CONDUCT DETAIL ANALYSIS OF ENVIRONMENTAL LAW / REGULATIONS IN LEATHER AND PLASTIC SECTORS IN ORDER TO ENHANCE ENVIRONMENTAL COMPLIANCE OF THE SECTORS

Value Chain Assessment Report Leather Sector

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IFC International Finance Corporation WORLD BANK GROUP
Creating Markets, Creating Opportunities

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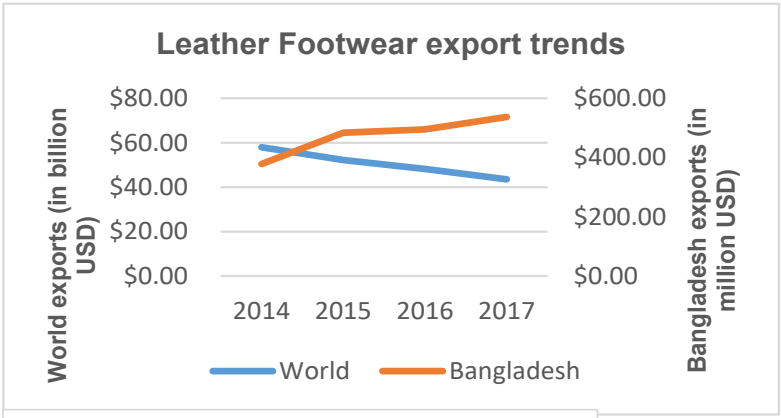
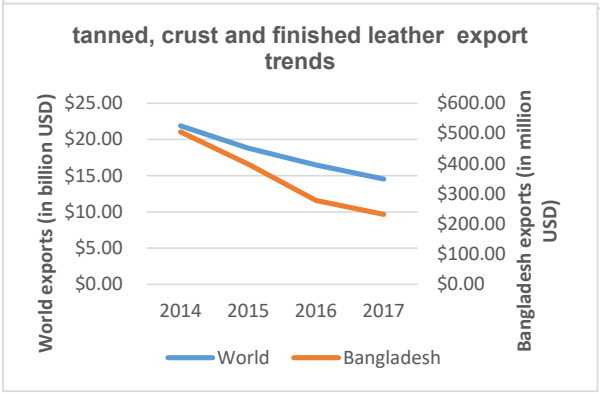
EXECUTIVE SUMMARY

Executive Summary

The leather industry is one of the oldest industries in Bangladesh and plays a significant role in the country's economy. Presently, the leather sector contributes about 2% to the country's industrial production and 0.6% to the GDP by employing about 0.3 million people directly or indirectly. The sector is currently the second largest export industry in the country after ready-made garments (RMG), with the total exports in FY 18 being 1.33 Billion USD and about 558,000 people earning income directly through employment in leather and leather goods production, and 300,000 people indirectly through working in allied areas (FY 2015-16). The Government of Bangladesh (GoB) intends to diversify the export portfolio of the country so as to reduce overdependence of the economy on the RMG sector and has identified the leather sector as one of the thrust/priority sectors for increased share in the export portfolio.





In January 2017, the GoB announced leather, leather goods and leather footwear as the "Product of the Year" in order to give a boost to the sector. Going forward, the exports of the leather sector have the potential to evolve into a USD 5 Billion export market by 2021, subsequently creating additional direct employment opportunities for 306,000 people in leather footwear and leather goods manufacturing alone. Eighty

percent of the workforce is expected to comprise women. For the leather sector to evolve into a USD 5 Billion export market by 2021, the ambitious growth rate envisaged is 45% for leather footwear, 80% for leather products like trunks and suitcases, 60% for articles of apparel and clothing, and 40% for other articles of leather.

However, in contrast to the exponential growth rate required to achieve the ambitious plan of creating a USD 5 Billion export market, the exports of the leather sector in Bangladesh witnessed a steep decline of 12% during the last FY 2017-18. The export earnings of processed leather[1] decreased by a staggering 21.28%.

Although the global exports of leather, leather goods and footwear have also declined over the last 3 years as buying from the EU and the US has been sluggish - the decline is not as much as that experienced in Bangladesh. Last year, there was a decline of 12% in global exports of processed leather while the decline was 21% for Bangladesh. The quantum of decline in Bangladesh is an obstacle to attaining the 5 Billion USD target. Poor environmental performance of leather production is a significant cause of the decline in the exports of processed leather from Bangladesh, with the Buyers moving away due to the environmental non-compliance.

However, the leather footwear industry, which uses environmentally compliant leather, defied the global trend and its exports increased by 6% during the last FY, while globally there is a decline of 10%.

Also the emphasis of global brands on sustainable practices being adhered across the value chain of the leather sector is increasing with global brands setting up ambitious targets to reduce the negative environmental and social impacts of the entire supply chain. The poor environmental performance of manufacturing processed leather in conjunction with the evolving environmental sustainability requirements of global brands necessitates the need for adopting enhanced environmental safeguard practices for improving the export competitiveness of the leather sector.

Finance, Competitiveness and Innovation (FCI) Global Practice of the World Bank Group has launched a lending and technical assistance program to help Bangladesh achieve its ambition of improving export diversification. As part of this program, WBG has appointed PwC to undertake a comprehensive analysis and mapping of the leather value chain through the environmental lens and highlight the specific policy and regulatory interventions that can enhance competitiveness through improved environmental sustainability.

This report contains (i) Value Chain Analysis from the environmental point of view which includes mapping of the leather sector value chain; (ii) the regulatory landscape of Bangladesh governing the leather sector; (iii) An as-is assessment of the environmental performance of the value chain; and (iv) suggested interventions to improve the environmental sustainability of the sector.

Value Chain mapping of leather sector

The leather manufacturing value chain has three main components (a) slaughter houses; (b) tanneries; and (c) leather goods and leather footwear manufacturing. The raw hides produced by slaughterhouses are processed by tanneries for producing crust and finished leather. There are around 220 tanneries in Bangladesh with 70% of them located in the Savar Tannery Estate (STE). Till 2016, the tanning sector was primarily located in Hazaribagh, Dhaka. However as those tanneries lacked individual effluent treatment plants (ETP's), the GoB decided to relocate the tanneries to Savar with the provision of a Common Effluent Treatment Plant (CETP) for treating waste before discharge into the river. The tanneries in Bangladesh primarily produce crust or semi-finished leather for export – around 85% of the tanneries in Bangladesh produce crust leather while 15% produce finished leather. Lack of both technical skills (leather technologists in the country) and access to finance for installing capital intensive mechanized finishing machinery is constraining the adoption of the processes for producing finished leather from crust leather. The leather goods manufacturers and leather footwear manufacturers are scattered across Dhaka, Chittagong, Khulna and Bhairab. The footwear and goods producer segment of the value chain is predominantly export oriented.

[1] Processed leather comprises of tanned leather, finished leather and crust leather

As-is assessment of the environmental performance of the value chain

The baseline environmental footprint of Bangladesh's leather sector was assessed through field visits to 18 tanneries and 14 leather goods and footwear-manufacturing units. The tanning segment of the value chain was identified as having the highest environmental footprint with significantly low environmental compliance. Effluent generation from tanneries has a significant pollution load with a high concentration of pollutants like COD, BOD, SS etc. necessitating the requirement of effective treatment. However in spite of constant improvements Savar CETP's inability to function at the optimum performance levels is contributing to the high environmental footprint of the segment. Furthermore, tanneries have a significantly higher energy water and chemical consumption benchmark compared to the international benchmarks. The lack of Environmental Management Systems (EMS) at the tanneries was evident as only one out of the tanneries surveyed had ISO 14001 certification.

The environmental issues for slaughterhouses include high salt consumption and those for leather goods and footwear manufacturing include (a) high energy consumption, and (b) 'as-is' practice of solid waste disposal.

Suggested interventions to improve the environmental sustainability of the sector

A structured approach is recommended to firms for addressing the environmental challenges of the leather sector value chain in order to make the industries environmentally compliant and to enable them to meet the requirements of global brands. The approach should prioritize the issues that can be addressed in order for the sector to be environmentally complaint towards local legislations. The increased exports that the sector can achieve by being complaint towards national legislations can be leveraged in adopting global certifications (such as LWG certification) for meeting the evolving requirements of the brands. There is a business case for being compliant or compliant ++ (which is the Leather Working Group certification). **Back-of-the-envelope numbers show that for a 10% increase in cost to be compliant, firms can experience 3 times increase in profit margins. Likewise, for a 14% increase in cost to be compliant++ or LWG certified, firms can see up to 5 times increase in returns.**

The approach by the industry, with support from policy makers, should be undertaken in two phases: (a) meet the compliance requirement of national legislations by focusing on better effluent management and solid waste disposal as an immediate priority and then (b) adopt the LWG certification (which is compliance ++) requirements by focusing on resource efficiency, chemical management and implementation of the EMS systems.

The action plan for the Government of Bangladesh should be to ensure that the entire leather sector is environmentally compliant in the next 3 years, after which increased exports that the sector can achieve by being compliant towards the national legislations can be leveraged in being complaint ++ or adopting LWG certifications.

Policy recommendations to improve the environmental sustainability of the sector: In order to achieve sector wide compliance that will lead to medium-term competitiveness and export growth, private investment in the sector will need to be coupled with policy initiatives and reforms. Six policy areas have been identified as immediate priority:

1. Enhanced management of effluent discharge from tanneries through measures such as regulating the effluent pollution load at CETP inlet. This will encourage the establishment of pretreatment systems at tanneries and stringency of standards at CETP outlets.
2. Management of solid waste in the leather sector by issuing guidelines that allow reuse of solid waste as processed inputs in other industries.
3. Strengthening and increasing access to finance for investment in green technologies and processes.
4. Fiscal/custom incentives to establish chemical industries in Bangladesh.
5. Encouraging energy management by support proliferation of energy efficiency in industries through energy standards/labeling for energy efficient equipment.
6. Encouraging water efficiency measures within the factories by regulating ground water use.

As the next step, policy notes on these recommendations will be prepared and shared with key stakeholders. Although some of the firms in Bangladesh can implement the sustainability initiatives unregimented – a combination of enabling regulatory interventions and encouraging private sector investments to bridge the existing access to finance gaps, are required for greater penetration of the initiatives in small and medium scale factories. The small and medium scale factories comprise more than 80% of the leather sector landscape in Bangladesh and proliferation of better environmental performance amongst these industries is essential for the sector's growth.

The government needs to support the firms by catalyzing cash inflow through FDIs, expanding the size of existing funds such as GTF for financing the sustainability interventions as well as creating an investor friendly climate for the DFIs and FIs. Driving the sustainability agenda will require catalyzing sectoral investment of the sum of at least USD 500 Million to tap into the existing access to finance gaps. This provides an investment opportunity for the DFIs, impact investors, and growth capital funds to tap into for proliferation of the following illustrative sustainability initiatives. Back-of-the-envelope calculations suggest returns greater than the cost of capital for all these initiatives:

- Investment in cold storage facilities at *aroths* – this can reduce salt consumption for the preservation of hides by reducing the TDS content in the tannery effluent. The *aroths* are located in Dhaka, Chittagong, Comilla, Kushtia, Natore and Rangpur. As a pilot, cold storage can be deployed at the *aroth* in Dhaka to assess their viability and subsequently, the implementation can be scaled up to encompass *aroths* in the other divisions. Installation of cold storages for processing hides at the *aroth* in Dhaka (Posta) will require a capital investment of 1 Million USD.
- Encouraging Public Private Partnership for CETP operations by fostering innovation and technology transfer from private entities to improve the efficiency of CETP operations – this can also develop the competencies of local service providers (LSP) as they usually form consortia with international entities while undertaking PPP projects.
- Investment opportunity of USD 160 Million to capture the value addition from crust to finished leather production (around 10%) - finishing machinery is capital intensive and costs around 1.2 Million USD for producing 3 Million sq.ft of finished leather. Establishing the finished segment in the leather sector value chain will also require skill development. Each tannery will require about 10[2] leather technologists to augment their existing production processes for producing finished leather. WBG's envisaged technology centers can be leveraged for this purpose.
- Encouraging the establishment of chemical industries - the chemicals used in the tanning processes are predominantly imported from European Union, with the tanneries in Savar consuming around 200,000 tons of chemicals annually. The cost of the chemicals consumed by Savar Tanneries (which account for 80% of the tanneries in Bangladesh) is USD 139 Million per year. The absence of chemical industries provides an opportunity for the government to encourage the establishment of such industries in Bangladesh by tapping into the investments from FDI and institutional investors. The output of chemical industries is sector agnostic and can cater to the increased use of chemicals in the leather and other sectors, including the RMG sector. Encouraging the growth of the chemical industry can also stimulate investment in research and development (R&D) of green chemical production domestically. After the stabilization of the industries, they can explore investing in the R&D of green chemicals for organic growth.
- Significant investment opportunity exists for the installation of rooftop systems for tanneries in the Savar region. There is an opportunity to install ~150 MW systems with the capital investment sum of 150 Million USD. The investment opportunity for solar rooftop systems can be sector agnostic as well and can cater to the increasing electricity demand of RMG, plastic and light engineering sectors as well.

In the course of reaching the 5 Billion USD target of leather exports, Bangladesh can also explore the opportunity of investing in mechanized slaughterhouses with dedicated cattle rearing farms to cater to the requirement of raw hide. This can also impact upon the growth of the meat processing industry in Bangladesh. However, the investment opportunity needs to be explored cautiously considering the consumer patterns of the seasonality of slaughtering.

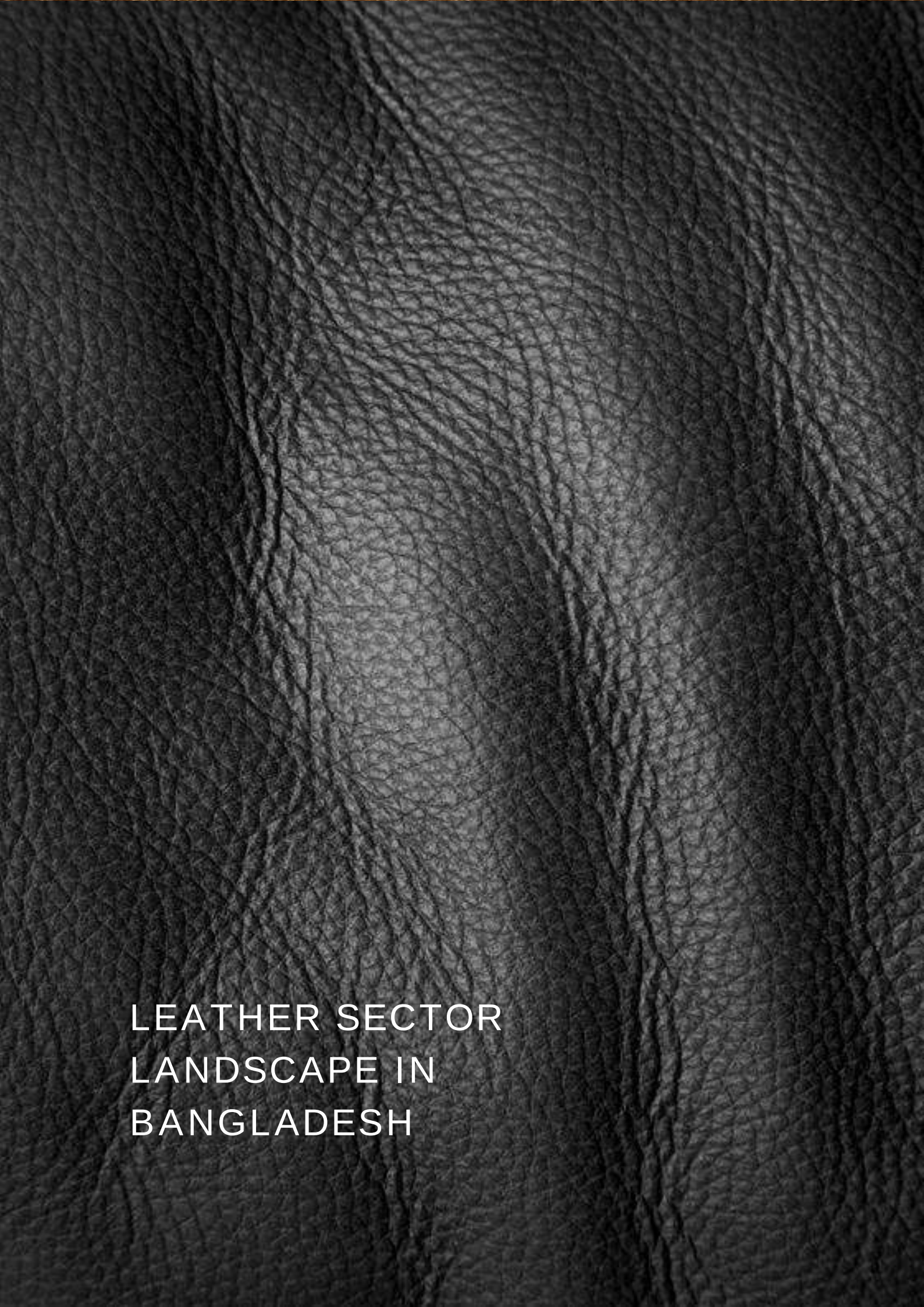
[2] ~10 leather technologists for 3 million sq ft. finished goods production

The study further noticed early trends on the uptake of artificial leather (PU leather) due to change in consumer preferences (towards being more vegan) which the government of Bangladesh also needs to be cognizant of while formulating the policy interventions. This reinforces the suggestion of cautiously considering the matter of investing in mechanized slaughtering.

While it is worthwhile to note that the recommendations are intended to enhance export contributions, they play an important role in making the leather used for domestic consumption environmentally compliant. Currently the leather used for domestic consumption, which is a 30 Million USD market, is environmentally non-compliant and has a water footprint of 216 Million m^3. The commitment of the stakeholders and champions to make the sector competitive and improve export performance will be reflected in their willingness and ability to work collaboratively to facilitate private investment worth $500m in the value chain, increase private investment at the firm level into machinery/practices/skills, and undertake serious policy reforms as noted above.

Driving the investments and policy agenda articulated above to realize the ambition of $5 billion exports in the leather sector by 2021 would require mainly a collaboration platform that is different from a PPD platform that seeks to prioritize and achieve policy reforms. Bangladesh has a highly successful PPD platform called Business Initiative Leading Development (BUILD) that was launched jointly in 2011 by the Dhaka Chamber of Commerce and Industry (DCCI) in partnership with the Metropolitan Chamber of Commerce and Industry (MCCI) and Chittagong Chamber of Commerce and Industry (CCCI). BUILD aims to facilitate structured dialogues between the public and private sectors under an institutional framework and under the Bangladesh Sector Competitiveness advisory TA, it has established a sectoral PPD for leather. However, given the agenda on hand, it is recommended that the sectoral dialogue PPD be expanded into a collaborative platform where the focus is not just on policy reforms but also on discovery, prioritization, catalyzing investments, supporting PPP negotiations, and encouraging firms to change behaviors and invest in compliance and better practices. Such a platform should hold all parties accountable for their role (instead of just the government) and include representation from academia, private banks, investors, international buying houses, tier 1 firms, adequate representation from tier 2 and 3 firms, civil society, and policy makers.

The effectiveness of BUILD and with it the growth of the leather sector in Bangladesh will depend first and foremost on the leadership of MoC. The leadership and commitment of MoI, international buyers and tier 1 players will be equally critical as well.



LEATHER SECTOR LANDSCAPE IN BANGLADESH

1. Introduction

1.1. Leather sector landscape in Bangladesh

Leather industry is one of the oldest industry in Bangladesh and plays a significant role in the country's economy. Presently, leather sector contributes about 2% to the industrial production and 0.6% to the country's GDP by employing about 0.3 million people directly or indirectly.

The leather manufacturing value chain comprises of (a) slaughter houses (b) tanneries and (c) Leather goods and leather footwear manufacturers. Bangladesh has significantly large livestock population to support a strong and growing leather industry. Raw hides are produced from slaughterhouses at multiple locations including households (during Eid-ul-Adha festival). In Bangladesh, there are very few large-scale mechanized slaughterhouses (e.g. Bengal Meat) and most of the raw hides are produced from small or micro scale slaughterhouses across Bangladesh. Annually, approximately 450 million square feet of raw hides used in leather sector is produced in Bangladesh. The produced raw hides are processed by the tanneries for producing crust and finished leather. There are around 220 tanneries in Bangladesh with 70% of the tanneries located in Savar Tannery Estate.

Until 2016, the tanning sector was primarily located in Hazaribagh, Dhaka. However as the tanneries in Hazaribagh were devoid of individual effluent treatment plants (ETP's), Government of Bangladesh decided to relocate the tanneries to Savar with the provision of Common Effluent Treatment Plant (CETP) for treating waste before discharge into the river. Of the 150 plots allocated, about 110 tanneries have initiated the operations in Savar and are primarily producing crust or semi-finished leather for export.

The visits and consultations with various tanneries elucidated that Bangladesh is missing a significant opportunity to capture the value addition from crust to finished leather production due to the lack of technical know-how of producing finished leather from crust and lack of availability of finance. To estimate the investment need for expanding the 'as-is' operations to include the finished leather segment, various tanneries and footwear manufacturers were consulted. The information was further validated with the quotations from suppliers of machinery for producing finished leather. It was found that the finishing machinery is capital intensive and costs around 1.2 Million USD for producing 3 Million sq.ft of finished leather. This presents an investment opportunity of USD 160 million to capture the value addition from crust to finished leather production (around 10%). Establishing the finished segment in the leather sector value chain will also require skill development – each tannery will require about 10[3] leather technologist to augment its existing production process to produce finished leather for which WBG's envisaged technology centers can be leveraged.

The leather goods manufacturers and leather footwear manufacturers are scattered across Dhaka, Chittagong, Khulna and Bhairab. The finished leather goods and footwear-manufacturing segment of Bangladesh consists of around 2500 small and medium shoe manufacturers, 30 modern large-scale shoe manufacturers, 1000 small to medium and 60 large leather goods manufacturers. Nearly 90% of all leather footwear making units are located in and around Dhaka city with some leather footwear making units existing in Chittagong, Khulna and Bhairab.

Footwear and goods producer segment of the value chain is predominantly export oriented. Leather footwear exported in 2017-18 fiscal year was approximately $566 million, majorly comprising of exports to Europe and Japan. In addition, finished leather goods were responsible for exports of $336 million from Bangladesh in the FY 18. The leather goods and footwear manufacturers are largely dependent on the import of the finished leather for production of export quality products.

Overall, the leather sector is currently the second largest export oriented industry in the country, after ready-made garments (RMG) with the total exports in FY 18 being 1.33 Billion USD. The sector employed about 558,000 people directly through employment in leather and leather goods production, and 300,000 people indirectly, through employment in allied areas in FY 2015-16.

[3] ~10 leather technologists for 3 million sq ft. finished goods production

1.2. Ambitious growth potential for leather exports - Bangladesh

The Government of Bangladesh (GoB) intends to diversify the export portfolio of the country so as to reduce overdependence of the economy on the ready-made garments (RMG) sector and has identified leather sector as one of the thrust/priority sectors for increased share in export portfolio.

To give a boost to the sector, the Government of Bangladesh announced leather, leather goods and leather footwear as the "Product of the Year" in January 2017. Going forward, the exports of leather sectors have the potential to evolve into a USD 5 Billion by 2021, subsequently creating direct employment opportunities for 306,000 people in leather footwear and leather goods manufacturing alone. 80% of this workforce is expected to comprise of women. The figures clearly indicate the promising potential that the sector demonstrates in contributing to the national economic development. For the leather sector to evolve into a USD 5 Billion export market by 2021, the ambitious growth rate envisaged is 45% for leather footwear, 80% for leather products like trunks and suitcase, 60% for articles of apparel and clothing, and 40% for other articles of leather

However, in contrast to the exponential growth rate required to achieve the ambitious plan of USD 5 Billion, the exports of leather sector witnessed a steep decline of 12% during the last FY 2017-18. The export earnings of processed leather[4] decreased by a staggering 21.28%. The poor environmental performance of the leather production is a significant factor attributing to the decline in the leather exports from Bangladesh and buyers moving out due to the environmental non-compliance. Though the decrease in process leather exports mirror the global trend, the quantum of decline is exasperating for the 5 Million USD target. In contrast, the leather footwear industry, which uses environmentally complaint leather, defied the global trend and the exports have increased by 6% during the last FY.

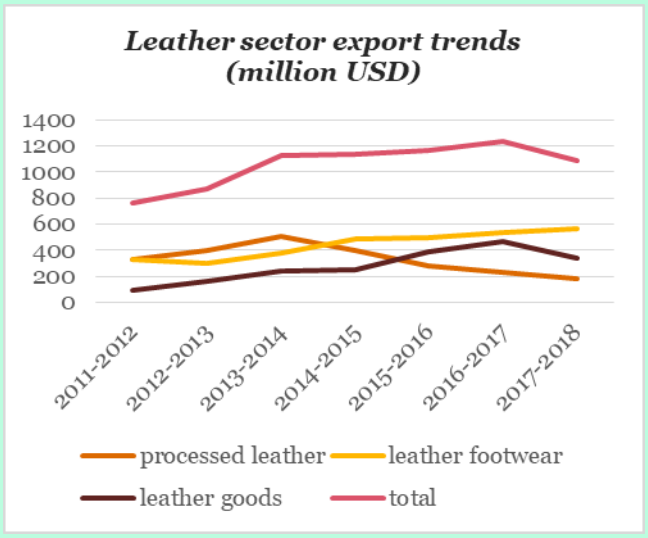


Figure 1: Export trends of Bangladesh's leather sector; Source EPB

Thus, it is evident that growth of leather sector exports to 5 Billion USD may greatly depend on one key condition – environmental compliance and adherence to the evolving sustainability requirements of the global brands.

1.3. Increasing sustainability requirements of brands

There has been an increased emphasis of the global brands on sustainable practices being adhered across the value chain of the leather sector. As evident from the below snapshot, global fashion brands are setting up ambitious targets to reduce the negative environmental and social impacts of their entire supply chain.

[4] Processed leather comprises of tanned leather, finished leather and crust leather

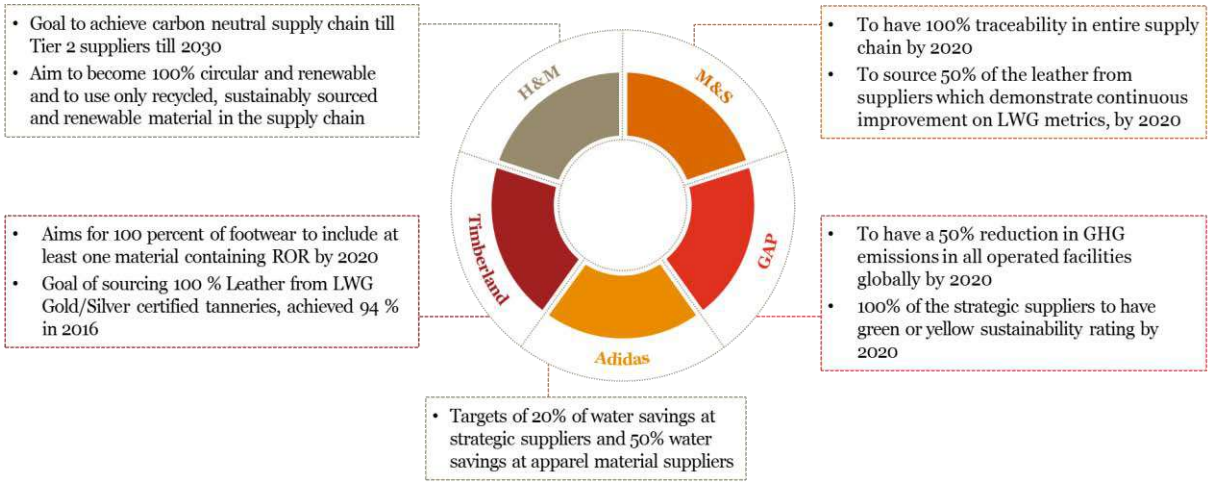


Figure 2: Global brands moving towards sustainable procurement

Furthermore, retail fashion brands across the globe are associating, to adopt global certifications and creating platforms (such as Leather Working Group) to work on sustainability related issues in the leather value chain.

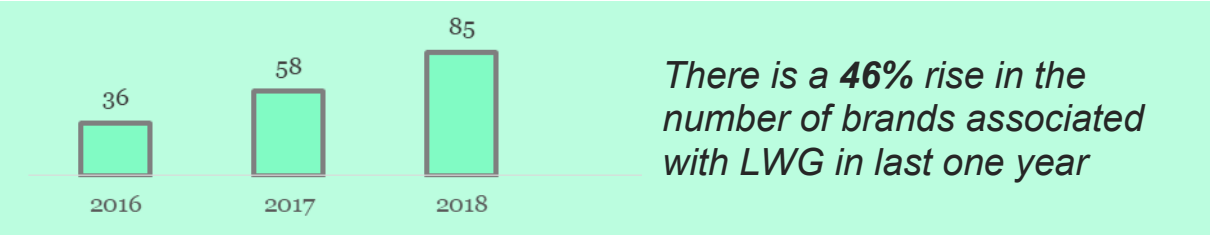


Figure 3: No. of brands associated with LWG (Leather Working Group)

In addition, global brands are increasingly committing to Sustainable Development Goals (SDGs). Some of the key commitments of prominent brands in leather sector towards SDGs[5] are provided below:

Figure 4: Global brands commitments to SDGs

The poor environmental performance of the manufacturing of the processed leather in conjunction with the evolving environmental sustainability requirements of global brands necessitates the need for

[5] H&M: https://about.hm.com/content/dam/hmgroup/groupsite/documents/masterlanguage/CSR/reports/2017%20Sustainability%20report/HM_group_SustainabilityReport_2017_Highlights.pdf
PUMA: https://annual-report-2017.puma.com/en/company-overview/sustainability/
Timberland: https://www.tiaa.org/public/pdf/Timberland_sustainability_report_2018.pdf

adopting enhanced environmental safeguard practices for enhancing the export competitiveness of the leather sector.

1.4. Bangladesh's commitment to improve environment through sustainable development goals (SDG)

The government of Bangladesh is committed to meet the United Nations' sustainable development goals with the common agenda to end poverty, protect the planet and ensure that all people, irrespective of their country of origin, enjoy peace and prosperity. The commitment has led GoB to set SDG targets for improving the quality of the environment and protect its natural resources.

Under the SDG 6 (Clean water and sanitation), GoB has committed to improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally by 2030.

It also targets to substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity by 2030.

Under its commitment for SDG 7 (Ensure access to affordable, reliable, sustainable and modern energy for all), GoB aims to increase substantially the share of renewable energy in the global energy mix by 2030.

In order to achieve its goal towards sustainable consumption and pattern (SDG 12), country aims to achieve the environmentally sound management of chemicals and all wastes throughout their life cycle, in accordance with agreed international frameworks, and significantly reduce their release to air, water and soil in order to minimize their adverse impacts on human health by 2020.

The commitments to the UN sustainable development goals is also a significant catalyst for proliferation of new initiatives, capacity development and technology integration to improve the environment performance of the leather sector in Bangladesh and meet the national objectives.

1.5. Addressing the environmental performance for increased competitiveness

Presently the Bangladesh leather industry is constrained by the challenges of environmental non-compliances due to lack of environmental regulations, lack of firm level awareness and limited availability of relevant skills in adhering to the environmental compliance.

To ensure the envisaged target of increased share of leather products in the export portfolio in Bangladesh, it is essential to identify and prioritize areas for regulatory and firm level interventions for embedding sustainable production practices across the existing value chain of leather sector in Bangladesh. The policy level interventions need a continuous and cohesive dialogue between the private and public sector to create an inclusive partnership realize shared value by considering development outcomes alongside business interests. One such platform is Business Initiative Leading Development (BUILD) that was launched jointly by the Dhaka Chamber of Commerce and Industry (DCCI) in partnership with the Metropolitan Chamber of Commerce and Industry (MCCI) and Chittagong Chamber of Commerce and Industry (CCCI) in 2011 as to facilitate structured dialogues between the public and the private sectors under an institutional framework.

For formulating effective policy as well as the firm level interventions which can be further pursued through a structured dialogue platform, a detailed assessment of environmental performance of the sector was undertaken by PwC. The assessment was undertaken using the value chain approach which included (a) value chain establishment and validation (b) looking at each segment of the value chain from the environment lens to identify the constraints impairing the environmental performance of the sector (c) mapping the environmental regulatory landscape of each segment of the value chain and (d) identifying the firm level and regulatory level interventions to achieve increased environmental performance.

Chapter 2 and Chapter 3 of the report elaborates the existing value chain for leather sector in Bangladesh along with the environmental footprint of each segments of the value chain. The regulatory interventions and the firm level interventions to alleviate the performance of the critical environmental aspects have been detailed in Chapter 5 of the report.

Regulatory interventions required for improving the environmental performance of each environmental aspect were formulated by identifying the gaps existing in the regulatory landscape of Bangladesh. This was undertaken through mapping of the regulatory landscape which included (a) As-is assessment of the existing environment policies and (b) Comparative assessment of the existing regulatory landscape of Bangladesh vis a vis the international best practices to assess the gaps in the existing regulatory landscape of Bangladesh. The assessment of the legislations applicable to the sectors was undertaken primarily through focused secondary research and literature review. Stakeholder consultations (meeting with DoE, Tanneries associations) were undertaken to validate the applicable environmental laws and to assimilate information that were not captured through secondary research and desk review. Based on the above, list of environmental laws and regulations relevant to the leather sector in Bangladesh has been compiled. Further to the desk review of the environmental regulations and validation through stakeholder interactions, the team also mapped the environmental aspects across of the leather sector and assessed the existing regulations covering the mapped environmental aspects. This was undertaken to (a) ensure the comprehensiveness of the applicable regulations gathered from the secondary research and stakeholder interactions and (b) identify the gaps with the international standards.

Subsequent to the mapping of the environmental regulatory landscape across each segment of the value chain, comparative assessment of the existing regulatory landscape of Bangladesh vis a vis the international best practices has been undertaken to assess the gaps in the existing regulatory landscape of Bangladesh. The countries for the comparative assessment included US, Italy, India, Ethiopia and Brazil. These countries were selected across the thematic areas of (a) top export destinations for Bangladesh (b) top leather global importers and (c) competing producer countries.

LEATHER SECTOR VALUE CHAIN IN BANGLADESH

2. Value chain assessment

The leather sector chain includes various constituent entities such as core manufacturing units, input suppliers, upstream and downstream units, logistics and other business service providers, utility service providers, industry associations, quality testing centers, training and academic institutions. Based on our prior experience in Bangladesh and through extensive secondary research we had initially mapped value chain of the leather sector. The mapped value chain was then validated through extensive stakeholder interactions and through site visits. Establishing a robust value chain was key to (a) Identify environmental hotspots specific to each segment of the value chain (b) Identifying interventions to drive sustainability agenda specific to each segment of the value chain (c) Stakeholder mapping to identify the key stakeholders to drive the sustainability agenda.

2.1. Leather Sector Value Chain in Bangladesh

The leather manufacturing in Bangladesh is vertically integrated as the country has a huge raw material base. Animals are slaughtered by butchers and households and the raw hides and skin are sourced by the tanneries. The tanneries process the procured hides in pre tanning section and subsequently, the cured hides are tanned to produce wet blue. The wet blue is further processed to produce crust leather and then finished leather which is supplied to the leather goods manufactures. The footwear manufacturing further includes four processes – cutting, machining, lasting, and finishing. The broad segments of the leather sector value chain are illustrated in Figure 2, with the elaborated value chain illustrated in Figure 3.

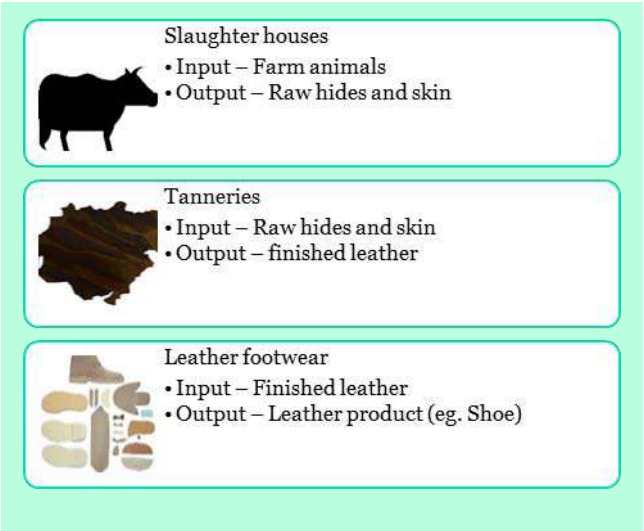
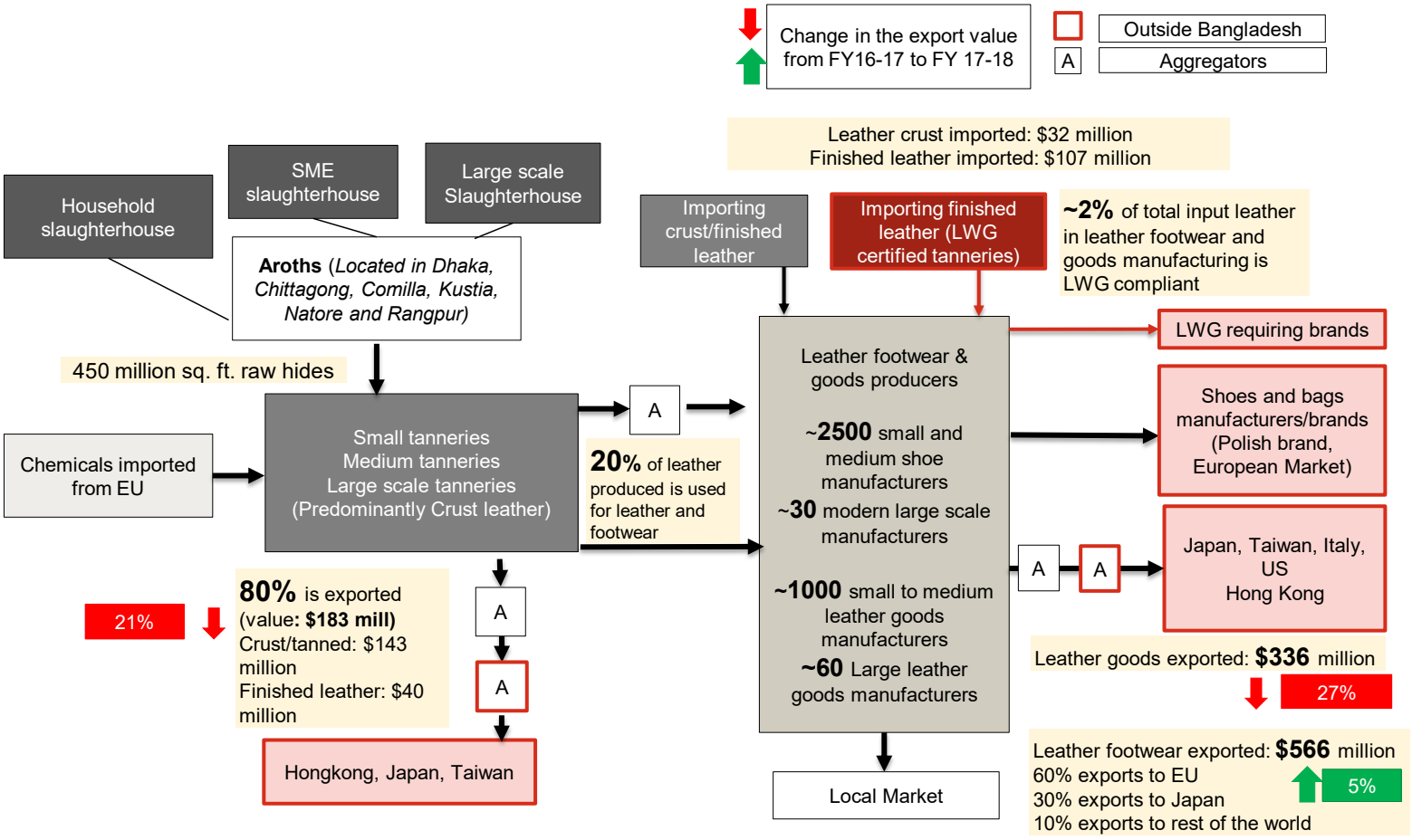


Figure 5: Leather production value chain

Figure 6: Outline of the leather sector value chain in Bangladesh



As illustrated in the above figure, the leather value chain in Bangladesh can be divided into following key segments

(i) Slaughter houses (ii) Aroths (iii) Tanneries (iv) Leather goods and footwear producers (v) Buyers (vi) Ancillary services (vii) Governance system

1. Slaughterhouses:

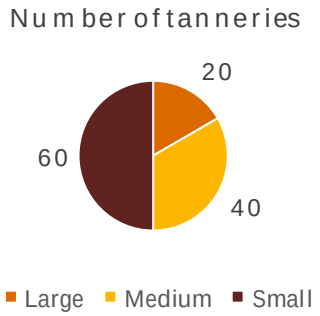
Bangladesh has significantly large livestock population to support a strong and growing leather industry. Raw hides are generated from slaughterhouses at multiple locations including households (during Eid-ul-Adha festival). In Bangladesh, there are very few large-scale mechanized slaughterhouses (e.g. Bengal Meat) and most of the raw hides are collected from small or micro scale slaughterhouses across Bangladesh. ***Annually, approximately 450 million square feet of raw hides used in leather sector is produced in Bangladesh.***

*About **50-60%** of rawhides are produced during Eid-ul-Adha festival*

2. Aroths: The rawhides are collected and transported to *Aroths,* which are the aggregators (market places) for raw-hides. The Aroths are located in Dhaka, Chittagong, Comilla, Kustia, Natore and Rangpur. Here the hides are preserved using salt and are then supplied to the tanneries.

3. Tanneries

The tanners depend on the aroths for the supply of hides for further processing. The tanners use chemicals, which are provided by suppliers based out of European countries like Germany, for processing the raw-hides to crust or finished leather. Until recently, the majority of the tanneries were located at Hazaribagh and were polluting the Buriganga river with untreated effluent discharge containing toxic heavy metals. *Pure Earth listed the Buriganga river as one of the top ten polluted sites in the world, including Chernobyl*. In July 2017, the High Court of Bangladesh issued an order for relocation of Hazaribagh tanneries to the newly established Savar Tannery Park[6]. To overcome the challenge faced by the tanneries in establishing individual ETP's, Savar Tannery Estate provides the tanneries with the Common Effluent Treatment plant for treating the discharged effluent. As of today, 155 tanneries have been allocated land at Savar Tannery estate of which 120 tanneries have started operations in Savar Tannery Estate (STE) – the proportion of tanneries in STE comprise of 20 large units, 40 medium units and 60 large units



*Savar Tannery Estate houses about **80%** of the tanneries in Bangladesh. Most of the leather produced from tanneries of Savar region is crust leather.*

Figure 6: Distribution of the size of tanneries in Savar Tannery Estate

The tanneries in Bangladesh predominantly produce crust leather curtailing the significant value add that the tanneries can avail by processing crust to finished leather. Approximately 80% of the leather produced (value: $183 million) is exported to countries like Hong Kong, Japan and Taiwan. The export takes place through aggregators present at domestic and international level.

[6] http://www.lynnebuchanan.com/blog/2018/3/7/savar-tannery-park-and-the-textile-industry-on-the-dhaleshwari-river-in-bangladesh

4. Finished leather goods and footwear manufacturing:

The finished leather goods and footwear-manufacturing segment of Bangladesh consists of around 2500 small and medium shoe manufacturers, 30 modern large-scale shoe manufacturers, 1000 small to medium and 60 large leather goods manufacturers. Nearly 90% of all leather footwear making units are located in and around Dhaka city with some leather footwear making units existing in Chittagong, Khulna and Bhairab.

Import of raw material and export of finished product: Footwear and goods producer segment of the value chain is predominantly export oriented. Leather footwear exports in 2017-18 fiscal year stood at approximately $566 million, majorly comprising of exports to Europe and Japan. In addition, finished leather goods were responsible for exports of $336 million from Bangladesh in the FY 18.

As earlier elaborated, there has been an increased emphasis of global brands on improved environmental performance across their sourcing supply chain. The retail fashion brands across the globe are associating, to adopt global certifications and creating platforms - Leather Working Group, to work on sustainability related issues in the leather value chain. The poor environmental compliance of the tanneries and the lack of technical know-how of producing finished leather from crust is constraining the use of the domestically produced crust by the leather goods and leather footwear manufacturers in Bangladesh. Consequently, the leather goods manufacturing and footwear sector of Bangladesh primarily import environmentally compliant leather to cater to the requirement of the global brands.

Until date, only one leather footwear manufacturer in Bangladesh has received LWG (Leather working group) certification. However, due to an increasing demand from the international brands for LWG compliant leather production, several Bangladesh tanneries as well as leather footwear production facilities are also aspiring to achieve Leather Working Group (LWG) certification. Currently, about 2% of all finished leather used in the leather footwear and goods production is LWG certified. The leather footwear industry imports LWG complaint leather (amounting to ~2% of the total processed leather used in Bangladesh) to supply to LWG member brands.

LWG – Leather Working Group

It is multi-stakeholder group with an objective to develop and maintain a protocol that assesses the environmental compliance and performance capabilities of leather manufacturers and promotes sustainable and appropriate environmental business practices within the leather industry. Group comprises of member brands, retailers, product manufacturers, leather manufacturers, chemical suppliers and technical experts that have worked together to develop an environmental stewardship protocol

Key insight

A significant opportunity to capture the value addition from crust to finished leather production is lost as most of the crust is exported instead of being processed to finished leather and used in Bangladesh's strong downstream industry of leather footwear and finished leather goods.

A substantial opportunity exists for the tanneries in Bangladesh to work towards LWG compliance and reduce the dependence on the LWG complaint imported processed leather.

5. Buyers

- Leather crust from Savar is exported to countries like Hong Kong, Japan and Taiwan. The export takes place through aggregators (traders) selling either directly to international market or through international traders.
- The European Union (EU) is the biggest destination for footwear exports accounting 60% share followed by Japan with 30%[7]. Leather goods and footwear segment exports directly to few Polish brands in European markets. Significant export of finished leather goods is to

[7] LFMEAB http://lfmeab.org/images/report/LEATHER_SECTOR_INVESTMENT_BROCHURE_LFMEAB.pdf

Japan, Taiwan and Hong Kong through aggregators present at domestic and international level.

- International brands & buying houses have established offices in Dhaka to source leather goods & footwear from Bangladesh. Some of the prominent buying houses which are procuring in large volumes includes - Decathlon, H&M, PQC, Timberland, KGS Sourcing Ltd. Buying houses play an important role in the sector by providing the product designs, assisting in procuring components, ensuring quality checks, managing shipments along with providing access to markets.

6. Ancillary services – chemical suppliers

Presently, all the chemicals being used in tanneries and leather footwear and goods manufacturing are imported from European Union and are REACH compliant.

REACH (Regulation no 1907/2006 of the European Parliament and of the Council) is the European regulation relative to the Registration, Evaluation, Authorization and Restriction of Chemicals. This Regulation came into force on 1st June 2007, and its main objective is to ensure a high level of protection of human health and the environment with regard to the use of chemicals.

No chemical manufacturing exists in Bangladesh due to which the entire sector is dependent on the imported chemicals particularly from EU. The chemicals are procured through agents or the chemical suppliers directly. Unsafe storage and handling of chemicals is a concern particularly in the small and medium scale tanneries.

7. Governance system

Industry Associations

Bangladesh Tanner's Association (BTA), Leather Goods & Footwear Manufacturers Exporters Association of Bangladesh (LFMEAB), Bangladesh Finished Leather, Leather Goods and Footwear Exporters Association (BFLLFEA) are the industry associations representing more than 550 members involved in leather and footwear manufacturing.

Ministry of environment

The Ministry of Environment, Forest and Climate Change (MOEF) is the nodal agency in the administrative structure of the Central Government, for the planning, promotion, co-ordination and overseeing the implementation of environmental programs

Department of environment

The Department of Environment (DOE), as the technical arm of the Ministry, is responsible for environmental planning, management, monitoring and enforcement. DoE follows following classification of industry as per the Environment Conservation Rules, 1997.

Table 1: Categorization of leather sector for environment clearance

Type of leather processing	Category
Production of shoes and leather goods (capital up to 5 hundred thousand Taka)	Orange A
Production of shoes and leather goods, above 5(five) hundred thousand Taka capital	Orange B
Tanneries	Red

VALUE CHAIN ASSESSMENT FROM ENVIRONMENTAL LENS

3. Value chain assessment from environmental lens

The assessment of the environmental performance of leather sectors along different nodes of the value chain was undertaken by evaluating each segment of the value chain from environmental lens. This was undertaken by (i) mapping the environmental hotspots across each segment of the value chain and (ii) mapping the key sustainability requirements of the global brands. The environmental performance assessment using value chain approach was important to (a) identify the actions to improve the environmental performance of each node to meet the compliance requirements and (b) identifying actions to align Bangladesh's production houses to evolving global buyer requirements. The findings will subsequently provide inputs to the recommendations for policy advocacy that support the growth of the leather sector. The study has further tried to assess the linkages of the problems in tanneries with other nodes to get to the root cause of the issue. This would further facilitate in developing practically implementable solution.

3.1. Environmental performance across each segment of the leather sector value chain

The baseline environmental performance of Bangladesh's leather sector was assessed through the field visit to 18 tanneries and 14 leather goods and footwear-manufacturing units. The assessment was based on information gathered through field surveys on the following parameters:

- ***Effluent management:*** The quantity and quality of effluent discharged; effluent treatment practices
- ***Solid waste management:*** The quantity of waste produced; method of disposal; material utilization
- ***Water management:*** quantity of water used; water usage practices and water conservation measures
- ***Energy management:*** Energy consumption data; equipment power rating and usage pattern; potential of using renewable energy
- ***Chemical management:*** Chemical types and quantities used; chemical management practices like classification to hazardous, non-hazardous chemicals, record keeping, RSL
- ***Environmental Management Systems (EMS):*** ISO 14001 certifications; Environmental management policies

Based on the field visits to the slaughter houses, tanneries and leather goods and footwear-manufacturing units, the key environmental issues identified across each of these segment and the reasons for the 'as-is' practices resulting in the poor environmental performance is summarized in the below table:

Table 2: Summary of the findings and recommendations

Segment of the value chain	Key environmental impact	Reasons for as is practice	Recommendations to improve the environmental performance
Slaughter houses and Aroths	1. Excessive salt usage for preservation leading to high pollution load in the effluent discharge from tanneries	Lack of regulation controlling the usage Cheap availability of salt Lack of awareness of the consequences of usage of salt on the river pollution Lack of alternative technology for preservation	***Policy level interventions*** • Chillers at aroths for preservations to reduce salt usage. • Awareness programs for the workers in slaughterhouses and aroths to limit the usage of salts wherever possible
Tanneries	1. Discharge of untreated effluents	Unregulated waste water discharge standards for tanneries Lack of segregation of effluent discharge Ineffective operations of CETP Lack of SOP's for chemical consumption	***Policy level interventions*** • Develop and regulate the pretreatment standards for CETP inlet • Standards of effluent discharge needs to be revised based on international best practices • Third party monitoring and enforcement through improved technologies (SCADA) at CETP • Pricing on effluent treatment based on pollution load • Consideration of O&M models or permitting individual ETPs for enhanced effluent treatment • Mandate to regulate chemical handling and ***Firm level interventions*** • Installation of pre-treatment system at tannery level • Segregation of effluent in to soak, chrome and beam-house liquor in the tannery for effective treatment
	2. High consumption of chemicals compared with international benchmarks	• Lack of regulations controlling the usage of chemicals • Lack of SOPs for chemical consumption	***Policy level interventions*** • Mandate to regulate chemical handling and develop the standard operation procedures for chemical usage. • Develop the standard operation procedures for chemical usage.
	3. Unscientific disposal of the	• Absence of	

Segment of the value chain	Key environmental impact	Reasons for as is practice	Recommendations to improve the environmental performance
	solid waste	technology transfer	***Policy level intervention*** • Develop PPP (Public Private partnership) models for using these solid wastes in other industries
	4. High resource (energy and water) consumption compared with international benchmarks	• Lack of labelling standards for calculating the energy efficiency of the equipment and absence of the pre-approved database of the energy savings potential of various equipment and machinery • Access to Finance • Unregulated water abstraction	***Policy level interventions*** • Develop labelling standards for calculating the energy efficiency of the equipment • Develop and maintain pre-approved database of the energy savings potential of various equipment and machinery • Increasing access to finance for investment in green technologies. Institutional capacity to access and utilize funds like Bangladesh Bank's Green Transformation Fund (GTF) needs to be enhanced. Inclusion of leather sector specific technology under eligible technologies in the Energy Efficiency and Conservation Promotion Financing Project shall enhance concessional loan accessibility to leather industry. • Regulate the water abstraction at the industry level ***Firm level intervention*** • Conduct training programs to sensitize workers about resource efficiency and promote behavioral change for achieving resource efficiency
Leather goods and footwear manufacturer	High energy consumption	• Constrained by lack of access to finance for investment in green technologies and processes • Lack of Fiscal incentives	***Policy level interventions*** • Increasing access to finance for investment in green technologies by increasing the scale of funds like Bangladesh Bank's Green Transformation Fund (GTF)

Segment of the value chain	Key environmental impact	Reasons for as is practice	Recommendations to improve the environmental performance
			• Extending tax exemption, lower tax rates to the resource efficient and renewable energy technologies
	Hazardous chemical handling and consumption	• Lack of regulations controlling the usage of chemicals • Lack of SOPs for chemical consumption	***Policy level interventions*** • Mandate to regulate chemical handling and develop the standard operation procedures for chemical usage.
	Solid waste generation and disposal	Non-point source of waste generation Absence of technology transfer	***Policy level interventions*** • Develop PPP (Public Private partnership) models for using solid wastes in other industries

As evident from the above table, the tanning segment of the value chain has the highest environmental footprint which is further exacerbated due to significantly low environmental compliance. One of the primary reasons for the high environmental footprint of the tanning sector is due to the high pollution load of the tannery effluent - pollution load is high due to the concentration of pollutants like COD, BOD, SS. However, the lack of effective treatment of the effluent generated, due to the non-optimal performance of the CETP in Savar (constant improvements in treatment are underway) is further aggravating the environmental pollution of the segment. Furthermore, the information gathered from site visits to the tanneries elucidated significantly high energy, water and chemical consumption compared with the international benchmarks. The low performance on the energy management can also be attributable lack of Environmental Management Systems (EMS) at the tanneries, as only one tannery out of the tanneries surveyed had ISO 14001 certification. The high environmental impact of the segment is resulting in decline in demand of leather produced from Bangladesh's tanneries. Consequently, the exporting leather goods and footwear manufacturers importing finished leather due to environmental non-compliance by most of the existing tanneries.

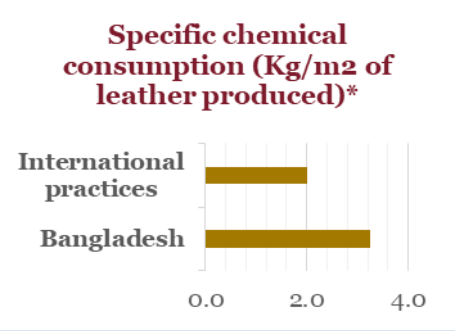
The environmental hotspots for the slaughterhouse includes high salt consumption and for the leather goods and footwear manufacturing the environmental issues emanates from (a) high energy consumption (b) 'as-is' practice of solid waste disposal.

The key environmental issues identified in each of the segment have been elaborated in the below table.

Table 3: Environmental hotspots in each segment of the value chain

Value chain segment	Key environmental issue	Reasons for "as is practice"
Slaughter houses and Aroths	• **Excessive usage of salts for preservation of raw hides and skins leading to high pollution load in the effluent discharge from tanneries:** Both slaughter houses and "aroths" in Bangladesh use excessive salts to preserve the raw hides and skins. The use of salts (approximately 40-50% on raw hides/skins weight) enhances the pollution load of tannery effluent with increased total dissolved solids (TDS) and chlorides.	• **Lack of regulation** Currently there is no regulation in Bangladesh that limits the usage of salt for preservation of raw hides and skins resulting in unrestrained usage of salt • **Cheap availability of salt** The usage of salt is prevalent in the supply chain due to it being a cheap and most convenient chemical to be used for preservation. No skills are required for its usage and the workers at slaughterhouses and aroths use excessive salts to avoid the putrefaction of the raw hide and skins during storage and transport to tanneries. • **Lack of awareness** Salt curing is an age old practice which is very common in the supply chain of leather processing across Bangladesh. The workers need no skill to put salt on the raw hide or skin and therefore, they indiscriminately use the salt for the preservation of raw hides and skins. With no awareness of the consequences of the usage of salts on the country's rivers, salt usage is considered as the best method for preventing putrefaction of the raw hides and skins. • **Lack of established alternative technology** Alternatives to salt curing such as use of biocides, cold temperature, boric acid etc. are being practiced in other countries to reduce the salt usage at the preservation stage. However, these technologies are yet to be piloted in Bangladesh
Tanneries	• **Pollutant effluent generation and discharge to river** The effluent generation from the tanning stage of the leather processing is highly polluting as it produces large amounts of organic and chemical pollutants. The major water pollutants from the tanning operation	• **Unregulated Waste Water discharge standards** Currently, there are no regulations in Bangladesh, limiting or guiding the standards of discharge from tanneries to common effluent treatment plant. The existing standards govern the discharge limits of the wastewater from the final

Value chain segment	Key environmental issue	Reasons for "as is practice"
	are BOD (Biological Oxygen Demand), COD (Chemical Oxygen Demand), pH, Sulphides, Suspended Solids (SS), TDS (Total Dissolved Solids), Oil and Grease & Chromium. Effluents contain varying amount of several salts used or formed during processing of leather. Sodium chloride, calcium hydroxide, sulphides and hydrosulphides are the most common constituents of the tannery effluents. The discharged chemicals present in the effluent cause changes in pH (the acidity or basicity of the effluent) and also influence the saturation of dissolved oxygen termed Chemical Oxygen Demand or COD. The lowered level of dissolved oxygen in the water of the river results in turning the river water incapable of supporting aquatic ecosystem. Effluent also contain the organic wastes such as dirt, dung, blood, soluble protein, fleshings and fleshy matter along with hair which results in lowering the dissolved oxygen which results in large quantity of suspended particles and increases the turbidity of water. Daily discharged wastewater from all the tanneries in Savar Tannery Estate is about 22900 m^3 of liquid waste. The effluents are currently discharged to the common effluent treatment plant (CETP) and the chrome recovery plant at Savar. However, due to inadequate treatment at the CETP, poorly treated wastewater is released into the Dhaleshwari river, deteriorating the quality of the river. Tanneries in Savar do not have any primary treatment of the wastewater at their facility, which increases the pollution load at the inlet of the CETP, reducing the efficacy of CETP's performance in treating the wastewater.	treatment vis-à-vis the CETP. This attenuates the responsibility of the tanneries in managing the quality of waste water discharge from the tanneries • **Lack of segregation of effluent discharge** Tanneries must segregate the effluent into (a) soak liquor (b) chrome liquor and (c) normal liquor prior to the discharge. 'As-is' scenario gathered through visit to tanneries in Savar industrial estate revealed the absence of segregation prior to the discharge which is contributing to the ineffective CETP operation. .
	• **Hazardous chemicals consumption and handling** The tanning process has extensive usage of chemicals for production of crust leather with more than 250 chemicals type being used in the process. Most of the chemicals used in the tanning processes are imported from European Union. The tanneries in Savar consume around 0.2 million tons of chemicals annually costing approximately USD 139 million per year. The impacts from the use of chemicals emanate from (i) storage of chemicals (ii) emissions generated during the use or handling (iii)	• **Lack of regulations for chemical handling and storage** Currently, there are no regulations in Bangladesh that control the handling, storage and usage of hazardous chemicals, posing serious risk to health of workers and environment. • **Lack of SOP's for chemical consumption** The tanning process has extensive usage of chemicals for production of crust leather with more than 250 types of

Value chain segment	Key environmental issue	Reasons for "as is practice"
	containers used for storage and transport of these chemicals. The impact of such exposure can range from temporary effects such as dizziness, headache, irritation of eyes, skin or lungs, allergic reactions, collapse due to lack of oxygen, poisoning of liver, kidney, nervous system to long term impairments such as ulcer, bronchitis, genetic defects and, in some rare cases, even instantaneous death. The quantity of the chemicals and the chemicals mixture also impact the pollution load of the chemicals by increasing (a) the use of water thereby increasing the quantity of effluent and (b) the increase in effluent parameters such as Chemical Oxygen Demand (COD). In the study, the current chemical consumption of the surveyed tanneries was estimated and compared with the international benchmarks[8]. As seen in the graph below, the chemical consumption of the Savar tanneries is higher than that practiced internationally. 	chemicals being used in the process. The as-is scenario in the tanneries highlighted the lack of Standard Operating Procedures for the chemical formulation resulting in the use of excessive chemicals for formulation. Absence of chemist in most of the tanneries attributes to lack of standards for the chemical usage in formulations. The use of excessive chemicals increase the pollution load of the effluent discharge.
	• **Solid waste generation and disposal** Solid wastes generated by the tanning process include: (i) wastes from untanned hides/skins (trimmings, fleshing wastes) (ii) wastes from tanned leather (shaving wastes, buffing dust) (iii) wastes from dyed and finished leather (trimmings from leather) (iv) Sludge from CETP Processing 1 Ton of raw hide produces 0.15 Tons of crust while generating 0.85 tons of Solid waste. The various processes in the tanning segment that generate solid	• **Absence of technology transfer** Prevailing practices around the world that can hydrolyze the solid wastes and use it as useful by product such as use of chrome tanned leather, splits and trimmings for glue and gelatin practices have not been institutionalized in Bangladesh. The lack of technology transfer is impairing the institutionalization of technologies for the use of solid waste generated from the tanneries

[8] https://leatherpanel.org/sites/default/files/publications-attachments/benchmarking_final_d2012.pdf

<table>
<tr><th>Value chain segment</th><th>Key environmental issue</th><th>Reasons for “as is practice”</th></tr>
<tr><td></td><td>waste include: fleshing, 50-60%; chrome shaving, chrome splits and buffing dust, 35-40%; skin trimmings, 5-7%; and hair, 2-5%.

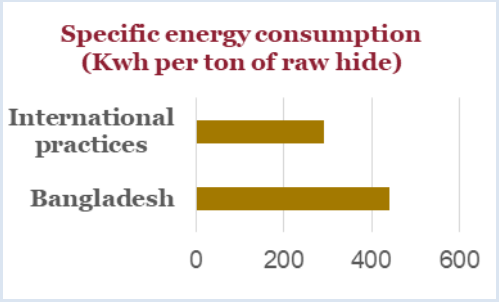
The proportion of the types of tannery solid wastes generated from processing of 1 ton of raw hides in Bangladesh[9]

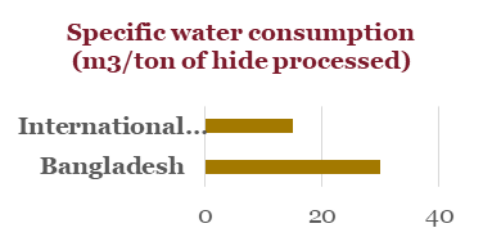
<table><tr><th>Nature of solid waste</th><th>Quantity (kg/ton)</th></tr><tr><td>Salt from handshaking</td><td>80</td></tr><tr><td>Salt from solar pans</td><td>220</td></tr><tr><td>Hair</td><td>100</td></tr><tr><td>Raw trimmings</td><td>40</td></tr><tr><td>Lime sludge (mostly bovine)</td><td>60</td></tr><tr><td>Fleshings</td><td>120</td></tr><tr><td>Wet blue trimmings (grain splits)</td><td>30</td></tr><tr><td>Chrome splitting (bovine)</td><td>65</td></tr><tr><td>Chrome shaving (mostly bovine)</td><td>95</td></tr><tr><td>Buffing dust (including shaving bovine after crust)</td><td>65</td></tr><tr><td>Dyed trimmings</td><td>35</td></tr><tr><td>Dry sludge from CETP</td><td>125</td></tr></table>
Fleshing’s wastes undergo putrefaction if not properly disposed that results in obnoxious odor and contamination of soil and surface water. About 40 heavy metals and acids are used in the processing of raw hides10. The tanned leather and finished leather waste contains these heavy metals and acids which can contaminate the soil and groundwater (through leachate) if not properly disposed.

The study estimated that Savar region is currently generating 291 tons per day of solid wastes from the tanneries. Presently, the solid waste is disposed in a dumpyard resulting in soil and groundwater pollution.</td><td></td></tr>
</table>

[9] Sardinia 2017 / Sixteenth International Waste Management and Landfill Symposium / 2 - 6 October 2017, SOLID WASTE MANAGEMENT OF TANNERY INDUSTRIAL ESTATE DHAKA

[10] J. Environ. Sci. & Natural Resources, 7(1): 149 –156, 2014

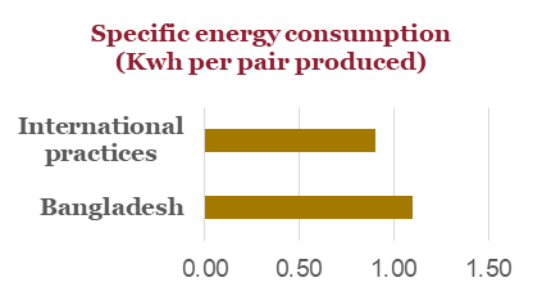
Value chain segment	Key environmental issue	Reasons for "as is practice"
	The problem exacerbates during monsoon with the generation of the leachate and the surface run-off contaminating the Dhaleshwari river and soil strata. This leachate contains a large amount of organic content, heavy metals and inorganic salts used during the leather processing.  **Picture 1: Hazardous leachate contaminating ground as well as surface water due to unscientific solid waste disposal in Savar**	
	• **High energy consumption** The energy consumption in tanneries depends on the production methods, capacity of the facility, size and efficiency rating of the equipment, extent of mechanization in handling the raw hide, drying method and heat losses from process. The study estimated that the specific energy consumption of the tanneries in Savar region is high compared to the international benchmarks for model tanneries. The following figure indicates the average specific energy consumption of tanneries in Bangladesh compared with the international practices.  The high specific energy consumption in tanneries are owning to factors as usage of low efficiency motor drives, wooden drums, locally manufactured washing drums, long	• **Lack of labelling standards for calculating the energy efficiency of the equipment and absence of the pre-approved database of the energy savings potential of various equipment and machinery** The major consumer of energy in a mechanical equipment is the motor. In tanneries, the drum tanning, drum soaking and drum dyeing processes require high electrical rating motor to produce the rotational motion. Most of the tanneries in Bangladesh use refurbished drive or old scrap motor purchased from ship breaking yard, which are inefficient in terms of energy consumption. Interactions with the stakeholders highlighted the absence of (a) labelling standards for calculating the energy efficiency of the equipment and (b) pre-approved database of the energy savings potential of various equipment and machinery as two significant factors for the lack of proliferation of energy efficient equipment. • **Access to Finance** Owners of tanneries have recently relocated Hazaribagh to Savar resulting in significant financial stress. Consequently, the tanneries are constrained financially for investing in new efficient equipment.

Value chain segment	Key environmental issue	Reasons for "as is practice"
	floats and reconditioned air compressors. All the tanneries are meeting their energy demand from grid that eventually depends on the natural gas. This puts the electricity grid under huge strain that increases the likelihood of curtailment.	There is a need for strengthening and increasing access to finance for investment in green technologies and processes. Bangladesh has a Green Transformation Fund (GTF) of limited scale (200 Million USD) and it covers refinancing facilities for approved green technologies in leather and textile sector. • **Lack of Fiscal incentives** The fiscal incentives such as tax exemption, lower tax rates being not extended to the resource efficient and renewable energy technologies is constraining the tanneries in adopting resource efficient measures
	• **High water consumption** The study indicated that the specific water consumption for Tanneries is significantly higher than the international benchmarks.  The high specific water consumption has several detrimental impacts which include: · Increased energy usage to abstract water from groundwater and surface water · Increased effluent discharge · Increased use of chemicals and power for effluent treatment · Cost of increased use of chemicals in the process · Increased time of operations · Increased wear and tear of equipment · Tanneries in Savar are also dependent primarily on the ground water abstraction. This largescale and uncontrolled abstraction of water for the processing	• **Lack of regulations** Lack of regulations on the use of ground water by industries is leading to largescale uncontrolled groundwater abstraction escalating the water scarcity further.

Value chain segment	Key environmental issue	Reasons for "as is practice"
	aggravates the problem of availability of water in the region. The concerns over the groundwater usage in Bangladesh has been receiving great attention in the last few years due to large abstraction by water wells causing a linear to exponential drop in groundwater level and substantial aquifer dewatering, particularly in Dhaka, Bangladesh. Dhaka is dependent primarily on groundwater for the urban water supply; about 84% of the present municipal water supply comes from groundwater and 16% is from surface water[11] .	

11 WASA, 2003

The key environmental issues identified in the leather goods and footwear manufacturing segment are described below:

Value chain segment	Key environmental issue	Reasons for "as is practice"
Leather goods and footwear manufacturing	• **High energy consumption** Leather goods and footwear manufacturing is one of the highly fragmented sectors in the Bangladesh. It comprises of more than 3500 micro, small and medium enterprises (MSMEs) along with 90 large players, catering to both domestic and international demand. Based on the survey conducted, it has been estimated the specific energy consumption for a pair of shoe produced in Bangladesh is higher than the internationals et benchmark for the model tannery as shown below:  All the units are meeting their energy demand from grid that eventually depends on the natural gas. This puts the electricity grid under huge strain that increases the likelihood of curtailment.	• **Access to Finance** The leather goods and footwear manufacturers are constrained by lack of access to finance for investment in green technologies and processes. Bangladesh has a Green Transformation Fund (GTF) of limited scale (200 Million USD) and it covers refinancing facilities for approved green technologies in leather and textile sector. • **Lack of fiscal incentives** The fiscal incentives such as tax exemption, lower tax rates not being extended to the resource efficient and renewable energy technologies is constraining the leather goods and footwear manufacturers in adopting these measures.
	• **Hazardous chemical handling and consumption** Solvent based adhesives are traditionally used in the production processes for leather products, e.g. for gluing, cleaning and painting of shoe parts. Solvent based chemicals release Volatile Organic Compounds (VOCs) which are considered as damaging to human health and the environment. VOCs are present in many dyes, adhesives, cleaners and polishes used in the production of leather items. Since there is no monitoring of the VOCs emissions from the leather segment, no data is available to estimate the VOCs emissions from the leather goods and footwear segment.	• **Lack of regulations** Currently, no regulation exist in Bangladesh that regulates the safe storage, use, handling and disposal of chemicals (particularly the hazardous chemicals). Some of the units do not have the material safety data sheets for all the hazardous chemicals, which could provide practical information and guidelines to the worker on routine handling of the chemical as well as on measures in an emergency. There is no monitoring of the VOCs (volatile organic chemicals) emission in the manufacturing and therefore, no data on the air emissions by the units.
	• **Solid waste generation and disposal** The majority of solid waste from footwear manufacture is from the cutting process and packaging waste. In Bangladesh, the solid waste generated is disposed in the dumpyard	• **Non-point source of waste generation** Unlike the tanneries, the leather goods and footwear manufacturers are scattered

Value chain segment	Key environmental issue	Reasons for "as is practice"
	and no regulation currently exists to regulate the packaging waste usage and disposal.	throughout the Dhaka city and other areas of Bangladesh. Although there is a potential of recycling the solid waste generated from the units, the collection mechanism and the subsequent economic viability of recycling is constrained by lack of aggregation at single facility.
		• **Absence of technology transfer** Prevailing practices around the world that recycle the solid wastes leather trimmings and buffing dust from leather products manufacturing and use it for making leather boards have not been institutionalized in Bangladesh. The lack of technology transfer is impairing the institutionalization of technologies for the use of solid waste generated from the leather footwear and goods manufacturing units.

AS-IS REGULATORY LANDSCAPE

4. As-is Regulatory Landscape

In the last two decades, the economy of Bangladesh has grown at nearly six percent per annum. Per capita national income has increased at an even higher rate due to the robust flow of remittances from expatriates. The percentage of population living below the poverty line has reduced by almost half to about 31 per cent compared to the early 1990s. Bangladesh has launched various initiatives and programs for enhancing the pace of economic development to reach to the middle-income status by 2021. One of the flagship programs of GoB, export diversification program intends to diversify the export portfolio of the country so as to reduce overdependence of the economy on the ready-made garments (RMG) sector and has identified leather sector and plastic sectors as two of the thrust/priority sectors for increased share in export portfolio. To achieve export diversification, GoB has introduced various measures like declaring footwear and leather products sector as '*Highest Priority Sector'* in its export policy. Various cash incentives, duty drawbacks/bonded warehouse facilities, exemption of custom duties on import of machinery and low cost access to finance are provided to '*highest priority sector'.* Finished leather goods receive a 15 percent cash assistance while the tanners who have moved to the Savar Tannery Estate are eligible for a 10 percent cash support for the export of crust and finished leather[12]

However, the increase of emphasis of environmental sustainability as a leverage to attract global buyers, necessitates the need of robust environmental regulatory framework coupled with the enabling financial regulatory measures to achieve the intended growth of exports.

The robustness of the environmental regulatory landscape of Bangladesh was undertaken through mapping of the regulatory landscape which included (a) As-is assessment of the existing environment policies and (b) Comparative assessment of the existing regulatory landscape of Bangladesh vis a vis the international best practices. Value chain approach was used to map the regulatory landscape across the leather sector.

Subsequent to the mapping of the environmental regulatory landscape across each segment of the value chain, comparative assessment of the existing regulatory landscape of Bangladesh vis a vis the international best practices has been undertaken. The countries for the comparative assessment included US, Italy, India, Ethiopia and Brazil. These countries were selected across the thematic areas of (a) top export destinations for Bangladesh (b) top leather global importers and (c) competing producer countries.

The regulatory assessment was undertaken to identify (a) gaps in the existing regulations and (b) assess the stringency of the standards prescribed by the existing regulations by comparing them with the standards prescribed by the benchmarked countries

4.1. Regulatory assessment – Slaughtering

The environmental parameters that are most relevant to slaughtering operations are water usage, wastewater discharge and solid waste management. The key recommendations emanating from the regulatory assessment of the slaughtering segment of the value chain and comparison with the international best practices include:

4.1.1. Strengthening the effluent discharge standards by incorporating specific standards for effluent discharge from slaughter house

While, Ethiopia, United States and India provide specific effluent discharge standards for Slaughterhouses, Bangladesh's ECR 1997 categorizes slaughterhouse as commercial units (if capital

[12] Leather and leather goods exports from Bangladesh: Performance, Prospects, and Policy Priorities, Technical report: Feb 2018

investment exceeds 5 hundred thousand takas) with general effluent discharge standards being applicable to slaughterhouses as well. These standard limits for the key pollutants in wastewater generated from slaughterhouses have been provided below:

Table 4: Standards limits for effluent discharge for slaughterhouses in Bangladesh

Parameter	Bangladesh
BOD	250 mg/L (5 day)
COD	400 mg/L
pH	6-9
Oil and grease	20 mg/L
TSS	500 mg/L

Some of the important parameters for slaughtering operations like fecal coliform are unregulated in Bangladesh. The lack of standards on such parameters could result in adverse human health impacts like diarrhea, fever etc.

Slaughtering industry in Bangladesh is largely fragmented in nature with small-scale units dominating the landscape. Aggravating the situation further is that more than 50-60% of the hides are generated during the Eid-ul-Adha festival in which slaughtering takes place at household levels despite the designation of disposal spots by City Corporations. Therefore, **effluent discharge from slaughtering is largely unregulated in Bangladesh.**

4.1.2. Formulation of guidelines on solid waste disposal

The solid waste disposal of the slaughterhouses in Bangladesh which operate in City Corporation area are governed by the City Corporation Ordinance. City Corporation Ordinance mandates the local corporations for the solid waste management. However, the ordinances are deficient in outlining the responsibilities of the slaughterhouses for the solid waste disposal. Consequently, the waste from slaughterhouses, which could be a resource for many other industries, is being managed unscientifically and most of it ends up in dumpsites. Non-utilization of animal by-products in a proper way may create major aesthetic and catastrophic health problems.

In contrast, the regulations in US and India clearly describe the responsibilities of slaughterhouses which are discussed below.

In US, Texas is one of the largest exporter of rawhide skins. Slaughterhouses' solid wastes have been categorized as class 1 non-hazardous "special waste" in the Texas state. The owner or operator of the farm or facility is responsible for disposal in a timely and sanitary manner. Title 30, Texas Administrative Code, Section 335.4 (30 TAC 335.4), prohibits:

- discharges into or adjacent to water in the state
- creation or maintenance of nuisance conditions
- endangerment of public health and welfare

In India, all slaughterhouses/ meat processing units are required to ensure safe and proper disposal of solid waste {Type I (Vegetable matter such as rumen, stomach and intestinal contents, dung, agriculture residues etc.) and Type II (Animal matter such as inedible offal, tissues, meat trimmings, waste and condemned meat, bones etc.)} through suitable technology approved by State Pollution Control Boards/Pollution Control Committee.

4.2. Regulatory assessment –Tanning

The parameters that are most relevant to tanning operations are water usage, air pollution, solid waste, hazardous waste, effluent discharge, chemical usage and energy. The key recommendations emanating from the regulatory assessment of the tanning segment of the value chain and comparison with the international best practices include:

4.2.1. Regulating extraction of groundwater

The concerns over the groundwater usage in Bangladesh has been receiving great attention in the last few years due to large abstraction by water wells causing exponential drop in groundwater level and substantial aquifer depletion, particularly in Dhaka, Bangladesh. Dhaka is dependent primarily on groundwater for the urban water supply; about 84% of the present municipal water supply comes from groundwater and 16% is from surface water[13] . Though the city is largely dependent on groundwater, **lack of regulations on the use of ground water by industries is leading to largescale uncontrolled groundwater abstraction escalating the water scarcity further.**

The annual average of monthly surface/ground water scarcity is provided in the below figure[14]:

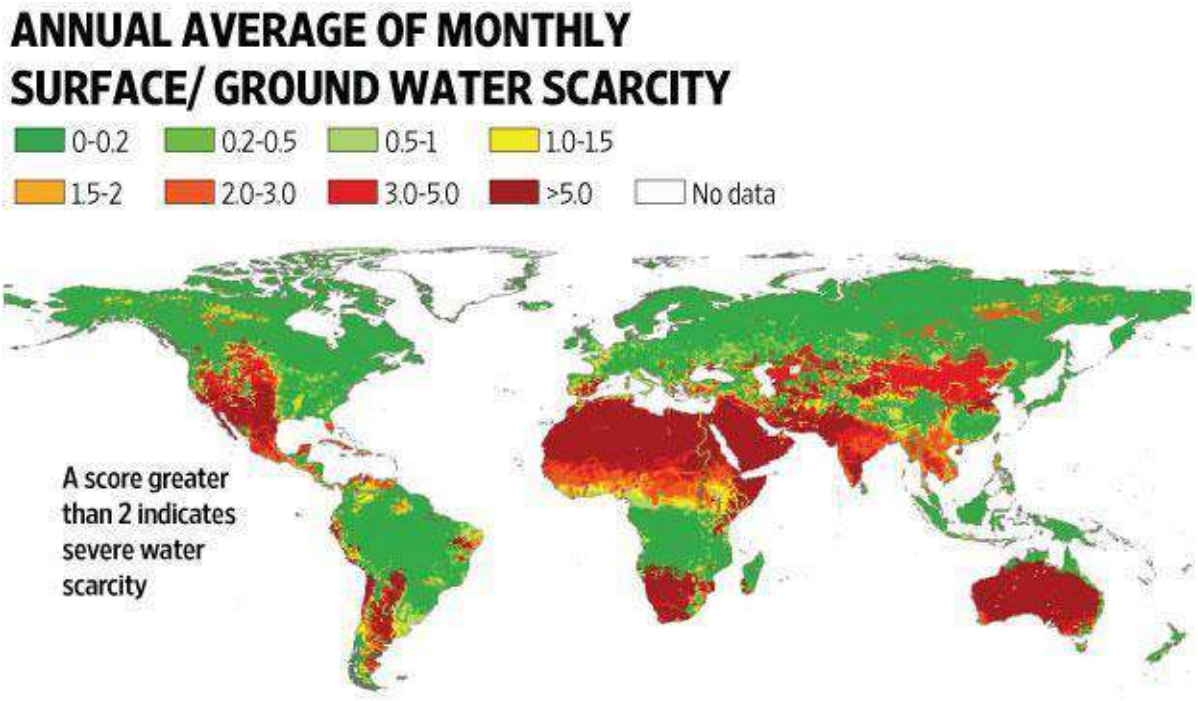


Figure 7: Annual average monthly water scarcity distribution worldwide

4.2.2. Promulgation of regulations for the storage, usage and disposal of hazardous chemical

The chemicals used in the tanning process can be divided into three broad categories:

1. Pre-tanning Chemicals
2. Tanning Chemicals
3. Finishing Chemicals

13 WASA (Water Supply and Sewerage Authority), 2003

[14] Source Mekonnen, M.M and Hoekstra, A.Y. (2016) Four billion people facing severe water scarcity, Science Advances, 2(2): e1500323

Taking cognizance of the severe water scarcity, Ethiopia and India have regulated the ground water abstraction. In Ethiopia, there is a limit on the ground water abstraction i.e. abstraction is not allowed from more than 100 meter depth. In India, in the critical areas (as defined by Central Ground Water Authority, Government of India), large and medium industries are required to fully recycle and reuse the waste water and withdrawal is permitted subject to undertaking of ground water recharge measures. In addition, withdrawal is not permissible above 100% of the recharged quantity in the critical areas.

In Bangladesh, Bangladesh Water Act (2013) provides provisions of declaring water scarce areas as stressed areas. As per the act, any groundwater abstraction would be guided by the defined safe yield for certain area and one can abstract the groundwater resources using shallow and deep tube well within the limit of safe yield. However, as per the official website of WARPO, no area has been declared as water stressed so far.

Pre-tanning chemicals are used to clean and prepare skins for the tanning process and they are mostly washed away with the wastewater. Tanning chemicals react with the collagen fibers of the skin to convert them into leather and significant portion of the tanning chemicals are discharged into wastewater.

Most of the chemicals used in tanneries of Bangladesh are imported from Germany and other European countries, and are REACH compliant. However, acknowledging the environmental impacts, countries in EU are gradually substituting the following chemicals which are still prevalent in Bangladesh:

Chemical or substances	Process
Ammonium chloride	Deliming & bating
Sodium chlorite	Pickling
Ammonium bicarbonate	Neutralization
Magnesium oxide	Re-tanning
Sodium bicarbonate	Re-tanning
Styrene co-polymer	Fat liquoring
Sodium formate	Fixing

In India, The Manufacture, Storage and import of Hazardous Chemical Rules, 1989 provides the criteria for categorizing the chemicals into hazardous and schedule 3 of the Rules lists the hazardous chemicals for the industry. The Rules also require maintaining “material safety data sheet” for all the listed hazardous chemicals or as identified under the set criteria.

In USA, the Toxic Substances Control Act (TSCA) addresses the manufacturing, processing, distribution, use, and disposal of commercial and industrial chemicals. The Department of Transportation’s Pipeline and Hazardous Materials Safety Administration regulates the transport of hazardous materials.

In Italy, Regulation on the Classification, Labelling and Packaging of Substances and Mixtures regulates the identification and record keeping of the hazardous chemicals being used in the industry and REACH (EC 1907/2006) addresses the production and use of chemical substances. All companies manufacturing or importing chemical substances into the European Union in quantities of one ton or more per year are to register these substances with the European Chemicals Agency (ECHA). It also bans the use of certain chemicals in the process.

Bangladesh lacks regulation on the handling, storage, usage and disposal of hazardous chemicals

4.2.3. *Strengthening the effluent discharge standards by regulating the inlet effluent characteristics of CETP*

Picture 2: Status of Dhaleshwari river

(http://www.theindependentbd.com/printversion/details/146958)

To ensure treated discharge of the effluent from the tanneries at Savar, Government of Bangladesh has institutionalized a Common Effluent Treatment Plant (CETP) facility. It is the first CETP in Bangladesh which is dedicated to leather sector. However, CETP operations are facing hurdles for effective operations and hence incompletely treated effluent is being discharged to Dhawleswari river creating a dejavu of the Buriganga.

Bangladesh provides an overall limit on total chromium, however, limit to hexavalent chromium is not prescribed for tannery effluents.

Although ECR, 1997, limits the parameter for discharged wastewater from the tanneries, however, there are **no regulations that define the effluent characteristics at the inlet of the CETP.** It has been widely recognized that the CETP is ineffective if the effluent characteristics at the inlet of the CETP are unregulated. In India, standards for Common Effluent Treatment Plants as per, (Environment Protection Rules, 1986) clearly delineates the effluent standards both inlet quality of effluent to CETP and the discharge from CETP. For each CETP, the State Board prescribes the inlet quality standards for "general" parameters and ammonical nitrogen and heavy metals as per the design of the CETP and local needs and conditions.

Further, since the CETP in Savar is designed to treat chrome free effluent, hence the tanneries are required to segregate the chrome liquor (which further goes to the common chrome recovery unit). **The rule should outline the requirement to segregate "chrome liquor".**

	Bangladesh	Brazil	Ethiopia	Italy	India
Hexavalent chromium	Effluent parameter not regulated	0.1 mg/L	0.1 mg/L	0.2mg/L	0.1 mg/L

Hexavalent chromium is more toxic with large exposure leading to myriad of health problems, which include acute respiratory effects, cancer, reproductive and developmental, lung cancer, irritation and damage to eyes etc.

Absence of standards for COD concertation in the effluent prior to discharge.

	Bangladesh	Brazil	Ethiopia	Italy
COD	Effluent parameter not regulated	330 mg/L	500 mg/l	160 mg/L

If effluent with a high oxygen demand is discharged directly into surface water, the sensitive balance maintained in the water becomes overloaded. Oxygen is stripped from the water causing oxygen dependent plants, bacteria, fish – as well as the river or stream itself – to die. The outcome is an environment populated by anaerobic bacteria (which are not oxygen-dependent) leading to toxic water conditions. It is unconducive for fisheries and hurts the nutritional and economic interest of people dependent on fisheries.

Standards for effluent from tanneries do not prescribe limit to metal compounds like Iron and Aluminum and non-metals like Boron, Phosphorus.

Metal compounds are non-biodegradable and hence they have long-term environmental features like accumulation. Aluminum, in particular, appears to inhibit the growth of green algae and crustaceans are sensitive to low concentrations. High phosphorous content may lead to death of fishes in the water and also impair the immune system and increases stress in some of the aquatic species. Italy regulates the limits of metallic elements like Aluminum and Iron in the effluent discharge, which are not regulated in Bangladesh. Non- metals like Boron, Phosphorus have been regulated in Ethiopia, India and Brazil.

4.3. Regulatory assessment – Leather goods manufacturing

The parameters that are most relevant to finished leather goods manufacturing operations are air pollution, solid waste, chemical usage and energy. The key recommendations emanating from the regulatory assessment of the leather goods manufacturing segment of the value chain and comparison with the international best practices include:

4.3.1. Regulating VOC emissions in leather goods and footwear manufacturing

VOC's (Volatile organic chemicals) are emitted from various chemicals and organic solvents being used in the production of leather goods and footwear. Organic solvents such as primers and adhesives are the prime source of these VOCs. Some of these volatile organic chemicals are carcinogenic in nature and may lead to serious health impacts on exposure.

Currently, Bangladesh does not have a comprehensive chemical policy that regulates VOC's emissions. Considering the harmful impacts of these VOCs, countries like Italy have adopted a new European directive on solvents usage that defines new limit on solvent consumption and total emissions, as shown in the following table:

Solvent consumption threshold (t/a)	Total emissions (g VOC/ m² of leather produced)
10-25	85
>25	75
>10*	150

A tannery consuming 10-25 tons per annum of solvents in the leather processing shall be permitted to discharge a maximum of 85 g VOC per m^2 of leather it produces.

Bangladesh has less stringent limit of suspended particles (PM10) emissions as compared to benchmarked countries.

Bangladesh	Brazil	Ethiopia	Italy	India	US
500 micro g/m3	50 mg/Nm3	730 mg/Nm3	150 mg/Nm3 (dust)	PM10: 100 microgram/m3	PM10: 150 microgram/m3

Particulate matter is emitted at cutting and finishing stage of finished leather good production. Exposure to such particles can lead to many heart and lung related problems. Considering the lack of safety equipment, the workers in Bangladesh are more vulnerable to the health effects of particulate matter.

Bangladesh does not provide a separate limit of PM2.5 (particulate matter of less than 2.5 micron), which is in contrast to the practices being followed in India and United States.

	Bangladesh	India	US
$PM_{2.5}$	Not regulated	60 microgram/m^3	35 microgram/m^3

PM2.5, is linked with an increase in risk of heart attack, cancer of bronchia, trachea, throat and other respiratory disorders[15]. Considering vulnerability of workers in Bangladesh, a separate limit for PM2.5 needs to be prescribed.

Bangladesh's regulations do not regulate color in effluent. In contrast, Italy provides guideline to regulate color in effluent.

	Bangladesh	Italy
Color	Not regulated	Not perceptible with 1:20 dilution

Highly colored water has significant effects on aquatic plants and algal growth. Light is very critical for the growth of aquatic plants and colored water can limit the penetration of light. Thus, a highly colored body of water could not sustain aquatic life which could lead to the long term impairment of the ecosystem. Italy regulates the concentration of color in the effluent discharge.

4.4. Governance system and enforcement of regulations

Governance System:

The environment governance system in Bangladesh is vertically integrated, with MoEF (Ministry of Environment & Forest) being the apex authority in the administrative structure responsible for the planning, promotion, co-ordination and overseeing the implementation of environmental matters in the country. Department of Environment is responsible for enforcing the application of environmental rules and regulations through (a) guiding, training, and promoting awareness of environmental issues; and (b) Sustainable action on critical environmental problems that demonstrate practical solutions, and that galvanize public support and involvement. The local civic bodies are responsible for administring the safe disposal of waste along with the governing the funcitioning of slaughetering during the 'Qurbani' fesitvities amongst other adminsitritive responsibilities.

[15] International Journal of Advanced Technology in Engineering and Science http://www.ijates.com Volume No.02, Issue No. 04, April 2014 ISSN (online): 2348 – 7550

Applicable Permits:

In accordance with the EIA guidelines, 1997, tanning industries are red category industries. In case of Red category industries, firstly a Location Clearance Certificate, then Environment Impact Assessment (EIA) approval and thereafter an Environmental Clearance Certificate is required for establishing an industry. Apart from general requirement, for every Red category proposed industrial unit or project, the application must be accompanied with feasibility report, Initial Environmental Examination (IEE), Environmental Impact Assessment (EIA) based on approved terms of reference (ToR) by DoE, Environmental Management Plan (EMP).

Production of leather shoes (capital more than 500 thousand BDT) comes under the ambit of orange B category while production of leather shoes (capital up to 500 thousand BDT) are categorized as orange A industries.

In addition, the Environmental Clearance is required to be renewed every year during the operation phase by demonstrating the adequate implementation of the environmental management plan.

The industries are also mandated to submit the effluent monitoring reports every quarter to the DOE.

Enforcement:

The poor enforcement of the environemntal regulations is envident among the tanning segment of the leather sector value chain. Due to recent relocation of tanneries from Hazaribag to Savar, the tanneries have not been able to maintain operating licenses, and lack environmental clearances required as per the Environment Conservation Rules 1997. Further, the pollutants concentration in effluent is not being monitored due to various operational constraints including (a) lack of technical and administrative staff at Zonal offices (b) inadequate monitoring capabilities for water and ambient air quality monitoring, toxic pollutants, monitoring of aquatic resources; (c) lack of sufficient equipment for monitoring of specific pollutants such as hazardous and persistent pollutants (d) absence of inspection and testing standards to accredaite the laboratories, consequently most of the laborateries are following ISO/IEC 17020:2012 for Inspection Services and ISO/IEC 17025: 2005 for Testing Services (e) limited laboratories that have accreditation due to the cost associated with the accrediation.

The weak enforcement is further excaberating the problem of environmental issues across the leather sector value chain. The regulatory landscape assessment guided the specific regualtory interventions required for improving the environmental performance of each segment of the leather sector value chain which are further detailed in the subsequent chapters of the report.

5. Increased competitiveness through improved environmental performance

Sector's ambitious growth is highly reliant on exports and thus hinges on meeting the compliance requirement of the global brands, which are evolving beyond the compliance towards the national legislations. Today, retail brands procuring leather are moving towards adopting "sustainable procurement practices" not only to make their products more acceptable but also more marketable – as positive environmental and social attributes help lend a value proposition to their products.

However, the Bangladesh leather sector, particularly the tanning segment, is constrained by challenges of non-compliances, lack of awareness, etc. The existing status of the Bangladesh leather supply chain as elaborated in previous chapters illustrates that there is long way to go for the leather sector to reach to the level of standards the global brands are gradually shifting to.

The tanning segment of the leather sector value chain has the highest environmental footprint with significantly low environmental compliance. Effluent generation from tanneries has significant pollution load with high concentration of pollutants like COD, BOD, SS etc. necessitating the requirement of effective treatment. However, the CETP in Savar not functioning at the optimum performance levels (constant improvements in treatment are underway) is contributing to the high environmental footprint of the segment. The high environmental impact of the segment is resulting in decline in demand of leather produced from Bangladesh's tanneries. Apart from the non-compliant effluent discharge to Dhaleshwari river, another significant environmental concern of the sector is the management of solid waste emanating from the tanneries and leather goods and footwear manufacturing. Presently, the solid waste is disposed in a dumpyard resulting in soil and groundwater pollution. The problem exacerbates during monsoon with the generation of the leachate and the surface run-off contaminating the Dhaleshwari river and soil strata

A structured approach is suggested in addressing the environmental challenges of the leather sector value chain for becoming environmentally compliant and meeting the global brands requirements to increase the competiveness of the sector. The approach should prioritize the issues that can be addressed for the sector to be environmentally complaint towards the local legislations. The increased exports that the sector can accrue by being complaint towards the national legislations can be leveraged in adopting the global certifications (such as LWG certification) for meeting the evolving requirements of the brands.

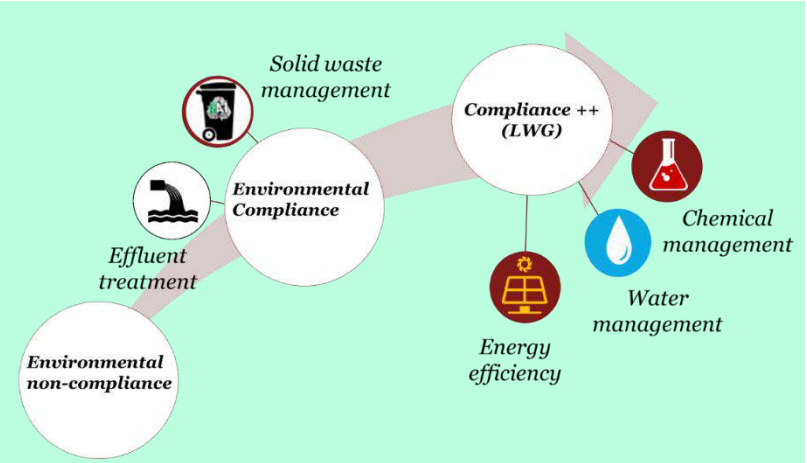


Figure 9. Structured approach representation for improving environment performance

Thus, the approach should be two pronged (a) meeting the compliance requirement of the national legislations by focusing on better effluent management, solid waste disposal and then (b) adopt the LWG certification (which is compliance ++) requirements by focusing on the resource efficiency, chemical management and implementation of the EMS systems.

5.1. Cost benefit analysis for environment compliance

Environmental compliance brings in additional economic value to the tanneries. Most of the processed leather export from Bangladesh is in form of crust leather. As per Bangladesh Tanneries Association, crust export comprises of 87.7% of total annual processed leather export.

Value from environment compliance

Currently, crust produced by tanneries in Savar is being sold through aggregators at an average price of **1.45 USD/sq. ft.** The crust leather being produced by Tanneries in Savar Industrial Estate is significantly discounted due to the non-adherence to the environmental compliance on the effluent treatment and the solid waste management.

Stakeholder consultations highlighted that the average price of the environmental complaint leather catering to the brands from US and European Union is the range of 2.3 USD/sq ft[16]. Considering value addition of approximately 10%[17] from crust to finished leather, the hypothesized price of the environmentally compliant crust is estimated to be **1.9 USD/sq. ft.**

Market value of environmentally non-compliant crust is 1.45 USD/sq.ft.

Market value of environmentally compliant crust is 1.90 USD/sq.ft

Non-adherence to the environmental compliance is resulting in the opportunity loss of catering to the US and European Union markets and also to domestic leather goods manufacturers who supply to the global brands such as Timberland, Picard.

Cost of environment compliance

Stakeholder consultations indicated that the cost of production of crust in Savar is in the range of **1.3 USD per sq. ft**.

Further, the team interacted with tanneries outside Savar Industrial Estate with their own ETP to understand the increase in cost of production due to effluent treatment to comply with local norms. The implementing of environment compliance requirements leads to 10% increase in the cost of production. Thus, the cost of producing environment compliant crust is approximately 1.43 USD/sq.ft[18].

The profit margin in case of non-compliance crust production is approximately 0.15 USD /sq.ft (1.45 - 1.31 USD /sq.ft.) and in case of complaint crust production is approximately 0.46 USD sq.ft. (1.90-1.44 USD sq.ft.). Therefore, adhering to environmental compliance, the tanneries can realize three times their existing profit margin. The table below summarizes the benefit that the tanneries could achieve by adopting environment compliance measures.

Table 5: Summary of the Cost Benefit Analysis of environment compliance

	Crust leather production in non-compliance case (USD/sq.ft)	Crust leather in basic environmental compliance case (USD/sq.ft)
Price	1.45	1.90
Cost of production	1.31	1.44
Profit Margin	0.15	0.46 **(3X)**

In case of supply to local product and footwear manufacturers, lead-time for finished goods manufacturers shall decrease significantly thereby decreasing

- inventory carrying costs

[16] The indicative price is based on the export price of the leather produced by tanneries
[17] Source: LFMEAB
[18] Note: the capital investments vary considerably depending on the production capacity and processes in tanneries. For the analysis only operating costs have been considered

- working capital requirement
- days of Cash Conversion Cycle
- costs of transportation

Environmental compliance can be achieved by focusing on (i) effluent management (ii) solid waste management. The issues and challenges existing in the management of these environmental aspects as well as some of recommendations to mitigate those challenges are elaborated in the subsequent chapters.

5.2. Environmental compliance – Efficient effluent treatment

Picture 3: Effluent from the Savar Tannery Industrial Estate is dumped into the Dhaleshwari, turning the river water black and leaving thick foam on the surface.

https://www.thedailystar.net/frontpage/dhaleshwari-danger-1590847)

River Dhaleshwari is witnessing visible degradation in its water quality for the past two years due to discharge of untreated effluent from the tanneries. This has not only created negative impacts on local aquatic life and nearby residents but also highlighted the environmental issues of tanneries of Bangladesh at a global level forcing buyers withdrawing their presence in Bangladesh. Estimated annual economic loss due to extinction of aquatic life and loss of livelihood of dependent community is around $6,800 per hectare of river polluted[19]. ***The cost of restoration of Buriganga river, which has been polluted by the tanning industry in Hazaribagh has been estimated at 4078.80 Million Taka over 10 year period[20].*** Status-quo of the discharge of untreated effluent in Dhaleshwari river will result in incurring similar costs for the restoration of Dhaleswari river. Ensuring effective treatment of the effluent requires concentrated regulatory as well as firm interventions.

[19] Parvarkar P. (2013). Present Status of Fish Farming and Livelihood of Fish Farmers in Shahrasti Upazila of Chandpur District, Bangladesh. (the fish yield in a nearby district has been mentioned as 2900 kg/ha/year. A conservative estimate of economic value of fish at $2.3/kg results in a $6,800 per hectare loss)

[20] https://www.researchgate.net/publication/232968341_CostBenefit_Analysis_of_Restoring_Buriganga_River_Bangladesh

5.2.1. Potential interventions to reduce the usage of salts for storage of hides and skins

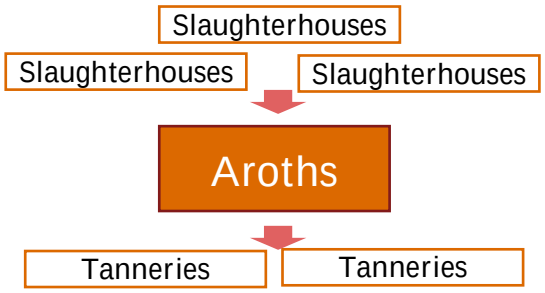
5.2.1.1. *Chillers at Aroths for reducing salt usage*

Issue: Excessive salt usage for storage of hides/skins

Large quantity of salt (40% to 50% on weight basis) is used for preservation of the raw hides because of its easy availability at affordable price. Use of excessive salt for preservation increases the concentration of TDS and chlorides in the tannery effluent.

Impact: High amount of chlorides in the discharged water impact freshwater organism and plants by altering reproduction rates, increasing species mortality, and changing the characteristics of the entire local ecosystem. In addition, as chloride filters down to the water table, it can stress plant respiration and impact the quality of drinking water. Use of excess salt also increases the quantity of water required for cleaning of raw hides.

Potential intervention: Chillers have been used in few western countries and Australia for preservation of raw hides. They result in good grain quality of resultant leather. Chillers eliminate need for salt consumption for preservation and thereby reduce the TDS and chloride load in effluent.



Presence of Aroths (point source of collection and channelization of hide and skins to tanneries) provides opportunity for deploying chilled storage to preserve raw hides at these places.

Key stakeholder for the intervention:

Stakeholder	Responsibility
Bangladesh Hide and Skin Merchant Association	• Identification of key rawhide market places for deployment of chillers
Bangladesh Tanners Association	• Identify tanneries that should prefer rawhides preserved with salt-less preservation techniques • Establish contracts of procuring a certain proportion of rawhides from the rawhide traders using chiller systems for preservation of rawhides
Bangladesh Cold Storage Association	• Preparation of action plan for inclusion of rawhides in the existing infrastructure for meat, agricultural industry
Ministry of Industries	• Encourage installation of chillers and cold storage supply chains by providing incentives like capital subsidies, interest reimbursement etc.

5.2.1.2. *Awareness campaigns for controlling salt usage*

***Issue:* Excessive salt usage for storage of hides/skins**

Easy availability of salt at affordable price leads to injudicious usage of salt (40% to 50% on weight basis) for preservation of the raw hides by the workers. Use of excessive salt for preservation increases the concentration of TDS and chlorides in the tannery effluent.

Impact: As discussed in section 5.2.1.1, high amount of chlorides in the discharged water impact freshwater organism and plants by altering reproduction rates, increasing species mortality, and changing the characteristics of the entire local ecosystem. In addition, as chloride filters down to the water table, it can stress plant respiration and impact the quality of drinking water. Use of excess salt also increases the quantity of water required for cleaning of raw hides.

Potential intervention: Launch awareness drives and campaigns for the workers in slaughterhouses and aroths to sensitize them about the environment impacts of usage of excess amounts of salts. That will facilitate changing the behavior of the workers to limit the salt usage to optimum level. The workers must be equipped with necessary standard operating procedures to guide them in usage of optimum quantity of salt for preservation of salt.

Key stakeholder for the intervention:

Stakeholder	Responsibility
Bangladesh Hide and Skin Merchant Association	• Design awareness campaigns and training programs to promote optimal usage of salt for hide preservation

5.2.2. Potential policy level interventions for efficient effluent treatment

5.2.2.1. *Modernizing slaughterhouses for enhanced slaughterhouse effluent treatment*

Issue: The slaughtering operations in Bangladesh take place predominantly in small scale or household level slaughterhouses. Since the capital investment in most of the slaughter houses is less than 5 hundred thousand taka, majority of the segment doesn't fall under the ECR Rules. However, the collective pollution load generated by these slaughter houses is significantly high. Such slaughterhouses produce large quantities of effluent (mainly blood) which is rich in COD (chemical oxygen demand). These effluents are directly discharged to the domestic municipal sewers without any treatment resulting in increased pollution load in the municipal waste water. Apart from generation of untreated effluent, household level slaughtering also results in improper management of solid waste.

Impact: COD load in the effluent impacts the Dissolved Oxygen (DO) in the surface water body where the effluent is discharged. An increase in the COD of the effluent will lead to a reduction of the DO affecting the aquatic ecosystem of the surface water body. Solid waste generated from slaughterhouses such as cow dung, intestine, solids from effluent treatment plant may be found disposed in open sites, leads to leachate generation that contaminates the surface and ground water thus causing public nuisance accompanied by the danger of spreading severe water borne and air borne diseases.

Potential intervention: As a possible measure to reduce pollution, Bangladesh needs to establish large scale modernized slaughterhouses. Modernization of slaughtering facilities shall require:

- Installation of chillers: This would eliminate need for salt usage for hide preservation which shall result in reduction of TDS in effluent
- Line separation: segregation of various waste streams like separate blood line, grease waste streams, sanitary lines etc. provides easier treatment of effluent

- Training of workers in slaughtering and flaying techniques: better flaying of skin ensures improved quality of leather resulting in better prices for the hides
- **Carcass utilization centers**[21] could be established in close proximity to such large-scale slaughterhouses. Such centers are equipped with anaerobic treatment facility of effluents; composting /vermicomposting facilities for decomposing the ruminal and intestinal contents. This approach ensures maximum value extraction from the waste generated from slaughtering operations.
- **Pre-treatment of effluent**: The effluent discharge needs to be disinfected and treated through either chemical treatment or autoclave before discharge to domestic sewer system

Key stakeholder for the intervention:

Stakeholder	Responsibility
Ministry of Industries	• Extend financial support for capital expenditure for building, plant & machinery and effluent treatment plant to catalyze the modernization process
Slaughterhouses	• Install equipment for modernizing the facility • Train workers in using modern equipment

5.2.2.2. *Regulating effluent discharge at CETP inlet*

Issue: Unregulated Waste Water discharge standards

Effective operation of CETP requires the inlet effluent of similar kinetics. In the absence of regulated effluent quality standards for discharge to CETP, the existing effluent discharge at the inlet of CETP is of varying pollution load rendering CETP ineffective. Moreover, lack of regulation also inhibits the tanners in minimizing the pollution load of the generated effluent.

Impact: Discharge of the effluent with high pollution load to Dhaleshwari river results in degradation of the river affecting the aquatic life of the river as well as impacting the health of community residing near the river. Failure to provide effective CETP operations leads to automatic audit failure in certifications like LWG (Leather Working Group) certification.

Potential intervention: Bangladesh can adopt the standards prescribed by India[22] for regulating the effluent quality standards for discharge to CETP. These standards are presented below:

Table 6: Pre-treatment effluent standards in India

Type of tannery	Parameter	Standards
Chrome tanneries/combined chrome & Vegetable tanneries	pH	6.5-9
	SS	600 mg/L
	Chromium Concentration after treatment in the chrome waste water stream	45 mg/L
Vegetable tanneries	pH	6.5-9
	SS	600 mg/L

[21] http://www.csir.res.in/ruralsectors/carcass-utilisation
[22] Source: The Environment (Protection) Rules, 1986;
http://cpcb.nic.in/displaypdf.php?id=SW5kdXN0cnktU3BlY2lmaWMtU3RhbmRhcmRzL0VmZmx1ZW50LzQzNy5wZGY=

Key stakeholder for the intervention:

Stakeholder	Responsibility
Department of Environment	Setting up pre-treatment standards in consultation with the operation team of CETPs in Bangladesh
Operations teams, CETPs	Provide the design specifications of CETPs to DoE for indicative limits on pretreatment standards
Institute of Leather Engineering & Technology (ILET)	Provide technical inputs on defining standard limits based on the Best Available Technology in Bangladesh

5.2.2.3. *Standards of effluent discharge for critical parameters need to be revised in line with international best practices*

Environment Conservation Rules, 1997 prescribe the standards for effluent discharge. The standards prescribed in ECR were benchmarked with international best practices[23] that highlighted (a) absence of permissible limits (b) lower stringency for the below parameters:

Slaughtering:

- **Issue:** Standard limit for total coliform, fecal coliform and E coliform has not been prescribed for the effluent discharge from slaughterhouses in Bangladesh

	Bangladesh	Ethiopia	United States
Fecal Coliform	No limit	400 CFU per 100ml	400 CFU per 100ml

- Impact: Coliform is a disease-causing bacteria if present in water may cause symptoms like gastrointestinal upset and general flu-like symptoms such as fever, abdominal cramps, and diarrhea. It is one of the significant contaminant released in water during slaughtering stage. In the absence of regulating standards for fecal coliform, the effluent is likely to contaminate drinking water sources impacting human health.
- **Issue:** Chemical Oxygen Demand (COD) parameter in Bangladesh was less stringent compared to prescribed limits in India and Ethiopia

	Bangladesh	Ethiopia	India
COD	400 mg/L	90% removal or 250 mg/L, whichever is less	250 mg/L

- **Impact:** Blood, one of the major dissolved pollutants in abattoir wastewater, has the highest COD of any effluent from slaughtering operations. COD load in the effluent impacts the Dissolved Oxygen (DO) in the surface water body to which the effluent is discharged. An increase in the COD of the effluent will lead to a reduction of the DO affecting the aquatic ecosystem of the surface water body.
- **Issue:** Total Suspended Solids (TSS) parameter in Bangladesh was less stringent compared to its leather sector competitors India and Ethiopia

	Bangladesh	Ethiopia	India
TSS	500 mg/L	80 mg/L	50 mg/L

[23] The prevalent standards in United States, Italy, Ethiopia, Brazil and India were compared for benchmarking

- **Impact:** Excessive suspended sediment can impair water quality for aquatic and human life, impede navigation and increase flooding risks. Presence of high amount of suspended solids in water could result in growth of algae which results in decrease in oxygen levels in water. Presence of suspended solids have also been a cause for the reduced development and survival of certain fish eggs and larvae, which are an important economic and nutritional resource for humans.

Tanning:

- **Issue:** Bangladesh provides an overall limit on total chromium, however, limit to hexavalent chromium is not prescribed for tannery effluents

	Bangladesh	Brazil	Ethiopia	Italy	India
Hexavalent chromium	Effluent parameter not regulated	0.1 mg/L	0.1 mg/L	0.2mg/L	0.1 mg/L

- **Impact:** Upon exposure to large concentrations of chromium, humans can develop health problems, which include acute respiratory effects, cancer, reproductive and developmental, lung cancer, irritation and damage to eyes etc.
- **Issue:** Bangladesh does not prescribe limit to COD parameter for tannery effluents

	Bangladesh	Brazil	Ethiopia	Italy
COD	Effluent parameter not regulated	330 mg/L	500 mg/l	160 mg/L

- **Impact**: Discharge of effluent with high COD deprives the water of Oxygen content – thriving environment for anaerobic bacteria leading to toxic water conditions. Biologically dead rivers are unconducive for fisheries and affect the livelihood of the fisherman.

Leather goods and footwear manufacturing:

- **Issue:** Bangladesh's regulations do not regulate color in effluent. In contrast, Italy provides guideline to regulate color in effluent

	Bangladesh	Italy
Color	Not regulated	Not perceptible with 1:20 dilution

- **Impact:** Highly colored water effects the growth of aquatic plants and algal growth by blocking sunlight, which is critical for the growth of aquatic ecosystem.

Key stakeholder for the interventions:

Stakeholder	Responsibility
Department of Environment	• Setup standards for missing parameters (Hexavalent chromium, COD etc.) • Strengthening the standards for less stringent parameters

Stakeholder	Responsibility
Institute of Leather Engineering & Technology (ILET)	• Provide technical inputs on defining standard limits based on the Best Available Technology in Bangladesh

5.2.2.4. *Strengthening of third party monitoring and enforcement (SCADA systems)*

Issue: Though, Environment Conservation Rules, 1997 prescribe standards on effluent discharged from tanneries, lack of supervision and monitoring of the discharged effluent is impairing the enforcement of the standards. For these standards to have desired environmental impacts, it is necessary to have effective monitoring and enforcement. Field visits to the regional offices of the DoE indicated capacity constraint and paucity of technological use for seamless enforcement.

Impact: Absence of monitoring and enforcement of existing regulations discourages the tanneries to ensure compliance to existing standards.

Potential intervention: A designated third party monitoring agency needs to be authorized and made responsible for ensuring monitoring and enforcement of regulations at Savar Industrial Estate. Disruptive technologies such as SCADA can be implemented for real time monitoring. In the SCADA, the measurements are made through peripheral electronic sensors and instrumentation, and relayed to the processing unit through the Input/Output, (I/O), subsystem.

Apart from ensuring enforcement, use of SCADA systems reduces the energy costs, maintenance costs, and efficiency improvement through process optimization – thereby reducing the operating costs and increasing the returns of the CETP operations.

Key stakeholder for the intervention:

Stakeholder	Responsibility
Department of Environment	• Accrediting independent agencies for monitoring the effluent • Periodic inspections for ensuring seamless monitoring by the independent agency
Independent monitoring agency	• Real time monitoring of the effluent characteristics
BSCIC	• Commissioning independent monitoring agency • Infrastructure provision for implementing the real-time monitoring system

5.2.2.5. *Pricing on effluent treatment based on pollutant load (BOD, SS, etc.)*

Issue: The pricing mechanism for the effluent discharge by the tanners is yet to be formulated. Absence of pricing on the treatment inhibits the tanners in controlling both the volume and the quality of the effluent discharged.

Impact: Lack of pricing results in unregulated discharge of the effluent by tanners rendering the CETP ineffective and consequently discharge of untreated effluent in Dhaleshwari river impacting the aquatic ecosystem and the livelihood of the communities dependent on the riverine ecosystem.

Potential intervention: Charging the tanneries based on pollution load of the effluent to be treated. This will push the implementation of effective treatment systems at tanneries, ensuring discharge of effluent with low pollution load.

Key stakeholder for the intervention:

Stakeholder	Responsibility
Committee as per tripartite MoU	• Setup pricing mechanism based on pollution load

5.2.2.6. *Options for effective CETP operations*

Issue: Bangladesh Small and Cottage Industries Corporation (BSCIC) contracted Jiangsu Lingzhi Environmental Protection Co. Ltd (JLEPCL) to construct and implement Central Effluent Treatment Plant (CETP), Common Chrome Recovery Unit, Sewage Treatment Plant, and Chloride and Solid Waste Management System. The operation of the CETP for a period of two years was also subsumed in the contractual obligation of JLEPCL. However, the CETP is not functioning optimally resulting in high pollution load of the effluent discharged to Dhawleswari river. The non-optimal performance of the CETP can be attributable, amongst other reasons, to the inadequate formulation of the appropriate institutional and governance arrangements for ownership and operation of a CETP.

Potential intervention: It is recommended that a detailed investigative study be undertaken the root-cause analysis for the sub-optimal performance of the CETP and identify the design changes necessary to ensure effective CETP operations. Such study needs to have cohesive and collaborative partnership among the stakeholders leveraging the combined resources of the DFI's. For ensuring an effective operating model, government could consider the following options:

- Encouraging Public Private Partnership for CETP operations
- Permitting ETP t for individual tanneries

a) Encouraging Public Private Partnership for CETP operations.

Encouraging Public Private Partnership for CETP operations by fostering the innovation and technology transfer from private entities for increase in the efficiency of the CETP operations – this can also develop the competencies local service provider's (LSP) as the LSP's usually form consortia with international entities while undertaking the PPP projects. The PPP model of operation should be augmented by engaging an independent agency for online monitoring the effluent characteristics

Stakeholder	Responsibility
PPP Authority, Bangladesh	• Assessment of feasibility of developing the project in PPP mode • Structure the project, formulating concessionaire agreement, running the bid process for section of the concessionaire

b) Permitting ETP establishment for individual tanneries

Permitting individual tanneries to have their own effluent treatment plant will result in ensuring the attainment of necessary environmental performance that the global buyers demand. However, restrictive criteria needs to be imposed to confine the industries subscribing for individual ETP's. Possible restrictive criteria can include "80-20 principle" – the tanneries, which contribute to 80% of the exports, could be permitted to establish individual ETP. Restricting criteria shall ensure that the CETP continues to receive the critical effluent volume necessary for effective operations.

Key stakeholder for the intervention:

Stakeholder	Responsibility
MoC, MOI and BSCIC	• Setup criteria for granting permission to tanneries to set up individual ETP

5.2.3. *Potential firm level interventions for efficient effluent treatment*

5.2.3.1. *Segregation of effluent in to soak, chrome and beam-house liquor for effective treatment*

Issue: The CETP in Savar estate has a separate chrome recovery unit designed to recover the chrome content from the effluent and an effluent treatment unit which is designed to treat the chrome free effluent. For effective functioning of the chrome recovery unit and effluent treatment unit, it is important that the effluent generated from tanneries is segregated. According to UNIDO's model tannery description, the effluent from the tanneries must be segregated into (a) soak liquor (b) chrome liquor and (c) normal liquor prior to the discharge. The tanneries in Savar Industrial Estate are designed to segregate the effluent into two streams; chrome liquor and normal (chrome free liquor). However, it was observed during the visit that in most of the tanneries the effluent drainage pipes entrances are manually controlled and therefore the chances of mixing of the effluents are very high. The improper segregation of the effluent discharge is one of the key reasons for ineffective operations of CETP.

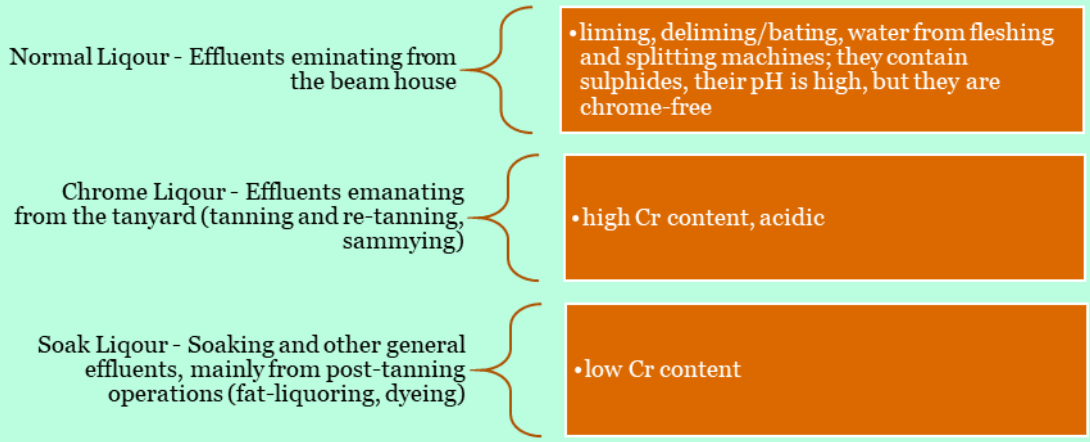


Figure 8: Segregation of effluent discharge from tanneries into three waste streams

Impact: Absence of segregation of these streams and to pre-treat them separately according to their characteristics results in health and safety risks (formation of hydrogen sulphide which is lethal for human life) and increases the cost of treatment and sludge disposal (contamination of sludge with Cr). Treating the mixed effluent comprising of soak and normal liquor results in pH of the effluent at 7 – conditions at which H2S is generated. Hydrogen sulphide (H2S) is a toxic gas with offensive odour. Acute exposure to H2S may result in olfactory paralysis, severe lung and eye irritation, pulmonary oedema and is fatal for humans.

Picture 3: One of the tanneries visited connected flexible pipes from drums to segregate discharge

Possible intervention: The segregation of effluent into three streams should be implemented by installation of different drainage pipes connected to the drums discharging into separate pits.

Key stakeholder for the intervention:

Stakeholder	Responsibility
Tanneries	• Installation of automatic segregation systems
Department of Environment	• Ensure enforcement of segregation of liquor through independent accredited agency
BSCIC	• Provision of infrastructure such as segregation pipelines at the discharge of tanneries to CETP

5.2.3.2. *Installation of pre-treatment systems at the tanneries*

Issue: Currently tanneries in Savar directly discharge the effluent to the CETP. This uncontrolled discharge is leading to the scenario where the CETP is receiving effluent with pollutant concentrations beyond its designed treatment capacity, resulting in ineffective operations. It is therefore important for tanneries at Savar to undertake the pre-treatment of the effluent before discharging it to the CETP.

Impact: Since CETP is not designed to treat the concentration of pollution load that it is currently receiving, the untreated or ineffectively treated effluent from the CETP gets discharged to the Dhaleshwari river causing severe damage to the biodiversity of the river.

Potential intervention: Tanneries should install pre-treatment systems that should encompass removal of large particles, sand/grit and grease, and significantly reduce the content of chrome and sulphides before the effluent is discharged into the CETP. The pre-treatment systems at a minimum comprise of installation of screeners, settling tanks.

Key stakeholder for the intervention:

Stakeholder	Responsibility
Department of Environment	• Setup pretreatment standards • Monitoring of effluent quality at tannery outlets and CETP inlet
Tannery management	• Conduct a detailed assessment of tannery effluent quality against DoE's pre-treatment standards and install necessary equipment to achieve the same

5.3. Environmental compliance – Solid waste management to extract value from waste

Picture 4: Hazardous leachate contaminating ground as well as surface water due to unscientific solid waste disposal in Savar

Leather industry generates large quantity of solid waste, which when decayed in open emits obnoxious and toxic gases such as ammonia, hydrogen sulphide and carbon dioxide. More than 400kg of solid waste comprising of leather cuttings, trimmings, shavings, fleshing's residue, hair etc. is generated per ton of rawhide processed to leather. Savar Tannery Industrial Estate generates approximately 291 tons of solid waste per day which is disposed of to a temporary dumpyard. The surface run-off of the leachate generated from the decay of the solid waste is further polluting the Dhaleshwari.

Various studies have estimated the environmental costs due to the open dumping of the solid waste in the ranges between $11.6 to $15.1 per ton of waste dumped[24]. With, approximately 291 tons of solid waste generation per day, it is estimated that the ***environmental costs due to the open dumping of the solid waste at Savar is approximately $1 million to $1.4 million per annum.***

In other countries like India, tannery waste is being co-processed in symbiotic industries like glue manufacturing, leather board manufacturing. The rawhide trimmings are purchased by glue manufacturers and some cottage industries in India at $22 to $43 per ton of raw trimmings. Similarly, wet blue split waste and shavings are purchased at approximately $13 per ton for leather board production. This clearly provides an evidence that apart from the environmental cost that Bangladesh is incurring on dumping the waste in the dumpyard, a huge opportunity is being lost by not utilizing this waste for other products manufacturing. Therefore, the interventions should be directed to utilize these wastes from tanneries and leather products and footwear manufacturing by other industries

[24] Rabl, Ari & Spadaro, Joseph & Zoughaib, Assaad. (2008). Environmental impacts and costs of solid waste: A comparison of landfill and incineration. Waste management & research: the journal of the International Solid Wastes and Public Cleansing Association, ISWA. 26. 147-62. 10.1177/0734242X07080755.

5.3.1. Potential policy level interventions for solid waste management

5.3.1.1. *Well defined guidelines for solid waste management*

Issue: Bangladesh's environmental regulations were compared against the environmental regulations of countries like Brazil, Ethiopia, Italy, India and United States. While countries like United States had comprehensive solid waste management policies like Resource Conservation and Recovery Act, Bangladesh lacks a comprehensive policy for solid waste management. Although, there is a City Corporation Ordinance which mandates the local corporations for the solid waste management, but these ordinances are deficient in outlining the responsibilities of industries for the solid waste disposal.

Impact: Lack of well-defined guidelines for solid waste management have resulted in unscientific disposal of solid waste at a dumping site near the Dhaleshwari River contaminating it. It has resulted in loss of fisheries in the river, which has resulted in loss of livelihood of fishermen. Some livestock feed on this waste causing outbreak of diseases and in some cases death of the animal.

Potential intervention: Better management of solid waste could be achieved by formulating and implementing a comprehensive solid waste management guidelines. The key features for such guideline could include the following:

- **Classification of hazardous and nonhazardous waste:** Criteria for classification of solid waste shall ensure unambiguous segregation of waste. It results in better treatment of solid waste.
- **Define roles and responsibilities of waste generators:** It could include responsibility of segregation of waste, maintenance of waste disposal records, sending waste to authorized agency for proper treatment or disposal etc.
- **Criteria for disposal, material recovery and energy recovery:** These features shall be designed keeping in view the establishment of circular economy
- **PPP framework for waste management:** The public sector is constrained due to lack of finances and manpower to handle the large quantity of solid waste generated from Savar region. Encouraging Public Private Partnership shall ensure availability of resources for better management of solid waste.
- **Designated monitoring and enforcement responsibility:** Independent organizations like BSCIC or DoE should be designated with the authority and responsibility to monitor and enforce these guidelines.

Key stakeholder for the intervention:

Stakeholder	Responsibility
Department of Environment, (DoE) and Ministry of Environment, Forest and Climate Change (MoEF)	• **Design and implementation of comprehensive solid waste management policy** • **Commissioning independent monitoring agency**
Monitoring and enforcement agency	• **Ensure frequent monitoring of industry on the basis of the formulated solid waste management policy**

5.3.2. Potential firm level interventions for solid waste management

5.3.2.1. *Establish circular economy by utilizing solid wastes*

Issue: The waste generated from leather sector has significant commercial value. However, currently solid waste is disposed in dumping yards resulting in loss of the economic opportunity.

Impact: The solid waste that could have been a resource in another industry goes unutilized and instead is dumped in uncontrolled manner resulting in adverse air and water pollution.

Potential intervention: The solid waste generated from leather footwear and leather goods manufacturing and tanning has commercial value as it could be used in other industries. The following uses of waste generated from leather sector could be explored for establishing a circular economy:

- **Leather board manufacturing:** Leather waste as well as wet blue split waste and shavings could be easily used in leather board manufacturing
- **Soil conditioner/fertilizer:** Vegetable tanned leather could be grounded and used as a fibrous soil conditioner.
- **Use of Leather Waste as a Filler:** Rubbers and plastics both commonly use fibrous fillers as reinforcing fillers. In Sri Lanka, leather fibers have been incorporated into rubber, which on vulcanization has produced materials as hard as ebonite. Such materials could be an alternative to styrene in floor tiles and file covers.
- **Paper Making:** Leather fibers from uncoated leather can be used as a co-raw material in the manufacture of paper. Up to 10 % of leather fibers can be added. About 10% leather fiber addition, leads to improvement of properties of paper like, inter-fiber cohesion.
- **Glue manufacturing:** Rawhide trimmings and fleshings have been used in adhesive manufacturing in India.

Key stakeholder for the intervention:

Stakeholder	Responsibility
BTA, LFMEAB, Individual units	• **Identification and establishment of contract with potential user industries**
DFI's such as World Bank Group etc	• **Assess the feasibility of using these wastes in other industries** • **Develop PPP (Public-Private Partnership) models to use these wastes in other industries**

5.4. Cost benefit analysis for environment compliance++

The increased exports that the sector can accrue by being complaint towards the national legislations can be leveraged in adopting the global certifications, which is compliance++ (such as LWG certification) for meeting the evolving requirements of the brands and gaining significant premium for the LWG certified crust.

Value from environment compliance++

Currently, the average price at which the crust is being sold is about **1.45 USD/sq. ft.** In Savar Industrial Estate, tanneries are not being able to effectively manage their effluent and solid wastes and therefore, this price of the crust can be considered as the value of the product in an environment non-compliant scenario.

Market value of environmentally non-compliant crust is 1.45 USD/sq.ft.

Market value of LWG complaint crust is 2.30 USD/sq.ft.

Compliance++ case is well represented by prices of LWG certified crust leather. The export price for the LWG certified crust was hypothesized as **2.3 USD/sq. ft.** through (a) consulting with LWG certified tanneries in India and (b) validating by interacting with leather footwear manufacturer in Bangladesh having experience in procuring LWG certified leather. In addition, the tanneries in Savar are also losing an opportunity of supplying to the domestic leather goods and footwear manufacturers who are

currently importing the LWG certified finished leather from other countries to meet the requirements of the global brands.

Cost of environment compliance++

Stakeholder consultations indicated that the cost of production of crust in Savar is in the range of **1.3 USD per sq. ft**.

To ascertain the cost of producing LWG certified crust, LWG-certified tanneries in India were consulted. From the discussions, it was established that the increase in operational cost due to following the certificate protocol is approximately 20%. Thus the cost of producing **LWG certified leather crust is hypothesized as 1.57 USD/sq. ft (20% increase over 1.30 USD/sq.ft).**[25]

The profit margin in case of non-compliance crust production is approximately 0.15 USD /sq.ft (1.45 - 1.31 USD /sq.ft.) and in case of LWG certified crust production the profit margin is approximately 0.73 USD sq.ft. (2.30 – 1.57 USD sq.ft.), which is a 5X increase in the profit margin.

Table 7: Summary of Cost benefit analysis of adoption of LWG certification

	Crust leather production in non-compliance case (USD/sq.ft)	*Crust leather production in compliance++ case (USD/sq.ft)*
Price	1.45	2.30
Cost of production	1.31	1.57
Profit Margin	0.15	0.73 **(5X)**

In case of supply to local product and footwear manufacturers, lead-time for finished goods manufacturers shall decrease significantly thereby decreasing

- inventory carrying costs
- working capital requirement
- days of Cash Conversion Cycle
- costs of transportation

Environmental compliance ++ can be achieved by focusing on (i) resource efficiency (water and energy efficiency) and (ii) chemical management. The issues and challenges existing in the management of these environmental aspects as well as some of recommendations to mitigate those challenges are elaborated in the subsequent chapters.

Apart from these sector specific international certifications, to cope with the challenges and requirements of quality, safety, environmental management and social accountability, global buyers are also requiring the implementation of environmental management systems such as 14001 by the suppliers.

The issues and challenges in adopting (a) resource efficiency and (b) better chemical management measures along with the policy as well as firm level interventions that would facilitate in addressing those challenges, are elaborated in the subsequent sections of the report. In the end, the report also highlights the benefits that ISO certification implementation will bring in for the sector.

5.5. Environmental compliance++ – Improved water management

As it has been reported in various literature, the water scarcity in Bangladesh is increasing and it is projected that by 2030, Bangladesh will need 21 percent more water than its available supply during

[25] Note: the capital investments vary considerably depending on the production capacity and processes in tanneries. For the analysis only operating costs have been considered

the dry season[26]. The predominant dependence on groundwater aggravates the situation further. The Bangladesh Agricultural Development Corporation (BADC) updated the groundwater-zoning map of Bangladesh in 2010[27]. Significant changes in groundwater levels have taken place between 2004 and 2010, especially in areas where industries are located, to the north of the Greater Dhaka area[28]. The ground water table has depleted in most of the areas around Dhaka.

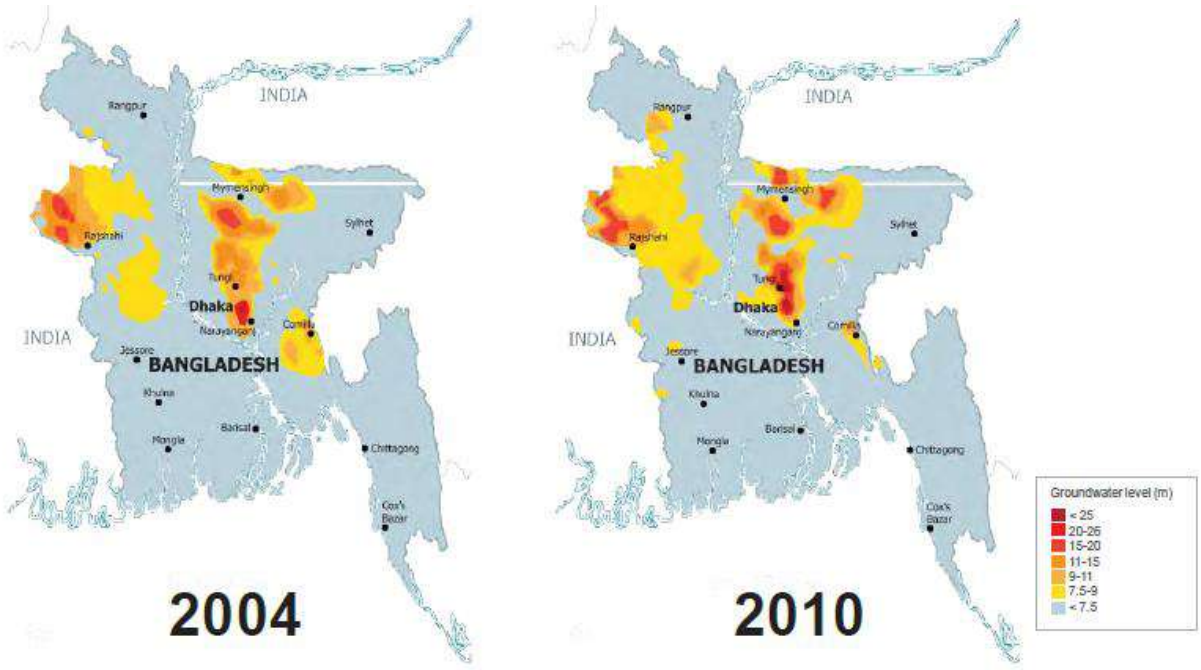


Figure 11: Groundwater zoning maps in 2004 and 2010[27]

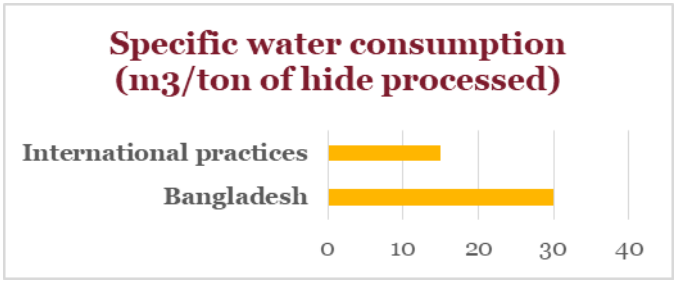


Figure 9: Specific water consumption of tanneries in Savar Estate (based on the sample of tanneries studied

Leather sector is a water intensive sector, with tanning segment of the value chain having the highest water footprint. The tanners in Savar Industrial Estate are predominantly dependent on ground water for processing rawhides to leather. Based on the data collected from tanneries operating out of Savar Tannery Estate, it was found that the specific water consumption was almost twice the water consumption of international benchmarks.

Though the ground water abstraction is unregulated, the excessive water usage for processing has hidden costs which include:

Cost of energy to abstract water from groundwater and surface water: Every unit of water consumed has associated costs of abstraction or usage. In case, a unit-based fee is levied on water usage, as is the case with direct water supply, the increased costs are directly reflected in the water bills. In case, water supply is unregulated, as is the case with ground water usage, the increased costs are reflected in the increased electricity costs associated with pumping.

[26] https://www.2030wrg.org/bangladesh-stories/#av_section_2
[27] http://www.badc.gov.bd/files/map/water_zoning_map_small.pdf
[28] Based on Arup report: An analysis of industrial water use in Bangladesh with a focus on the leather and textile industries

- **Cost of increased use of chemicals in the process:** As a minimum concentration level of chemicals is required for desired quality of leather, so a higher amount of process water leads to a proportionate increase in usage of chemicals and subsequently the cost of chemicals.
- **Cost of chemicals and power for effluent treatment:** The increased water consumption proportionately increases the effluent generation thereby escalating cost of treatment of the tannery effluent – both from increased use of electricity and chemicals for effluent treatment.
- **Cost of increased time of operations:** More than optimum water consumption leads to increased time in filling drums. Consequently, rinsing time also increases. Higher operation time make the tanneries less competitive in a price sensitive market.
- **Cost of increased wear and tear of equipment:** Heavy loading of drums due to higher than optimal amount of water increases the mechanical stress on drum and connected motors. Prolonged heavy loading leads to wear and tear leading to higher maintenance costs.

The stress on water could be reduced by efficient usage of water in tanneries. To achieve better water management, several concentrated regulatory as well as firm interventions are required.

5.5.1. Potential policy level interventions for better water management

5.5.1.1. *Regulating ground water abstraction*

Issue: Almost all of the tanneries in Savar Tannery Estate are dependent on ground water for its process water requirements. Bangladesh Water Act (2013) provides provisions of declaring water scarce areas as stressed areas. As per the act, any groundwater abstraction would be guided by the defined safe yield for certain area. Abstraction of groundwater resources shall be allowed within the limit of safe yield. However, the Water Resources Planning Organization (WARPO) has not declared water stressed areas. Consequently, ground water is unregulated in Savar.

Impact: High consumption of ground water leads to lowering of water table, which in turn increases the cost of abstraction. Scarcity of ground water, a common resource, affects nearby communities and other ground water dependent industries. In addition, high ground water abstraction in some cases could cause land subsidence problems and therefore it becomes a safety risk.

Potential intervention: Regulating ground water would encourage efficient management of water resources. Based on the provisions of Bangladesh Water Act, WARPO, could consider declaring water stressed areas. Sectoral safe yield limits for water abstractions shall be defined for the declared water stressed area. In addition, the water abstraction could be priced to discourage over abstraction of ground water. This would require ground water metering. Electronic cards systems to activate well systems and easier recording of water use could be considered for better enforcement of the regulations.

Key stakeholder for the intervention:

Stakeholder	Responsibility
WARPO	• **Declaration of water stressed areas** • **Determine safe-yield for water consumption in water stressed areas** • **Price ground water in water stressed areas** • **Mandate installation of metered wells for industrial use**

5.5.1.2. *Incentives to encourage adoption of water efficient technology*

Issue: Owners of tanneries have recently relocated Hazaribagh to Savar resulting in significant financial stress. Consequently, the tanneries are constrained financially for investing in new water efficient measures. There is a need for strengthening and increasing access to finance for investment in green technologies and processes. Though, Bangladesh has a Green Transformation Fund (GTF), the fund is of limited scale (200 Million USD) and covers refinancing facilities only for approved green technologies in leather and textile sector

Potential intervention: In order to increase the adoption of efficient technology incentives like Viability Gap Funding, foreign currency loans can be considered for the leather sector particularly for water flow control devices. This would assist in achieving financial viability of installing the equipment and technologies that are currently uneconomical for the facilities. The technologies that are covered in the GTF can be further expanded and also increasing the fund size of the GTF. Further, as GTF is USD denominated loan, there is significant hassle and paper work involved in accessing the GTF. The current processes for access to the Green Transformation Fund could be made more simple and convenient and list of specific approved resource technologies and equipment could be added to it.

Key stakeholder for the intervention:

Stakeholder	Responsibility
Ministry of Industries	• **Conduct a detailed assessment of financial requirements of approved water efficient technologies** • **Allocate budget to leather sector basis the financial viability gap** • **Preparation and inclusion of the list of capital intensive volume control equipment in approved technologies and equipment for receiving financial support.**
Bangladesh Bank and Technical consultants	• **Ease access to Green Transformation Fund for resource efficient technologies by adding a list of approved resource efficient technologies and equipment**

5.5.2. Potential firm level interventions for better water management

5.5.2.1. *Adoption of batch rinsing method*

Issue: Most of the tanneries in Savar use continuous flow of water for rinsing processes in tanneries.

Impact: As most of the tanners have minimal control on flow rate and time, continuous flow of water increases the water consumption. Moreover, attaining uniform product becomes difficult.

Potential intervention: To reduce the water consumption due to running water washes, tanneries could adopt batch-washing methods. Batch washing involves washing of hides and skins during processing by introducing the required quantity of clean water into the processing vessel and using the action of the vessel to achieve the required agitation, as opposed to using the agitation provided by the inflow and outflow of large quantities of water. Batch washes often yield a saving of over 50% of total water. In addition, better uniformity of the product is attained.

Key stakeholder for the intervention:

Stakeholder	Responsibility
BTA, Tannery owners	• **Analyze the suitability of batch rinsing methods for the leather they produce** • **Conduct a detailed assessment of process and equipment modifications required for adoption of batch washing methods** • **Training of workers on using batch washing methods**

5.5.2.2. *Installation of volume control equipment*

Issue: Most of the tanneries in Savar lack volume control equipment like water flow meters, spring controlled valves etc. In addition, the workers are not trained adequately to optimally use water.

Impact: Due to lack of volume control equipment, water consumption is higher than the process requirements.

Potential intervention: Installation of volume control equipment like water flow meters, spring controlled valves would result in significant savings of water. Some of tanners could consider advance volume control equipment like AQUAMIX. It automatically and accurately mixes a predefined quantity of water. Currently, it is installed at one of the tanneries in Bangladesh.

Picture 5: AQUAMIX - Water mixing equipment to control the water and dosing into the system

An AQUAMIX system can result in 20-30% water savings[29] and costs approximately USD 20400[30]. Such a system could provide accurate water mixing control for up to 6 drums. Back of envelope calculations suggest that an investment of USD 2 million in AQUAMIX systems could result in savings of 1,390,000 m^3 of process water annually in Savar Tannery Estate. At WASA's commercial tariff rate of USD 0.41/thousand liters[31], it would result in annual savings of USD 0.56 million. Considering life of 7 years for the equipment, and maintenance cost of approximately 5% per year **the Internal Rate of Return (IRR) for the investment shall be 15%.**

Key stakeholder for the intervention:

Stakeholder	Responsibility
BTA, Tannery owners	• **Conduct water audit to identify key processes consuming larger quantities of water** • **Install volume control equipment like water meters and valves to reduce water consumption**

5.5.2.3. *Recycling of individual process liquors*

Issue: Large quantity of wastewater is generated from various processes in tanning. The wastewater stream is generally discharged as effluent. Some of the wastewater could be reused in same or different processes by adequate replenishment of water and chemicals.

Impact: Absence of recycling of process liquors leads to higher consumption of water in tanning process.

Potential intervention: Reuse of some of the process liquors is a viable option that produces leather with properties comparable to that of conventionally processed leathers. An illustration of reuse of wastewater produced from washing fleshed pelts is provided below:

[29] http://www.hueni.com/en/Automation/Aquamix
[30] https://www.zauba.com/import-aquamix/hs-code-84531000-hs-code.html
[31] https://dwasa.org.bd/water-tariffs/

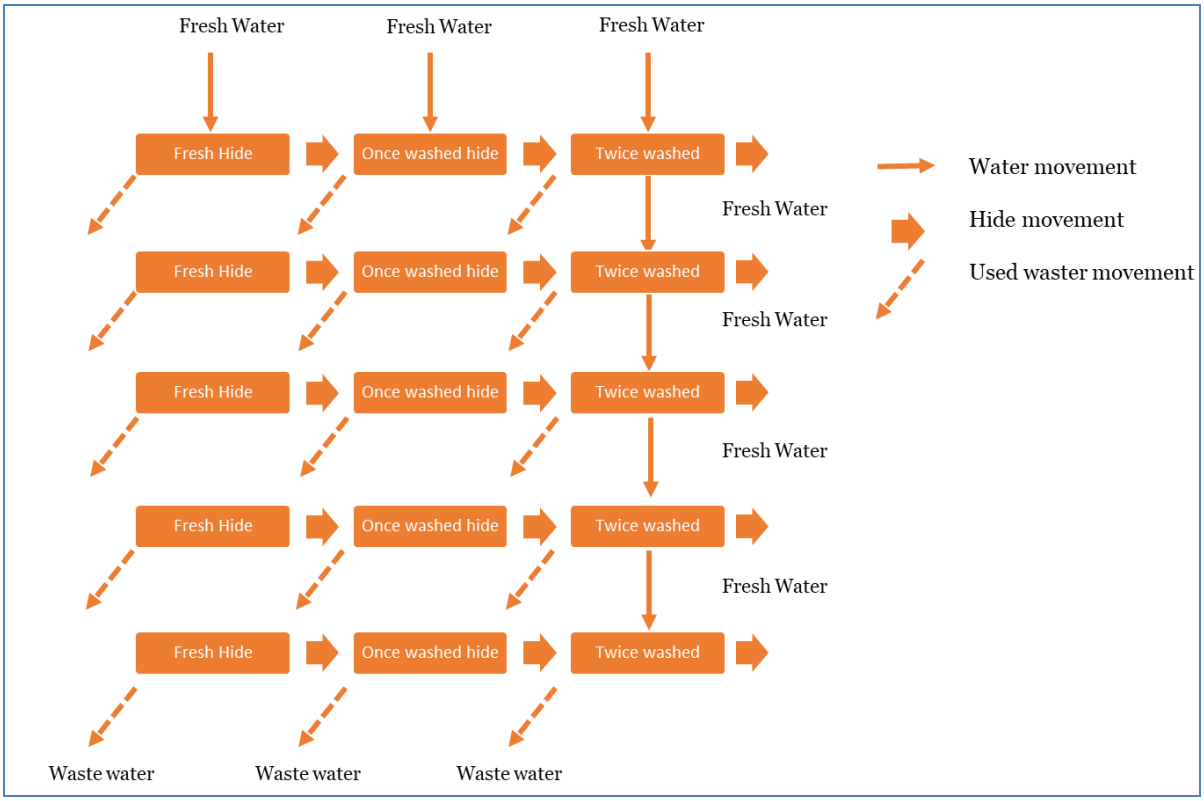


Figure 12: Illustration for reusing waste (Source: V Sundar (2001). Water Management in Leather

Key stakeholder for the intervention:

Stakeholder	Responsibility
BTA, Tannery owners	• **Assess the suitability of recycling of waste liquor for leather produced** • **Align the processes to adopt recycling of process liquors** • **Train the workers sufficiently for adoption of recycling of waste water**

5.6. Environmental compliance++ –Better chemical management

Picture 6: Tannery workers in Bangladesh working with several toxic chemicals but completely unprotected

(Source: http://www.maryscullyreports.com/barbarisms-in-bangladesh-tannery-factories)

Tanning is a hotspot for environmental risks associated with chemical usage. Injudicious usage of chemicals has detrimental environmental as well as health impacts. The studied tanneries in the Savar Industrial Estate had a higher specific chemical consumption compared with international practices. During the processing stage, workers are exposed to hazardous chemicals creating health hazards like skin rashes, chronic bronchitis, gastritis and conjunctivitis. Increased chemical usage intensifies the pollution load of the effluent thereby escalating the effluent treatment costs. As the CETP is currently not functioning effectively, effluent with high chemicals concentration is being discharged to Dhaleshwari river affecting the aquatic life and dependent community negatively. Moreover, high concentration of chemicals like chromium (VI) in produced leather could cause dermatitis in human beings. Several European countries have begun imposing stringent regulations on the presence of chemicals in the leather products. Regulations like EU 301/2014 impose restrictions on leather articles with concentration of 3 mg/Kg or more. Therefore, it is important to manage the chemical usage in the processes to reduce their impact at the effluents as well as the product level and meet the international environmental requirements.

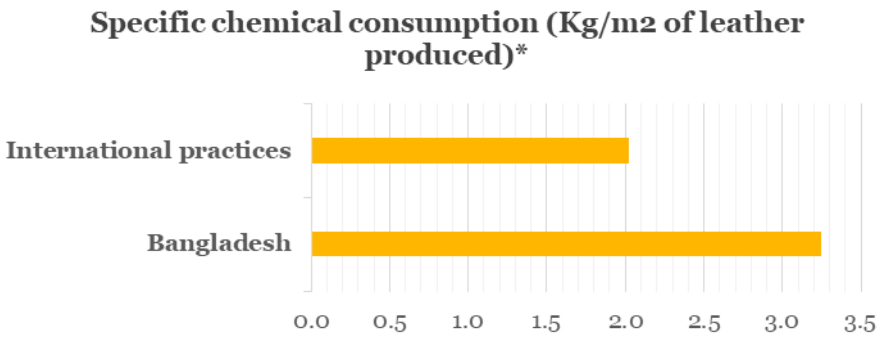


Figure 13: Specific chemical consumption of tanneries in Bangladesh (based on the sample of tanneries studied)

5.6.1. Potential policy level interventions for better chemical management

5.6.1.1. *Well defined policy or guidelines for chemical management*

Issue: Bangladesh's environmental regulations were compared against the environmental regulations of countries like Brazil, Ethiopia, Italy, India and United States. In India, *The Manufacture, Storage and import of Hazardous Chemical Rules, 1989* provides the criteria for categorizing the chemicals into hazardous and schedule 3 of the Rules lists the hazardous chemicals for the industry. In USA, *The Toxic Substances Control Act (TSCA)* addresses the manufacturing, processing, distribution, use, and disposal of commercial and industrial chemicals. In Italy, *Regulation on the Classification, Labelling and Packaging of Substances and Mixtures* regulates the identification and record keeping of the hazardous chemicals being used in the industry and REACH (EC 1907/2006) addresses the production and use of chemical substances. In contrast, there are no regulations in Bangladesh that control the handling, storage and usage of hazardous chemicals, posing serious risk to health of workers and environment.

Due to lack of policies on chemical management, the facilities do not maintain and practice standard procedures for chemical formulations and usage leading to injudicious usage of chemicals in the leather processing. Consequently, the pollutant load in tannery effluent is considerably high. It increases the costs associated with CETP operations and results in ineffectiveness of CETP operations. Absence of effective treatment of effluent is resulting in high pollution load in the Dhaleshwari river. Absence of hazardous chemical handling and storage protocols is detrimental to the workers' health as well. It can cause health hazards like skin rashes, chronic bronchitis, gastritis and conjunctivitis among the tannery workers.

Potential intervention: Better management of chemicals usage could be achieved by formulating and implementing a comprehensive chemical management policy or guidelines. The key features of such a policy or guidelines should be as follows:

- Categorization of hazardous and non-hazardous chemicals
- Formation of hazardous chemical handling and storage protocols
- Development and dissemination of information in the form of safety data sheet and containers labelling
- Record evidence conforming to Manufacturing Restricted Substance List (MRSL) and Restricted Substance List (RSL)
- On site/Off Site Emergency preparedness plan
- Designated authority for monitoring and enforcement

Key stakeholder for the intervention:

Stakeholder	Responsibility
Department of Environment, (DoE) and Ministry of Environment, Forest and Climate Change (MoEF)	• **Design and implementation of comprehensive chemical management policy or guidelines** • **Commissioning independent monitoring agency**
Monitoring and enforcement agency	• **Ensure frequent monitoring of industry on the basis of the formulated chemical management policy**

5.6.2. Potential firm level interventions for better chemical management

5.6.2.1. *SOPs for optimal formulations*

Issue: The specific chemical consumption in tanneries in Bangladesh is 3.2 kg/m^2. It is significantly higher than the specific chemical consumption in some of the international tanneries of 2 kg/m^2.

Potential intervention: To decrease the specific chemical consumption, the tanneries should maintain standard operating procedures (SOPs), defining optimal formulations for the specific leather production and the usage procedures for the same. Optimal formulation should be such that it develops the desired quality of leather with least chemical consumption.

Key stakeholder for the intervention:

Stakeholder	Responsibility
BTA, Tannery owners	Develop a repository of optimal formulations based on the quality of leather Collaborate with leather research institutes like ILET to ensure quality standards of leather are met produced using SOPs for optimal formulations Train workers on using the optimal amount of chemicals according to the SOPs for optimal formulations
Institute of Leather Engineering and Technology (ILET)	Provide technical inputs to ensure development of optimal formulations while maintaining quality standards of the leather produced

5.6.2.2. *Training on safe usage and handling of chemicals*

Issue: Most of the workers in Bangladesh's tanneries work in unsafe conditions with toxic chemicals. They lack necessary Personal Protective Equipment (PPE) like gloves or boots. Most of tanneries lack decontamination processes.

Impact: Exposure of tannery workers to hazardous chemicals leads to health hazards. Consequently, health hazards like gastrointestinal problem, diarrhea, blood pressure, asthma, eye problems are highly prevalent among tannery workers in Bangladesh[32].

Potential intervention: The tanneries should ensure that the workers are provided necessary PPEs and are adequately trained to use them. All the workers should be equipped with necessary PPEs while working with toxic chemicals. Decontamination procedures should be established to neutralize impact of exposure to chemicals.

Key stakeholder for the intervention:

Stakeholder	Responsibility
BTA, Tannery owner(s)	• **Inform the workers about safety and health risks as well as about adequate measures of protection and prevention** • **Provide appropriate safety and health training measures on recruitment**

[32] Mahamudul Hasan MD, Hosain S, Asaduzzaman AM, Haque MA, Roy UK (2016) Prevalence of Health Diseases among Bangladeshi Tannery Workers and associated Risk factors with Workplace Investigation. J Pollut Eff Cont 4:175. doi: 10.4175/2375-4397.1000175

5.6.2.3. *Substitution of environmentally harmful chemicals*

Issue: Some of the chemicals like sulphides and ammonium salts that are being used by the tanners in Bangladesh have significant environmental impacts. Ammonium salts are used in deliming processes. Excess ammonium discharged in effluent increases nutrients in water bodies. This leads to eutrophication, generating algal toxins. It could accumulate in fishes and reach humans during consumption causing muscular paralysis and gastrointestinal symptoms.

Potential intervention: Substitution of the hazardous chemicals with green chemicals – illustrations for use in tanneries are provided in the below table:

Table 8: Potentially harmful chemicals being used in Bangladesh

Harmful chemicals used in tanneries	Impacts	Potential chemical substitution	Environmental benefits from substitution
Sulphides	High amount of sulphides may generate hydrogen sulphide (H2S) gas which is toxic with offensive odour and prolonged exposure may result in olfactory paralysis, severe lung and eye irritation, pulmonary oedema and unconsciousness in humans.	Inorganic sulphides could be partially or completely replaced with organic sulphur compounds including thioglycollate, thiourea derivatives (low sulphide systems).	The consumption and discharge of sulphides to the wastewater using commercial low-sulphide systems, are reduced by 40 – 70%.
Ammonium salts	Excess nitrogenous compounds lead to eutrophication in water bodies. It generates algal toxins which could accumulate in fishes, reaching humans during consumption causing muscular paralysis, gastrointestinal symptoms etc.	Substitution of ammonium compounds by organic acids. Partial replacement using boric acid is also possible	Reduction of nitrogen in the effluents and a reduction of gaseous ammonia that releases during deliming.

Key stakeholder for the intervention:

Stakeholder	Responsibility
BTA, Tannery owner(s)	Identification of environmentally harmful chemicals and potential eco friendlier substitutes
Ministry of Industries	Develop green chemical research and manufacturing centers Subsidies to encourage usage of green chemicals
Customs Wing of National Board of Revenue	Appraisal and adjustment of import duty on hazardous chemical to encourage adoption of green chemicals
Department of Environment, (DoE) and Ministry of Environment, Forest and Climate Change (MoEF)	Preparation and implementation of a sectoral roadmap to phase out environmentally harmful chemicals

Encouraging the establishment of chemical industry - The tanneries in Savar consume around 0.2 million Tons of chemicals annually, predominantly through imports from European countries. The cost of the chemicals consumed by Savar Tanneries (which account for 80% of the tanneries in Bangladesh) is USD 139 Million per year. The absence of chemical industries provides an opportunity for the government to encourage establishment of chemical industry in Bangladesh by tapping into the investments from FDI, Institutional investors. The output of chemical industries is sector agnostic and can cater to the increased use of chemicals in leather sector, RMG sector amongst others. Encouraging the growth of the chemical industry can also stimulate the investment in the R&D of the green chemicals production domestically – Once the chemical industry in Bangladesh matures, exploration of investing in the R&D of green chemicals for organic growth could be considered.

5.7. Environmental compliance++ – Better energy management

Both the tanning and leather goods segment of the value chain are energy intensive and are dependent on the grid electricity to meet the power requirement at their facilities. The total installed capacity of Bangladesh is 15.9 GW and predominantly relies on natural gas (62% of grid installed capacity) and oil (21% of installed capacity) to meet the electricity requirement of the country. The rising cost of oil imports and decreasing level of reserves of natural gas has resulted in GoB to increase the electricity tariff, affecting the competitiveness of the leather industry. Coupled with the global buyer's paradigm shift towards environment and social sustainability necessitates the industry to adopt better energy management practices encompassing (i) improved energy efficiency or (ii) installation of renewable energy sources.

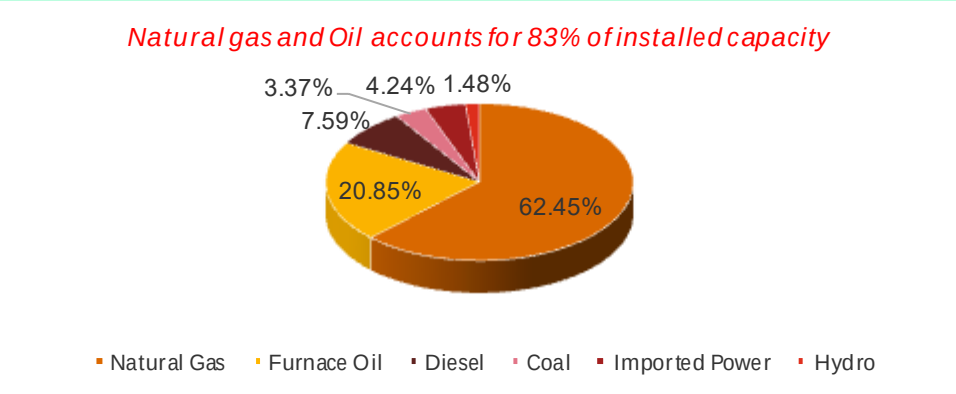


Figure 10: Share of energy sources in Bangladesh

5.7.1. Energy consumption in leather industry

Tanning segment: The energy consumption in tanneries depends mainly on the production methods, capacity of the facility, size and electrical rating of the equipment, amount of mechanization in handling the raw hide, drying method and heat losses from process vessels. However, this energy consumption rises significantly if the equipment installed are neither standard nor operated under standard operating conditions. The poorly performed mechanical operations such as splitting, sammying and shaving not only degrade the quality, also reduce the yield, eventually hitting the bottom line. The cost of rework, precisely as reprocessing of batches not meeting the quality standards of customers adds to cost and high-energy consumption.

The parameter to measure the facility energy efficiency is specific energy consumption; defined as the energy consumed per ton of rawhide processed in tannery. This is calculated using the primary

source data collected by stakeholder consultation and visiting the tanneries. Figure 11 indicates that the average specific energy consumption of tanneries located in Savar region of Bangladesh is significantly higher than international practices.

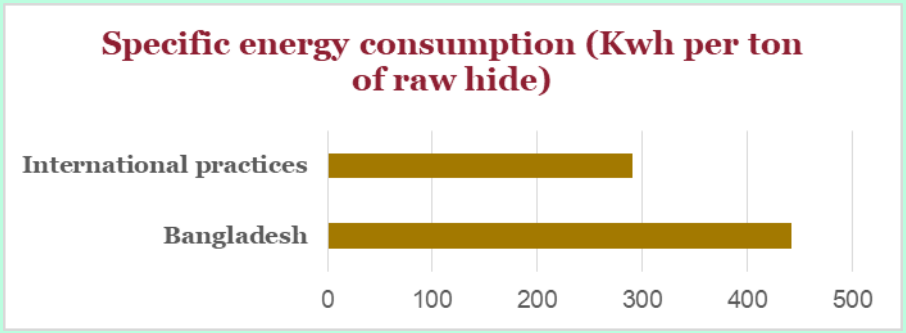


Figure 11: Specific energy consumption in tannery

The high specific energy consumption in tanneries is due to low efficiency motor drives, wooden drums, locally manufactured washing drums, continuous operation of equipment, use of long floats and reconditioned air compressors.

Leather goods and footwear: The segment is one of the highly fragmented sectors in the Bangladesh comprising of more than 3500 micro, small and medium enterprises (MSMEs) along with 90 large players, catering to both domestic and international demand. Based on the factory visits and stakeholder consultations, the specific energy consumption for a pair of shoe produced in Bangladesh is shown as below:

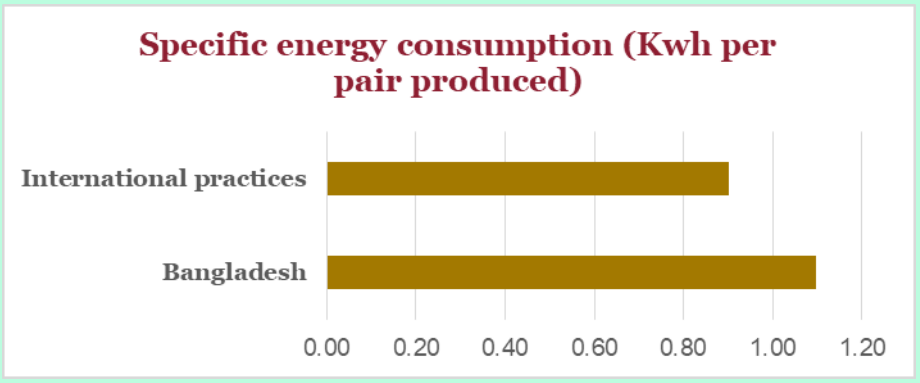


Figure 12: Specific energy consumption in leather and footwear industry

The high specific energy consumption in leather goods and footwear are due to factors as refurbished drives, conventional heat setter machines and refurbished air compressors purchased from scrapped ships.

5.7.2. Potential interventions for better energy management

5.7.2.1. *Promoting energy efficiency through policy level interventions*

The potential policy interventions that can support the proliferation of the energy efficient technologies include:

- ***Developing Energy efficiency standards:*** Energy efficiency standards encompassing the measurement, calculation and test methods can be developed to facilitate the adoption of energy efficient equipment.

- ***Access to Finance:*** The leather goods and footwear manufacturers are constrained by lack of access to finance for investment in green technologies and processes. The existing Green Transformation Fund (GTF) can be expanded to cover financing new energy equipment, increase the fund size and reduce the complexities in accessing the fund. Inclusion of leather sector's technologies under the eligible technologies in the Energy Efficiency and Conservation Promotion Financing project shall promote proliferation of energy efficient equipment by easing access to finance for the sector.
- ***Increased fiscal incentives:*** Extending the fiscal incentives such as tax exemption, lower tax rates to the resource efficient technologies.
- ***Pre-approved database of energy saving potential of various equipment***
- ***Establishment of accredited testing laboratories:*** Testing and calibration laboratories accredited by Bangladesh Accreditation Board (BAB) through ISO 17025 need to be established in Bangladesh in addition to the BSTI.
- ***Energy Efficiency verification system:*** A label certification body shall evaluate the EE test report and issue label certificate on the product with star rating, and deliver it to the manufacturer/importer. The energy efficiency labels on equipment should be verified by 3rd party agencies to maintain credibility of labels.
- ***Phase out plan for energy inefficient equipment:*** Once the market has equipment labelled according to a harmonized system, the government shall issue phase out plans for the energy inefficient equipment. The government shall provide the minimum energy efficiency standards for the equipment used in leather sector (could be extended to other sectors). This measure being sector agnostic, along with necessary fiscal support, will provide conducive ecosystem for adoption of energy efficient equipment in Bangladesh's overall industrial sector.

5.7.2.2. *Promoting energy efficiency through firm level interventions*

Policy intervention: In addition to the support from GoB through policy interventions the firms can adopt the following energy efficient measures to reduce their energy consumption:

i. ***Higher efficient motors*:** The major consumer of energy in a mechanical equipment is the motor. In tanneries, the drum tanning, drum soaking and drum dyeing processes required high electrical rating motor to produce the rotational motion. High-efficiency motors (HEM) are 10-20% more efficient than the conventional motors installed in the tannery units of Bangladesh. Most of the tanneries in Bangladesh install a refurbished drive or old scrap motor purchased from ship breaking yard

ii. ***Variable frequency drive (VFD):*** Inclusion of VFD to a motor driven system offer substantial energy savings as system load varies over time. Its installation on washer pump motors, fan motors and air compressors could yield an energy saving of 50% for a reduction in speed of 20%. The cost of 7.5 Kw VFD for a motor is approx. 37,500 taka. High cost, unavailability and enforcement of appliance standards along with no information dissemination about benefits of the VFD, may be the prime reason for non-installation in the facilities.

5.7.3. ***Assessment of potential renewable energy technologies***

Bangladesh has substantial renewable energy potential and majority of the existing investment has been in the off-grid technology namely solar home system (SHS), solar microgrid and irrigation pumps. With rising energy demand and shortfall in production of natural gas, it has become imperative to exploit the inherent renewable energy potential to its maximum. The primary renewable energy sources in Bangladesh include solar, biomass and biogas, with a total installed capacity of 437 MW[33], comprising of 230 MW grid connected hydropower and 14 MW rooftop solar.

The tanning and leather manufacturing segment of the leather sector can also achieve an improved energy management through various renewable energy options, a comparative assessment of the same is provided in the below table:

[33] https://www.climateinvestmentfunds.org/sites/cif_enc/files/bangladesh_srep_ip_final.pdf

Table 9: Comparative assessment of renewable energy options in Bangladesh

	Rooftop Solar	Group Captive	Gasification
Resources availability	Available Potential generation based on the roof size of the tanneries visited: **153 MW**	Area required for **1 MW** plant: **2.5 acre**	Solid waste available in Savar Region**: 779 ton/day**
Cost of installation (per MW)	**7 Crore BDT** (without roof modification)	**BDT 6.3 Cr**	**BDT 16 Cr**
Levelized cost of generation	**6.2 BDT / Kwh**	**6.3 BDT/Kwh**	**10 BDT / Kwh**
Capacity utilization factor	15%	15%	75%
Current grid off-take	**8.15 BDT / Kwh**	**8.15 BDT /Kwh**	**8.15 BDT /Kwh**
Regulatory framework required to support proliferation of the RE technology	1. Building codes for structural stability of buildings needs to be established 2. Formulation of regulations on wheeling charges, distribution charges and cross-subsidy charges applicable for Savar region		• **Framework to embed the Waste to energy as part of integrated solid waste management system tailored to the specific local conditions** • **Framework which guarantees legal security and is based on transparency and trust** • **Segregation facility and mechanism needs to be established to minimize the variability in the feed**

The preliminary findings of the study indicate greater viability of implementation of the solar rooftop systems for the tanneries in Savar region considering (a) the tanneries are located in a cluster (b) the availability of the roof size. The rooftop systems can be implemented by RESCO model which will ensure that the tanneries are not constrained by high capital investment. There is an opportunity to install ~150 MW of the rooftop systems for tanneries in Savar region. This would require investments of size of 150 million USD. The investment opportunity for solar rooftop systems can be sector agnostic as well and can cater to the increasing electricity demand of RMG, plastic and light engineering sectors as well.

For proliferation of the renewable energy technologies, Government of Bangladesh can support the sector through various policy interventions which include:

- Accelerated depreciation
- Tax holiday for small and medium enterprises (SMEs)
- Including renewable energy as part of Priority sector lending (PSL)
- Viability gap funding (VGF)
- Pooled vehicle concept for cluster level financing

5.7.3.1. *Regulatory interventions to proliferate renewable energy*

The potential policy interventions that can support the proliferation of the renewable energy technologies include.

Accelerated depreciation: Here, an asset loses book value at a faster rate than it would in traditional depreciation methods such as the straight-line method. This allows the deduction of higher expenses in the initial years after investment, eventually reducing the tax liability

Tax holiday for small and medium enterprises (SMEs): A government incentive program that offers a tax reduction or elimination to businesses for a temporary period in order to stimulate investment and encourage economic activities. It should be for periods ranging from 5 to 10 years

Priority sector lending (PSL): Priority sector means those sectors, which the GoB and Bangladesh Bank consider as important for the development of the basic needs of the country and are to given priority over other sectors. Inclusion of renewable energy in PSL may help the project developers to secure funds at lower interest rates. The current rate of interest for industrial loan ranges from 12 to 15%

Viability gap funding (VGF): An economic instrument to support projects that are economically justified but fall short of financial viability. The lack of financial feasibility may be due to long span of time to recover the capital expenditure and inability to increase the user charges to commercial levels. Through the provision of one time, grant assistance to the capital cost, these projects may become bankable and help mobilize private investment in renewable energy technologies.

Pooled vehicle concept: These funds are funds from many individual investors that are aggregated for meeting of same objective. This methodology puts emphasis on cluster level financing and can be used to finance grid based solution, wherein the entire cluster of tanneries benefits from the project

5.8. Environmental Management Systems

An Environmental Management System (EMS) is a technique allowing operators of installations (tanneries and leather footwear and goods manufacturers) to address environmental issues in a systematic and demonstrable way. ISO-14001 is one of the most popular standard that organizations can certify to for setting an effective Environmental Management System. To cope with the challenges and requirements of quality, safety, environmental management and social accountability, companies look for norms, standardized rules and certification systems. In this sense, they work to put in practice an effective system that can be integrated into other management requisites, helping them to achieve their economic and environmental objectives. Since the official launch of ISO 14001 in 1996, more than 320,000 organizations worldwide have certified their Environmental Management Systems (EMSs) through this standard.

In order to avoid problems of asymmetric information from the suppliers on the environmental performance, the global brands are relying on such certification to legitimize their actions under their company environmental policy and commitment and demanding as a key requirement from their suppliers.

Many brands demand ISO-14001 certification

1. **Adidas Group** expects its suppliers' activities to be compatible with its Integrated Management system (IMS) Policy. ISO-14001 is an important part of their Integrated Management System Policy.
2. **Puma** requires all its suppliers to implement a sound Environmental Management System. In this regard, Puma encourages suppliers to secure a certified EMS program like ISO 14001 and/or the EU Eco-Management and Audit Scheme EMAS[34].
3. **Hush Puppies** sources all of the leather from ISO 14001 certified tanneries only[35].

[34] http://about.puma.dievision.de/damfiles/default/sustainability/environment/environmental-KPIs/PUMASafeEnvironmentalHandbookVol1-7d7c317782dd612e77380c5e6896b133.pdf
[35]https://www.hushpuppies.co.za/store/index.php?option=com_content&view=category&layout=blog&id=3&Itemid=35

5.8.1. Status of Bangladesh's leather sector on EMS

To understand the EMS implementation, field visits to the tanneries and leather goods and footwear manufacturers were conducted. The leather goods and footwear-manufacturing segment performed better than the tanneries segment on implementation of EMS. ***Out of the surveyed leather footwear and leather goods manufacturers, 38% did not have ISO 14001 certification***. It suggests a substantial scope of improvement on EMS implementation exists for the leather goods and footwear-manufacturing segment.

In the tanning segment, only one of the surveyed tanneries had ISO 14001 certification. The primary reason of non-compliance of tanneries to ISO 14001 is the ineffective CETP operations in Savar.

5.8.2. Key requirements of an EMS

An Environmental Management System (EMS) is based on plan–do–check–act (PDCA) approach. As part of EMS, an organization should establish and maintain programs for:

- Identification of significant environmental aspects
- Monitoring and measuring, on a regular basis, the key characteristics of identified operations
- Achievement of set environmental targets
- Ensuring availability of documents like policy, an aspect list(s), a legal list(s), an environmental action plan, procedures created by organization
- Identification and delivery of training to personnel who could have significant environmental aspects
- Identify potential for and respond to accidents and emergency situations and for preventing and mitigating the environmental impacts that may be associated with them

- Defining responsibility and authority for handling and investigating nonconformance, taking action to mitigate any impacts caused and for initiating and completing corrective and preventive action need to be defined
- Conducting EMS audit and management review

5.8.3. Costs associated with EMS implementation

Depending on the baseline state of manufacturing unit, EMS implementation costs may vary considerably. The key costs components for implementation of an EMS like ISO 14001 includes[36]:

Cost of acquiring information and technologies necessary for completing the certification requirements;

[36] Mitigating the High Cost of ISO 14001 EMS Standard Certification: Lessons from Agribusiness Case Research. https://ageconsearch.umn.edu/bitstream/8122/1/0702yi01.pdf

Costs associated with record keeping and documentation, and changes in practices necessary for meeting the requirements of the ISO 14001 EMS;

Employee training, and the opportunity cost of down time due to nonconformance;

Auditing costs which would include both internal and third party auditing costs to verify that the policies and practices established by the organization and required by the standard are being followed; and

Registration cost that are paid to an accredited registrar (i.e., national agency that oversees ISO standardization)

The following table provides the number of days required for an ISO 14001 audit. ***Audit in leather processing is considered as highly complex.*** EMS certification fee of an auditor for one man-day is approximately USD 500. Based on the table below, a tannery employing 50 workers would need approximately 8 mandays of audit. An audit fees of around USD 4000 could be expected for the audit of such a tannery.

Table 10: Summary of approximate duration of the EMS audit basis the number of employees

Effective number of employees	Audit Duration (days)			Effective number of employees	Audit Duration (days)		
	High	Med	Low		High	Med	Low
1-5	3	2.5	2.5	626-875	17	13	10
06-10	3.5	3	3	876-1175	19	15	11
11-15	4.5	3.5	3	1176-1550	20	16	12
16-25	5.5	4.5	3.5	1551-2025	21	17	12
26-45	7	5.5	4	2026-2675	23	18	13
46-65	8	6	4.5	2676-3450	25	19	14
66-85	9	7	5	3451-4350	27	20	15
86-125	11	8	5.5	4351-5450	28	21	16
126-175	12	9	6	5451-6800	30	23	17
176-275	13	10	7	6801-8500	32	25	19
276-425	15	11	8	8501-10700	34	27	20
426-625	16	12	9				

5.8.4. *Benefits of EMS implementation*

Costs on EMS implementation are justified only when the benefits from EMS implementation outweigh the associated costs. Achieving accredited certification to ISO 14001 certainly brings commercial value to an organization, including reduced greenhouse gas emissions and streamlined waste management, as well as providing a better handle on business risk and competitive advantage. The adoption of an EMS enables enterprises to increase their operating efficiency, management of chemical products and waste, emergency preparedness and response, etc.

EMS systems were implemented on 20 leather sector SME's of Bangladesh in Switch Asia's ECOLEBAN project[37]. Some of the key benefits of EMS implementation were:

[37] Implementing an environmental management system and eco-label in Bangladesh's leather industry. Switch Asia. url extracted: https://www.switch-asia.eu/fileadmin/user_upload/Publications/2017/ECOLEBAN/Switch_Asia_Impact_Sheet_-_2017_-_ECOLEBAN.pdf

Process waste reduced by 10%. Waste was segregated properly and in some cases, it was sold instead of dumping in landfills.

Noise and lighting conditions improved in SMEs implementing the EMS

It improved the chemical waste management of the SMEs

It enhanced the emergency preparedness of the SMEs

Other benefits the implementation of the EMS include, improving company's image, meeting buyers' requirement and increasing customer base and reducing the risk of non-compliance to environmental regulations

CONCLUSION

Conclusion

For the leather sector to evolve into a USD 5 billion export market by 2021, adherence to the evolving sustainability requirements of the global brands will be the key determinative factor. As a response to the issue of pollution of the Buriganga river due to untreated effluent discharge from the tanneries, Government of Bangladesh took an initiative of shifting tanneries from Hazaribagh to Savar Industrial Estate with the provision of Common effluent treatment. However, the move has still not been able to achieve its core objective of curbing the pollution as the load has just been shifted from Buirganga river to Dhaleshwari with ineffective operations of CETP. Key observation of the current study is that a single measure may not be sufficient to resolve the issue and a holistic program encompassing both policy level as well as firm level interventions are required to address the problem as a whole.

To ensure an improved environmental performance, it is essential to identify and prioritize areas for regulatory and firm level interventions for embedding sustainable production practices across the existing value chain of leather sector in Bangladesh. The interventions need to rolled out in a phased approach where the objective of the first phase should be to achieve the compliance with the existing environmental norms. Constructing on the compliance requirement, Bangladesh leather sector need to establish the processes to achieve the stage of compliance ++ and achieve recognition through international certifications like LWG.

Apart from strengthening the environmental regulatory enforcement, Government of Bangladesh needs to support the firms by driving cash inflow through FDI's, expanding the size of existing funds such as GTF for financing the RE technologies creating an investor friendly climate for the DFI's (Development Finance Institutes) and FI's (Financial Institutes). For driving the sustainability agenda sectoral investment of size of at least USD 500 million needs to be catalyzed to abridge the existing access to finance gaps. This provides an investment opportunity for the DFI's, impact investors, growth capital funds to tap into for proliferation of sustainability initiatives with positive returns like investment in finishing machinery, development of chemical industry with gradual transition towards green chemical industry, installation of roof top solar systems and volume control systems like AQUAMIX.

Driving the sustainability agenda will also require a multi-dimensional collaborative platforms between the private sector players, the buyers, various financial institutions, regulatory institutions, ministries for continuous and cohesive dialogue to create an inclusive partnership. One such platform is Business Initiative Leading Development (BUILD) that is launched to facilitate structured dialogues between the public and the private sectors under an institutional framework. For the success of driving the initiatives for better environmental performance of the sector, more such platforms need to evolve for promoting the discovery, transfer and dissemination of the sustainability agenda. The dialogue platform should highlight the need of collaborative working between the large scale and SME industries, the involvement of buyers to drive the sustainability agenda, the need of multilateral and regional financial and development institutions for catalyzing the investment, civil societies, universities and research institutions to consider possible arrangements for a facilitation mechanism to promote the sustainability agenda. Such platforms should also facilitate identifying and highlighting the synergies, areas of duplication and opportunities for cooperation between existing mechanisms and processes, which would help in the improvement of the coherence and enhancing inter-linkages. The platforms should also focus on the involvement of think tanks, from the perspective of the research & development, fostering innovation, including the diffusion of the proven technologies to meet the evolving requirements of the sustainability agenda.

ANNEXURES

Annexure 1 – Stakeholder engagement

Picture 1: Validation workshop held by PwC at the IFC office on 13th of August 2018

The study was primarily based on the stakeholder consultations that were conducted throughout the study with multiple stakeholders with diverse background. Apart from collecting the primary data from factory surveys, a validation workshop was conducted on 13th August 2018 to validate the data received from the primary survey and the analysis done by the in-house expert

The workshops were important for validating the value chain and associated issues. In addition, the session with stakeholders from diverse institutional settings facilitated the streamlining and finalization of implementation-worthy recommendations. The dialogue sessions provided fact-based and research-based recommendations, which, if implemented, could contribute towards sustainable growth of the sectors.

The key participants of the validation workshop included representatives from Ministry of Commerce, BUILD, EC4J Project, Department of Environment, Bangladesh Tanners Association, BUET, BSCIC, tanneries and leather goods and footwear manufacturers. Participant list has been provided below:

1. List of participants in validation workshop for leather sector

Participants from public sector:

Name	Organization	Designation
Md. Obaidul Azam	Ministry of Commerce	Additional Secretary
Mustain Billah	EC4J Project	Component Coordinator
Syed Nazmul Ahsan	Department of Environment	Director- EC
Sanjoy Thakur	BUET BRTC	Consultant

Participants from private sector:

Name	Organization	Designation
Md. Belal Hossain	ABC Footwear Industries Ltd.	Senior Officer
Md. Nazmul Islam Khan	Apex Tannery Ltd.	GM Technical
Atiqul Islam	Apex Footwear Ltd.	GM- Leather
Md. Zahidul Islam Siam	Escort Footwear (BD) Ltd.	Designer
Md. Nurul Islam	Bangladesh Tanners Association	Secretary
Farid Uddin Ahmed	Picard Bangladesh	Compliance Officer
Nazmul Huda	Fancy Leather Complex	Managing Director

Participants from public-private collaborated agencies:

Name	Organization	Designation
Dr. Rabiul Amin	BUILD	Consultant
Chaity Ghosh	BUILD	Research Associate
Minhazur Rahman	BUILD	Research Associate
Jannatul Ferdous Shetu	BUILD	Research Associate

The key points that were discussed during the validation workshop are and the several views on that has been summarized below:

i. Slaughterhouses and Traceability of leather:

Bangladesh's slaughtering industry is dominated by small-scale household level slaughterhouses. Animal sacrifices in Eid-Ul-Adha generates more than 50 percent of the total annual hide collection in Bangladesh. Inexperienced flaying of the skin damages the produced hides, which effects the quality of the finished leather produced from the hide. To counter these challenges, Bangladesh should focus on increasing the number of large-scale modern slaughterhouses to ensure the traceability of the hide as well as quality of leather.

ii. Waste Management and Recycling

The tannery industrial estate in Savar does not have a proper waste management facility. Waste is dumped haphazardly and there are no efforts of reusing or recycling the generated waste. In developed countries, the fleshing and trimmings generated in tanneries are used to produce leather

boards, gelatin or adhesives. The tannery estate as a whole generates a large quantity of solid waste at one place. Recycling these wastes could prove to be cost-effective as the associated collection and transportation cost shall be minimal. This poses an opportunity for the sector.

A salt recovery system in association with a salt management plan could be adopted to recover salts from waste water and reusing it in the tanning process. Cold storages could be adopted within the hides supply chain to reduce the salt usage in the long run.

iii. Tannery Industrial Estate- CETP

The participants were concerned about the effectiveness of CETP. International regulations and buyers' requirement on wastewater treatment are becoming stringer. The sector is struggling to compete in the international market and the private sector fears further loss of market share due to non-compliance.

Despite claims of improved performance of the CETP by relevant authorities, there is a need for an independent total assessment so that a comprehensive corrective action could be formulated in order to make the CETP operations effective. This will help the industry increase its exports.

iv. Energy and Water Use-Efficiency

Most of the tanneries are using old and inefficient motors. Replacing these motors with energy efficient motors shall result in energy savings and reduced sound pollution by the drums. There is a need for raising the awareness about the benefits of using energy efficient equipment among the private sector players through demonstrations.

Water use efficiency is one of the key requirements for LWG certification. If there is interest from the private players to implement water efficiency projects then ministry of commerce can extend grant facilities to fund such projects.

v. Chemical Consumption

Bangladesh does not have any chemical usage and chemical safety regulations or guidelines. There are no standard operating procedures for chemical usage to process leather. The recipes for various chemicals need to be optimized and standardized so that chemical usage can be controlled.

Annexure II – Stakeholder Mapping for policy recommendation

Business Initiative Leading Development (BUILD) was launched jointly by the Dhaka Chamber of Commerce and Industry (DCCI) in partnership with the Metropolitan Chamber of Commerce and Industry (MCCI) and Chittagong Chamber of Commerce and Industry (CCCI) in October 2011 as a Public Private Dialogue (PPD) platform to facilitate structured dialogues between the public and the private sectors under an institutional framework.

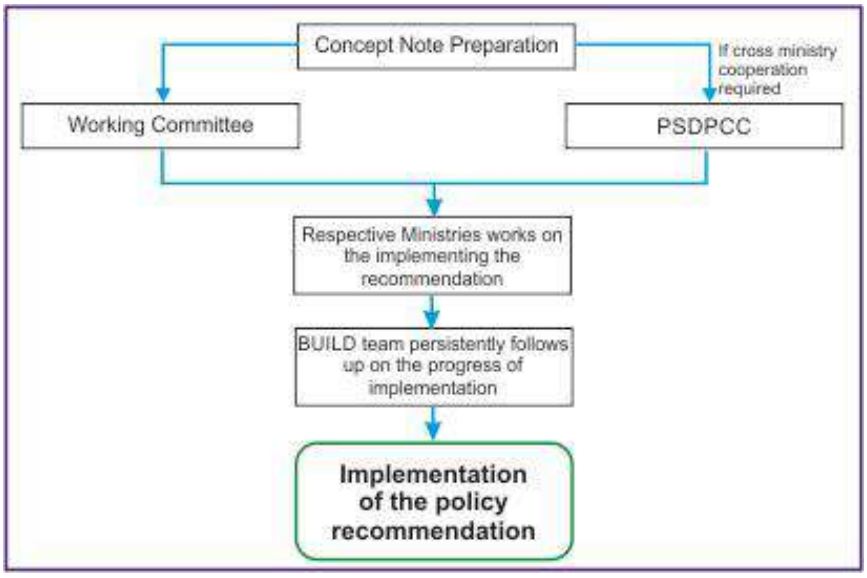
BUILD is the bridge that connects the public and private sector for better communication, coordination and collaboration in bringing reforms in business policies and procedures to improve the country's investment climate in Bangladesh. BUILD has been recognized as the primary source of recommendations for meetings of the PSDPCC (Private Sector Development Policy Coordination Committee), established at the Prime Minister's Office (PMO).

Currently, BUILD has five working committees which are as follows:

Theme	*Private Sector Co-Chair*	*GoB Co-Chair*
Trade & Investment	President, MCCI	Secretary, Ministry of Commerce
SME Development	Managing Director, SMEF	Secretary, Ministry of Industries
Financial Sector Development	President, DCCI	Deputy Governor, Bangladesh Bank
Taxation	President, FBCCI	Chairman, National Board of Revenue
Sustainability and Green Growth	President, BGMEA	Secretary, Ministry of Environment and Forests

BUILD has been recognized as the primary source of recommendations for meetings of the Private Sector Development Policy Coordination Committee (PSDPCC), established at the Prime Minister's Office (PMO). The meetings are organized twice annually. PSDPCC is comprised of representatives from 17 Ministries of GoB, 5 Chamber Presidents and PMO members.

BUILD prepares the concept note for the policy and it goes to either the working committee or PSDPCC depending upon the requirement of cross ministry involvement or not. Diagram below outlines the procedure for the policy recommendation:



20% of the working committee members are fixed, whereas the rest are included in the working committee depending upon the proposed intervention. BUILD identifies and suggest the potential working committee members for the assessment of the policy that is to be recommended.

The stakeholder mapping was done for each policy recommendation and it has been suggested that for each of the policy recommendation, these stakeholders are considered as the potential members for the working committees for the respective policy.

The summary of the stakeholder is provided below:

1. Chillers at Aroths for reducing salt usage

Stakeholder	Organization	Responsibility
1. Delwar Hossain, Chairman	Bangladesh Hide and Skin Merchant Association	• **Identification of key rawhide market places for deployment of chillers**
2. Md. Shaheen Ahmed, President, BTA 3. (ii) Mohammad Nurul Islam, Secretary, BTA	Bangladesh Tanners Association	• **Identify tanneries that should prefer rawhides preserved with salt-less preservation techniques** • **Establish contracts of procuring a certain proportion of rawhides from the rawhide traders using chiller systems for preservation of rawhides**
4. Md. Mosharaf Hossain, President	Bangladesh Cold Storage Association	• **Preparation of action plan for inclusion of rawhides in the existing infrastructure for meat, agricultural industry**
5. Parag Huq, Additional Secretary, Ministry of Industries	Ministry of Industries	• **Encourage installation of chillers and cold storage supply chains by providing incentives like capital subsidies, interest reimbursement etc.**

2. Awareness campaigns for controlling salt usage

Stakeholder	Organization	Responsibility
1. Delwar Hossain, Chairman	Bangladesh Hide and Skin Merchant Association	• **Design awareness campaigns and training programs to promote optimal usage of salt for hide preservation**

3. Modernizing slaughterhouses for enhanced slaughterhouse effluent treatment

Stakeholder	Organization	Responsibility
1. Parag Huq, Additional Secretary, Ministry of Industries	Ministry of Industries	• **Extend financial support for capital expenditure for building, plant & machinery and effluent treatment plant to catalyze the modernization process**
	Slaughterhouses	• **Install equipment for modernizing the facility** • **Train workers in using modern equipment**

4. Regulating effluent discharge at CETP inlet

Stakeholder	Organization	Responsibility
1. Dr. Sultan Ahmed, Director General 2. Prodoush Kanti Das, Director (Law) 3. Syed Nazmul Ahsan, Director (EC)	Department of Environment	• **Setting up pre-treatment standards in consultation with the operation team of CETPs in Bangladesh**
4. Shabbir Ahmed, Deputy Secretary and PD, BSCIC & TIE 5. Engr. Sehly Sadeque, BSCIC, MOI 6. Prof. Dr. Md. Delwar Hossain, BUET-BRTC	Operations teams, CETPs	• **Provide the design specifications of CETPs to DoE for indicative limits on pretreatment standards**
7. Dr. Md. Aftab Ali Shaikh, Professor & Director 8. Sobur Ahmed, Ast. Professor	Institute of Leather Engineering & Technology (ILET)	• **Provide technical inputs on defining standard limits based on the Best Available Technology in Bangladesh**

5. Standards of effluent discharge for critical parameters need to be revised in line with international best practices

Stakeholder	Organization	Responsibility
1. Dr. Sultan Ahmed, Director General 2. Prodoush Kanti Das, Director (Law) 3. Syed Nazmul Ahsan, Director (EC)	Department of Environment	• **Setup standards for missing parameters (Hexavalent chromium, COD etc.)** • **Strengthening the standards for less stringent parameters**
1. Dr. Md. Aftab Ali Shaikh, Professor & Director 2. Sobur Ahmed, Ast. Professor	Institute of Leather Engineering & Technology (ILET)	• **Provide technical inputs on defining standard limits based on the Best Available Technology in Bangladesh**

6. Strengthening of third party monitoring and enforcement (SCADA systems)

Stakeholder	Organization	Responsibility
1. Dr. Sultan Ahmed, Director General 2. Dr. Mollik Anowar Hossain, Director (Enforcement) 3. Syed Nazmul Ahsan, Director (EC)	Department of Environment	• **Accrediting independent agencies for monitoring the effluent** • **Periodic inspections for ensuring seamless monitoring by the independent agency**
	Independent monitoring agency	• **Real time monitoring of the effluent characteristics**
1. Shabbir Ahmed, Deputy Secretary and PD, BSCIC & TIE	BSCIC	• **Commissioning independent monitoring agency** • **Infrastructure provision for implementing the real-time monitoring system**

7. Pricing on effluent treatment based on pollutant load (BOD, SS, etc.)

Stakeholder	Organization	Responsibility
1. Md. Shaheen Ahmed, President, BTA 2. Mohammad Nurul Islam, Secretary, BTA 3. Mohiuddin Ahmed Mahin, President, BFLLFEA 4. Md. Jainal Abedin, Secretary, BFLLFEA 5. Shabbir Ahmed, Deputy Secretary & Project Director (PD), BSCIC & TIE	Committee as per tripartite MoU	• **Setup pricing mechanism based on pollution load**

8. Management of operations and maintenance of effluent treatment

a. Encouraging Public Private Partnership for CETP operations

Stakeholder	Organization	Responsibility
1. Syed Afsor H. Uddin, Chief Executive Officer	PPP Authority, Bangladesh	• Assessment of feasibility of developing the project in PPP mode • Structure the project, formulating concessionaire agreement, running the bid process for section of the concessionaire

b. Permitting ETP's for individual tanneries at Savar

Stakeholder	Organization	Responsibility
1. Dr. Sultan Ahmed, Director General Prodoush Kanti Das, Director (Law)	Department of Environment, DoE	• **Setup criteria for granting permission to tanneries to set up individual ETP**

9. Segregation of effluent in to soak, chrome and beam-house liquor for effective treatment

Stakeholder	Organization	Responsibility
1. Md. Shaheen Ahmed, President, BTA 2. Mohammad Nurul Islam, Secretary, BTA	Tanneries	• **Installation of automatic segregation systems**

Stakeholder	Organization	Responsibility
3. Mohiuddin Ahmed Mahin, President, BFLLFEA 4. Md. Jainal Abedin, Secretary, BFLLFEA 5. Shabbir Ahmed 6. Deputy Secretary & Project Director (PD), BSCIC & TIE		
1. Dr. Sultan Ahmed, Director General 2. Dr. Mollik Anowar Hossain, Director (Enforcement) 3. Syed Nazmul Ahsan, Director (EC)	Department of Environment	• **Ensure enforcement of segregation of liquor through independent accredited agency**
4. Shabbir Ahmed, Deputy Secretary and PD, BSCIC & TIE	BSCIC	• Provision of infrastructure such as segregation pipelines at the discharge of tanneries to CETP

10. Installation of pre-treatment systems at the tanneries

Stakeholder	Organization	Responsibility
1. Dr. Sultan Ahmed, Director General 2. Dr. Mollik Anowar Hossain, Director (Enforcement) 3. Prodoush Kanti Das, Director (Law)	Department of Environment	• **Setup pretreatment standards** • **Monitoring of effluent quality at tannery outlets and CETP inlet**
1. Md. Shaheen Ahmed, President, BTA 2. Mohammad Nurul Islam, Secretary, BTA 3. Mohiuddin Ahmed Mahin, President, BFLLFEA 4. Md. Jainal Abedin, Secretary, BFLLFEA 5. Shabbir Ahmed, Deputy Secretary & Project Director (PD), BSCIC & TIE	Tannery management	• **Conduct a detailed assessment of tannery effluent quality against DoE's pre-treatment standards and install necessary equipment to achieve the same**

11. Well defined guidelines for solid waste management

Stakeholder	Organization	Responsibility
1. Dr. Sultan Ahmed, Director General 2. Prodoush Kanti Das, Director (Law)	Department of Environment, (DoE) and Ministry of Environment, Forest and Climate Change (MoEF)	• **Design and implementation of comprehensive solid waste management policy** • **Commissioning independent monitoring agency**
	Monitoring and enforcement agency	• **Ensure frequent monitoring of industry on the basis of the formulated solid waste management policy**

12. Establish circular economy by utilizing solid wastes

Stakeholder	Organization	Responsibility
1. Md. Shaheen Ahmed, President, BTA 2. Mohammad Nurul Islam, Secretary, BTA 3. Mohiuddin Ahmed Mahin, President, BFLLFEA 4. Md. Jainal Abedin, Secretary, BFLLFEA 5. Md. Saiful Islam, President, LFMEAB 6. Ms. Kazi Roushan Ara, Executive Director, LFMEAB	BTA, LFMEAB, Individual units	• **Identification and establishment of contract with potential user industries**
	DFI's such as World Bank Group etc	• **Assess the feasibility of using these wastes in other industries** • **Develop PPP (Public-Private Partnership) models to use these wastes in other industries**

13. Regulating ground water abstraction

Stakeholder	Organization	Responsibility
1. Bodrun Nahar, DG, WARPO 2. Md. Rezaul Karim, Principle Scientific Officer, PSO, Engineering Section, WARPO	WARPO	• **Declaration of water stressed areas** • **Determine safe-yield for water consumption in water stressed areas** • **Price ground water in water stressed areas** • **Mandate installation of metered wells for industrial use**

14. Incentives to encourage adoption of water efficient technology

Stakeholder	Organization	Responsibility
1. Parag Huq, Additional Secretary, Ministry of Industries	Ministry of Industries	• **Conduct a detailed assessment of financial requirements of approved water efficient technologies** • **Allocate budget to leather sector basis the financial viability gap** • **Preparation and inclusion of the list of capital intensive volume control equipment in approved technologies and equipment for receiving financial support.**
1. Manoj Kumar Biswas, General Manager, Sustainable Finance Department, BB	Bangladesh Bank and Technical consultants	• **Ease access to Green Transformation Fund for resource efficient technologies by adding a list of approved resource efficient technologies and equipment**

15. Adoption of batch rinsing method

Stakeholder	Organization	Responsibility
1. Md. Shaheen Ahmed, President, BTA 2. Mohammad Nurul Islam, Secretary, BTA	BTA, Tannery owners	• **Analyze the suitability of batch rinsing methods for the leather they produce** • **Conduct a detailed assessment of process and equipment modifications required for adoption of batch washing methods** • **Training of workers on using batch washing methods**

16. Installation of volume control equipment

Stakeholder	Organization	Responsibility
1. Md. Shaheen Ahmed, President, BTA 2. Mohammad Nurul Islam, Secretary, BTA	BTA, Tannery owners	• **Conduct water audit to identify key processes consuming larger quantities of water** • **Install volume control equipment like water meters and valves to reduce water consumption**

17. Recycling of individual process liquors

Stakeholder	Organization	Responsibility
1. Md. Shaheen Ahmed, President, BTA 2. Mohammad Nurul Islam, Secretary, BTA	BTA, Tannery owners	• **Assess the suitability of recycling of waste liquor for leather produced** • **Align the processes to adopt recycling of process liquors** • **Train the workers sufficiently for adoption of recycling of waste water**

18. Well defined policy or guidelines for chemical management

Stakeholder	Organization	Responsibility
1. Dr. Sultan Ahmed, Director General 2. Prodoush Kanti Das, Director (Law)	Department of Environment, (DoE) and Ministry of Environment, Forest and Climate Change (MoEF)	• **Design and implementation of comprehensive chemical management policy or guidelines** • **Commissioning independent monitoring agency**
	Monitoring and enforcement agency	• **Ensure frequent monitoring of industry on the basis of the formulated chemical management policy**

19. SOPs for optimal formulations

Stakeholder	Organization	Responsibility
1. Md. Shaheen Ahmed, President, BTA 2. Mohammad Nurul Islam,	BTA, Tannery owners	• **Develop a repository of optimal formulations based on the quality**

Stakeholder	Organization	Responsibility
Secretary, BTA		of leather • **Collaborate with leather research institutes like ILET to ensure quality standards of leather are met produced using SOPs for optimal formulations** • **Train workers on using the optimal amount of chemicals according to the SOPs for optimal formulations**
3. Dr. Md. Aftab Ali Shaikh, Professor & Director 1. Sobur Ahmed, Ast. Professor	Institute of Leather Engineering and Technology (ILET)	• **Provide technical inputs to ensure development of optimal formulations while maintaining quality standards of the leather produced**

20. Training on safe usage and handling of chemicals

Stakeholder	Organization	Responsibility
1. Md. Shaheen Ahmed, President, BTA 2. Mohammad Nurul Islam, Secretary, BTA	BTA, Tannery owner(s)	• **Inform the workers about safety and health risks as well as about adequate measures of protection and prevention** • **Provide appropriate safety and health training measures on recruitment**

21. Substitution of environmentally harmful chemicals

Stakeholder	Organization	Responsibility
1. Md. Shaheen Ahmed, President, BTA 2. Mohammad Nurul Islam, Secretary, BTA	BTA, Tannery owner(s)	• **Identification of environmentally harmful chemicals and potential eco friendlier substitutes**
1. Parag Huq, Additional Secretary, Ministry of Industries	Ministry of Industries	• **Develop green chemical research and manufacturing centers** • **Subsidies to encourage usage of green chemicals**
1. Arun Kumar Biswas, First Secretary (Customs Exemptions), National Board of Revenues	Customs Wing of National Board of Revenue	• **Appraisal and adjustment of import duty on hazardous chemical to encourage adoption of green chemicals**
1. Dr. Sultan Ahmed, Director General 2. Prodoush Kanti Das, Director (Law)	Department of Environment, (DoE) and Ministry of Environment, Forest and Climate Change (MoEF)	• **Preparation and implementation of a sectoral roadmap to phase out environmentally harmful chemicals**