



Making TVET in Bangladesh future-proof

Textile diploma curriculum and industry needs assessment for green transformation



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Dhaka, May 2022

Message from GIZ

This study examines the future needs of the Bangladesh textile industry on sustainability issues, coupled with a gap analysis of the existing curriculum of Textile Diploma Institutes for technical and vocational education and training (TVET). Its results serve as a first baseline for the curriculum revision and capacity development that the Bangladesh Technical Education Board (BTEB), anchored in the Ministry of Education, is undertaking with the support of GIZ.

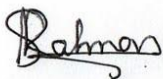
It is high time to future-proof TVET in Bangladesh and use formal textile diploma education as a springboard. In global comparison, Bangladesh peaks both in terms of population density as well as in economic growth. The country's production for domestic and international markets is and will continue to be a driver for jobs and growth. Its export-led growth is heavily relying on the textile sector.

However, in the current scenario, youth unemployment is particularly high as only few of the 2 million yearly newcomers to the labor force find a job. Instead, informal, low-income work dominates. Conversely, employers hardly find qualified workers who are able to fit their demand-oriented job profiles. Demand-oriented means first and foremost flexible: Flexible for new products and services, new markets and new forms of 'Work 4.0', paired with a concern for compliance and global supply chain laws for a **just and green transformation**.

Against this backdrop, **TVET can be the backbone of sustainable growth in Bangladesh**, serving as a key element of lifelong learning and equipping people with the competencies required in the labour market, including up- and reskilling. With this in mind, and with the awareness that the COVID-19 pandemic has seriously disrupted all forms of learning and training, **general messages to policy makers in TVET** derive, backed by and beyond the study at hand:

- Create a learner-centered framework, interlinking diverse learning systems, giving students flexibility to decide when and how they learn
- Anchor a win-win academia-industry link, providing 'hands-on' on-the-job learning opportunities, especially through apprenticeships
- Increase digital readiness, hence resilience, of TVET/ textile diploma institutions, trainers and students
- Ensure that TVET/ textile diploma curricula reflect the digital, just and green transformation of the industries of Bangladesh.

The study is published in the **50th Year of Germany-Bangladesh Development Cooperation** in Bangladesh. It was carried out with the Bangladesh Technical Education Board as the governmental lead authority and conducted by the national consultancy REED Consulting Bangladesh. More than 120, mostly Bangladeshi people from the government, industry, trade bodies, brands and buyers, associations and academicians contributed. In fact, the study is **made from Bangladesh for Bangladesh**. This makes us proud. We look forward to further cooperation.



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Dr. Christian Bochmann
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Foreword

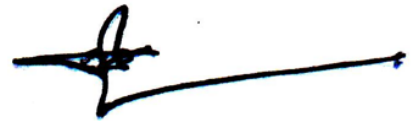
Bangladesh's textile and garment sector has every prospect of remaining one of the world's largest RMG manufacturers and continuing its impressive story of growth and improvement. The textile industry in Bangladesh is putting considerable effort into increasing compliance with social and environmental sustainability standards.

To make these efforts sustainable, initiatives need to be taken up. Future specialists and executives from specialised educational institutes (textile universities, colleges, and diploma institutes) need to be made knowledgeable on sustainable corporate management to meet the needs of the industry.

Students from textile diploma institutions get qualified for lower to middle management positions in textile companies with their degree or training. In these positions, they have considerable influence on factory compliance with environmental and social standards. It is high time to act upon the upgradation of the existing curriculum to produce competent diploma graduates who are equipped with the necessary knowledge and skills to deal with sustainability issues in workplaces.

This study on industry needs assessment and evaluation of the existing curriculum of textile diploma institutes is very unique and sector-specific. It has come up with a list of pressing social and environmental sustainability needs of the textile industry. The recommendations provide guidance on how the competencies of diploma graduates can be improved and aligned with the industry needs through the upgradation of the curriculum.

In addition, strategic recommendations on the action plan for the Bangladesh Technical Education Board (BTEB) will support the development of a roadmap on institutional capacity building and collaboration with the private sector.



Md. Ali Akbar Khan
Chairman
Bangladesh Technical Education Board (BTEB)

Acknowledgment

The industry needs-assessment and evaluation of the existing curriculum of textile diploma institutes is a way forward for the improvement of the knowledge of future specialists to address the social and environmental sustainability needs of the textile industry. I would like to express my deep gratitude to GIZ Bangladesh for their initiative to conduct the study. I would like to thank Dr. Christian Bochmann, Project Manager, Higher Education and Leadership Development for Sustainable Textiles in Bangladesh (HELD). We would like to express our deepest appreciation to our GIZ colleagues Ms. Sanjida Rahman, Advisor, HELD, as focal point from GIZ for this assignment, and Mr. Shamsul Arafin, Senior Technical Advisor, HELD. My special thanks go to REED consultancy Bangladesh and most importantly Md. Mamunul Huda, team leader, for his dedication and effort to conduct the study within the timeframe.

We humbly remember the guidance of Mohammad Ali Akber Khan, Honourable Chairman, Bangladesh Technical Education Board (BTEB). The highest level of cooperation from BTEB; S M Shahjahan, Deputy Director (Course Accreditation) and Dr. Md. Shah Alam Majumder, Specialist (Course Accreditation), was remarkable throughout the study duration. We do appreciate the cooperation provided by the principals and teachers of public textile diploma institutes.

We further acknowledge the insights from Mr. Md. Raisul Alam Mondal, Director General, Department of Environment (DoE), Raju Ahmed, Deputy Director (technical), Department of Textile (DoT) and Mr. Farid Ahmed, Joint Inspector General, Department of Inspection for Factories and Establishments (DIFE).

We must acknowledge our gratitude to Md. Fazlul Haque, MD, Plummy Fashion, Dr. Shahjalal Khandaker, Professor, DUET Gazipur; Dr. Lal Mohon Boral, Professor and Head of Department, Textile University of Technology and Engineering (AUST); Dr. Abbas Uddin Shiyak, Assistant Professor and Head of Department of Dyes and Chemical Engineering (BUTEX); Prof. Ummul Khair Fatema, Head, Department of Environmental Science and Engineering and Director, Research and Extension, BUTEX; Major Md. Imtiaz Islam, psc, MDS, MBA (retired), part-time faculty at BUFT for sharing their guidance from the perspective of an academican and considering the future work of world.

We are also thankful to the representatives of industries, brands and buyers, Ready-Made Garments and Textile Industry Skill Council (RTISC), Institution of Diploma Engineers (IDEB), Bangladesh, diploma graduates and interns for sharing their experience and expectations which have added value to this report.



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Contents

Message from GIZ	iii
Foreword.....	iv
Acknowledgment.....	v
Abbreviations	vii
Executive summary.....	1
1 Introduction	3
3 Methodology and approach.....	5
4 Challenges and limitations of the study	10
5 Rationale behind including sustainability topics in a textile diploma curriculum	10
6 Generic perspective of stakeholder views on sustainability.....	11
7 Industry needs assessment.....	11
7.1 Identification of pressing sustainability needs in the textile industry	11
7.2 Identification of environmental and social sustainability topics: industry stakeholders.....	12
7.3 Challenges and way forward to bring social environmental sustainability in practice... ..	13
7.4 Proposed social and environmental sustainability topics recommended for inclusion in the curriculum.....	15
8 Evaluation of existing curriculum	16
8.1 Stakeholders' perspective on gaps within the existing curriculum	16
8.2 Review of the existing curriculum	18
9 Recommendations	20
9.1 Recommendations on curriculum upgradation	20
9.1.2 Contents for social sustainability.....	22
9.1.3 Including sustainability topics in the curriculum: propositions	23
9.1.3.1 Proposed sustainability topics for inclusion in the existing courses	23
9.1.3.2 Proposed sustainability topics for inclusion as a new module	24
9.1.3.3 Prioritising sustainability topics for inclusion in the curriculum	24
9.2 Strategic recommendations for a BTEB road map.....	24
10 Conclusion.....	26
Annexure	27
Annex 1 - Pressing sustainability topics identified by the stakeholders	27
Annex 2 - Sustainability topics identified by industry stakeholders	28
Annex 3 - Summary of challenges and way forward.....	31
Annex 4 - Summary of comments and suggestions by industry and academia.....	32
Annex 5 - Generic comments and suggestions made by industry and academia related to the up-gradation of the curriculum	33

Abbreviations

AUST	Ahsanullah University of Science and Technology
BTEB	Bangladesh Technical Education Board
BGMEA	Bangladesh Garment Manufacturers and Exporters Association
BKMEA	Bangladesh Knitwear Manufacturers and Exporters Association
DIFE	Department of Inspection for Factories and Establishments
DoT	Department of Textile
DoE	Department of Environment
IDEB	Institution of Diploma Engineers Bangladesh
RTISC	RMG and Textile Industry Skills Council
TVET	Technical and Vocational Education and Training
HELD	Higher Education and Leadership Development for Sustainable Textiles in Bangladesh
TDI	Textile Diploma Institute
TDG	Textile Diploma Graduates
BSCI	Business Social Compliance Initiative
WRAP	Worldwide Responsible Accreditation Production
ETI	Ethical Trading Initiative
ISO	14001, 4500 International Organisation for Standardisation
HIGGS FEM	Higgs Facility Environment Module
GOTS	Global Organic Textile Standard
OCS	Organic Content Standard

Executive summary

On behalf of the German Federal Ministry for Economic Cooperation and Development (BMZ), GIZ implements the **project ‘Higher Education and Leadership Development for Sustainable Textiles in Bangladesh’ (HELD)**. It **targets at strengthening the application-oriented competencies of future specialists and managers of the textile industry in sustainable corporate management**. One of its objectives is to integrate social and ecological sustainability topics in technical and vocational education and training (TVET).

Under this scope, the present study has been commissioned to **analyse the existing curricula of textile diploma institutes based on an industry needs assessment on social and environmental sustainability** so that such topics can be developed and integrated on a demand-oriented basis into the curricula/training programmes of textile diploma institutes.

To achieve this objective, two tasks were outlined by GIZ and conducted by consultants of Reed Consulting Bangladesh (RCB): 1) The ‘industry needs assessment’ throughout the manufacturing value chain of the textile sector helped to identify the most pressing needs of the sector through the lens of social and environmental compliance. 2) Based on the findings, the ongoing curriculum was evaluated to modify and include needs-oriented and demand-driven social and environmental compliance topics. 120 interview partners from business, academia and politics actively contributed to this study through in-depth interviews.

Under 1), the following topics were identified for inclusion under the umbrella of environmental sustainability: energy efficiency, 4R in resource management, circularity, effluent treatment, waste management, chemical management and the implementation of an environment management system (EMS). In addition, the interviewees identified topics for increased social sustainability. Among these were: basic notions of compliance, occupational health and safety (OHS), industrial relations, relevant national acts and rules, ILO conventions, women empowerment, social compliance certification procedures, effective grievance procedures and functions of participative committees.

Subsequently, under 2), the existing curriculum was reviewed. Social Science-I Code: 5811, Social Science-II Code: 5821, Environmental Management Code: 5840 and Industrial Management-1 Code: MGM 632 were identified as suitable courses to be updated with social and environmental sustainability topics. A new dedicated course has been recommended for inclusion, titled *‘Sustainability in the Textile Industry’*.

Strategic recommendations offered to the Bangladesh Technical Education Board (BTEB) are outlined as:

- *Short-term* action plan: Immediate incorporation of sustainability topics in the curriculum, tapping into national and international knowledge and experience for developing training materials, contents and modules for ToTs, engagement of industry representatives during the process and digitalisation of learning procedures
- *Medium-term* action plan: Conducting a training programme for capacity development of teachers and upgrading lab facilities with latest equipment to introduce more practical and outcome-based learning. Contextualisation of generic courses, strengthening the engagement with industry, experts, IDEB and audit companies to support industry attachment and factory visits of students as well as more frequent reviewing of courses in the curriculum

- *Long-term* action plan: Taking up a sectoral initiative to strengthen collaboration with apparel brands, associations, IDEB, TDIs and audit companies. Engaging experts with a textile academic background and strong exposure in industry and academia fields to strengthen linkages between the stakeholders, thus enabling the upgradation of the curriculum on a regular basis. Also includes the development and update of the entire curriculum with a particular focus on industry needs and on creating a workforce with application-based competencies.

1 Introduction

The rapid growth of the textile and apparel sector positions Bangladesh as the second largest exporter in the global apparel market. In 2021, the country exported garments and apparels equivalent to USD 44.34 billion (ITC Trademap 2022). The sector directly employs more than 4 million workers, the majority of which are women.¹ It is championing the country's exports by capturing more than 80% of total exports for ten consecutive years (ITC Trademap 2022).

However, the implementation of environmental and social sustainability lacks behind international standards. Brands have started to disseminate roadmaps to increase awareness on environmental and social due diligence among their suppliers. Various initiatives for capacity development have been launched in cooperation with development partners. Still, the impacts of textile production on humans and nature are monitored insufficiently. To become future-proof, the textile manufacturing value chain has no other alternative than to transform from 'brown' to 'green' and fair production.

A key factor that limits the sector's growth is the predominant lack of qualified specialists and managers working in sustainable business management. This is where the Higher Education and Leadership Development for Sustainable Textiles in Bangladesh (HELD) project, implemented by the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH, steps in.²

GIZ, on behalf of the German Federal Ministry for Economic Cooperation and Development (BMZ), is implementing the bilateral project 'Higher Education and Leadership Development for Sustainable Textiles in Bangladesh' (HELD) in cooperation with the Secondary and Higher Education Division (SHED) of the Ministry of Education (MoE) as the line ministry and the University Grants Commission of Bangladesh as the executing agency.

The objective of the project is to strengthen the application-oriented competencies of future specialists and managers of the textile industry in sustainable corporate management. Social and environmental sustainability topics will be integrated into the textile engineering curricula of universities and colleges (Output 1) and institutes for technical and vocational education and training (TVET, Output 2). Moreover, social dialogue platforms will be established where young leaders from textile companies and trade unions will discuss relevant issues for sustainable economic development in Bangladesh (Output 3).

Under the scope of Output 2, the study has been commissioned to **assess the existing curriculum of textile diploma institutes based on an industry needs assessment on social and ecological sustainability** so that such topics can be developed and integrated on a demand-oriented basis into the curriculum/training programmes of textile diploma institutes.

The introduction of and compliance with internationally recognised social and environmental standards is a prerequisite for the country's long-term success in international markets. In recent years, fostered by the pressure of international buyers, there has been an increased awareness on sustainable production and standards. To comply with these standards, the industry needs specialists and executives derived from sector-specific educational institutes³ – textile universities, colleges and diploma institutes – with proven skills in sustainable corporate management.

Most courses offered in the relevant subjects are not sufficiently practice-oriented and out of date. Requirements of the competencies as per industry needs remain insufficiently fulfilled. Communication and coordination with the industry is lacking. As a result, the topic of sustainable

¹ [download.bgmea.com.bd/BGMEA Sustainability Report 2020.pdf](https://download.bgmea.com.bd/BGMEA_Sustainability_Report_2020.pdf)

² <https://www.giz.de/en/worldwide/104340.html>

³ There are 10 public textile diploma institutes under the Bangladesh Technical Education Board (BTEB) and 1 under the Bangladesh Handloom Board of the Ministry of Textile and Jute.

corporate management hardly plays a role in the curricula. However, students from these institutions get qualified for a lower to middle management position in textile companies with their degree or training. In these positions, they have considerable influence on compliance with environmental and social standards. Hence, it is pivotal to revise the curriculum of the institutes, focusing on the needs of the industry, especially in the area of sustainability and compliance, to produce thus knowledgeable textile diploma engineers.

Sustainability

Sustainability is to be prioritised for three major reasons, i) government or buyers demand, ii) competitiveness and iii) environmental safety and social responsibility. It is not a separate and isolated topic to be integrated into the curriculum of textile diploma institutes. Instead, it facilitates the gradually transform the textile industry into a **green economy** and fosters the sustainable economic development in Bangladesh.

Protecting nature is pivotal to make human existence sustainable. Sustainability in doing business is high on the global agenda. Irresponsible and reckless industrialisation as well as economic development happened in the past at the cost of extensive damage to nature. The scale and gravity of environmental destruction has reached an alarming stage and threatens the planet.

Environmental sustainability needs to be considered from a long-term perspective. It includes conserving the productivity of water, soil and the ecosystem and reduce the impact on the natural environment and people's health to a level that the natural environment and humanity can manage and handle. The functioning of the Earth's biogeochemical system, specific includes:

- Water (pollutants, groundwater levels, salinity, temperature, alien species)
- Air (pollutants, particles, ozone layer, climate system, noise)
- Land (pollutants, erosion, land use, alien species)
- Biodiversity (species and habitats (natural habitats), GMOs)
- Ecosystem services (e.g., pollination, photosynthesis, water purification, climate control)

Similarly, compliance with **social standards** is insufficient. Human rights and decent working conditions need to be addressed to be in line with international standards and best practices.

The clothing industry has been subject to multiple labour rights abuses; including forced overtime, numerous cases of harassment at the workplace, delays or negligence of paying wages, lack of social insurance and unsafe work environments. To tackle these issues, social sustainability considers the health and well-being of workers along the supply chain. In the context of international supply chains, social sustainability emphasises, among others, on human rights (freedom of association and elimination of child labour), occupational health and safety (training and working conditions) and emerging market communities (initiatives for education).

Sustainability needs to be integrated throughout the textile and apparel value chain; covering the product's entire life cycle from sourcing, design, product development, manufacturing, packaging, storage and transportation to disposal, recovery and post sales services, including end-of product life management ('closing the loop'). In the highly competitive textile sector, those factories that are certified have the highest chances of survival and success.⁴

⁴ For social compliance, certifications, standards and initiatives, include the Social Accountability certification (SA-8000), Business Social Compliance Initiative (BSCI), Worldwide Responsible Accreditation in Production (WRAP), Cradle to Cradle Certification (CCC), Ethical Trading Initiative (ETI), Fairtrade, and Fair Wear Foundation (FWF). Further, several standardisations and certifications of the International Organisation for Standardisations (ISO 14001, 45001), the Higgs Facility Environment Module (Higgs FEM), Oeko-Tex Standard 100, Green Button, Global Organic Textile Standards (GOTS), Organic Content Standard (OCS), Blue Sign and EU Flower are commonly used for addressing environmental and social sustainability issues in the apparel and textile manufacturing chain.

2 Objective of the study

The **specific objective of the study is to integrate demand-driven sustainability topics in TVET curricula**. The goal is to produce competent diploma graduates who are equipped with the necessary knowledge and (leadership) skills to increase sustainability at workplaces. It is thus aligned with the vision of the project 'Higher Education and Leadership Development for Sustainable Textiles in Bangladesh' (HELD) to strengthen application-oriented competencies of future specialists and managers in the textile industry in the context of sustainable corporate management.

This will eventually impact:

- adherence to social standards at work
- environment friendly production process and compliance with standards towards a 'green economy'
- the global competitiveness of Bangladesh's textile industry.

3 Methodology and approach

The study was initiated with a kick-off meeting between HELD and the Reed Consulting Bangladesh (RCB) expert team on 25 November 2021.

To conceptualise the assignment in-depth, secondary literature was thoroughly reviewed. Gantt charts were developed to detail activities, steps and milestones to be achieved and incorporated in the inception report. **Accordingly, the study topics were outlined.**

Consultation forum / workshop with stakeholders: The RCB consultants participated in a consultation forum held on the 8 and 9 December 2021 in Gazipur. During the workshop, the objective of the study was presented and discussed among the participants. The rationale to incorporate environmental and social sustainability topics in textile diploma curricula was presented along with a stakeholder map.

Questionnaire development and data collection: To conduct the 'industry needs assessment', respondent-specific sets of questionnaires were developed and endorsed by GIZ. The questionnaires included open questions in order to capture wider insights. The questionnaires for internship students and former diploma graduates were translated to Bangla, as suggested by the respondents. The interviews have been piloted accordingly.

Interviews and consultations with respondents were conducted in-person, virtual (individual/collective), through e-mail and telephone. Questionnaires were shared with each respondent individually or collectively in a group for their feedback. Further, in-person or virtual interviews/consultations were conducted with respondents, whenever deemed necessary, in form of in-depth interviews, key-informant interviews and focus group discussions. Virtual meetings added value to the questionnaires. Additional phone calls and online discussions provided the option to accumulate further insights of respondents. In addition, one focus group discussion was conducted with internship students in the textile institute of Chittagong.



Figure 1: Market place presentation by Md. Mamunul Huda (RCB team leader)

In total, 120 stakeholders were interviewed. The stakeholders / respondents have been mapped through RCB's network with the support of GIZ and BTEB.

Representative group	No. of respondents interviewed
Senior factory management	3
Factory sustainability, compliance & HR	5
Representatives of brands and buyers	6
BGMEA	2
BKMEA	2
RTISC	1
IDEB textile wing and association	4
Textile universities	5
Graduate employees	23
Student in industry attachments (interns)	30
Supervisors / line managers of employees and interns	9
Textile diploma institute principals and teachers	21
Officials from BTEB	6
Department of Textile (DoT)	1
Department of Environment (DoE)	1
Department of Inspection for Factories and Establishments (DIFE)	1
Total	120

Table 1: Distribution of respondents

The responses were analysed and aggregated to recommend social and environmental sustainability topics on a demand-oriented basis for integration into the curriculum and training programmes of textile diploma institutes.

Existing curriculum review: The existing curriculum was reviewed based on findings gathered from the field survey on industry needs. Environmental and social sustainability-related subjects have been identified and reviewed. An overall evaluation of the curriculum has been made and findings were discussed accordingly.

The validation workshop: A validation workshop was conducted on 28 March 2022 to present major findings and outcomes of the study. The discussion mostly focused on study findings and possible ways forward to address the proposed recommendations to improve the knowledge of future specialists. Prioritising the sustainability topics, provisions of upgradation of the existing curriculum and the proposition of a new module were the key points of discussion. **All participants agreed that active participation and contribution of industry representatives along with academicians are highly required to address the industry needs in the curriculum.**



Figure 2 Mr. Md. Ali Akbar Khan, Chairman BTEB, speaking at the study validation workshop.

The final report: The final report incorporates feedback from representatives of BTEB and further stakeholders who participated in the validation workshop.

4 Challenges and limitations of the study

- **Stakeholder mapping:** Identifying suitable respondents for the 16 interview groups
- **Taxonomy:** To shift into sustainable production, activities are defined as **green**, signifying environment-friendly, **brown** for environmental pollution or stress and **white** as no impact to environmental pollution or stress. Globally, scholars have yet to find a common language and interpretation to define the term 'sustainability' as well as the activities to be marked as green, brown and white.
- **Respondent's minimal knowledge on sustainability:** Often, interviewing students posed as a challenge, as their understanding of sustainability was poor.
- **Different agenda and mandates of stakeholders:** Different respondent groups have different mandates when it comes to responding to sustainability challenges in the textile industry.
- **Understanding of the objective of the study:** With a versatile group of interviewees, it was important but time-intensive to provide a clear understanding of questions among respondents.
- **Sampling limitation:** Findings of a study are highly influenced by the number of respondents, competence, experience, acumen and orientation of respondents. Its quality also depends on the sincerity and ability of respondents to share their opinions.

5 Rationale behind including sustainability topics in a textile diploma curriculum

From the study it has been revealed that **the mind-sets of textile diploma engineers are over-stretched towards maximising production in the factory. Thus, their accountability is mainly production-centric.** Professionally, they see sustainability issues as an extra burden to their work. Accordingly, it becomes challenging for them to be spontaneous and engage in activities related to piloting or practicing social and environmental sustainability initiatives. Sustainability initiatives need to be fostered in higher education in order to be instilled in the mind-sets of graduates. On industry side, sustainability needs to be advocated from the factory management, creating a win-win situation for all.



i. Complying to buyers CoC (Code of Conduct)

National and international development agencies are increasing their supervision and monitoring activities to help minimise environmental impacts of textile and apparel manufacturing. It has become a 'must' for brands and buyers to ensure that their suppliers are maintaining a social and environmental protocol in their production process. Against this backdrop, the textile sector needs knowledgeable and technically sound production forces who can manage sustainability compliance. The changing requirements have created a high demand in the industry and job market for expertise in sustainable corporate management.

Accordingly, academia, specifically textile diploma institutes, needs to revise its curriculum, teaching methods, tools and techniques as per the needs of the industry and international standards. Textile professionals must be educated with concepts, approaches, processes and techniques on how to strategise efficient, sustainable production.

ii. Mainstreaming responsible corporate management in the factory

Major stakeholders of the textile industry, which include leading brands, factory owners, sustainability and social compliance experts of factories, principals and teachers at textile diploma institutes and textile universities, IDEB members, DoT, DoE, associations, textile diploma engineers and (internship) students, were consulted as part of the study. At the core, they all united on the feedback; **diploma engineers with knowledge and skills in dealing with sustainability issues at factory level are absolutely necessary for the transformation towards sustainable corporate management in the textile industry.** Academia can plant the seeds of sustainability to produce market needs-oriented textile engineers with leadership qualities.

iii. Leveraging the employability of graduates

The respondents highly appreciated the idea of including industry needs-oriented sustainability topics. They agreed that knowledge and skills development in academic institutes will enhance the employability of textile diploma engineers in the job market and facilitate sustainability practices in the industry towards green transformation.

6 Generic perspective of stakeholder views on sustainability

The **concepts and approaches to incorporate sustainability topics vary not only across industries globally, but also within the sector and in between factories.** Many professionals in the textile sector of Bangladesh perceive sustainability as a relatively new topic. Different actors across the sector, including brands, textile entrepreneurs, workers, teachers, students, suppliers, associations, government agencies and civil society perceive and value sustainability differently. Accordingly, sustainability issues reflect multi-dimensional perspectives among the interviewed.



In addition, social and environmental sustainability differs in its application and practice throughout the textile production process. Hence, the **difficulties in finding consensus on the definition of sustainability need to be taken into account in developing the curriculum.**

7 Industry needs assessment

The interview questions for the industry needs assessment aligned to the following topics:

- a. Identification of pressing sustainability topics in the textile industry
- b. Identification of the most relevant sustainability topics for textile diploma curricula
- c. Challenges in practicing sustainability in the textile industry
- d. Way forward to the challenges in practicing sustainability in the textile industry
- e. Analysis of challenges and solution in practicing sustainability in the textile industry
- f. Proposed sustainability topics for inclusion in curricula
- g. Guideline for content development

7.1 Identification of pressing sustainability needs in the textile industry

The stakeholder inputs have been captured keeping in mind bias and agendas throughout the stakeholder map. These impact their motivation to learn, understand and practice sustainability.

This section summarises the feedback of

1. Brands and buyers
2. Factory's sustainability, HR and compliance professionals
3. Senior factory management
4. Department of Environment (DoE)
5. Department of Inspection of Factory and Establishment (DIFE)
6. Consultation forum / workshop (8 - 9 December 2021)

The findings on pressing sustainability issues in the textile industry are summarised in Table 2 (see complete list in [Annex 1](#)).

Environmental	Social
<ol style="list-style-type: none"> 1. Energy efficiency 2. Renewable energy (solar rooftop PV) 3. Circularity 4. 3R (Reduce, Reuse, Recycle) 5. Process optimisation 6. Chemical management 7. Water and waste management 8. Effluent treatment 9. Operation and maintenance of ETP (Effluent Treatment Plant) 	<ol style="list-style-type: none"> 1. Occupational Health and Safety (OHS) 2. Industrial Relations (IR) 3. Wage management 4. Participative committee 5. Social compliance

Table 2: Pressing sustainability needs identified by stakeholders from the industry

7.2 Identification of environmental and social sustainability topics: industry stakeholders

In this section, the most relevant topics on industry (**demand**) side that can be infused into the curriculum of the textile diploma institute (**supply**) side are highlighted. For the screening, pressing needs and sustainability topics of the industry, as identified by respondents from different stakeholder groups, are analysed for inclusion in the curriculum.

Feedback of all stakeholders was summarised group-wise ([Annex 2](#)). The items that were mentioned most often are summarised in Table 3.

Environmental topics	Social topics
<ol style="list-style-type: none"> 1. Renewable energy (solar rooftop PV) 2. Energy efficient management and energy saving technology 3. Adaption of low carbon technology and the manufacturing process 4. 4 R (reduce, reuse, recycle, recovery/replace) of resources 5. Circularity in textile manufacturing 6. Resource efficient innovation and technology and manufacturing process 7. Environment management system (EMS) 8. Waste management 9. Business cases 	<ol style="list-style-type: none"> 1. Occupational Health and Safety (OHS) 2. Basics of compliance 3. Legal compliance; ILO conventions 4. Workers and management relations (Industrial relations) 5. Participation committees 6. Women empowerment 7. Effective grievance procedures 8. Gender and decent work 9. Case studies 10. Soft skills 11. Social compliance certification procedures

Environmental topics	Social topics
10. Chemical management 11. Basic knowledge of LEED certification 12. Waste reduction in dyeing and washing 13. Procedures of environment protection related certifications 14. ETP functionality and its operation	

Table 3: Most relevant social and environmental sustainability topics identified by industry stakeholders

Similar topics were proposed by multiple interviewees which reflects the paramount importance and relevance of the topics to be taken into account as a guideline **for the assessment and evaluation of the curriculum for necessary changes.**

7.3 Challenges and way forward to bring social environmental sustainability in practice

During the discussion, respondents identified several challenges and ways forward which have been detailed under [Annex 3](#) and summarised in Tables 4 and 5.

Respondent groups	Challenges that hamper practiced sustainability
Brands and buyers	<ul style="list-style-type: none"> • Overall lack of incentives from brands and government • Knowledge and skill gaps • Lack of ownership from top management • Absence of sufficient monitoring and enforcement from government
Factory's sustainability, HR & compliance professionals	<ul style="list-style-type: none"> • Ongoing tasks may be disrupted with capacity development trainings, although these will act as an investment in competitiveness • Getting capital expenditure for high-end environmental initiatives • Lack of infrastructural preparedness for solar or other renewable energy installations • Technical head is not aligned with sustainability activities • Lack of manpower • Non-availability of technological innovations • Minimal understanding on technical know-how at employee level • Minimal or no financial allocation • Sustainability yet not set as a priority • Lack of awareness on sustainability
Senior factory management	<ul style="list-style-type: none"> • Disrupted availability of natural gas • Interrupted supply of water and electricity • Challenges in minimisation of dyes and chemical consumption • Treatment of wastewater • Sludge management and wastewater treatment • GHG emission reduction • Poorly managed ETP • Lack of centralised ETP facility • No technical guideline for carbon emission • Knowledge gap among professionals

Respondent groups	Challenges that hamper practiced sustainability
	<ul style="list-style-type: none"> • Non-availability of technological advancement • Technical know-how of individuals
BGMEA	<ul style="list-style-type: none"> • Lack of skilled manpower • Knowledge gap • Lack of finance support
BKMEA	<ul style="list-style-type: none"> • Lack of willingness among the factory owners • Practicing sustainability, higher investment-oriented activities • Lack of skilled employees

Table 4: Challenges identified by stakeholders in the textile industry

Respondent groups	Way forward to address challenges faced by the industry
Brands and Buyers	<ul style="list-style-type: none"> • Capacity development • Value addition for sustainable products • Proper policy for incentivising innovative sustainable products and manufacturing processes • Self-awareness, self-motivation, responsibilities and liabilities towards social and environmental aspects as well as proactiveness • Time-oriented laws and regulations with proper accountability and monitoring / auditing system to evaluate sustainability performance, introduction of an award to acknowledge best sustainability performance • A common sustainability platform, e.g. SAC (Higgs FEM and FSLM), can be formed to evaluate facilities' sustainability practices • Joint approach involving all the stakeholders • More digitalisation
Factory's sustainability, HR & compliance professionals	<ul style="list-style-type: none"> • Scheduled maintenance of machineries • Reducing the lack of sustainability knowledge of professionals (Civil, mechanical, maintenance, production, marketing / merchandising) • Getting financial allocation for sustainability related tasks/ programmes/ projects • Having sustainability-responsible with relevant knowledge
Senior factory management	<ul style="list-style-type: none"> • Reducing energy and water consumption • Introducing energy efficient machineries • Routine-wise maintenance (both preventive and breakdown) • Employment of professionals with basic knowledge on Higgs FEM, carbon emissions and water consumption

Table 5: Ways forward to address challenges as described by industry stakeholders

All challenges and solutions (ways forward) summarised (Annex 3), it can be concluded that most respondents have identified **'the knowledge and skills gap'** as the main challenge to practicing sustainable manufacturing in the textile industry. **'Capacity development'** has been described as the way forward to address knowledge and skills gaps by all respondent groups. Other findings and recommendations in this section are mostly related to knowledge and capacity development on technology, efficient use of resources and management.

Knowledge gaps in solar rooftop photovoltaic, energy saving technology, GHG emission reduction and 4R (reduce, reuse, recycle and recovery/replace) for efficient resource management in production processes, waste management, ETP operation, wastewater and sludge management are currently the most popular topics in the industry. Academia is focusing on these issues on university level. However, some challenges are not part of the tasks of academia. These challenges can be

resolved by incorporating sustainability topics in the curriculum. Challenges like ‘lack of ownership from top management’ or ‘lack of finance’ hamper the implementation of sustainability. They could be resolved by picking suitable topics (i.e. 4R-centric applications in production processes to reduce, reuse, recycle and recover material, energy and waste) to be included in the curriculum.

Further topics that can be incorporated in the curriculum of textile diploma institutes are:

- Technical features
- Cost-benefit analysis (economic return, payback time, environment and social impact, image building, buyers’ satisfaction, competitiveness, etc.)
- Machineries and equipment description
- Implementation procedure and time
- Approximate budget to invest in sustainability measures

Among the social sustainability topics, basic understanding of social compliance, occupational health and safety, understanding of national acts and rules, ILO conventions, industrial relations, gender and decent work were mentioned. Even though topics for increased awareness on social sustainability were mentioned less often than environmental aspects, they should not be neglected in the curricula. This rather shows a lack of awareness on social standards among the stakeholders that needs to be improved upon through curricula upgradation in order to increase knowledge and skills along the supply chain and, in particular, of textile diploma graduates. If successful, they can influence in the decision-making process and convince factory owners to invest in sustainability measures. Thus, support from top management and fund allocation should be ensured to gear up sustainability practices.

Selecting industry needs-oriented sustainability topics and developing relevant topics for the textile diploma curriculum is the first step to reducing knowledge and skill gaps between industry and academia. Developing **text, tools, teaching techniques and modules** is equally important and needs due attention, too.

7.4 Proposed social and environmental sustainability topics recommended for inclusion in the curriculum

Considering the social and environmental sustainability challenges, interviewees have given their feedback on possible topics for inclusion in the curriculum of textile diploma institutes (Annex 2). The summaries are listed in Table 6.

Proposed environmental topics	Proposed social topics
1. Renewable energy (solar rooftop PV)	1. Occupational Health and Safety (OHS)
2. 4R (reduce, reuse recycle and recovery/replace in the manufacturing processes of yarn, fabric, wet-processing and others)	2. Basic knowledge on social compliance (legal/national law)
3. Circularity in textile manufacturing	3. Knowledge on ILO convention, national acts and rule
4. EMS (environmental management system)	4. Industrial Relation (IR)
5. Chemical management	5. Soft skills
6. ETP operation process toward ZDHC and ETP laboratory analysis	6. Effective grievance procedures
7. Basic orientation to existing certification system	7. Gender and decent work
	8. Basic orientation to existing social certification system

Table 6: Proposed social and environmental topics for inclusion in the curriculum

8 Evaluation of existing curriculum

The existing curriculum was reviewed based on the findings of the industry needs assessment. Courses that already include social and environmental sustainability issues were identified and further modifications and upgradations suggested. Also, the study suggests a new course that exclusively teaches industry needs-based social and environmental topic, based on the findings of the interviews.

In a meeting with the Bangladesh Technical Education Board (BTEB) on 26 February 2022, attended by Md. Ali Akbar Khan, Chairman, Engr. Farid Uddin Ahmed, Director (curriculum), Dr. Md. Shah Alam Majumder, Specialist (course accreditation), Mr. S. M. Shahjahan, Deputy Director (course accreditation), Eng. Md. Faruque Reza (curriculum specialist) and Ms. Salma Akter, Superintendent (TVI and assistant exam controller), the review status of the existing curriculum was discussed.

8.1 Stakeholders' perspective on gaps within the existing curriculum

From the **demand side** (industry), responses from textile diploma engineers working in the industry, internship students, reporting supervisors of students at factories and members of the Institution of Diploma Engineers of Bangladesh (IDEB) were captured. The stakeholders shared their observations and identified challenges in the curriculum; likewise providing suggestions for upgradation.

On the **supply side** (academia), responses were summarised from principals and relevant teachers at textile diploma institutes and leading textile university faculties – BUTEX, DUET and AUST – and representatives from Bangladesh Technical Education Board (BTEB).

The key suggestions offered by the interviewees on filling the gaps between industry and academia included:

Sustainability topics: basic knowledge on how to obtain green certifications, 4R (reduce, reuse, recycle and recovery/replace), buyer restricted hazardous chemicals, sustainable dyes and chemicals, knowledge on water, dyes and chemicals, energy and manpower-saving, basics on social compliance, OHS, national acts and rules, ILO conventions, gender and decent work. Courses on Social Science-I Code: 5811; Social Science-II Code: 5821 and Environmental Management Code: 5840 were suggested for upgradation.

ETP (Effluent Treatment Plant): ETP functionality is high on the agenda for all stakeholders. Related topics are 4R, knowledge on wastewater treatment ETP (physical, chemical, biological, advance treatment), impact of non-functional ETP, knowledge on measurement and standard parameters of biochemical oxygen demand (BOD), carbonaceous biochemical oxygen demand, chlorine, chemical oxygen demand (COD), ammonia, nitrogen, nitrate, total dissolved solids (TDS), total phosphorous and total suspended solids (TSS).

Major courses need to be updated with contents on latest technology: Contents of major courses, like yarn manufacturing, fabric manufacturing, wet processing, etc. should be updated with the latest technology available in the industry. The exchanges with interns and diploma graduates working in the industries revealed a huge gap between academic teaching and the industry reality.



Figure 3: Meeting with BTEB officials on 26 February 2022

Upgradation was requested by textile diploma graduates (TDGs), internship students and their supervisors as well as IDEB members on the following courses: Textile Raw Material-I Code: 1911; General Textile Process-I Code: 1912; Textile Raw materials-II Code: TT 212; General Textile Processes-II Code: TT 224; Yarn Manufacturing-I, II, III, IV (Code: 1931, 1941, 1951, TT 613); Fabric Manufacturing-I, II, III, IV (Code: 1932, 1942, 1952, TT 623); Wet Processing-I, II, III IV (Code: 1943, 1953, 1963, TT 633). Additionally, Clothing I and IV (Code: 1954, TT 643).

Incorporation of production-related topics in major courses: Topics related to denim dyeing, waterless dyeing, knowledge on carbon dioxide dyeing without water, thermosol dyeing and different kinds of washing techniques are suggested for inclusion in the curriculum. Knowledge on yarn dyeing, flax, rotor and bartex spinning and on the sequence of bleaching, sizing, de-sizing, drying and calendaring are suggested for inclusion in the curriculum. Knowledge on dyeing procedures and parameters need to be well-defined in the curriculum, including knowledge of the sequence of wet-processing, dyeing, opening, slitting, stentering and compacting.

Upgradation of lab: Lab upgradation with latest equipment and testing machines is another area that requires attention. Some textile diploma graduates expressed their frustration that certain lab equipment became obsolete with time. Further, lab technicians often lack knowledge on how to use the equipment and testing machineries properly to support students in practical learning.

Emphasis on more practical training: Respondents perceived that not enough credits were attributed to practical learning. The BUTEX faculty thus suggested to distribute theory and practical marks as 60/40. Further, more activity-oriented teaching methods were requested by students. Sudden tests, quizzes, assignments, report writing, group work etc. can be incorporated in the teaching module to introduce outcome-based learning.

Contextualisation of general courses: Some respondents suggested contextualising general subjects like Bangla, English, mathematics, accounting and bookkeeping, physics and chemistry, thus including examples from textile industry-oriented activities. This approach will support students to enrich their knowledge not only in general subjects but also strengthen their ability to apply this knowledge in the context of the textile sector.

Other non-technical courses to be considered: Teachers, diploma graduates in the industry and internship students have concertedly emphasised on the improvement of **English** and **computer courses**. English-II Code: SS222; English-II Code: 5722; Computer Application-I Code: 6621; Computer Application-II Code: 6632 need to be modified. These courses need to be updated according to the needs at workplaces. Contents of English courses are expected to be aligned with the needs of the industry so that diploma graduates feel comfortable in business communication in English as required at the workplace. Similarly, contents of computer courses need to be customised so that diploma graduates can learn graphic design, CAD operation and other necessary applications, including MS Office.

The respondents have also requested that factory visit of teachers and students are made more frequent. They strongly suggested to develop a good relationship with the industry for increased exchange. A detailed summary, addressing the gaps between industry and academia, is outlined in [Annex 4](#).

Topics on shared sustainability topics for inclusion in the curriculum were repeated by different groups of respondents. This repetition shows the paramount importance of the topics for reviewing the curriculum alongside with designing teaching models and modules with the right topics, contents, tools and techniques. Sustainability-related feedback from industry and academia is detailed in [Annex 5](#).

8.2 Review of the existing curriculum

The 55 courses of the existing curriculum of textile diploma institutes have been assessed in the course of the study. Core major subjects and courses were yarn manufacturing (I, II, II IV), fabric manufacturing (I, II, III, IV) and wet processing (I, II, III, IV). Further relevant subjects were the courses Textile Raw Materials (I, II), General Textile Process (I, II), Textile Testing and Quality Control (I, II, III, IV), Maintenance of machineries (yarn, fabric, wet processing etc.), advance courses in the 7th semester of yarn, fabric and wet processing. General subjects included Bangla (I, II), English (I, II) and Mathematics (I, I, III). Other subjects included Computer Application (I, II), Physics (I, II), Chemistry (I, II), Engineering science (III, IV) and Statistics.

Out of the above, 4 courses are relevant for environmental and social sustainability. Information on the contents of the course on Industrial Management-II (Code: MGM 723, Theory 3, Practical 0, Credit 3, Marks 150) for the 7th semester was not available. However, the upgradation of this course with relevant content on sustainability is likely to be recommended. The objective and short description of the four courses are excerpted from the syllabus and mentioned in Table 5.

Course identification	Course content
Social Science-I (Economics) Code: 5811 Theory 2 Practical 0 Credit 2 Marks 100 2 nd semester	<p>OBJECTIVES</p> <p>To provide opportunities to acquire knowledge and understanding on:</p> <ul style="list-style-type: none"> • importance of civics and its relationship with other social sciences • the relationship of an individual with other individuals in a society • social organisations, state and government • rule of law, public opinion and political parties • United Nations Organisation (UNO) and its roles • the basic concepts and principles of economics and human endeavors in the economic system • the realities of the Bangladesh economy and the current problems confronting the country • the role of diploma engineers in industries • occupations and career planning for diploma engineers. <p>SHORT DESCRIPTION</p> <p>Civics and social sciences; individual and society; nation and nationality; citizenship; state and government; law; constitution; government and its organs; public opinion; political party; UNO and its organs; scope and importance of economics; basic concepts of economics – utility, wealth, consumption, income wages, salary and savings; production – nature, factors and laws; demand and supply; current economic problems of Bangladesh; role of diploma engineers in the economic development of Bangladesh; occupations and career planning; engineering</p>
Social Science-II (history and culture) ⁵ Code: 5821 Theory 2 Practical 0 Credit 2	<p>OBJECTIVE</p> <ul style="list-style-type: none"> • To be able to understand the formation of Bengali society in the geographical area inhabited by the Padma-Meghna-Jamuna delta and the evolvement of modern Bangladesh that have undergone various stages of historical evolution

⁵Note: The original syllabus is outlined in Bangla and translated here by the authors of RCB

Course identification	Course content
Marks 100 3 rd semester	<ul style="list-style-type: none"> • To be able to perform as a competent and sophisticated citizen by considering the cultural development of Bangladesh in the context of its natural and economic structure <p>BRIEF DESCRIPTION</p> <p>History: Definition of history; climate and inhabitants of Bangladesh, Bangladesh from prehistoric and ancient times to Bangladesh independence</p> <p>Culture: Definition of culture; outline of socio-culture of Bengal from the Early Age to the context of independent Bangladesh</p>
Environmental Management Code: 5840 Theory 2 Practical 0 Credit 2 Marks 100 4 th semester	<p>OBJECTIVE</p> <p>To be able to understand</p> <ul style="list-style-type: none"> • the concepts of ecology, ecosystems, global environmental issues, air, soil, water, radioactive and sound pollution • the methods of controlling air, water and sound pollution • the management of waste, soil and pesticide pollution and • the major environmental issues and problems in Bangladesh. <p>BRIEF DESCRIPTION</p> <p>Basic concepts of the environment; ecology and eco-systems; global environmental issues; air pollution sources and effects; climate change, greenhouse effect and depletion of the ozone layer; control of air pollution; water pollution sources and effects; monitoring of water pollution; wastewater treatment; sound pollution and its control; soil pollution and its management; radioactive pollution and its control; solid waste management; major environmental issues and disaster management; arsenic pollution; pesticide pollution and its management, environmental legislations and guidelines framework and policy in Bangladesh (EIA).</p>
Industrial Management-1 Code: MGM 632 Theory 2 Practical 0 Credit 2 Marks 100 6 th semester	<p>OBJECTIVE</p> <ul style="list-style-type: none"> • To provide the opportunity to develop skills and knowledge of industrial management • To be able to improve working conditions • To be able to develop labour management relations • Use of management tools and techniques in the process of decision-making • Handling union relations • Conducting case studies on decision-making <p>BRIEF DESCRIPTION</p> <p>Basic concepts of management; principles of management; scientific management: planning; organisation; motivation; span of supervision; decision making; leadership; budget and budgetary control: inventory control; economic-lot size; break-even-analysis personnel management and human relation; staffing and manpower development; training of</p>

Course identification	Course content
	staff ; job evaluation and merit rating; industrial disputes ; concept of leadership; trade unions ; labour laws and industrial laws

Table 5: Relevant courses and their contents

All 4 courses are awarded 2 credits each and 100 full marks are given to theory. Based on the feedback offered by the curriculum specialist of BTEB, the technical (structure) can be described for one course of T-P-C distribution T=2, P=0 and C=2 (Theory: 2, Practical: 0, Credit: 2):

1. 16 weeks per semester
2. 50 minutes are allocated for 1 theory class
3. 150 minutes are allocated for 1 practical class (3 times more than theory class $50 \times 3 = 150$ minutes/class)
4. P = 0 means no practical class and no credit to practical implementation; all marks and teaching times are allocated for theory
5. T= 2 means 2 theory classes in a week and total $16 \times 2 = 32$ classes in 16 weeks or in a semester = $16 \times 2 \times 50 = 1600$ minutes per semester
6. 1 credit = 800-900 minutes and 2 credits = 1600-1800 minutes in 1 semester

On analysing the contents of the above courses through the lens of environmental and social sustainability, it becomes apparent that most topics, particularly in the **environmental management** course, are thematically relevant to tackle environmental issues in the textile sector. The same is the case for the **Industrial Management-I** course. One of the courses on **social science** is not directly relevant to address the environmental or social aspects as demanded in the textile sector. For the sake of developing outcome-based teaching and learning to produce graduates with the required knowledge and skills to serve the needs of the industry, it is suggested to contextualise the contents of these courses.

All existing courses are rather generic in nature. This provides scope to incorporate industry need-based sustainability topics to contextualise the curriculum according to the needs of the industry.

9 Recommendations

The following recommendations are segregated into two thematic blocks:

- Recommendations on the curriculum upgradation
- Strategic recommendation for BTEB to develop their road map

9.1 Recommendations on curriculum upgradation

Under this heading, potential social and environmental sustainability topics are proposed, including relevant contents. The list includes topics that may be addressed simultaneously. Towards the authority, it is recommended to identify key topics as a start. Eventually, the curriculum can be upgraded to phase-by-phase incorporate all of them.

9.1.1 Contents for environmental sustainability

Environmental sustainability topics and contents	
Topics	Contents
Energy saving technologies	<ol style="list-style-type: none"> 1. Technical analysis on energy saving technologies 2. Cost-benefits analysis of adding sustainability measures 3. Material and machineries required 4. Implementation procedures and timeline 5. Budgeting
Renewable energy, solar rooftop photovoltaic (alternative energy to minimise carbon emissions)	<ol style="list-style-type: none"> 1. Technical explanation on renewable energy introduction 2. Cost-benefits analysis of adding sustainability measures 3. Material and types of machinery required 4. Implementation procedures and timeline 5. Budgeting
Knowledge to apply concept of 4R (Reduce, Reuse, Recycle and Recovery) in the production process	<ol style="list-style-type: none"> 1. Housekeeping (Changing attitude towards efficient consumption of limited resources in personal and professional life) 2. Application of the 4R concept (additionally, 20% of the content can be dedicated to yarn and fabric manufacturing and wet processing for sustainable production) 3. How to reduce, reuse, recycle and recover the material, water, energy and wastage in the production process through improved housekeeping and technology 4. Economical, environment and social impact of applying 4R principles
Resource recovery from production process (Re-use)	<ol style="list-style-type: none"> 1. Technical explanation on resource recovery 2. Cost-benefits analysis of adding sustainability measures 3. Material and machineries required 4. Implementation procedures and timeline 5. Budgeting
ETP functionality	<ol style="list-style-type: none"> 1. Legal bindings of functional ETPs 2. Technical explanation of ETP functionality 3. Types of ETPs 4. Impact of non-functional ETPs 5. Contents: Biochemical Oxygen Demand, Carbonaceous Biochemical Oxygen Demand, Chlorine, Chemical Oxygen Demand, Ammonia Nitrogen, Nitrite, Nitrogen, Nitrate, Total Dissolved Solids, Total Phosphorous, Total Suspended Solids, BOD, COD measurement and standard 6. ETPs for washing and printing 7. Lab test procedure for ETPs 8. Knowledge on ZDHC, net zero 9. Solid waste generation and management
Chemical management	<ol style="list-style-type: none"> 1. Knowledge on material safety data sheet (MSDS) 2. Procedure and system of transporting, storing and using 3. Pre-treatment of chemicals, technical data sheets of chemical parameters
Use of sustainable dyes and chemicals	<ol style="list-style-type: none"> 1. Listing green chemicals approved by buyers and authorities 2. Literature on green / sustainable chemicals 3. Listing hazardous and banned chemicals and their impact

Environmental sustainability topics and contents	
Topics	Contents
Waste management	<ol style="list-style-type: none"> 1. Technical knowledge on how to conduct waste management (material, water, energy, time, etc.) 2. Economical, social and environmental impact
Waterless dyeing	<ol style="list-style-type: none"> 1. Technical analysis 2. Benefits and environmental impact
Wet processing	<ol style="list-style-type: none"> 1. Impact of economic use of water in wet processing 2. Process minimisation 3. Minimisation of the consumption of chemicals, energy, water and time 4. How to tag two processes together (multi-process) 5. Knowledge on setting up parameters for knit dyeing 6. Knowledge on i.e. sequencing of bleaching, sizing, de-sizing, dyeing, drying and calendaring 7. Knowledge on washing techniques 8. Denim dyeing procedures 9. Knowledge on low liquor ratio machine 10. Knowledge on ultra-low liquor ratio machine
Basic knowledge and understanding of sustainability	<ol style="list-style-type: none"> 1. Sustainability and its importance, dimension and benefits 2. Sustainability in the context of the textile industry 3. Addressing the impact of the manufacturing process on the environment 4. Basic knowledge on Environmental Management System
Certification and standards related to environmental issue	<ol style="list-style-type: none"> 1. Basic knowledge on ISO 14001, 45001, Higgs FEM, Oeko-Tex Standard 100, Green Button, GOTS, OCS, Blue sign, EU Flower 2. How to get certifications; procedures and criteria

Table 6: Contents that can foster the implementation of environmental standards

9.1.2 Contents for social sustainability

Social sustainability topics and contents	
Topics	Contents
Occupational Health and Safety (OHS)	<ol style="list-style-type: none"> 1. Basic understanding on OSH at the workplace 2. Importance and practice of OSH at the workplace
Basic knowledge of social compliance	<ol style="list-style-type: none"> 1. The basic ideas of social compliance 2. Wage management 3. Importance of social compliance in factories 4. Impact of (missing) social compliance 5. Social compliance standards 6. Checklist on how to introduce social compliance
Basic knowledge on ILO convention, national acts and rule	<ol style="list-style-type: none"> 1. Basic understanding on relevant ILO conventions 2. Knowledge on Bangladesh labour law and rules
Industrial Relation (IR)	<ol style="list-style-type: none"> 1. Basic knowledge on IR 2. Leadership 3. Importance of IR in an organisation 4. Main aspects of IR 5. How to practice IR 6. Effective grievance procedures

Social sustainability topics and contents	
Topics	Contents
Soft skills	1. Basic knowledge on soft skills and their application in professional life
Effective grievance procedure	1. Features and importance on effective grievance procedures 2. Steps in grievance handling procedures 3. Effective grievance handling in an industry
Gender and decent work	1. Basic knowledge on decent work 2. Knowledge on relevant ILO conventions 3. Women empowerment 4. Gender-based violence and discrimination
Certifications of social compliance issues	1. Basic knowledge on criteria for obtaining certification on SA-8000, BSCI, WRAP, Cradle to Cradle Certification (CCC), ETI, Fairtrade

Table 7: Contents that can foster the implementation of social standards

9.1.3 Including sustainability topics in the curriculum: propositions

Curriculum revision of textile diploma institutes is a regular, needs-based activity of BTEB. In the context of incorporating sustainability in the syllabus, the following four courses were analysed. They can be modified and adjusted by incorporating sustainability topics. These topics were identified by the interviewed stakeholders of the industry, including academia.

- I. Social Science-I Code: 5811 Theory 2 Practical - 0 Credit - 2 Marks-100 (2nd semester)
- II. Social Science-II Code: 5821 Theory -2 Practical - 0 Credit - 2 Marks-100 (3rd semester)
- III. Environmental Management Code: 5840 Theory - 2 Practical - 0 Credit - 2 Marks-100 (4th semester)
- IV. Industrial Management-1 Code: MGM 632 Theory - 2 Practical - 0 Credit - 2 Marks-100 (6th semester)

9.1.3.1 Proposed sustainability topics for inclusion in the existing courses

I. Social Science-I Code: 5811 Theory - 2 Practical - 0 Credit - 2 Marks - 100 (2nd semester)

This course is comprised of basic topics relating to civics and economics and can thus be useful for textile diploma engineers. Some contents, like civics and social sciences; law; UNO (United Nations), scope and importance of economics; basic concepts of economics – utility, wealth, consumption, income wages and salary and savings; production – meaning, nature, factors and laws; demand and supply are taught in the course.

Textile diploma engineers are responsible for production processes. This course can be made more useful if the contents are thus contextualised to adhere to match sustainability with the needs of the industry. Contents need to be sector-specific to create outcome-based learning.

The course can be termed as '**Social compliance in textile industry**' or '**Social science for social compliance in the textile industry**' with the inclusion of 1. Basic knowledge on social compliance (legal/national law), 2. Knowledge of ILO conventions 3. Industrial Relation (IR) 4. Soft skills 5. Business cases on social compliance.

II. Environmental Management Code: 5840 Theory-2 Practical-0 Credit-2 Marks-100 (4th semester)

Most of the contents of this course are relevant to solve sustainability challenges in the textile industry. The topics are generic but useful for the basic knowledge-building of students. This course

can be more beneficial if existing contents are contextualised with textile industry needs-based sustainability topics. These may include 1. Environmental management system (EMS) and 2. Application of 4R principles in the manufacturing value chain as well as 3. Mapping of environmental hazards generated through the manufacturing process of yarn, fabric, wet processing, washing and other activities.

III. Industrial Management-1 Code: MGM 632 Theory-2 Practical-0 Credit-2 Marks-100 (6th semester)

Topics of this course are connected to (social) compliance issues and are thus relevant to the needs of the textile industry. Contents need to be contextualised as per industry needs. Social sustainability topics like 1. Effective grievance procedures 2. Supporting participation committees and 3. OHS can be included in this course.

9.1.3.2 Proposed sustainability topics for inclusion as a new module

As a result of the consultation with respondents and the recommendations made by the BTEB representatives, the study proposes the introduction of a new course; '**Sustainability in the Textile Industry**'. As suggested by BTEB, the new course can be included in the curriculum as a mandatory non-credit subject at the beginning. After a trial period, it can be adapted to become a regular course with full credits. It is important to name the course properly, making it self-explanatory. This course should teach demand-driven social and environmental sustainability topics. These may include 1. Renewable energy (solar rooftop PV) 2. 4R (reduce, reuse recycle and recovery/replace in the manufacturing process of yarn, fabric, wet-processing and others) 3. Circularity in textile manufacturing 4. Chemical management 5. ETP operation process toward ZDHC & ETP laboratory analysis 6. Procedures of obtaining environment-related certifications from accreditation authority. 7. Procedures of obtaining social compliance-related certifications from accreditation authority. 8. Business cases on environmental compliance measures 9. Effective grievance procedures 10. Gender and decent work. This course can be awarded with 3 credits that can be divided between theoretical and practical classes in a 60/40 ratio.

9.1.3.3 Prioritising sustainability topics for inclusion in the curriculum

The relevance of sustainability relies on how efficiently related topics are incorporated in the curriculum. Basic knowledge on social and environmental sustainability, its importance, impact, laws and regulations should be prioritised. Secondly, social sustainability, social compliance requirements, OHS and IR can be prioritised. For environmental sustainability, application of 4R (reduce, reuse, recycle and recovery/replace) and ETP functionality can be targeted as topics.

The study identified that the inclusion of sustainability topics into the existing courses at university level is under progress, awaiting final approval of the concerned authority. Offering a degree in sustainability at university level will need to be discussed in the future.

9.2 Strategic recommendations for a BTEB road map

After recommending sustainability topics and guidelines, the study further analysed suggestions and proposals that were received from the respondents on how to execute the recommendations. These are summarised in this chapter under 'strategic recommendations'.

Recommended activities were categorised under short-term, medium term and long-term action plans to be taken up by BTEB. Some activities fit in several of the action plans.

Activities under short-term action plan

1. Taking initiative to incorporate proposed topics in the curriculum
2. Reviewing and examining the existing curriculum to fit proposed topics
3. Scaling topics and contents to match with the structure of the curriculum
4. Tapping into international knowledge and experience for the development of training materials, contents and modules for the teachers training (ToT) programme at diploma level and including curriculum development at university level
5. Engaging a national expert with industry exposure and expertise in developing appropriate contents for sustainability topics as per industry needs
6. Engaging a national expert to compose a textbook in Bangla on fundamental sustainability issues related to the textile industry at diploma level
7. Introducing digital technologies in teaching, i.e., multi-media, to transfer knowledge on latest technologies and national and international trends in the textile industry

Table 8: Strategic short-term recommendations

Activities under medium-term action plan

1. Conducting a training programme for capacity development of teachers
2. Upgrading lab facilities with latest lab equipment to introduce more practical based learning. Training for lab technicians to support students in practical classes properly. At least 40% credit can be dedicated to practical learning. More case studies and activity-based learning should be developed. Activities, such as sudden quizzes, assignments, report writing, group work etc., should be strengthened in the curriculum to make learning outcome-based.
3. Contextualisation (as much as possible) of general courses, like Bangla, English, Mathematics, Accounting & Bookkeeping, physics, chemistry and other courses with the activities of textile industry to strengthen students' ability to apply acquired knowledge better at workplace.
4. Strengthening engagement with industry, industry experts, IDEB, audit companies to support industry attachment and factory visits of students. DoT, BTEB and TDIs can work together in this regard
5. Collaborating with textile universities
6. Developing liaisons between TDIs with their former students who are in responsible positions in the industry. Maintaining a data bank of professionals to invite them at the institutes for teaching, training and lectures to update students and teachers with latest technology and trends in the industry and to facilitate industrial attachment and factory visits of diploma students.
7. Inviting industry experts to institutes to conduct sessions on latest industry trends for teachers and students and conducting training programmes
8. Facilitating annual events, seminars, symposiums with industry experts and alumni to bridge the gap between institutes and the industry
9. Introducing digital technologies in teaching, i.e., multi-media, to transfer knowledge on latest national and international technologies and trends and best practices in the textile industry
10. Introducing activities oriented at project and research work, for example on perks of sustainable natural fiber in contrast to synthetic fiber or research by students and supervisors on 3R (reduce, reuse and recycle) with 4-5 students in a group
11. Introducing outcome-based industrial attachment. For example, internship students may learn how factories practice and maintain sustainability. Assignments can be arranged during the industrial attachments; reports on the findings can be written as a deliverable.
12. Reviewing relevant courses more frequently in the curriculum to be in line with the fast pace of the textile industry.

Table 9: Strategic medium-term recommendations

Activities under long-term action plan

1. Sectoral initiative should be taken to strengthen collaboration with apparel brands, associations, IDEB, TDIs and audit companies for developing better linkages with the industry and other relevant stakeholders
2. Establishment of an institute-based alumni platform for the long-term connection of graduates and current students. These connections can be utilised to ensure knowledge sharing on the latest technologies and trends in the industry and to facilitate industrial attachment and factory visits of diploma students.
3. Establishing a permanent set-up for digital technologies in teaching i.e., multi-media, projector etc., to transfer knowledge on latest technology and trend in the context of national and international best practice in the textile industries.
4. Engaging with an expert with textile academic background and strong exposure in industry and academia for strengthening the linkages between industry stakeholders and academia in order to upgrade the curriculum on a regular basis. Decisions need to be taken in the policy level as well.
5. Regularisation of the project-based research work at industry level to ensure hands-on trainings.
6. Develop and update the entire curriculum with the highest focus on the industry needs and creating a workforce with application-based competencies

Table 10: Strategic long-term recommendations

10 Conclusion

Through conducting a survey on industry needs, the most pressing sustainability topics for the industry have been identified. The existing curriculum was reviewed through the lens of environmental and social sustainability. Courses that can be modified to include sustainability topics, likewise responding to industry needs in the curriculum, were recommended. In addition, an additional course, that exclusively includes sustainability topics, was recommended for inclusion. In the study, feedback from industry and academia was analysed to conclude on topics that can be added to existing courses. While proposing the sustainability topics for inclusion in the curriculum, sustainability topics at university level will add to the alignment between textile universities and textile diploma institutes for higher education of diploma graduates. All propositions are summed up as recommendations.

The evaluation summarised the findings per stakeholder group in order to identify gaps for upgradation on the existing curriculum. Insights on the initiatives that can be taken up by BTEB to develop their roadmap for upgradation of the curriculum to align with industry needs were recommended, building the stepping stones to capacitate students to acquire knowledge and competencies that foster sustainability in Bangladesh.

Finally, it cannot be emphasised enough that turning diploma graduates into sustainability scholars is not the core goal of the curriculum upgradation. Rather, the objective is to orient them with basic understanding on sustainability issues. Diploma graduates are directly involved with textile manufacturing. Thus, **graduates who are trained in sustainability topics can be considered as enablers for the green transformation of textile Made in Bangladesh.**

Annexure

Annex 1 - Pressing sustainability topics identified by the stakeholders

Stakeholder groups	Identification of pressing sustainability topics in the textile industry
Brands and buyers	<p>Environment:</p> <ol style="list-style-type: none"> 1. Zero waste to landfill, etc. 2. Process optimisation 3. Circularity 4. Corporate sustainability 5. Renewable energy 6. ETP functionality; what type of ETP for what process (for dyeing, washing, printing, etc.) 7. Recycling 8. Dyes and auxiliary 9. Chemical management 10. Waste management 11. Capacity building 12. Hazardous materials 13. Energy efficiency 14. Restricted chemicals <p>Social compliance:</p> <ol style="list-style-type: none"> 1. Wage management 2. IR (Industrial Relation) 3. Gender violence 4. OSH (Occupational Health and Safety) 5. Participative committee elected 6. Effective grievance procedures 7. Women empowerment
Factory's sustainability, HR and compliance professionals	<p>Environmental:</p> <ol style="list-style-type: none"> 1. Reduction of carbon emissions 2. Renewable energy usage 3. Water reduction in total & in processes 4. Energy reduction with special focus to carbon emission reduction 5. Wastage reduction and recycling plan 6. Scheduled maintenance of the machineries 7. GHG emission at factory <p>Social:</p> <ol style="list-style-type: none"> 1. Women empowerment 2. Improving healthcare services in the community
Senior factory management	<p>Environmental:</p> <ol style="list-style-type: none"> 1. Water 2. Electricity reduction 3. Minimisation of dyes and chemical consumption 4. Clean energy like rooftop PV 5. Chemical inventory with ZDHC level 3 or green passport or with low COD, TDS, BOD (ETP wastewater handling parameters)
Department of Environment (DoE)	<ol style="list-style-type: none"> 1. Proper EIA preparation 2. EIA evaluation 3. EIA recommendation 4. EIA implementation
Department of Inspection of Factory and Establishment (DIFE)	<ol style="list-style-type: none"> 1. Occupational Health and Safety (OHS)
Consultation forum/workshop (Bhawal, 8 - 9 December 2021)	<ol style="list-style-type: none"> 1. Energy emission efficiency 2. Water use efficiency and reduction 3. Managing eco-certification 4. Waste management 5. Common platform 6. Waste efficiency and reduction 7. Work-life balance 8. SOP for pollution control (water, air, sound)

	<ul style="list-style-type: none"> 9. Sexual harassment 10. Pay gap (gender discrimination) 11. OSH 12. Social compliance 13. Hazardous chemical management 14. Waste management (process and procedures) 15. 3R and waste management planning
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Annex 2 - Sustainability topics identified by industry stakeholders

Respondent groups	Topics identified
Brands and buyers	<p>Environment:</p> <ul style="list-style-type: none"> 1. Resources efficient manufacturing process 2. Sustainable raw materials 3. Circular business 4. Innovation and technology 5. EMS 6. Use of energy and greenhouse gas emission 7. Water use 8. Waste management 9. Chemical management etc. 10. Low liquor ratio machine 11. Ultra-low liquor ratio machine 12. Water reuse withing the process 13. Servo motor 14. Air leakage management 15. Waste recovery 16. Resource recovery 17. Gas boiler 18. Business case, 19. Solar rooftop PV <p>Social Compliance:</p> <ul style="list-style-type: none"> 1. Basic idea of compliance 2. Legal compliance, Knowledge on ILO conventions 3. Better work Bangladesh 4. Case study 5. IR 6. Participative committee elected 7. Women empowerment 8. Effective grievance procedures 9. Workers and management relation (IR) 10. Occupational Health and Safety (OHS)
Factory's sustainability, HR and compliance professionals	<p>Environment:</p> <ul style="list-style-type: none"> 1. Carbon emission reduction 2. Renewable energy usage 3. Women empowerment 4. Efficient water use/process water reduction 5. Energy saving technology/management 6. Pollution control 7. EHS 8. Leadership 9. Latest technology of production 10. Chemical management 11. Waste management 12. Use of core, UP, ozone, rainforest and E flow technology 13. EMS 14. Greenhouse gas emission – impacts and control options 15. Water management system – savings options 16. Wastewater management 17. System-ZDHC platform, DoE concerned issues, buyer demand 18. ETP operation process and ETP laboratory analysis 19. Introduce to new technology 20. Proper use of raw materials 21. Introduce to environment sustainability platform and follow their guidelines <p>Social Compliance:</p> <ul style="list-style-type: none"> 1. Disability inclusion 2. Community development

Senior factory management	Environment: <ol style="list-style-type: none"> 1. Energy 2. Water 3. Chemical 4. Economic circularity etc. 5. Energy efficient machineries like dyeing machine, knitting machine 6. Boiler with economizer 7. Exhaust Gas Boiler (EGB) 8. VFD 9. Water flow meter 10. Metering system of energy 11. Solar panels 12. ETP 13. Inverter drive motor etc. 14. Carbone emission
Principal and teachers of TDI	Environment: <ol style="list-style-type: none"> 1. Sustainable development 2. Air, water, soil pollution by textile industries 3. Environmental and social sustainability relate to workplace 4. Biochemical oxygen demand 5. Carbonaceous 6. Chemical oxygen demand 7. Total dissolved solids 8. Total suspended solids etc. 9. Total Phosphorous, Ammonia Nitrogen, Nitrite, Nitrogen, Nitrate 10. ETP related topics 11. Efficient water use in dyeing process 12. Waterless dyeing 13. Basic knowledge of LEED certification 14. Waste reduction in dyeing and washing 15. 3 R (reduce, re-use and recycle)
Faculties of textile universities (DUET, BUTEX, AUST, BUFT)	Environment: <ol style="list-style-type: none"> 1. Carbon emission reduction 2. Water reduction 3. RO, ZLD 4. Re-Use, recycle 5. Renewable energy 6. Wastage management 7. Mapping waste generation in production process 8. Knowledge building on 3R (reduce, reuse and recycle) 9. Wastewater sequence 10. Basic knowledge of environment 11. Solid waste generation 12. Global warming 13. Sound and air pollution in manufacturing process 14. Inclusion of 20% sustainability topics in the context of 3R 15. (Reduce, Re-use and Recycle) in the process of 16. Yarn manufacturing 17. Fabric manufacturing 18. Wet processing and others <p>At diploma level,</p> <ol style="list-style-type: none"> 1. Basic knowledge and concept of sustainability 2. Dimension of sustainability 3. Benefits of sustainability 4. Implementation procedures of sustainability 5. More practical oriented teaching 6. ETP function, BOD, COD etc measurement/standard 7. Process profitability 8. Efficiency enhancement
Textile diploma graduates	Environment: <ol style="list-style-type: none"> 1. Environment and sustainability 2. Sustainability in fashion and textiles 3. Environmental management towards sustainability 4. Recycling 5. Sustainable use of chemical 6. Water conservation 7. Pollution prevention 8. Energy management 9. Sustainable community 10. Aquatic and biological sustainability 11. Use of bleaching replacement chemical

	<ul style="list-style-type: none"> 12. Denim dyeing and washing 13. Replacement of potassium permanganate by Lavacon PDA 14. Use of sustainable dyes and chemicals 15. Practicing 3R in production process 16. Paper wastage reduction 17. Knowledge of advance technology
IDEA (Institution of Diploma Engineers Bangladesh - textile wing)	<p>Environment:</p> <ul style="list-style-type: none"> 1. Setting dying process parameter 2. Setting knitting parameter 3. Product recycling 4. Denim dyeing 5. Costing 6. Pre-recycling 7. Post-recycling 8. Water reduction and wastewater re-use 9. Environmental pollution reduction 10. Practicing 3R in production process
Consultation forum/ workshop (Bhawal on 8 - 9 December 2021)	<ul style="list-style-type: none"> 1. Gender and decent work 2. Sustainable resource management 3. Industrial relation 4. Eco-friendly production 5. Resource nexus 6. Responsible business 7. Faculty on sustainability 8. 3R and resource efficiency 9. SP focus for diploma 10. Linking with higher education 11. Revise the existing course with sustainability
BGMEA	<ul style="list-style-type: none"> 1. Natural resource management 2. Energy management 3. Sustainable development 4. Waste management 5. Chemical management 6. Climate change
BKMEA	<ul style="list-style-type: none"> 1. Environmental law 2. Chemical safety management 3. ETP operation and maintenance management 4. International green building guideline 5. Green supply chain management 6. Product life cycle assessment 7. Industrial air and water quality management, indoor & outdoor environment quality management 8. Rainwater harvesting management 9. 4R management

Annex 3 - Summary of challenges and way forward

Challenges	
1.	Lack of expertise
2.	Lack of aspiration for innovation within manufacturing industries
3.	Overall lack of incentives from both brands as well as the government
4.	Knowledge and skills gaps
5.	Less competent and less authority for sustainability organisation
6.	Lack of ownership from top management
7.	Gaps in monitoring and infrastructure (local government), poor connection between sustainability and business
8.	Reactive approach rather than proactive
9.	Transparency
10.	Lack of monitoring
11.	Bureaucracy
12.	Knowledge
13.	Balancing between existing operations and future development
14.	Ongoing tasks may be disrupted with capacity development trainings although this will act as an investment
15.	Getting capital expenditure for high-end environmental initiatives
16.	Solar or other renewable energy installations: technologies have very high payback periods and current technologies may become obsolete
17.	Sustainability team is not reporting directly to the owner
18.	Technical head is not aligned with sustainability activities
19.	Not enough team members in the team
20.	Non-availability of technological advancement
21.	Technical know-how of individuals
22.	Allocation of financial budget
23.	Allocation of manpower
24.	Priority of sustainability tasks
25.	Lacking positive and fruitful thinking towards sustainability programme by top management
26.	Natural gas
27.	Water
28.	Electricity reduction
29.	Minimisation of dyes and chemical consumption
30.	Treatment of wastewater
31.	Sludge management
32.	GHG emission reduction
33.	Operational ETP
34.	Duty on dyes chemical duty
35.	Lack of centralized ETP facilities
36.	Carbone emission reduction
37.	Technical guideline for carbon emission (recommendation)
38.	Knowledge gap of professionals
39.	The biggest challenge is non-availability of technological advancement
40.	Technical know-how of individuals
Way forward	
1.	Capacity building
2.	Value addition for sustainable products
3.	Proper policies for incentivising innovative sustainable products and manufacturing processes
4.	Self-awareness, self-motivation, responsibilities and liabilities towards social and environmental aspects and proactiveness can play the key roles to address those challenges
5.	Needs time-oriented laws and regulations with proper accountability and monitoring/auditing system to evaluate factory sustainability (social and environmental) performance and introduce award-giving ceremony to acknowledge best performance regarding sustainability
6.	A common sustainability platform, e.g. SAC (Higgs FEM & FSLM) can be formed to evaluate facilities' sustainability practices, which can share more business profitability with suppliers.
7.	Joint approach involving all stakeholders
8.	More digitalisation
9.	Making more ease of the process
10.	Reducing energy and water consumption
11.	Introducing high energy efficient machineries
12.	Routine-wise maintenance (both preventive and breakdown)

Annex 4 - Summary of comments and suggestions by industry and academia

Aspects	Discussion
<p>Topics to be included in the curriculum as identified by TDGs, internship students, supervisors and IDEB</p>	<ol style="list-style-type: none"> 1. 3 R, (reduce, reuse and recycle (pre-cycling and post cycling) in yarn, fabric, wet-processing and in other uses, is important to include in the syllabus 2. Use of sustainable dyes and chemicals and to identify buyers' restricted and hazardous chemicals (i.e. AZO) 3. Denim dyeing and washing-related topics and technology should be included in the curriculum 4. Basic knowledge on how to obtain green certifications should be included in the curriculum 5. Courses on environment and sustainability, sustainability in fashion and textiles, environmental management towards sustainability, merchandising, sustainability in fashion and textiles, communication and networking can be included in the curriculum 6. Very important to include sustainability topics in the curriculum. Water conservation, pollution protection, energy management, sustainable community, aquatic and biological sustainability can be included in the curriculum 7. Technical knowledge on ETP function, ETP checking, lab-test of ETP, BOD, COD, TSS, etc. as parameters. 8. Dyeing technology must be upgraded, new technology in dyeing, thermosol dyeing machine 9. Knowledge on sustainability in textile value chain 10. Knowledge on water, chemical, energy, manpower-saving to be included for sustainability 11. Knowledge on washing techniques to be included in the courses 12. WTP, knowledge on water saving, energy saving, time saving, dyes/chemical saving to be included 13. Application of each fabric's dyeing procedures is not well defined in the curriculum (wet-processing, dyeing, opening, slitting, stentering, compacting, etc.) 14. Dyeing process parameters are not well defined. Knowledge on parameters need to be taught for knit dyeing (woven dyeing is a continuous process and knit dyeing an exhaustive process) 15. Knowledge on sequence of bleaching, sizing, de-sizing, sizing, dyeing, drying, calendaring etc. 16. Knowledge on yarn dyeing, denim dyeing, flax spinning, rotor, bartex spinning details 17. Industrial production management course can be added 18. Costing can be added 19. Waste management (material, water, energy, time, etc.)
<p>Topics to be taught as identified by teachers and principals of textile diploma institutes, and faculties from textile university</p>	<ol style="list-style-type: none"> 1. Topics on wastewater treatment ETP (physical, chemical, biological, advance treatment) sensor in ETP outline for real time monitoring of COD, BOD etc. Impact of non-functional ETP. Contents to be infused in the biochemical oxygen demand, carbonaceous biochemical oxygen demand, chlorine, chemical oxygen demand, ammonia nitrogen, nitrite, nitrogen, nitrate, total dissolved solids, total phosphorous, total suspended solids etc. Knowledge on BOD COD measurement and standard 2. Inclusion of topics to apply 4R principles (reduce, reuse, recycle and redesign/re-engineering) in yarn manufacturing, fabric manufacturing, wet processing and other activities 3. Circularity in production process (Raw material, energy, water waste, dyes/chemicals etc.) 4. Knowledge on waterless dyeing 5. Knowledge on fire safety, gender equity 6. LEED-certification related knowledge can be included into the curriculum, criteria of attaining LEED certification 7. Knowledge on efficient use of 3M – Man, machine and materials 8. Knowledge on Carbon dioxide dyeing without water 9. Infusing sustainability topics in the curriculum 10. Social sustainability: CSR, WRAP, Environmental: Fairtrade, Oeko-Tex, ISO 14000, eco-level quality management system (QMS) 11. Emphasis on negotiation skills, communication skills, (costing, professional communication, negotiation), small project, team management, group work and outcome-based education 12. Process optimisation, stenter's heat recovery 13. Environment: Knowledge on circularity in textile supply chain – life cycle analysis of textile products. Relevant laws and regulations. 14. Wet processing: Economic use of water; chemical requirement depends on amount of water used in wet processing. Water is a transport carrier of dyes. Less water use leads to less consumption of chemicals. Process minimisation decreases consumption of chemicals, energy, water, time etc. Two processes can be tagged together. 15. Chemical selection: Pre-treatment chemicals, technical data sheets of chemicals parameter can be included in the syllabus. 16. Sizing, de-sizing materials to be eco-friendly (woven, denim fabric etc.) 17. Knowledge on economic use of energy; green/cleaner production.
<p>Problem in the existing curriculum identified by TDGs, Internship students and supervisor and IDEB</p>	<ol style="list-style-type: none"> 1. Students assessment is that they find 80-90% knowledge gap between academia and industry 2. Teaching methodology is expected to be learning oriented to acquire industry-needs based knowledge instead of obtaining a mere certificate for a job 3. Old syllabus is expected to be updated with industry-needs of the time 4. Internship students need more practical knowledge and time allocation between theory and praxis should be revised

Aspects	Discussion
	<ol style="list-style-type: none"> 5. Lab facility needs to be improved so that students can acquire due practical knowledge to respond properly and perform better during the industrial attachment 6. Internship students lack knowledge on modern machineries, equipment and technologies 7. Curriculum for general subjects is much similar to that of classes 9 and 10 which need to be improved 8. Overall quality of education in TDIs is poor and needs to be improved as per industry needs 9. Theoretical knowledge must match with practical needs in the industry so that students can relate and apply the knowledge when needed 10. The teaching methodology should be more practical, and the activity based to shift into outcome-based learning modality
Courses identified by the TDGs, Internship students and supervisor, and IDEB for up-gradation	<ol style="list-style-type: none"> 1. Upgradation is required on courses: TRM Code-1911 & TT212, GTP Code-1912 & TT224, English Code-SS222 & 5722, Social Science Code-5811 & 5821, EM Code-5840, Yarn/Fabric Manufacturing/Wet Process/Clothing-1,2,3,4 2. Woven dyeing, yarn dyeing, denim washing, knitting technology (Code-1943, 1953, TT-633) needs to be upgraded 3. Emphasis should be given on a. English-II; code: 5722; b. Physical Education-life skill development code: 5812 c. Computer Application-II code 6632 – needs to include graphic design, CAD software MS word, excel etc. not sufficient 4. Computer knowledge as per industry needs and English language and communication skills is poor and should be given emphasis in the curriculum 5. Lab is not updated 6. Emphasis on English communication and computer course 7. More emphasis should be given on practical class 8. English course and computer course should be emphasised with industry needs-based context 9. English and computer knowledge should be job/needs oriented 10. Environment management course must be upgraded
Less important and irrelevant subjects as identified by TDGs, Internship students and supervisor and IDEB	<ol style="list-style-type: none"> 1. Less important subjects are Bangla code-5711, Bangla-II code SS212 & Basic electric code; ET 213 2. Engineering drawing, code: 1011 b. social science-II, code: 5821 should be removed from the syllabus 3. Social science not necessary in the syllabus

Annex 5 - Generic comments and suggestions made by industry and academia related to the up-gradation of the curriculum

Respondent Groups	Feedback
Textile Diploma Engineers and Graduates in the industry (TDEngr. /TDGs)	<ol style="list-style-type: none"> 1. Topics on bleaching replacement chemicals in denim, dyeing and washing topics 2. Topics on restricted chemicals and identification of sustainable dyes and chemicals 3. Basic understanding on obtaining certifications for social and environmental standards from accreditation authorities 4. Knowledge on applying 4R principles in spinning, fabric manufacturing and wet processing 5. Practical learning and knowledge on shade matching, PH of chemicals, data colour machine, datasheet of dye/chemicals, classification of eco-friendly and hazardous dyes/chemicals and PPE need to be included. 6. Capacity building of teachers 7. Topics on wet-processing chemicals, SAP to reduce wastage, chemical bonding etc.
Internship students at industrial attachment (FGD)	<ol style="list-style-type: none"> 1. Collaboration and cooperation between factories and industry must be stronger 2. Technical knowledge on ETP checking, boiler operation, waste-management, organic GRS, production planning etc. 3. Knowledge of AZO free and sustainable dyes 4. Updated environment management courses
IDEb (Institution of Diploma Engineers, Bangladesh-textile wing) FGD	<ol style="list-style-type: none"> 1. Knowledge of ETP functionality and its impact 2. Fire, social and environmental certification for registration processes 3. Knowledge of water saving, energy saving, time, manpower saving, and dyes/chemical saving 4. Factory visits should be more frequent to give the real feeling of the industry 5. Knowledge on green certified chemicals, ZDHC certified chemicals for ETP 6. Principals and teachers of TDIs should invite experts from industry (IDEb-members) for sharing knowledge at least twice in the year 7. IDEb can bridge between institutes and industry (way forward to collaboration)
Reporting supervisor of internship students	<ol style="list-style-type: none"> 1. Knowledge gaps between theory and practical 2. Topics on the application of 3R principles

Relevant Teachers of Textile Diploma Institutes	<ol style="list-style-type: none"> 1. Knowledge on waterless dyeing and ETP functionality 2. Knowledge on fire safety, gender equity to be introduced 3. Efficient use of water in dyeing and in normal use to be to be taught 4. LEED certification related knowledge can be included into the curriculum, riteria of attaining LEED certification 5. Knowledge on 3M – man, machine and materials 6. Knowledge on application of 3R principles (reduce, reuse & recycle) 7. Rain Harvesting concept 8. Two social science courses are not required, and relevant sustainability topics can be included instead 9. Teacher's training for capacity development, improving textbook, teaching module, theory, practical classes and more frequent factory visit should be ensured for quality education. 10. Textbook should be in Bangla on fundamental sustainability topics. Board or GIZ can take initiative to develop textbook
Principals of Textile Diploma Institutes (TDIs)	<ol style="list-style-type: none"> 1. Since consumer and buyer demand sustainability practice in the industries, sustainability topics should be incorporated in the curriculum 2. Knowledge on textile waste management 3. The new contents that should be incorporated are – work safety, work environment, gender equity, recycling, water pollution, increased focus on waste management (adding waste management to Fashion Designing and Machine Designing and Maintenance) 4. Recycling, ETP and 'Green' industry and other necessary sustainability content in waste management, can be added in environmental management or industrial management courses. 5. ETP topics can be incorporated in the last 7th semester with contents on Biochemical Oxygen Demand, Carbonaceous Biochemical Oxygen Demand, Chlorine, Chemical Oxygen Demand, Ammonia Nitrogen, Nitrite, Nitrogen, Nitrate, Total Dissolved Solids, Total Phosphorous, Total Suspended Solids etc. 6. Update knowledge and skills on sustainability will create wider employability of diploma graduates in the international market as the textile industries become a global village. 7. BTEB and TDIs should work together for facilitating training for capacity development of teachers to address scarcity of skilled curriculum specialist, teachers and resource persons and factory personal and teachers from respective field should be involved to ensure better syllabus.
Textile University Faculties	<ol style="list-style-type: none"> 1. Topics on wastewater treatment and ETP (physical, chemical, biological, advance treatment) functionality and knowledge on monitoring of COD, BOD etc. 2. Collaboration between industry and academia to be ensured to bridge the gap and industry can facilitate training and factory visit of students 3. Industrialist should visit academia to tell story of success, failure, challenges to students. 4. Education ministry can put condition for certification and renewal of certificates on basis of performance of factories on supporting students and for industry attachment and opening scope for frequent factory visit of students 5. Collaboration between industry and academia for strengthening opportunities of industry-based research 6. Topics on how to reduce energy, time, material and manpower, sound and air pollution 7. Inclusion of how to apply 4R principles (reduce, reuse, recycle and replace/recovery). Circularity in the production process (Raw material, energy, water waste, dyes/chemicals etc.) 8. Topics on introducing with multi-functional chemicals to reduce use of numbers of chemicals. 9. Capacity development of teachers through training programme should be implemented properly 10. Topics can be included on how to ensure sustainable wet processing (less water, less energy, less chemical/dyes). 20% contents can be changed and developed with sustainability topics in yarn manufacturing, fabric manufacturing, wet processing and other activities in textile industry 11. Lab content can be designed to keep provision of 20% for sustainability topics for practical class 12. Internship students can be assigned in the industrial attachment to report on how factory practices and maintain sustainability or how factory can obtain sustainability 13. Teachers and students to be closed though collaboration with industry experts and culture of developing partnership between industry and academia to be inculcated. 14. Students can be assigned with group works to develop ability to work as a team in the industry. 4/5 students can do assignment on a. how to reduce energy in building facility b. how to reduce input and maximise output (fibre to yarn) etc. – practicing sustainability through practical assignment 15. Two full courses on sustainability with 6 credit and 1 credit dedicated for LAB on Environmental Management at university level can be a good idea 16. It is a paramount importance to compose textbook on fundamental on sustainability fully customised with most important sustainability topics related to textile industry 17. Topics on how to reuse ETP treated water, purification of disposals, and knowledge waste management of yarn and fabric for re-use 18. Contents on water efficient (low liquor) technology in dyeing, Carbon dioxide dyeing 19. Knowledge on ethical issues- sociological and industrial psychology 20. At diploma level, contents on basic sustainability concept and various dimension of sustainability, benefits of sustainability, implementation procedures, and needs-based practical activities to be incorporated. At university level advance topics and research on sustainability issues to be introduced. 21. Collaboration between academia and industry is needed to introduce problem based and project-based learning system. Problems faced by industry with new technology could be a project to engage students and teachers for solution. Collaboration also needed to do joint research work 22. Curriculum review authority is expected to ensure quality education at management level to be aligned with SDG-4 23. Interaction between academia and ex-students to be established. Alumni may give two lectures at academia on latest trend and technology

	<ol style="list-style-type: none"> 24. Introduction of multi-media in teaching to transfer knowledge on new trend and technology for knowledge building of student and animated teaching materials can be used 25. Infusing sustainability topics in the curriculum Social sustainability: CSR, WRAP, Environmental: fairtrade, Oeko-Tex, ISO 14000, eco-level Quality Management System (QMS) 26. Contents on how to make process optimization in textile manufacturing to be included in courses 27. Chemical selection: Pre-treatment chemicals, technical data sheets of chemicals parameter can be included in the syllabus. 28. Agreement with Audit Firms, Buying houses, Brands etc. to visit factory for 4/5 days to gather practical knowledge 29. Teaching approach should encourage students to follow reference books beyond only following textbook and lecture sheet. Other teaching tools and techniques may include; <ol style="list-style-type: none"> I. Sharing relevant recent publication of article with students. II. Discussion and presentation by students and teacher. 1 or 2 topics in each semester. III. Video/multi-media/projector presentation on latest trend and technology IV. On test/spot test/surprise test to keep students alert V. Guest lecturers from industry for specific topics. VI. Industry alumni event by renowned industry experts VII. For Diploma, marks distribution could be 60/40 ratio for theory/practical.
BTEB	<ol style="list-style-type: none"> 1. Environmental management, social sciences and industrial management syllabus is not enough to address the present or future needs of the industry 2. Industry can co-operate by following ways <ul style="list-style-type: none"> ➤ They can arrange proper internship facilities of textile diploma graduates ➤ Facilitating regular industry visit 3. Department of Textile (DOT) can regulate or impose conditions in the case of internship 4. IDEB, IEB & BTEB can co-ordinate for student's internship activities 5. To build up international standard curriculum close relation between BTEB and BKMEA, BGMEA, BTMA, DOT as well as teacher training required 6. Through the employability enhancement, TDGs will have opportunities for placement at least for Mid-level officer in sustainability HR, compliance and other departments 7. There is a scope to include sustainability topics in other subjects.

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