current performance level of the company.

iii. Lack of supportive corporate structures and processes: Lack of information and technological systems, lack of supportive corporate structures and processes and lack of environmental professional knowledge for managers all require resources to make improvements.

iv. Difficulty in documentation: Certification companies require sets of documents to be submitted while applying for the Green factory certificate. This acts as a hindrance since the documentation process is time taking and complex.

v. Exemplary performance not easily achievable: It is difficult to achieve points under Innovation in Design

5. Resources

i. Lack of environmental professional knowledge: lack of qualified & trained professionals in environmental knowledge who can provide assistance

ii. Lack of Acceptance of Advancement in New Technology: An organizational barrier means difficulty of implementing fundamental change in the organization. This is especially true when there are changes in the core features of organizations like organizational goals, forms of authority, core technology, operational strategy and market strategy.

iii. Lack of Skilled HR Professionals in Sustainability: A Company with a higher quality of human resources such as better training or education will help in implementing Green Supply Chain Management. Quality human resources can provide new ideas for companies, learn new technologies easily, share knowledge with each other and use new technologies to solve the problem. However, due to financial constraint; quality of human resources is a barrier.

iv. Lack of information and standardization of alternate materials & technology: The market for alternate materials & technology still requires standardization and innovation. There is a lack of awareness and decisive factors which will help the customers

6. Strategical

i. Non-alignment with other SCM priorities: Green manufacturing is not aligned with other Supply chain management priorities, for example, a focus on cost reduction or other financial, technical, information related goals; acts as a barrier

ii. Green initiatives not integrated into corporate strategy: The companies that adopt Green initiatives perform these activities as peripheral to their core business and not integrated into their corporate strategy. Hence the execution is flawed, and they fail in realizing the full benefits.

External Barriers

1. Strategical

i. No tax benefit or other rewards from government: government incentives will encourage companies to adopt green aspects.

ii. Lack of Professional Treatment & Long-Term Contracts for Adopting Green Manufacturing Government: Government Rules & legislation is a major driver for company's environmental management. Regulations increase the threats of penalties and fines for non-compliance among companies. This driver is most helpful for implementing and adoption of Green Supply Chain Management in Manufacturing Industries. Lack of professional treatment and long-term contracts for adopting GSCM from the government have acted as barriers for promoting green technologies.

iii. Weak and inconsistent enforcement of government: Although the national policy intent is clear, its application at local level is not consistent.

iv. Lack of Industrial Training Institutes: Only a few relevant trades are offered by the Industrial Training Institutes. The technical training of engineers is not organized on a regular basis and it is hard to obtain industry- sponsored apprenticeships. The government and the industry need to collaborate to promote the training and skill- upgrading of the workforce and to explore the financial options to do so

2. Market

i. Pressure from competitors: competition for lower prices acts as a barrier in setting gup green garment factories due to the high investment involved

ii. Customer desire for lower prices: Conventional, less environmentally friendly raw materials, production methods and the production in offshore, low labour cost countries usually are less expensive than more sustainable alternatives.

iii. Global aspects: as language barriers and cultural barriers can impede communication as well and lead to misunderstandings and different perceptions of the given instructions

iv. Uncertainty and Competition in Market: in today's scenario market uncertainty is very high due to global competitiveness, and customer requirements. The external environment in which a firm conducts its business will also influence the innovative capability as well as intention to adopt innovations.

v. Customer's Unawareness towards GSCM Products and Services: A major barrier of GSCM is the lack of awareness of customers about the benefits of green products. Customer demands become the most crucial type of external pressure. Customer's awareness means if a customer demands green products; the company has to change technology and organization for innovative green products

vi. Lack of green Architects, Consultants, Green Developers, Contractors in the Region: *Suppliers Pressure and willingness can help to provide valuable ideas used in the implementation of environmental projects, but they generally do not act as a direct driving force. However, whilst suppliers may not be the drivers, integration, and cooperation in supply chains can support more effective management of environmental issues. Suppliers' reluctance to change towards Green garment factories is due to traditional mindset and suppliers' interests being different from those of the total network.*

vii. Poor supplier commitment: it is very difficult for a company to maintain a Green supply chain if their suppliers – for example for financial reasons – cannot or do not want to take part in green initiatives

viii. Lack of awareness of local customers in green products: Suppliers providing green technological solutions are often not able to find customers due to lack of awareness and insufficient promotion of their products.

ix. Poor Implementation of Green Practices within a Supply Chain: Innovative green practices involve hazardous solid waste disposal, energy conservation, reusing and recycling of materials. Innovative green practices promote innovative design, new market opportunities and make their quality better than others. However, due to market competition and cost implications, organizations try to save cost.

Source: Dash, Kumari and Bajpai, 2018

Annexure 2: Potential technology upgrades based on experiences in Bangladesh, China, India and Vietnam towards decarbonization of the industry

Utility improvements

- Reducing power consumption through pressure setting review of compressors
- Demand side controller of compressed air
- Proper insulation of bare surfaces, pipes, valves and correcting steam leaks
- Elimination of generator cooling tower to save water and energy
- Heat recovery from condensate
- VFD/Soft-starter for pumps motors and blowers
- Installation of energy-efficient lighting (T8 florescent tubes and T8 LED tubes)
- Installation of energy-efficient lighting (T5 florescent tubes and T5 LED tubes)
- Installation of skylights
- Oxygen tuning for boilers
- Auto blowdown controller for boilers
- Heat recovery from generator engine jacket
- Recovery of generator exhaust heat

Process improvements

- Reducing compressed air consumption by installing air nozzles on open pipes
- Reducing water consumption by installing trigger nozzles on open pipes
- Installing appropriate steam traps
- Lab to Bulk RFT performance improvement – RFT improvement from 50% to 80%
- Use of waterless direct softener injection in washing for reducing water consumption
- Recovery of water from drained liquor
- Heat recovery from hot liquor
- Re-coating/re-grinding of rubber padding mangles for reducing moisture percentage in stenter drying
- Retrofit of PLC based monitoring and controlling system of dyeing and washing machines

Knit dyeing utility related

- Improving energy metering system
- Improving wastewater treatment and re-use system
- Improving insulation of steam pipelines and valves
- Recycle the boiler drainage
- Condensate the cooling water reuse
- Upgrading to energy saving central air conditioner
- Yarn dyeing wastewater recovery
- Reducing he leakage of the water and steam system

Knit dyeing process related

- Implementing low liquor ratio dyeing machine
- Change batch washing to continuous rope washing machines
- Installing a waste-heat recovery unit on the hear setting machines
- Dyeing and finishing utility related
- Excess air controller in boilers
- VFD (Variable Frequency Drive) on soft flow machine circulation pumps
- Energy efficient lighting
- Insulate the un-insulated line, flange & valve of Steam Distribution Lines
- Power factor improvements
- Energy monitoring systems

Knit composite utility related

- Condensate recovery
- Oxygen monitoring in boilers
- VFD on ID fan of boilers
- Energy monitoring savings
- Lighting replacement
- Power factor improvement

Garment utility related

- Install VFD at ID fan of 2/3 boilers
- Optimizing cut off pressure on air compressors
- Optimization of lights after installing needle point LED lights
- Reuse of WWTP water for flushing, gardening and floor cleaning
- Installation VFDs on washing machines and tumble dyers
- Install flash steam recovery system
- Use fabric trimming as boiler fuel
- Arrest air leakages in compressor air line
- Replace 36W tube lights with LED lights to save energy
- Optimization of boiler blow down by proper control and stopping boiler drainage
- Install new energy efficient fluidized-bed (FBC) boiler for washing section
- Install VFD at chilled water pump
- Reuse ETP discharge in flushing
- Replace conventional tap to push type taps
- Replace clutch monitors of sewing machines with servo motors

Textile related

- Heat recovery from stenter to generate hot water to use in dyeing process
- Optimization of lights after utilization of natural lights in some shades and installing LED lights
- Optimization of blow down by using auto blow down controller
- Recovery of low-grade heat from hot drains in dyeing
- Insulation of jet dyeing machines with coating paints
- Optimize cut off pressure on air compressors
- Installation of energy efficient Co-generation system to get power and steam
- Modification of Condensate and flash steam recovery system including tank & pipe insulation
- Heat recovery from air compressors to generate hot water for use in dyeing process
- Use of condensate as hot process water to save steam
- Insulation of condensate lines, hot water valves
- Optimizing the combustion of steam boilers
- Reduce compressed air leakages
- Installation of caustic recovery plant

Textile process related

- Replacing of existing high MLR jet dyeing machines with low MLR (1:4) machines
- Reuse of WWTP water for screen/blanket washing and use auto cleaning system in screen printing
- Replace normal taps to push type to save water
- Insulation of jet dyeing machines
- Reducing water consumption by counter current washing in 2 printing washers
- Optimize mangle pressure and use 2 dip 2 nip process to save energy and productivity enhancement

HSBC

HSBC is one of the world's largest banking and financial services organizations. The Bank has a base of more than 40 million customers through their global businesses: Wealth and Personal Banking, Commercial Banking, and Global Banking & Markets. HSBC's network covers 64 countries and territories in Europe, Asia, the Middle East and Africa, North America, and Latin America.

HSBC global strategy for sustainability include working on decarbonization, nature-based solutions and future leadership. Apparel sector is a priority sector for HSBC in Sri Lanka due to the strong client base connected with the sector. HSBC's sustainability programme in Sri Lanka supports the conservation of natural capital such as Horton Plains and Peak Wilderness while carrying out strategic support in development sectors such as apparels, agriculture, water, and energy.

IUCN – International Union for Conservation of Nature

IUCN is a membership Union uniquely composed of both government and civil society organizations. It provides public, private and non-governmental organizations with the knowledge and tools that enable human progress, economic development and nature conservation to take place together.

Created in 1948, IUCN is now the world's largest and most diverse environmental network, harnessing the knowledge, resources and reach of more than 1,300 Member organizations and some 10,000 experts. It is a leading provider of conservation data, assessments and analysis. Its broad membership enables IUCN to fill the role of incubator and trusted repository of best practices, tools and international standards.

IUCN provides a neutral space in which diverse stakeholders including governments, NGOs, scientists, businesses, local communities, indigenous people's organizations and others can work together to forge and implement solutions to environmental challenges and achieve sustainable development.

Working with many partners and supporters, IUCN implements a large and diverse portfolio of conservation projects worldwide. Combining the latest science with the traditional knowledge of local communities, these projects work to reverse habitat loss, restore ecosystems and improve people's well-being.

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