

SDGs and Textiles

Gayathri Madubhani Ranathunga *Editor*


# Textiles of Sri Lanka

Sustainable Innovations and Practices

 Springer

# SDGs and Textiles

## Editor-in-Chief

Hafeezullah Memon , College of Textile Science and Engineering, International Institute of Silk, Zhejiang Sci-Tech University, Hangzhou, China

The book series “SDGs and Textiles” addresses the strategies to achieve sustainable development goals (SDGs) in the present, past, and future. It presents books about the present and future policies of textile ministries of different countries, and books related to sustainability education around different parts of the world in the textile sector. Moreover, it would welcome the conference proceeding related to SDGs and Textiles. The series would cover books comparing the sustainability and SDGs of different institutions and countries. The individual book volumes in the series are thematic. The goal of each book is to give readers a comprehensive overview of a different area of sustainability in the textile sector. As a collection, the series provides valuable resources to a broad audience in academia, the research community, industry, and anyone looking to expand their knowledge of SDGs and Textiles.

Textiles and life are together – life cannot be separated from textiles as it is the most important need for human beings after food. In 2015, the United Nations General Assembly proposed 17 interlinked global goals to be achieved by 2030. Since then, academia and industry have paid much attention to achieving these goals. Textile found its close relation with almost all of these 17 goals.

SDG 1 - No Poverty: Poverty would never be overcome by a charity only; it is essential to develop people’s skills to have a better and wealthy life. Thus, the textile can be considered an excellent discipline to achieve this goal by creating jobs and small and medium businesses.

SDG 2 - Zero Hunger: Through the effective utilization of advanced application of Agrotech Textiles, it is possible to have higher crop yields and save crops from rough weather, unexpected rains, floods, insects, etc.; thus, geotextiles play an essential in achieving this goal of sustainable development.

SDG 3 - Good Health & well-being: There has been much health consciousness after Covid19, and medical textiles assist in getting good health and well-being.

SDG 4 - Learning & Education: Textile or fashion has remained a significant discipline for societies for ages, and there has always remained much to explore in this field. Textile-related universities may play a vital role by offering free access to their education resources, training and spreading information among the locals.

SDG 5 - Gender Equality: The textile sector is one of the industrial sectors that accepted gender equality long ago; in particular, the garment sector has more females than males. Thus, the textile sector has been doing gender equality. Moreover, there has been a recent trend for Gender Neutral Clothing, which need worth studying and may further assist gender equality.

SDG 6 - Clean Water & Sanitation: Textiles could be achieved through filtration, and of course, textile is one of the critical materials for filtration.

SDG 7 - Affordable & Clean Energy: With the recent advancement in material science and engineering, the textile sector has come on the front for, not only by using this clean energy during textile production but also by assisting the production of this clean energy, either in the form of wind turbines blades made of textile composites or by energy harvesting from T-Shirts, etc.

SDG 8 - Decent Work: Recently, there has been much attention that the textile workers are not paid well, labor rights are not cared about, etc.

SDG 9 - Industry and innovation: Textile Industry always follows innovation; the textile companies that do not chase innovation cannot survive in the market.

SDG 10 - Reduced Inequalities: Getting better life and well-being would help reduce inequalities in the textile industry.

SDG 11 - Sustainable Cities: Sustainable Textile Cities through Buildtech and transport textiles.

SDG 12 - Consumption and Production: Textile and garment consumption and production all come under.

SDG 13 - Climate Action: Oekotech or Ecotech Textile, waste management of textiles are upfront to achieve this goal of sustainable development.

SDG 14 - Life Below Water: Mitigating microfiber waste in rivers and oceans may come under the context of it. There has been much attention on this subject after passing the bill at the parliament level of the UK.

SDG 15 - Life on Land: Geotech or Geotextiles studies life on land.

SDG 16 - Peace, Justice, and Strong Institutions: Protective textiles are doing their best to achieve peace, justice, and strong institutions.

SDG 17 - Partnerships for the Goals: The application of textiles to achieve sustainable development goals is only an example. In all textiles sectors, combined efforts of all the goals are essential to achieve true sustainability.

Gayathri Madubhani Ranathunga  
Editor

# Textiles of Sri Lanka

Sustainable Innovations and Practices

 Springer

*Editor*

Gayathri Madubhani Ranathunga  
Department of Textile and Apparel  
Engineering  
Fashion Design and Product Development  
Degree Course  
Faculty of Engineering  
University of Moratuwa  
Moratuwa, Sri Lanka

ISSN 2948-1236

ISSN 2948-1244 (electronic)

SDGs and Textiles

ISBN 978-981-97-0568-9

ISBN 978-981-97-0569-6 (eBook)

<https://doi.org/10.1007/978-981-97-0569-6>

© The Editor(s) (if applicable) and The Author(s), under exclusive license to Springer Nature Singapore Pte Ltd. 2024

This work is subject to copyright. All rights are solely and exclusively licensed by the Publisher, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, reuse of illustrations, recitation, broadcasting, reproduction on microfilms or in any other physical way, and transmission or information storage and retrieval, electronic adaptation, computer software, or by similar or dissimilar methodology now known or hereafter developed.

The use of general descriptive names, registered names, trademarks, service marks, etc. in this publication does not imply, even in the absence of a specific statement, that such names are exempt from the relevant protective laws and regulations and therefore free for general use.

The publisher, the authors and the editors are safe to assume that the advice and information in this book are believed to be true and accurate at the date of publication. Neither the publisher nor the authors or the editors give a warranty, expressed or implied, with respect to the material contained herein or for any errors or omissions that may have been made. The publisher remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

This Springer imprint is published by the registered company Springer Nature Singapore Pte Ltd.

The registered company address is: 152 Beach Road, #21-01/04 Gateway East, Singapore 189721, Singapore

Paper in this product is recyclable.

# Foreword

A rich collection of research on an industry in one country awaits you as the subject of this book. The book is all about Sri Lanka's textile and apparel industry explored along two roots—one with a very long history and the other less than 100 years. Both forms of industry are present across the country with different traditions and practices keeping the older form quite alive as well. As in textiles, the woven story of the narrative across 11 chapters links the industry in different ways to the Sustainable Development Goals—the all-consuming task of all the planetary inhabitants today. Some of us understand the dire consequences of missing these goals! Many of us I am afraid are not and research showcasing the progress being made or the absence is thus quite important.

Perhaps not many countries have their history starting with a storyline connecting to the textile industry and that is what Sri Lanka has. When King Vijaya and his group landed in Sri Lanka on or around 543 BC their first contact was a lady weaving spinning thread. Kuveni, the lady weaving spinning thread was a queen in Sri Lanka as per the Pali chronicle Mahavansa. She is from the indigenous inhabitants of Thambapani (then Sri Lanka). With this romantic occurrence—the legends vary in many ways but I select the joyful version—Vijaya married Kuveni and settled in Sri Lanka and the written history of Mahavansa then moves on.

Moving forward 2500 years the textile industry in Sri Lanka has become the sector to give a significant export earning to the country—a real GDP contributor. The industry over the years has only grown in importance in all its formats—economic, social, and environmental. Today it is the triple bottom-line considerations that we do in a well-meaning sustainable future-focused analysis to measure success of an industry, keeping in mind the future generations. The contributions as the research reveals have not been always positive as some growth has resulted in environmental and social stresses. One could foresee economic stresses as well as the industry's resources coming from the region with the majority of the consumers having to be reached with long supply chains. Primarily in the mass market apparel industry, it is the specialist production human capital the country provides. The compilation offers an analytical view of the industry from different directions. All chapters tackle those questions to different degrees keeping the UN goals of SDG as benchmark.

It is clear that while the industry sector is doing reasonably well many issues are exist. I hope that the findings do not reflect the Kuvani's curse that our history also alludes to. Authors are quite specific in their research recommendations too in ways to overcome the challenges and clear with details on the possibilities. That human capital sourced from Sri Lanka had served Bangladesh for instance quite well, and the industry there had surpassed Sri Lanka. Interesting to ponder—does that mean the Sri Lankan industrial environment is not conducive to dynamic growth though the technical abilities are excellent? Taking SDG 9 more seriously across the board the role of innovation in the Sri Lankan textile industry is enabling its competitiveness. The sufficiency of innovation process is opened up without an answer here. Though the exact details are not coming through the chapters Sri Lanka can boast of global firsts as well as perhaps the highest production floor areas per unit area in green apparel manufacturing. The “garments without guilt” projects a strong positive socially responsible image of the Sri Lankan Apparel industry.

Two chapters dwell into the handloom sector where one could witness history preserved. Interesting to read about the oral traditions keeping the handloom sector alive and how that is taking place in specific geographic locations. There was a significant impact on this sector when the economy opened up in 1977. However, the existence of it still in different parts of the country from the south to the central hills as described here, the research demonstrates the possible resilience when communities persist and society too responds positively. Yet there is a divide between this sector meeting local needs while the other serves globally and with a clear difference in economic value. Happening at different speeds SDGs are likely to be compromised.

The discussion also opens up the opportunity to bring natural fibres to create a sustainable manufacturing enterprise. The opportunity to scale up with natural fibres, i.e. banana as an example is presented though a technology gap exists in yielding required amounts of natural fibre. What is the impact of society embracing SDG 12 in reducing the demand burden? It is almost inconceivable to realise sustainable development in the absence of SDG 12. The modern apparel industry facing SDG 12 headwinds is still a slowly developing phenomenon as the current norm is more is needed by more. The handloom sector as a slow sector offers us a way to understand the value of a slow pace and controlling the demand.

The textile and apparel industry is well known for the significant no. of employment provided for females. The positivity that has come about by broad-basing the textile industry across Sri Lanka has come out. From the side of poverty, the industry has supported addressing multi-dimensional poverty. The glass ceiling appears to exist and definitely quite a significant amount of sticky floors. An interesting study with significant value is the dress choice of senior female executives and the correlation between the choice of dress and career growth. While reading this I visualised the picture in the Indian mission control room when the all-flight control personnel applauded when Chandrayan landed. Not exactly a comparison of apples with apples yet reading this I see there could be strong sociological considerations to be drawn from this study.

The circularity aspects of the industry have received attention. As good as new covers the second-hand garments. The upcycling has today come in, and some in

the industry are on global stage. The industry has embraced management techniques such as ISO14062: 2002 to embed sustainability drivers into organisational strategy. These steps however are with the large mass market apparel manufacturers who cater to distant markets. There is a need to customise and communicate these findings to those who operate at lower rungs. If one scales up plant dyes and carries out mordant-free dyeing you are in cleaner production from the beginning. Then as discussed testing is on sustainability practices, and testing themselves can be quite different and environmentally benign. All these thoughts get generated as one reads through. Important when designing change.

Quite a collection of practices, possibilities, and ideas is what this collection represents. Can the Pearl of the Indian Ocean rediscover the industry with the collective wisdom presented here? I see only the missing part of eco-innovation discussed at some length which is the prerequisite for the transformation. The seeds have been planted surely. This comes out as a unique collection covering one industry carried out by examining the role of driving the industry to develop their aspirational basis parallel to SDGs to grow and become meaningful to the economy.

Ajith de Alwis  
B.Sc. Eng (Moratuwa), MBA (PIM-SriJ),  
Ph.D. (Cambridge) FNASSL  
Senior Professor in Chemical and Process  
Engineering  
University of Moratuwa  
Sri Lanka  
  
Chief Innovation Officer  
National Innovation Agency  
Sri Lanka



# Preface

This book highlights the role of sustainable development in ancient practices and modern innovations in the textiles of Sri Lanka. Today, the textile industry of Sri Lanka has developed along two roots: the domestic handloom industry, which caters mainly to local consumers, and the apparel industry, which caters to global context needs. Both root causes have identified that the SDGs are aspirational to soar the country's economy.

The book reveals the textiles of Sri Lanka from the historical age to current tech-fabrics. The textile industry is one of the oldest in Sri Lanka, and it goes back to 2500 years of the country's history. The earliest handloom weaving was based on domestic weavers of Sri Lanka and practised as an indigenous craft. The most sought-after concepts and practices of maximum utilisation, zero waste, eco-friendly production process, reuse, upcycling, recycling, and longevity, such as sustainable development concepts and life, have been in the traditional society of Sri Lanka. The system was rooted in civil society; occupation and life became one. The employee and the employer were the craftsmen, and the learning has been handed down from generation to generation. The learning pattern remains sustainable in Sri Lanka even today.

The traditional textile industry has gradually developed into an industry that caters to the needs of the global context today. The end of the cultural revolution and the introduction of country-wide economic reforms, which saw the return of private enterprise, marked the second half of the 1970s as a period of change. In today's modern market, consumer demands and needs are constantly changing. New processes and steps are needed to keep up with these changes. The apparel industry of Sri Lanka has understood and long been practising that SDGs offer a common framework to increase the industry's own goals to address significant challenges in the global textile industry.

Through the analysis of the Textiles of Sri Lanka - Sustainable Innovations and Practices, this book explores the paths and methods of approaching Sustainable Development Goals. I would like to describe the diverse aspects to emphasise the uniqueness of the textiles of Sri Lanka and retain the interest and attention of many readers in this book.

The chapter “Sustainable Development Approaches for Sri Lankan Textile and Apparel Industry” overviews strategies for social responsibility and environmental impact reduction that the sector can implement. The chapter ““The Quality that Comes from Oral Tradition is the Trend and Luxury.” Indigenous Hand-Loom Textiles Show Potential Towards Sustainable Development” discusses how oral tradition preserves the distinctive identity of indigenous cultural textiles, demonstrating how tradition-derived quality is both luxurious and in style while offering guidance on sustainable growth. This is the first study to investigate the so-called oral tradition as the caretaker of identity in indigenous cultural textiles, showing the potential for sustainable survival and sustainable development. The chapter “Heritage of Living Entity and Living Skills: Advancing Sustainability Goals 1 and 4 in Handloom Textiles” identifies how handloom textile weaving heritage prevails as a living entity and living skills in the Southern Province. Despite the challenges posed by the current economic situation and administrative shortcomings, the Department and its management recognise and value the weavers and the broader workforce for their significant economic contributions. It underscores the importance of collaborating with universities to leverage their educational resources and training for the weavers. This partnership also facilitates the dissemination of information to the broader local community. The chapter “The Potential of Utilizing Sri Lankan Banana Agro-Waste to Generate Sustainable Textiles” provides available data on banana varieties of Sri Lanka and emphasises potential opportunities for extracting fibre from common varieties, their physical, chemical, and morphological characteristics, and possible textile applications and related government interventions. This is the only research providing genetic features and identification details of Sri Lankan banana cultivars. Also, the research provides specific physio-chemical and morphological characteristics of Sri Lanka banana fibres. Moreover, the research provides sophisticated and sustainable opportunities for banana fibre utilisation in the textile industry. Further, the chapter is inimitable as it also provides the provisions and interventions taken by the government to facilitate entrepreneurial opportunities linked to the research. The chapter “Achieving Sustainable Development Goals: The Impact of the Apparel and Textile Industry on the Eradication of Poverty in Sri Lanka” investigates the impact of the apparel sector on the reduction of income poverty in Sri Lanka, explores the potential impact of the apparel and textile industry on eradicating multidimensional poverty in Sri Lanka, and examines the role of the apparel sector on fostering female empowerment in the country. The findings indicate that over one-third of the sample lives below the income poverty threshold, with nearly 20 per cent experiencing multidimensional poverty. The apparel and textile industry significantly contributes to reducing income and multidimensional poverty in the country. The research emphasises that as the leading sector that energises the Sri Lankan economy, the textile and apparel sector has silently contributed to eradicating rural poverty in Sri Lanka. The chapter “As Good as New: A Study on Sri Lanka Consumers’ Secondhand Fashion Consumption” explores the concept of second-hand fashion consumption, which is not well-known in the Sri Lankan context. The research demonstrates five values that second-hand consumers consider: price consciousness, emotional bond consciousness, comfortability consciousness,

quality and brand consciousness, and social and environmental consciousness. The research demonstrates non-second-hand fashion consumers' consideration values of social status consciousness, hygienic consciousness, comfortability consciousness, quality and brand consciousness, and self-expressive consciousness. The findings indicated that consumer purchase and word-of-mouth intentions grew as emotional bonds increased. This research is one of the first studies to investigate second-hand fashion consumption amongst Sri Lankan fashion consumers, consequently offering valuable insights into Sri Lankan fashion retailers' sustainability strategies. The chapter [“The Use of ISO 14062:2002 Sustainable Design Strategies of the Designers to Address SDG 12: Ensure Sustainable Consumption and Production Patterns in the Export Apparel Industry in Sri Lanka”](#) investigates the impact of the export apparel industry in Sri Lanka on sustainable development, ensuring sustainable consumption and production patterns to concise possible regulatory guidelines and suggestions for the Sri Lankan apparel industry. It reveals that interpreting sustainable design strategies from a profit-oriented perspective can attract the mass-market apparel industry to actual, sustainable initiatives to achieve SDG12 more realistically. This chapter presented the only research using ISO 14062:2022 sustainable design strategies of designers in the Sri Lankan export apparel industry to address SDG 12: Sustainable Consumption and Production Patterns. The chapter [“Sustainability and Textile Testing”](#) explains that testing plays a significant role in ascertaining the suitability of materials and processes regarding their sustainability and environmental impact. This chapter discusses various tests to ascertain the sustainability of textile materials and related processes. It also seeks to discuss the actual testing itself in terms of its sustainability. The chapter [“An Investigation of Fashion for Career Development in Women’s Role in the Apparel Industry in Sri Lanka”](#) examines how fashion supports women’s career development in the Sri Lankan apparel industry. The study focuses on women’s career development and empowerment in the Sri Lankan apparel industry by thoroughly analysing the relationship between fashion preferences, professional image, and career advancement for women in Sri Lanka’s garment industry. The chapter [“Eco-Friendly Dyeing Techniques for Banana Fibers from \*Banana Application in the Sri Lankan Context. Promoting Sustainable Coloration Methods\*”](#) emphasises eco-friendly dyeing techniques. The chapter promotes sustainable colouration methods by prioritising eco-friendly dyeing techniques. Also, the chapter presents practical applications and results. The chapter goes beyond theoretical concepts by providing practical insights and results. It explores the extraction methods of natural dyes, optimisation of dye bath conditions, and evaluates the properties of dyed banana fibres, such as lightfastness, wash fastness, and eco-toxicity. Readers can gain valuable knowledge and guidance for implementing these eco-friendly dyeing techniques. The chapter discusses the contribution of the sustainable fibre and textile industry. The chapter aligns with the industry’s growing demand for sustainable and eco-friendly practices. By emphasising natural dye sources and minimising harmful chemicals, it offers a valuable resource for textile practitioners, designers, and researchers seeking to create environmentally conscious textiles. Overall, the chapter’s unique selling points lie in its

regional focus, emphasis on eco-friendly practices, practical application, and alignment with the sustainability trends in the fashion industry. These aspects make it a compelling and valuable contribution to the field. The chapter “[Role of Traditional Crafts in Sustainable Development: Reflections on Dumbara Weaving](#)” analyses the relationship between traditional crafts and sustainable development and identifies how those crafts can contribute to the long-term continuation of rural artisanal livelihood practices. The study proposes that Dumbara weaving and its endurance over time have been through the embeddedness of their livelihood within social institutions such as family and kinship and through the non-kin artisan-patron relationships, thereby contributing to achieving Sustainable Development Goals. It underlines the sixteenth of the UN’s Sustainable Development Goals, which are to respect and promote cultural diversity, facilitate cultural understanding and peace, reduce inequalities, and promote the rights of marginalised groups.

Thank you for your expert knowledge, deep analysis, and wise judgement. Sri Lanka, as an Island nation, has identical approaches to achieving Sustainable Development Goals. Multi-cultural, religious, and diverse social interactions analyse unique patterns in approaching global Sustainable Development Goals.

Prof. Gayathri Madubhani Ranathunga  
Department of Textile and Apparel  
Engineering  
Fashion Design and Product  
Development Degree Course  
Faculty of Engineering  
University of Moratuwa  
Moratuwa, Sri Lanka

# Contents

<b>Sustainable Development Approaches for Sri Lankan Textile and Apparel Industry</b> .....	1
U. G. Samudrika Wijayapala and K. G. R. Samarawickrama	
<b>“The Quality that Comes from Oral Tradition is the Trend and Luxury.” Indigenous Hand-Loom Textiles Show Potential Towards Sustainable Development</b> .....	23
G. M. Ranathunga and A. M. Lakshani Imeshika	
<b>Heritage of Living Entity and Living Skills: Advancing Sustainability Goals 1 and 4 in Handloom Textiles</b> .....	49
P. V. M. Karunaratne, U. I. Jayalath, and K. P. N. Bhagya	
<b>The Potential of Utilizing Sri Lankan Banana Agro-Waste to Generate Sustainable Textiles</b> .....	97
G. L. D. Wickramasinghe, U. S. W. Gunasekera, and A. C. S. I. Mumthas	
<b>Achieving Sustainable Development Goals: The Impact of the Apparel and Textile Industry on the Eradication of Poverty in Sri Lanka</b> .....	117
Thushari N. Vidanage, Lakshika C. Weragoda, Muditha Karunarathna, and Wasantha Athukorala	
<b>As Good as New: A Study on Sri Lanka Consumers’ Secondhand Fashion Consumption</b> .....	143
P. H. Thamoda Geegamage, H. R. Achini Ranaweera, and Rangika U. Halwatura	
<b>The Use of ISO 14062:2002 Sustainable Design Strategies of the Designers to Address SDG 12: Ensure Sustainable Consumption and Production Patterns in the Export Apparel Industry in Sri Lanka</b> .....	167
Prabod Dharshana Munasinghe	

**Sustainability and Textile Testing** ..... 191  
S. N. Niles

**An Investigation of Fashion for Career Development in Women’s  
Role in the Apparel Industry in Sri Lanka** ..... 199  
M. A. H. S. Hansadhi, D. S. Wijerathne, and C. Thenuwara

**Eco-Friendly Dyeing Techniques for Banana Fibers from *Banana  
Application in the Sri Lankan Context. Promoting Sustainable  
Coloration Methods*** ..... 213  
Subashini Balakrishnan, G. L. D. Wickramasinghe,  
and U. G. Samudrika Wijayapala

**Role of Traditional Crafts in Sustainable Development: Reflections  
on Dumbara Weaving** ..... 235  
Sulari De Silva

# Editor and Contributors

## About the Editor

**Gayathri Madubhani Ranathunga** is a Professor (ON MERIT) in the Department of Textile and Apparel Engineering, Faculty of Engineering, University of Moratuwa, Sri Lanka. She obtained Bachelor of Arts (Hons) in Fine Arts from the Faculty of Humanities, University of Kelaniya, Sri Lanka, in 2003. She earned her post-graduate qualification of Doctor of Philosophy in Integrated Design at the University of Moratuwa in April 2012. She obtained a post-graduate certificate in learning and teaching art, design, and communication (cltad) from the University of Arts London, UK, in 2006. Prof. Gayathri joined the University of Moratuwa in 2004. She teaches histories and the fashion of costumes around the world and in Sri Lanka, as well as the art and tradition of Sri Lanka and fashion illustrations. Her research interests are Cultural studies in Dress and Fashion, socio-cultural, political, and religious Influences on costume and fashion, Material culture analysis in historical costumes, Intangible heritage, indigenous skills in textiles and sustainable survival and sustainable development, and fashion Illustrations. She has published many research papers, conference proceedings, presentations, abstracts, and book chapters in international and national research journals and books. Prof. Gayathri has authored two scholarly books, *Fashions of Royalty: The Kandyan Kingdom of Sri Lanka* and *Art and Tradition of Sri Lanka Volume 01, Music of Sri Lanka*. She is a co-author of the textbook “The Buddhist Robe”: The Path Pointing to Natural Dyes and the Possible Establishment of a Natural Dyeing Industry in the Apparel Sector of Sri Lanka with special reference to the Buddhist Robe, published in 2019. She disseminates her knowledge and expertise in developing the country’s secondary and tertiary education in the fashion design stream, with 20 years of expertise in the field. She is a committee member of Subject Benchmark for Design, appointed by the University of Grants Commission of Sri Lanka. She served as a member of the Institutional review panel organized by the Ministry of Higher Education and Research. She has provided her services as a consultant, editor, unit author, and external examiner to the Bachelor of Industrial Studies Fashion Design and Product

Development of the Open University of Sri Lanka, Nawala. Also, she was a member of the National Competency Standard for Fashion Designing Technology Development group at the University of Vocational Technology, Kandawala, Rathmalana, Sri Lanka. She is a consultant at the National Institute of Education, Maharagama, Sri Lanka, giving her expertise in the development of a syllabus of Fashion Design for the programme of '13 years of guaranteed Education'. She is a jury member of the National and Provincial Judge board of "ShilpaAbhimani" Presidential Awards in Handicrafts Competition, organized by the National Crafts Council, Ministry of Industry and Commerce. She is also a jury member of the National and Provincial Judge Board 'Ransalu', National Textile Exhibition held by the Department of Textile Industries. She is also a consultant at the National Museum of Colombo, Sri Lanka.

## Contributors

**H. R. Achini Ranaweera** Department of Textile and Apparel Engineering, University of Moratuwa, Moratuwa, Sri Lanka

**Wasantha Athukorala** Department of Economics and Statistics, University of Peradeniya, Peradeniya, Sri Lanka

**Subashini Balakrishnan** Department of Textile and Apparel Technology, Faculty of Engineering Technology, The Open University of Sri Lanka, Nawala, Nugegoda, Sri Lanka

**K. P. N. Bhagya** Department of Textile and Apparel Engineering, University of Moratuwa, Moratuwa, Sri Lanka

**Sulari De Silva** Department of Textile and Apparel Engineering, Faculty of Engineering, University of Moratuwa, Moratuwa, Sri Lanka

**U. S. W. Gunasekera** Department of Textile and Apparel Engineering, University of Moratuwa, Moratuwa, Sri Lanka

**Rangika U. Halwatura** Department of Civil Engineering, University of Moratuwa, Moratuwa, Sri Lanka

**M. A. H. S. Hansadhi** Faculty of Graduate Studies, University of the Visual and Performing Arts, Colombo, 07, Sri Lanka

**U. I. Jayalath** Department of Textile and Apparel Engineering, University of Moratuwa, Moratuwa, Sri Lanka

**Muditha Karunarathna** Department of Economics and Statistics, University of Peradeniya, Peradeniya, Sri Lanka

**P. V. M. Karunaratne** Department of Textile and Apparel Engineering, University of Moratuwa, Moratuwa, Sri Lanka



**A. M. Lakshani Imeshika** Department of Textile and Apparel Engineering,  
University of Moratuwa, Moratuwa, Sri Lanka

**A. C. S. I. Mumthas** Sri Lanka Institute of Textile and Apparel, Ratmalana, Sri Lanka

**Prabod Dharshana Munasinghe** Department of Textile and Apparel Engineering, University of Moratuwa, Moratuwa, Sri Lanka

**S. N. Niles** Department of Textile and Apparel Engineering, University of Moratuwa, Moratuwa, Sri Lanka

**G. M. Ranathunga** Department of Textile and Apparel Engineering, University of Moratuwa, Moratuwa, Sri Lanka

**K. G. R. Samarawickrama** Department of Textile and Apparel Engineering, University of Moratuwa, Moratuwa, Sri Lanka

**U. G. Samudrika Wijayapala** Department of Textile and Apparel Engineering, University of Moratuwa, Moratuwa, Sri Lanka

**P. H. Thamoda Geegamage** Department of Textile and Apparel Engineering, University of Moratuwa, Moratuwa, Sri Lanka

**C. Thenuwara** Department of History and Theory of Arts, Faculty of Visual Arts, University of the Visual and Performing Arts, Colombo, 07, Sri Lanka

**Thushari N. Vidanage** Department of Economics and Statistics, University of Peradeniya, Peradeniya, Sri Lanka

**Lakshika C. Weragoda** Department of Economics and Statistics, University of Peradeniya, Peradeniya, Sri Lanka

**G. L. D. Wickramasinghe** Department of Textile and Apparel Engineering, University of Moratuwa, Moratuwa, Sri Lanka

**D. S. Wijerathne** Department of Textile and Apparel Technology, The Open University of Sri Lanka, Nawala, Nugegoda, Sri Lanka

# Sustainable Development Approaches for Sri Lankan Textile and Apparel Industry



U. G. Samudrika Wijayapala and K. G. R. Samarawickrama

**Abstract** The Sri Lankan textile and apparel industry is a significant contributor to the country's economy, but it also faces challenges related to sustainable development. This chapter explores sustainable development approaches that the industry can adopt to reduce environmental impact and promote social responsibility. The study begins by examining the current state of the textile and apparel industry in Sri Lanka and identifying its sustainability challenges, including water scarcity, carbon emissions, and labour practices. The chapter then discusses sustainable development approaches such as circular economy, eco-design, and green supply chain management, which can help address these challenges. The circular economy model emphasizes resource efficiency and waste reduction, eco-design incorporates sustainability into the design process, and green supply chain management promotes sustainability throughout the entire supply chain. These approaches can enable the textile and apparel industry in Sri Lanka to become more environmentally and socially sustainable, while also improving economic performance. Overall, the adoption of sustainable development approaches is critical for the long-term success of the Sri Lankan textile and apparel industry.

**Keywords** Sustainable development · Environmental impact · Circular economy · Eco-design · Green supply chain management

## 1 Introduction

The Sri Lankan textile and apparel industry has long been a cornerstone of the country's economic growth, serving as a critical driver of exports and employment. However, this industry is undergoing a profound transformation in the face of global

---

U. G. Samudrika Wijayapala (✉) · K. G. R. Samarawickrama  
Department of Textile and Apparel Engineering, University of Moratuwa, Moratuwa, Sri Lanka  
e-mail: [samu@uom.lk](mailto:samu@uom.lk)

K. G. R. Samarawickrama  
e-mail: [samrawickramakgr.20@uom.lk](mailto:samrawickramakgr.20@uom.lk)

sustainability challenges. Sustainable development approaches are emerging as a critical imperative, reshaping the way Sri Lanka's textile and apparel sector operates and thrives in the twenty-first century. Sustainability in this context transcends mere profitability and production. It encompasses a holistic commitment to environmental conservation, ethical labour practices, and social responsibility, all while ensuring the industry's long-term economic viability [59]. The Sri Lankan textile and apparel industry is at a pivotal crossroads, where sustainable practices are no longer optional but essential for its survival and global competitiveness. The Sri Lankan textile and apparel industry plays a pivotal role in the country's economy, contributing significantly to exports and providing employment opportunities for a large workforce. However, in an era marked by growing environmental concerns, ethical labour practices and evolving consumer preferences, there is an urgent need for the industry to adopt sustainable development approaches [2].

Sustainability in this context encompasses environmental stewardship, social responsibility, and economic viability. The sustainable development approaches in the Sri Lankan textile and apparel industry are not merely a choice but a necessity. It requires a fundamental shift in the way the industry operates, from raw material sourcing to production processes and supply chain management. This shift must prioritize long-term sustainability over short-term gains, fostering innovation and aligning with international standards and best practices [3, 5]. Sri Lanka has the opportunity to position itself as a global leader in sustainable textile and apparel manufacturing. By adopting and promoting sustainable practices, the industry can enhance its competitiveness, gain access to environmentally conscious markets, and contribute to a more responsible and equitable global supply chain. This journey towards sustainability is multifaceted, encompassing efforts to reduce environmental impact, uphold labour rights, and engage in ethical business practices. It also involves educating and training the workforce, fostering collaboration between industry stakeholders and integrating sustainability principles into educational curricula. In this series of articles, we will explore the various dimensions of sustainable development for the Sri Lankan textile and apparel industry [6, 17]. We will delve into strategies to reduce carbon emissions, minimize water usage, and manage waste responsibly. We will also examine the importance of fair labour practices, supply chain transparency, and ethical sourcing. Furthermore, we will explore how educational curriculum enhancement can play a pivotal role in shaping a sustainable future for the industry. The Sri Lankan textile and apparel sector sees sustainability as a strategic objective rather than a trendy concept. Through thoughtful and concerted efforts, the industry can secure its future and contribute positively to the well-being of the planet and its people [7]. In this chapter, we discuss the sustainability challenges and sustainable development approaches for sustainable development approaches for Sri Lankan textile and apparel industry.

## 2 Sustainability Challenges

The Sri Lankan textile and apparel industry has long been a cornerstone of the country's economic growth, serving as a key driver of exports and employment. However, this industry is undergoing a profound transformation in the face of global sustainability challenges. Sustainable development approaches are emerging as a critical imperative, reshaping the way Sri Lanka's textile and apparel sector operates and thrives in the twenty-first century. Sustainability in this context transcends mere profitability and production. It encompasses a holistic commitment to environmental conservation, ethical labour practices, and social responsibility, all while ensuring the industry's long-term economic viability. The Sri Lankan textile and apparel industry is at a pivotal crossroads, where sustainable practices are no longer optional but essential for its survival and global competitiveness. Sustainability challenges are complex and pressing issues related to the environment, society, and the economy that hinder the ability of individuals, communities, organizations, and nations to achieve long-term well-being while also ensuring that resources are preserved for future generations [8, 10]. These challenges are typically characterized by their multifaceted nature and the need for comprehensive, integrated solutions. Indeed, the Sri Lankan textile and apparel industry faces some sustainability challenges as it seeks to adopt sustainable development approaches. Water scarcity is a growing sustainability challenge impacting industries worldwide, including Sri Lankan textile and apparel. This sector relies heavily on water throughout its supply chain, from the cultivation of raw materials to the manufacturing processes. As water resources become scarcer due to climate change and increasing demand, addressing this challenge is paramount for the industry's sustainability. Water scarcity arises from the imbalance between water supply and demand, and it is exacerbated by factors such as population growth, industrialization, and changing weather patterns. Like many other regions, Sri Lanka faces the risk of dwindling freshwater resources. For the textile and apparel industry, which relies on substantial water usage for dyeing, finishing, and other processes, water scarcity substantially threatens its operations, the environment, and local communities [9, 11].

Carbon emissions are a significant sustainability challenge facing industries worldwide, and the Sri Lankan textile and apparel industry is no exception. This sector primarily contributes to greenhouse gas emissions through energy-intensive processes and transportation. As the global community grapples with the urgent need to address climate change, mitigating carbon emissions has become a crucial aspect of sustainability. Carbon emissions, primarily in the form of carbon dioxide (CO<sub>2</sub>) and other greenhouse gases, are a key driver of climate change. Sri Lanka, along with the rest of the world, is experiencing the adverse impacts of rising temperatures, extreme weather events and shifting climate patterns. The textile and apparel industry is a notable contributor to carbon emissions due to its reliance on energy-intensive processes, such as dyeing and finishing, and the extensive transportation of goods across the supply chain [12, 13].

Chemical management and pollution pose significant sustainability challenges, particularly in industries like the Sri Lankan textile and apparel sector, which rely on various chemicals in their manufacturing processes. The improper use, disposal, and management of chemicals can lead to environmental contamination, harm human health, and undermine the industry's sustainability efforts. Chemicals are integral to textile and apparel manufacturing, from dyes and finishes to treatments for fabric and garments. However, the improper handling, release, and disposal of these chemicals can have severe environmental and health consequences. Pollution, such as water and soil contamination, directly results from chemical mismanagement. Additionally, worker safety and well-being can be compromised if proper precautions are not in place. These challenges raise ethical and environmental concerns that must be addressed to achieve sustainability [14, 15].

Waste management is a critical sustainability challenge faced by industries worldwide, and the Sri Lankan textile and apparel industry is no exception. This sector generates a significant amount of waste, including off-cuts, defective products, and discarded garments. Inefficient waste management can lead to environmental pollution, resource depletion, and reputational damage. Addressing waste management challenges is essential for the industry to align with sustainable practices. The issue of waste management can be tackled to promote sustainability in the textile and apparel industry. The textile and apparel industry produces substantial waste during various stages of production, from raw material processing to finished product manufacturing. Inadequate waste management practices can result in environmental harm, such as landfills overflowing with textile waste and pollution from the disposal of hazardous materials. Sustainable waste management minimizes these adverse effects [20, 24].

Supply chain transparency is fundamental to sustainability, particularly in industries like the Sri Lankan textile and apparel sector. This industry's global supply chain involves various stages, from sourcing raw materials to manufacturing and distribution. Ensuring transparency throughout this complex web of suppliers and subcontractors is essential for addressing sustainability challenges. The textile and apparel supply chain is often intricate, involving multiple tiers of suppliers, subcontractors, and factories across different countries. Ensuring transparency at each stage is challenging but vital for addressing sustainability concerns. Issues such as unethical labour practices, environmental degradation and harmful chemicals can arise when supply chains lack transparency [21, 22].

Skills and education play a crucial role in promoting sustainability within the Sri Lankan textile and apparel industry. Like many others, this sector faces significant sustainability challenges from environmental impact to labour practices. The textile and apparel industry requires diverse skills, from design and production to supply chain management and sustainability practices. The challenge lies in ensuring that the workforce possesses the knowledge and competencies needed to drive sustainability initiatives effectively. Education and training must keep pace with evolving sustainability standards and best practices [25, 28].

Economic sustainability is critical to overall sustainability in any industry, including the Sri Lankan textile and apparel industry. It encompasses the ability to

balance economic viability with social and environmental responsibility. Economic sustainability challenges arise when businesses must navigate the complexities of reducing their environmental impact and promoting ethical labour practices while maintaining profitability. The textile and apparel industry faces a unique challenge in balancing sustainability with economic sustainability. While transitioning to sustainable practices often requires upfront investments in eco-friendly technologies, responsible sourcing, and ethical labour practices, the immediate costs can strain profit margins. Economic sustainability challenges emerge as businesses must find ways to absorb these initial costs while ensuring that long-term economic benefits outweigh them [29, 30]

The adoption of a circular economy is a transformative concept that challenges traditional linear models of production and consumption. In industries like the Sri Lankan textile and apparel sector, circular economy adoption presents both opportunities and challenges for sustainability. The shift towards circularity involves rethinking product design, manufacturing processes, and waste management. Circular economy adoption challenges traditional business models that prioritize linear production, consumption, and disposal. In the textile and apparel industry, where fast fashion has been prevalent, transitioning to a circular model means extending product lifecycles, reusing materials, and minimizing waste. This shift requires significant changes in product design, manufacturing, supply chains, and consumer behaviour [36, 38].

### 3 Sustainable Development Approaches

The Sri Lankan textile and apparel industry stands at a pivotal juncture where adopting sustainable development approaches is not just a choice but a necessity. This industry, a significant contributor to the country's economy, has experienced substantial growth over the years. However, this growth has come at a cost, with environmental concerns and ethical labour practices increasingly pressing. Sustainable development approaches represent a comprehensive strategy aimed at addressing these challenges while ensuring the industry's long-term viability. Sustainability in this context encompasses a broad spectrum of objectives, including reducing environmental impact, promoting ethical labour practices, optimizing resource usage, and fostering social responsibility. It calls for a fundamental shift in the way the industry operates, from the sourcing of raw materials and production processes to consumer behaviour and waste management. These approaches are essential for safeguarding the environment and improving the well-being of the workforce but also for maintaining the industry's competitiveness in a global market increasingly focused on sustainability. In exploring sustainable development approaches for the Sri Lankan textile and apparel industry, we will explore various strategies and initiatives to achieve a harmonious balance between economic growth, environmental responsibility, and ethical practices. These approaches present challenges and offer significant opportunities for innovation, efficiency, and long-term prosperity. Ultimately, they

are a blueprint for transforming an industry traditionally associated with fast fashion and high resource consumption into a beacon of sustainable and responsible business practices [19, 55].

Environmental sustainability is a cornerstone for improving sustainable development approaches in the Sri Lankan textile and apparel industry. This sector, while contributing significantly to the country's economy, has faced mounting challenges related to its environmental impact. Embracing environmental sustainability addresses these concerns and positions the industry for long-term resilience and competitiveness. One of the key aspects of environmental sustainability is resource efficiency. The textile and apparel industry is known for its high water and energy consumption. To address this, companies can invest in technologies that optimize resource usage. Water recycling systems, energy-efficient machinery, and reduced material waste are essential steps. These practices minimize environmental impact and reduce operational costs [39]. Sustainable sourcing is a critical strategy for enhancing sustainable development approaches in the Sri Lankan textile and apparel industry. Sustainable sourcing offers a pathway to achieving both environmental and social responsibility while ensuring the industry's long-term viability. Sustainable sourcing involves procuring raw materials that have a minimal environmental impact. This includes prioritizing organic cotton, recycled fibres and eco-friendly dyes. The industry can significantly reduce its carbon footprint and minimize its effects on ecosystems by choosing materials produced using sustainable agricultural practices and eco-friendly manufacturing processes. Sourcing from local suppliers and those who adhere to ethical labour practices is a crucial aspect of sustainability. By collaborating with suppliers who provide fair wages, safe working conditions, and adhere to ethical labour standards, the industry can ensure that its operations promote social responsibility and worker well-being [41].

Waste reduction is a crucial component of sustainable development approaches in the Sri Lankan textile and apparel industry. This industry is notorious for generating significant amounts of waste, including fabric off-cuts, unsold inventory, and discarded garments. Implementing effective waste reduction strategies minimizes the environmental impact and contributes to cost savings and overall sustainability. One of the primary sources of waste in the textile and apparel industry is inefficient material usage. Through meticulous pattern layouts, cutting techniques, and fabric optimization, companies can reduce the amount of textile waste generated during production. Overproduction is common in fast fashion, leading to excessive waste [42]. Adopting a more demand-driven approach, where production is aligned with actual customer orders, can significantly reduce overproduction. Another effective waste reduction strategy is repurposing and recycling textile scraps and unsold inventory. Rather than discarding these materials, they can be creatively repurposed into new products or recycled into new textiles. This reduces waste and extends the lifecycle of materials and aligns with circular economy principles. Donating unsold inventory to charitable organizations or implementing take-back programs that allow customers to return used clothing for resale or recycling can minimize waste and promote social responsibility. These initiatives not only reduce landfill waste but also contribute to community well-being. Educating consumers about

the importance of responsible consumption and disposal of textiles and apparel is crucial. By raising awareness about the consequences of fast fashion and encouraging consumers to recycle or donate clothing, the industry can foster a culture of sustainability. Embracing circular economy principles, such as designing products for durability, reparability, and recyclability, is pivotal. This approach extends the life of products and materials, reducing the need for new resources and minimizing waste generation. Ensuring compliance with waste disposal regulations is essential. Proper waste management practices, such as recycling and safe disposal, prevent environmental contamination and legal consequences [4, 44]

The adoption of green technologies is a pivotal strategy for improving sustainable development approaches in the Sri Lankan textile and apparel industry. Historically associated with resource-intensive and environmentally harmful practices, this sector is undergoing a transformation driven by the integration of eco-friendly technologies. Embracing these innovations reduces the industry's environmental footprint and enhances its long-term sustainability and competitiveness. Green technologies in the form of energy-efficient machinery and equipment are revolutionizing textile and apparel production. Companies can significantly reduce energy consumption by replacing older, energy-intensive machinery with more efficient models [45, 46]. This lowers operational costs and mitigates greenhouse gas emissions, contributing to environmental sustainability. Harnessing renewable energy sources like solar and wind power is another facet of green technology adoption. By installing solar panels or wind turbines, textile and apparel factories can generate their own clean energy, reducing their reliance on fossil fuels. This reduces carbon emissions and insulates businesses from energy price fluctuations. Traditional dyeing and printing processes in the industry often involve the use of chemicals and large volumes of water. Green technologies offer alternatives such as digital printing and waterless dyeing processes. These methods drastically reduce water consumption, chemical usage, and wastewater discharge, aligning with environmental sustainability goals. Innovations in sustainable materials, such as recycled or bio-based fabrics, are becoming increasingly prevalent. These materials reduce the environmental impact of textile production and cater to consumers growing demand for eco-friendly products. Advanced water recycling systems are emerging as essential green technologies in the textile and apparel industry. These systems capture and treat wastewater, allowing it to be reused in production processes. Green technologies also include sophisticated monitoring and control systems that optimize resource usage. Sensors and automation technology can regulate machine performance, reduce energy consumption during non-production hours, and minimize material waste, enhancing overall resource efficiency. Sustainable packaging solutions, such as biodegradable or recyclable materials, are integral to green technology adoption. By using eco-friendly packaging, companies reduce their contribution to plastic pollution and promote responsible disposal practices [31, 47].

Regulatory compliance plays a crucial role in improving sustainable development approaches in the Sri Lankan textile and apparel industry. As the industry faces mounting environmental and ethical challenges, adherence to local and international regulations is a legal requirement and a fundamental step towards promoting



responsible practices and enhancing long-term sustainability. Compliance with these regulations requires textile and apparel companies to adopt eco-friendly practices, reduce pollution, and manage waste responsibly. For instance, adherence to limits on wastewater discharge and the proper disposal of hazardous chemicals are essential aspects of environmental compliance. By meeting these standards, companies minimize their environmental footprint and contribute to the preservation of local ecosystems. Beyond environmental concerns, the Sri Lankan textile and apparel industry must address labour-related issues. Compliance with ethical labour standards, such as fair wages, safe working conditions, and protection of workers' rights, is vital. International organizations like the International Labour Organization (ILO) set guidelines for fair labour practices. Ensuring workers are treated ethically aligns with global human rights principles and enhances the industry's social sustainability. Many textile and apparel companies seek certifications and labels that demonstrate their commitment to sustainability and regulatory compliance [43, 51].

These certifications, such as Fair Trade or Global Organic Textile Standard (GOTS), provide consumers with assurance and open access to eco-conscious markets. Compliance with the standards associated with these certifications necessitates adherence to strict environmental and ethical criteria. Transparency in reporting environmental and social performance is increasingly important. Many companies voluntarily disclose their sustainability efforts through annual reports or dedicated sustainability websites. This practice builds consumer trust and highlights areas where the industry meets or exceeds regulatory requirements. Regulatory compliance extends throughout the supply chain. Companies must ensure that their suppliers and subcontractors adhere to environmental and labour regulations. Regular audits and monitoring of supply chain partners are essential to maintain compliance and minimize risks associated with non-compliance. Collaborating with governmental bodies is crucial for promoting sustainable development. Textile and apparel industry associations can work closely with government agencies to develop supportive policies, incentives, and regulations encouraging sustainable practices. Government support can further drive positive change within the industry [51, 54]

Consumer awareness plays a pivotal role in improving sustainable development approaches in the Sri Lankan textile and apparel industry. As consumers become increasingly conscious of environmental and ethical issues associated with the fashion industry, businesses are compelled to respond by adopting sustainable practices. Consumer awareness campaigns are essential for educating the public about the environmental and social implications of their clothing choices. These campaigns can highlight the environmental impact of fast fashion, including water and resource consumption, pollution, and textile waste. By raising awareness about these issues, consumers are more likely to make informed, sustainable choices when purchasing clothing. As consumers become more informed about sustainability issues, there is a growing demand for eco-friendly and ethically produced textiles and apparel. This shift in consumer preferences incentivizes businesses to prioritize sustainable sourcing, production processes, and materials. Companies that respond to this demand can gain a competitive edge and contribute to industry-wide sustainability. Informed consumers demand business transparency. They want to know where and

how their clothing is produced and whether ethical labour practices are upheld. This demand for transparency compels companies to improve supply chain visibility, traceability, and reporting. It encourages businesses to adhere to ethical labour standards and environmentally responsible practices to maintain consumer trust [53, 56].

Consumer awareness campaigns can lead to behavioural change, encouraging consumers to rethink their consumption habits. Concepts like “buy less, choose well, make it last” promote a more sustainable approach to fashion, emphasizing quality over quantity and reducing the frequency of disposal. Such shifts in consumer behaviour align with sustainability goals and reduce the industry’s environmental impact. Informed consumers actively seek out and support sustainable brands [57]. Companies committed to responsible practices, ethical labour, and eco-friendly materials can attract loyal customers. This support drives market competition, incentivizing more businesses in the textile and apparel industry to adopt sustainable practices. Consumer awareness often translates into pressure and advocacy. In response to consumer demands, some consumers and organizations actively campaign for change within the industry. This advocacy can lead to policy changes, industry-wide initiatives, and increased scrutiny of unsustainable practices. Informed consumers are more likely to participate in sustainable initiatives such as clothing recycling programs, clothing swaps, and second-hand shopping. These activities promote circularity, reduce textile waste, and extend the lifespan of clothing items [23, 61].

Ethical labour practices are fundamental to improving sustainable development approaches in the Sri Lankan textile and apparel industry. Embracing ethical labour practices addresses these issues and contributes to the industry’s long-term sustainability and reputation. Ethical labour practices demand safe and healthy work environments for textile and apparel workers. This includes proper ventilation, lighting, sanitation facilities, and measures to prevent accidents and injuries. By prioritizing worker well-being, businesses fulfil their moral obligations and reduce the risk of workplace-related incidents and associated costs. Ethical labour practices uphold workers’ rights, including the right to fair wages, reasonable working hours, and freedom from discrimination and harassment. Ensuring fair compensation and adherence to legal working hours helps improve the livelihoods of workers and promotes social sustainability. Fostering a diverse and inclusive workplace enhances the industry’s reputation and competitiveness. Ethical labour practices unequivocally reject child labour and forced labour. By conducting thorough supply chain assessments and implementing stringent monitoring mechanisms, the industry can identify and eliminate any instances of child labour or coercion in production. This not only aligns with global labour standards but also safeguards the well-being of vulnerable populations [60, 62]

Many textile and apparel companies seek Fair Trade and ethical certifications to demonstrate their commitment to responsible labour practices. These certifications assure consumers of ethical treatment and promote responsible and transparent supply chains. This helps businesses build trust and loyalty among consumers. Collaboration with Labor Organizations: Collaborating with labour organizations and unions can be instrumental in improving labour conditions. Businesses can

address concerns and find mutually beneficial solutions by engaging in open dialogue and negotiation with workers representatives. This collaboration fosters positive labour relations and contributes to workplace stability. Ethical labour practices involve investing in worker training and development programs. These initiatives enhance workers' skills, employability, and job satisfaction. Companies benefit from a more skilled workforce, reduced turnover, and improved productivity. Ethical labour practices extend throughout the supply chain. Companies must conduct regular supplier audits to ensure subcontractors and suppliers adhere to ethical labour standards. Holding suppliers accountable for ethical practices reinforces responsible sourcing and production [65, 67].

Consumer education is a potent tool for improving sustainable development approaches in the Sri Lankan textile and apparel industry. As consumers become increasingly aware of environmental and ethical concerns associated with the fashion industry, educating them about responsible choices can drive positive change in the industry. Consumer education initiatives can highlight the significant environmental impact of the textile and apparel industry. This includes the industry's contribution to water pollution, carbon emissions, and textile waste. By raising awareness of these issues, consumers are more likely to make eco-conscious choices when purchasing clothing [16].

Promoting ethical consumption is a powerful strategy for improving sustainable development approaches in the Sri Lankan textile and apparel industry. This approach focuses on raising awareness and encouraging consumers to make choices that align with ethical principles, such as fair labour practices and social responsibility. One of the fundamental aspects of promoting ethical consumption is consumer education. Initiatives and campaigns can inform consumers about the ethical challenges in the textile and apparel industry, including issues related to worker conditions, wages, and human rights. Educating consumers about these concerns makes them more likely to make informed choices when purchasing clothing. Ethical consumption encourages consumers to support brands and businesses that prioritize fair labour practices and uphold workers' rights. Consumers are encouraged to research and choose products from companies committed to ethical labour standards. This support sends a clear message to the industry that ethical practices are valued and rewarded. Ethical consumption promotes transparency within the industry. Consumers are encouraged to seek out brands that provide information about their supply chains, sourcing practices, and ethical commitments. This transparency allows consumers to make informed decisions about the brands they support and encourages businesses to be accountable for their practices [68, 69].

Consumers engaged in ethical consumption may boycott brands or products associated with unethical practices. This can pressure companies to improve their ethical standards to avoid losing market share. Fair trade and ethical certifications serve as indicators of ethical consumption. These certifications ensure that workers are treated fairly, receive fair wages, and work in safe conditions. Encouraging consumers to look for and support products with these certifications helps promote ethical practices within the industry. Ethical consumption often aligns with sustainable fashion movements such as the Fashion Revolution. These movements call for transparency,