2030 Water Resources Group

May 2015

An analysis of industrial water use in Bangladesh with a focus on the textile and leather industries

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This report has been prepared by Ove Arup and Partners International Ltd and Reed Consulting (Bangladesh) Ltd with the contributions of numerous attendees of interviews and workshops.

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Contents

List of Figures

List of Tables

Acronyms

2030WRG	2030 Water Resources Group
BADC	Bangladesh Agricultural Development Corporation
BAU	Business as usual
BELA	Bangladesh Environmental Lawyers Association
BEOGWIOA	Bangladesh Export Oriented Garments Washing Industries Owners Association
BEPZA	Bangladeshi Joint Export Processing Zone Authority
BFLLGFEA	Bangladesh Finished Leather, Leather Goods & Footwear Exporters Association
BGMEA	Bangladesh Garment Manufacturers and Exporters Association
BKMEA	Bangladesh Knitwear Manufacturers and Exporters Association
BoB	Bank of Bangladesh
BOO	Build Own Operate
BSCIC	Bangladesh Small and Cottage Industries Corporation
BTA	Bangladesh Tanners Association
BTMA	Bangladesh Textile Mills Association
BWDB	Bangladesh Water Development Board
CETP	Centralised Effluent Treatment Plant
COD	Chemical Oxygen Demand
C3ER	Centre for Climate Change and Environmental Research
DFID	Department for International Development
DoE	Department of Environment
DO	Dissolved Oxygen
DWASA	Dhaka Water Supply and Sewerage Authority
EDF	Export Development Fund
EIA	Environmental Impact Assessment
EPZ	Export Processing Zone
EQS	Environmental Quality Standard
ETP	Effluent Treatment Plant
FAO	Food and Agriculture Organization
FESI	Flagship Ecosystems Investment
giz	German International Development Agency
IFC	International Finance Corporation
IWM	Institute of Water Modelling
MLD	Megalitres per day
MoEF	Ministry of Environment and Forest
MoWR	Ministry of Water Resources
NITER	National Institute of Textile Engineering and Research
NGO	Non-Governmental Organisation
NWRC	National Water Resources Council
PPP	Public-Private Partnership
RMG	Ready-Made Garment
ROI	Return of Investment
UNIDO	United Nations Industrial Development Organization
VAT	Value Added Tax
WARPO	Water Resources Planning Organisation
WASA	Water Supply and Sewerage Authority
WDF	Washing, Dyeing and Finishing
WFA	Water Footprint Assessment
ZD	Zero Discharge
ZDHC	Zero Discharge of Hazardous Chemicals

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Multi-stakeholder workshop in October 2014

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Textile factory interior

Executive summary

In Dhaka and other industrial centres in Bangladesh, rapid and unplanned growth of the industrial sector is imposing increasing stresses on the environment. In terms of water the very real impacts of these pressures include declining groundwater levels and deteriorating river water quality.

The textile and leather sectors, which are the focus of this report, are heavily dependent on the water environment. To date, the sectors have failed to manage water in a sustainable way; rather it has been viewed as an unlimited resource. This sectoral view has been compounded by poor governance and regulation, with little enforcement or control of water abstraction and effluent discharges.

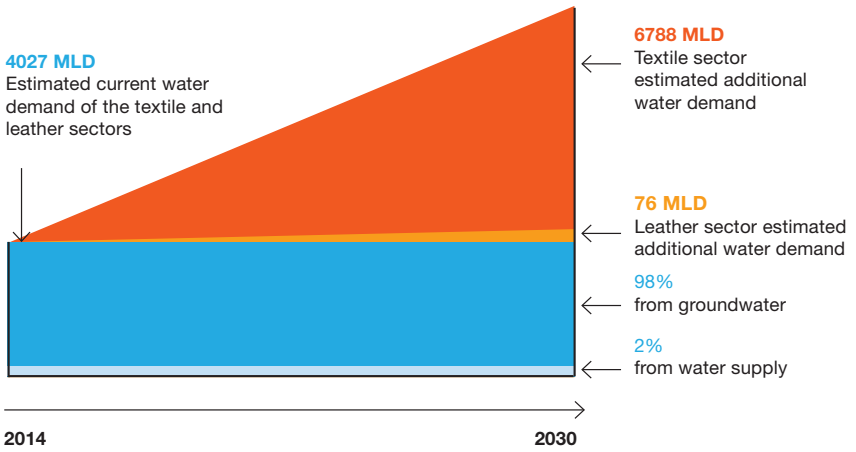
Industrialisation and export development are major policy objectives of the Government of Bangladesh. The textile and leather sectors also have ambitious plans for growth. However, sustaining and meeting future growth aspirations will require a new approach to managing the emerging water quality and availability risks.

The challenge

The Bangladesh Garment Manufacturers and Exporters Association has recently set an ambitious target for the textile sector to double its exports and reach $50 billion of exports by 2021 when the country celebrates the golden jubilee of its independence in 1971. Similarly, the leather sector expects that the relocation of the industry from the Hazaribagh district of Dhaka to the Savar industrial estate could boost the industry's export revenues from $1 billion to $5 billion in the next five years.

Water availability

If "business as usual" water demand continues for the textile sector, in particular, this will result in an additional water demand of over 6,750 megalitres per day by 2030. This is equivalent to the annual water needs of a population of approximately 60 million people in Bangladesh.



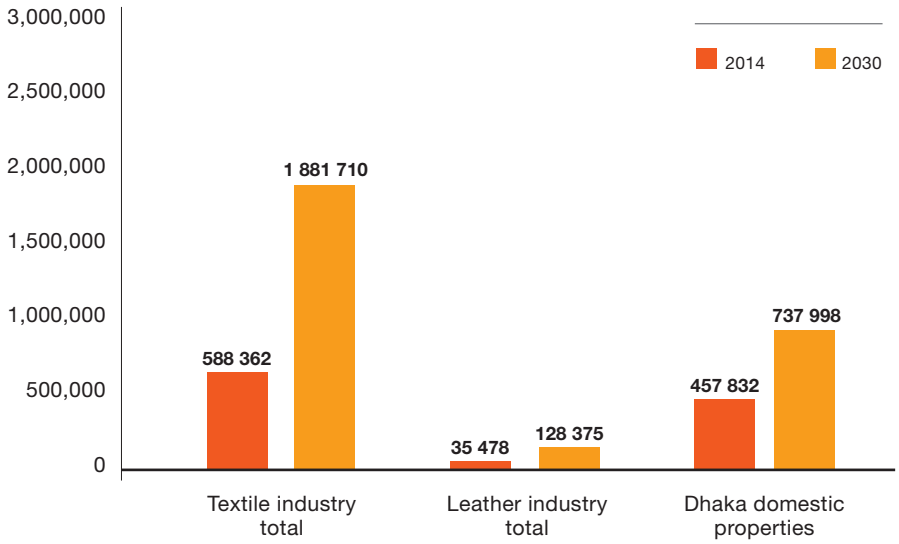
Projected water demand in 2030 for the textile and leather sectors
(2014-2030 in megalitres per day (MLD))

Increased water demand from the textiles sector will have to compete with increased demand from other industries and a growing population. The allocation of water resources will be a key issue in Dhaka, which will see industrial demand growth and significant growth in municipal demand in order to support a population which could reach more than 27 million by 2030.

The absence of any significant industrial metering or any effective regulatory enforcement perpetuates the view that water is abundant and virtually cost free. Developing the business case for individual factories to invest in water efficiency based on the cost of water alone is therefore challenging. Instead, the case needs to be made for an approach that manages individual and sector business risk and delivers energy and chemical use savings associated with reduced water use.

Water quality

In addition to water demand, the textile and leather sectors face even greater challenges in relation to environmental management and pollution. Untreated effluent from the industrial sector is a key source of poor surface water quality in and around Dhaka.



*COD (Chemical Oxygen Demand) is used as indicator

Comparison of pollution* in 2014 and 2030
(in tonnes per year)

Growth of the sector under a “business as usual” approach will compound the problem and impose unsustainable loads on the water environment. This will result in a further deterioration in surface water quality, impacting on local communities and ecosystems.

The response

A high level sector based analysis has been undertaken to understand “the opportunity” for the textile and leather industries in adopting improved water management. The analysis looks at the potential benefits associated with interventions to improve both water efficiency and effluent treatment, summarised in the Table below.

Issue	Challenge	Response
Availability	Current groundwater abstraction rates, which support most of the current factories, are unsustainable.	Bringing in new practices and behaviours around water use and water efficiency that will increase the affordability of the new sustainable sources of water and associated infrastructure (water treatment and supply, wastewater treatment).
Quality	Surface water quality has deteriorated due to the unregulated industrial expansion, urbanisation, overloaded infrastructure, untreated effluent discharges and weak enforcement of environmental regulations.	Ensuring that surface water quality, which is likely to be a key future source of water, is not compromised by the discharge of untreated effluent.

The analysis assumes that the current approach to abstraction and wastewater management is not sustainable. Under this assumption, future capacity and security of supply for the sector can only be delivered through the provision of new infrastructure. The capital and operational cost of the new infrastructure needed to service the sector will be dependent on the approach to the management of water. A number of scenarios for managing water have been explored in the analysis and the potential benefits in infrastructure cost have been determined.

The analysis

It is estimated that the level of investment in new assets (water abstraction treatment and distribution plant as well as effluent treatment plant) to support growth in the textile sector will be in the order of $19 to $30 billion through to 2030 under a “business as usual” water demand scenario.

The implementation of cleaner production measures will reduce the investment needed by the sector to provide water supply and pollution control. Metering as well as simple and low cost measures could reduce water use by up to 20% which will lower future infrastructure investment and operational expenditure by up to $6 billion. Installation of measures which reduce water use by 35%, would increase the total reduction in cost to $9 billion. The actual benefits that are likely to be achieved could be higher if future increases in energy prices are factored in.

The adoption of a strategy to develop centralised effluent treatment could deliver additional savings, of the order of $4 to $7 billion, to the sector. Furthermore, a centralised effluent treatment-led strategy also has the benefit of:

- Promoting compliance;
- Reducing land take;
- Unlocking opportunities for large scale reuse;
- Providing potential to explore efficient resource recovery and move towards a circular economy.

Potential reduction in future investment of:

up to

$9bn

due to effficient water use.

up to

$7bn

due to centralised treatment.

Recommendations

The analysis has identified a number of themes, summarised below, that need to be explored further to facilitate sustainable growth of the textile sector, and other water dependent industrial sectors.

Over-arching all these themes is the clear need to establish a broad coalition of stakeholders, all of whom have an interest in the water environment, to work through the challenges and the appropriate response. This multi-stakeholder grouping should include the textile sector, other industry, the Government of Bangladesh, civil society and expert groups, including 2030WRG.

Strategic water planning				Information and awareness			Environmental regulation and enforcement	
Water efficiency interventions	**Water and effluent treatment strategies**	**Alternative Water sources**	**Access to finance**	**Lack of sufficient data and evidence base**	**Capacity building and research**	**Public disclosure**	**Groundwater licencing**	**Weak enforcement**
Facilitate a review to identify opportunities and possible locations for CETPs for existing industrial clusters. The review should also explore opportunities for Public Private Partnerships in effluent treatment.				Promote the need for standardised data collection and reporting to enable accurate monitoring of industrial water use and the impact on water abstractions, effluent discharges and return flows to the environment.			Promote improvements to the groundwater licencing for industrial users.	
Engage with policy makers and commercial banks to improve disbursement of the Green Fund.				Gather local knowledge and establish the evidence base on the impact and cost of water saving and effluent treatment interventions to inform action by the industrial sectors.			Support stakeholders with the identification of incentives for the textile factories and other industrial sectors to reduce water use and untreated effluent discharges to surface waters.	
Assist in the development of a pilot project on the potential of zero discharge measures in the textile sector.				Facilitate capacity building in sustainable water management and cleaner production at factory level.			Encourage involvement of the civil society in the enforcement of environmental regulation and effluent discharge standards.	
Support the review of alternative water sources for use in industrial clusters.				Increase public and industry awareness on implications of future “business as usual” scenarios through sensitisation and marketing campaigns.			Facilitate discussions on the post relocation operational arrangements at the Savar industrial estate.	
Work with stakeholders to promote water efficiency equipment and stimulate the cleaner production market.							Promote the implementation of water certification schemes in the industrial sector.	

01 Introduction

Water resources management in the industrial sector is an important issue in Bangladesh. Industrialisation and export development are major policy objectives of the Government of Bangladesh, however, accelerating or even sustaining the export and industrial growth rates will be a challenge unless water security matters are resolved. The issue is recognised by the Government of Bangladesh at the highest level. The National Sustainable Development Strategy 2010-2021 highlighted the need for joint initiatives in the management of water resources and called for increased water efficiency, proper groundwater management and water pollution management from the industry.[1]

1.1 Objectives of the report

The objective of the report is to understand the impact of industrialisation on water security in Bangladesh, with a focus on the textile and leather industries, and raise awareness of the scale of the water challenges facing the industrial sector. It aims to improve the understanding of the impact of the sectors on water resources. It provides a summary of the aspirations for growth in both sectors and explores the impact of "business as usual" growth on water resources. The report then presents an analysis of the opportunities for the sector in improving water use and effluent treatment in order to support more sustainable growth. Finally it recommends a number of key focus areas within the industrial water sector where a 2030WRG Bangladesh multi-stakeholder partnership could add value.

1.2 Methodology

The study and the recommendations in this report are based on:

- Extensive field work including interviews and discussions with more than 30 key stakeholders representing the public sector, the private sector and civil society.
- A comprehensive desk research and data review using both international and local sources.
- Telephone interviews with leading local and international experts in water resources and industrial water management.
- Feedback from the 2030WRG Bangladesh High Level Dialogue Workshop held in Dhaka on 18 October 2014.
- Feedback from the 2030WRG Bangladesh workshops held in Dhaka from 15 to 18 March 2015.

Stakeholders included government ministries and organisations, trade associations, multinational brands, NGOs, international organisations and academia. Stakeholders were identified based on their influence on the textile and leather sectors and water resources issues in Bangladesh.

The interviews focused on exploring:

- Stakeholders' roles and responsibilities
- Identification of existing water initiatives
- Risks, barriers and opportunities related to industrial water use and discharges
- Stakeholders' views on possible solutions to identified risks

The list of stakeholders consulted is included in Appendix A. Existing water initiatives are presented in Appendix B.

Surface water quality in Dhaka has deteriorated over the last twenty years

The population of Dhaka is set to exceed 27 million by 2030

02 Industrial sectors in Bangladesh

Since the 1980s, Bangladesh has been experiencing a shift in its economy from the agricultural sector to the industrial and service sectors. The total gross outputs of the industrial sector in Bangladesh was estimated at almost $70 billion in 2012. The top ten sectors were: [2]

Table 1: Total gross outputs of top ten industrial sectors in Bangladesh

Industrial sector	Gross output $bn	Percentage of total
Textiles and RMG	32.47	46.98%
Basic metals	11.60	16.79%
Food products	7.80	11.28%
Non-metallic mineral products	4.51	6.52%
Electrical equipment	1.86	2.69%
Chemicals and chemical products	1.80	2.60%
Pharmaceuticals	1.45	2.10%
Tobacco	1.12	1.62%
Leather	0.98	1.41%
Fabricated metal products	0.91	1.32%
Other sectors	4.62	6.68%

There is limited recent data on total water withdrawals in Bangladesh. In 2008, FAO estimated the total water withdrawal at approximately 36 km^3, of which 31.50 km^3 (88%) was for agriculture, 3.60 km^3 (10%) for municipalities and 0.77 km^3 (2%) for industries.[3]

The following sections provide details on the textile and leather sectors which are the focus of this study.

2.1 Textile industry

The value of the global RMG market was estimated at $483 billion in 2014.[4] Bangladesh is currently the world's second largest exporter of ready-made garments with a global market share of about 5%. The sector currently accounts for more than 80% of Bangladesh's export earnings and more than 10% of the GDP. The industry directly employs four million workers, around 80% of whom are women.[5]

in 2014 RMG exports in Bangladesh reached

$24.5bn

The sector's exports have risen rapidly over the last 30 years and reached a high of $24.5 billion in 2014 as illustrated in Figure 1 below.

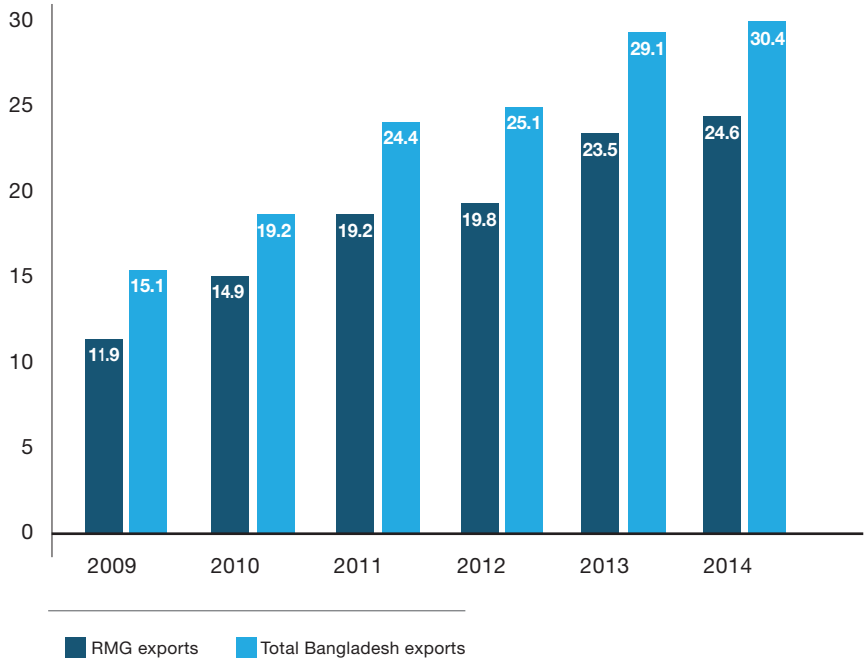


Figure 1: Comparison of RMG exports and total Bangladesh exports
(Total exports in $bn)

There are currently more than 5,000 cutting and sewing of garments factories in Bangladesh. Stakeholders estimate that there are up to 1,700 wet processing units but no evidence has been provided to support this figure. The number is likely to be significantly lower; probably in the region of 500-700. The local industry is increasingly moving towards higher value textile production processes including WDF textile units. The number of wet processing units is expected to increase significantly over the next few years.

It has been previously estimated that the RMG export values will increase from $15 billion in calendar year 2010 to around $36 to $42 billion in 2020.[6] BGMEA has recently set an even more ambitious target to reach $50 billion by 2021, when Bangladesh will celebrate the golden jubilee of its Independence.[7] The assumption for the analysis in this report is that the export values will reach $50 billion by 2021 and grow to $66.25 billion by 2030 (mid growth scenario).

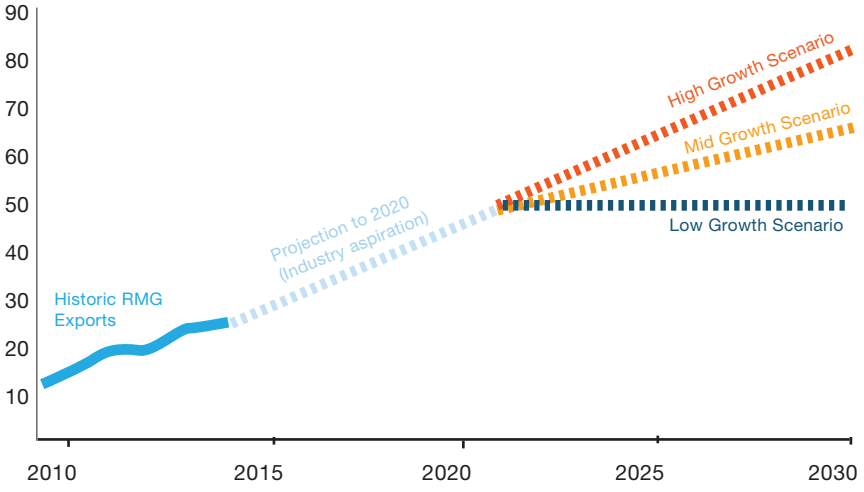


Figure 2: Projection of RMG exports to 2030
(total exports in $bn)

2.2 Textiles and water use

Water is a key input in the textile industry and large quantities are consumed in the direct operations of the sector and the supply chain. The water used in the processing and garment production phase has previously been estimated to be close to 50% of the overall water use in this sector (refer to Figure 3).[8]

Activities	Agriculture and petrochemical supplies	Dyeing and fabric finishing	Confection of clothing and apparel	Transport	Shops	Washing
	Yam/fibre producing/ spinning mills	Weaving		Stock/man management	Marketing	
		Knitting			Advertisement	
* Consumption	52%	43%	1%	4%	0%	No data
** Withdrawals	46%	47%	1%	6%	0%	No data

Area of interest for our analysis

* Water consumption: water used and not returned to its source

** Water withdrawal: water diverted or withdrawn from a surface water source

Figure 3: Water intensity across the textile and apparel sector value chain

Of this 50%, approximately 85% of the water is used and discharged from fibre processing factories in the wet processing stage, as shown in Figure 4.

Figure 4: Flow diagram of fibre processing stage in WDF factories

IFC's Water PaCT Programme has collated the most reliable water use data in the textile sector (refer to Appendix C).

According to IFC, the average factory water consumption in Bangladesh is estimated to be up to 250 to 300 litres of water per kilogram of fabric produced. This is the equivalent to the daily water use for two people in Dhaka. It is recognised, however, that better performing factories participate in this programme.

For comparison, the global benchmark for fabric production is 100 litres of water per kilogram.[9]

more than **500** WDF textile units in Bangladesh

70% are located in the Greater Dhaka area

The effluent discharges from the WDF factories are heavily polluted with high levels of dissolved solids and chemicals. Estimates on the number of factories with ETPs vary from 40 to 80% although it is widely acknowledged that many of the installed plants are poorly designed or not operated in an appropriate and responsible manner.[10]

It is estimated that around 70% of the WDF textile processing units, which are responsible for a considerable portion of the water demand and water pollution, are located in the Greater Dhaka area (Figure 5).[11] The remaining units are located in Mymansingh (north of Dhaka) and in Chittagong.

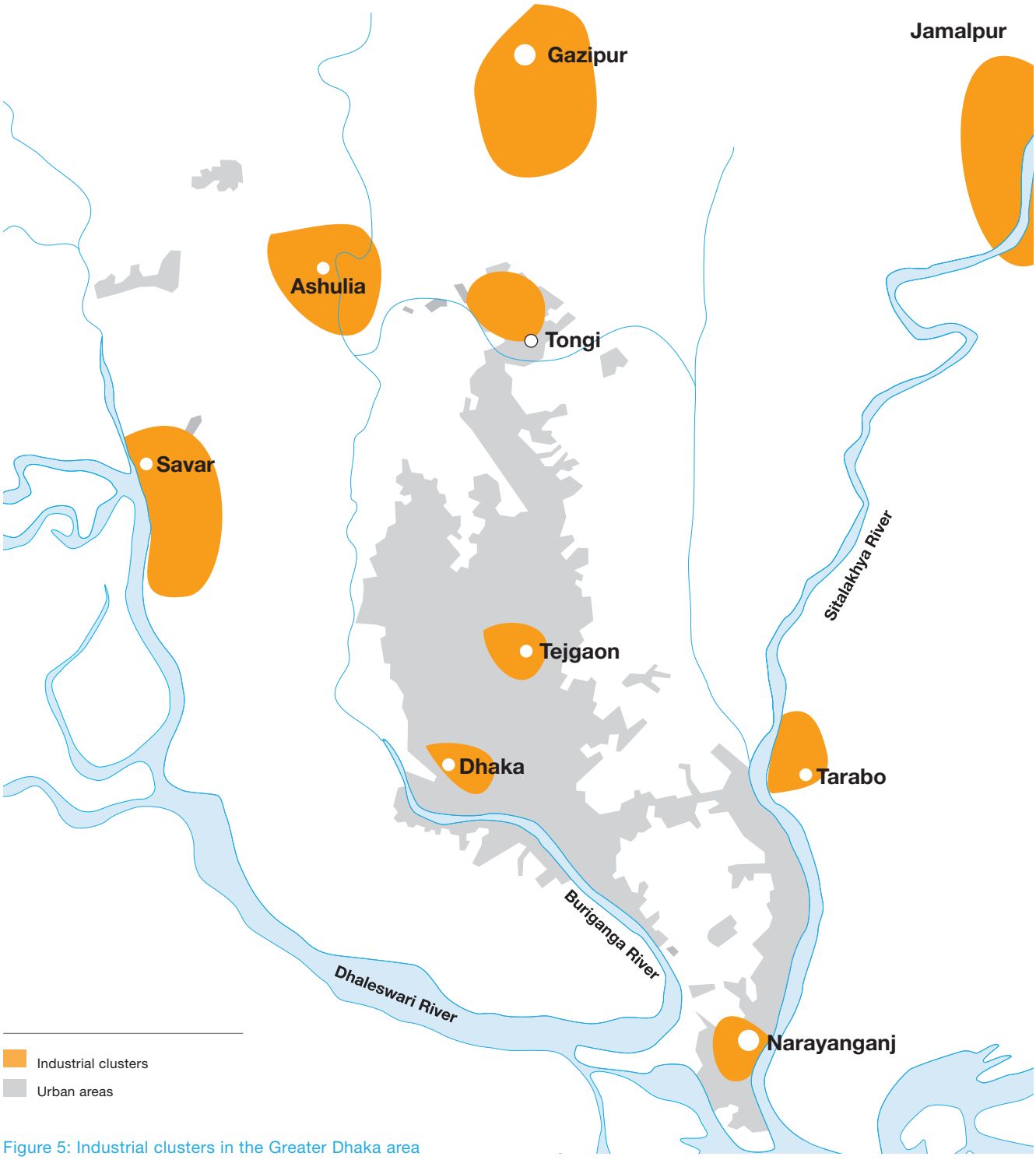


Figure 5: Industrial clusters in the Greater Dhaka area
(Adapted from the World Bank[12])

2.3 Leather industry

The Bangladesh leather sector is one of the country's oldest industries and supplies approximately 0.5% of the world's leather trade. It is estimated that the sector directly or indirectly employs approximately 750,000 workers. This figure includes the finished leather goods industry and service industries supporting the tanneries.[13]

The sector's exports have risen rapidly since 2010 and exceeded $1 billion in 2014. Added value leather products and footwear have had the fastest growth.

Employment in the leather industry

200,000
Raw hyde collection and supply

50,000
Tanning industry

300,000
Retailing of leather

150,000
Footwear industry

30,000
Leather goods industry

8,000
Exporting leather

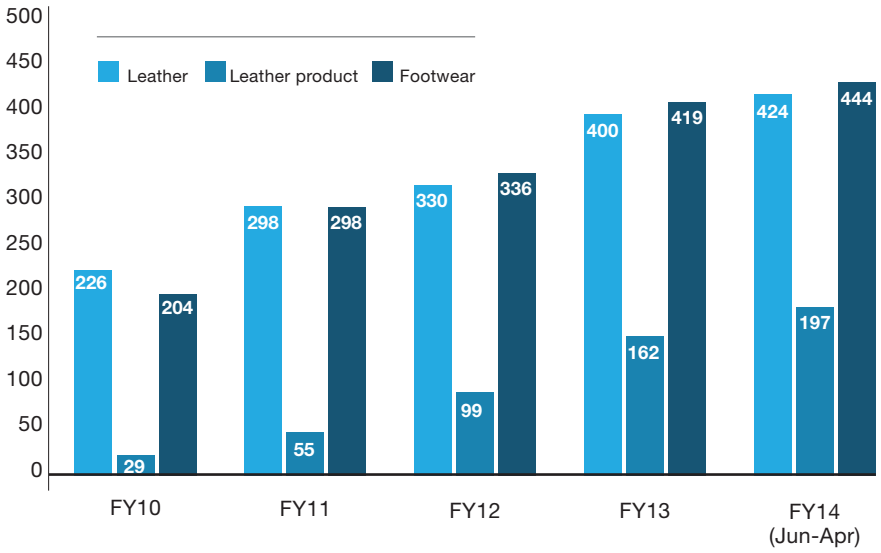


Figure 6: Bangladesh leather industry exports
(total exports in $m)

155
tanneries in Bangladesh

Over
95%
of the tanneries are located in the Hazaribagh area

There are reportedly around 155 tanneries operating in Bangladesh. Over 90% of the tanneries are located in the Hazaribagh area in Dhaka in a highly congested area of less than 30 hectares of land.[14]

Most of the leather produced at present is non-compliant with international social, ethical, safety and environmental standards and is therefore not attractive to North American and European brands and buyers. Skins processed at Bangladeshi tanneries are traditionally sold to other markets as part finished leather which has a lower value.

Relocation of the leather sector

In 2003, the Government of Bangladesh initiated a project for the relocation of tanneries to the purpose built "Savar Leather Industrial Park", some 20 kilometers outside Dhaka. The new location would provide infrastructure which could allow operations to be conducted in accordance with appropriate international environmental and safety standards. Twelve years on, the process of relocating the tanneries from Hazaribagh to Savar is still on-going and a new deadline of 31 December 2015 has recently been set to complete the transfer process.[15] The infrastructure required for the relocation is not yet in place but is scheduled to be completed by December 2015 at the earliest. Even if the relocation takes place, agreement on the long term operational arrangements are necessary to ensure the viability of the environmental and safety practices.

If the environmental and social performance improves, exports are expected to increase significantly as multinational brands and buyers are likely to renew their interest in Bangladeshi leather. The BTA has stated that the relocation to Savar could boost the industry's export revenues from $1 billion to $5 billion in the next five years.[16] The analysis assumes that the leather industry export value will continue to grow to reach $8.25 billion by 2030 (mid growth scenario).

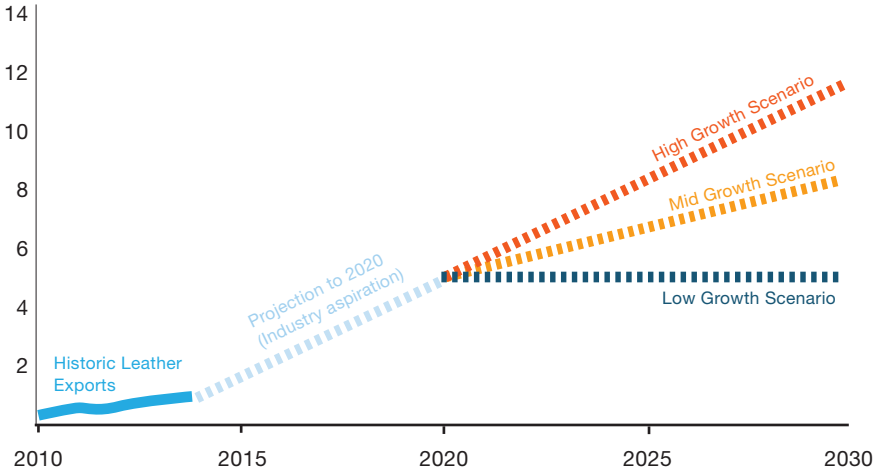


Figure 7: Projection of Leather Industry exports to 2030
(total exports in $bn)

2.4 Leather and water use

It is estimated that in Bangladesh approximately 40m^3 of water is required to process a tonne of wet salted hides (Figure 8). For comparison, modern processes utilised in Europe are able to reduce the water use to 20m^3 or less.[17] In addition to the water use, more than 450kg of chemicals are used in the process. As only a fraction of the chemicals are retained in and on the leather, the majority is discharged to the environment in various forms including wastewater discharges.[14]

Animal water consumption	Curing process	Tanning	Finishing	Transport	Shops	Washing	
	Storage	Post-tanning	Confection of clothing and apparel	Stock/man management	Marketing/ advertising		
	20 - 25	1 - 3	12 - 13	No data	No data		Withdrawal (m^3 per tonne of hide)

Area of interest for our analysis

Figure 8: Water withdrawals across the leather sector value chain

The total volume of effluent discharged from tanneries is estimated at 20,000m^3 per day which is in line with the capacity of the new CETP currently being constructed in Savar. At the moment, all effluent generated from Hazaribagh is discharged untreated to the sewer passing through the area leading to the Buriganga River, the main river through Dhaka. Therefore, the industry contributes significantly to poor river water quality and the associated environmental and health impacts.

03 Water risk analysis

Recent analysis undertaken by 2030WRG highlights that Bangladesh will have a water supply deficit during the dry season of up to 21% by 2030. This is due to the high seasonality of water availability, limited surface water storage and water quality issues.[18] There is additional stress on water supply due to climate variability and change and the increasing frequency of extreme events such as floods, storms and droughts.

Water users in Bangladesh including agriculture, industries and the domestic population predominantly use groundwater to meet their current demand. In Dhaka, 79% of the water supply comes from groundwater sources and the remaining 21% from surface water sources.[19]

Infrastructure capacity is recognised as a limiting factor in developing Bangladesh's industries. The Export Promotion Bureau has stated that modernised ports, transport, gas and power are the key constraints.[20] The availability of water is often overlooked as it is considered to be in abundance and obtained at "low" or "no" cost.

$62.25bn

Assumed value of RMG exports by 2030

3.1 Methodology

A macro level analysis has been undertaken for the textile and leather sectors in Bangladesh. The parameters used for the analysis were water demand and water pollution. Due to data availability, the assessment took into account water usage in direct operations only, excluding any supply chain contributions.

For the purpose of the analysis, it was assumed that the textile and the leather industries will reach $66.25 and $8.25 billion exports respectively by 2030. These are modest targets which the industries consider achievable. The findings of the analysis are presented throughout the rest of this report.

3.2 Water demand

Growth in outputs will increase water demand. The increase in demand will be heavily influenced by the textile sector, which is larger and more water intensive than the leather sector. It is projected that to meet the anticipated growth, water demand could increase by 250% by 2030.

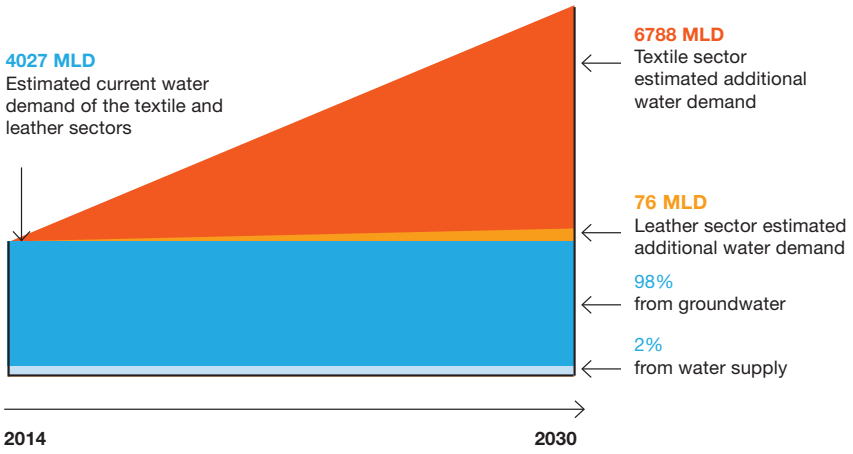


Figure 9: Projected water demand in 2030 for the textile and leather sectors
(2014-2030 in megalitres per day (MLD))

Based on projections published by the United Nations, the population of the Greater Dhaka area is currently estimated to be 17 million and will reach more than 27 million by 2030.[21] Dhaka will then be the sixth largest urban metropolitan area in the world.

Converting the projected water demand from the textile sector to population equivalent figures provides an insight into the scale of the challenge to meet future industrial water demand. The water demand from the textile industry nationally is projected to be almost three times the future domestic water demand in Dhaka, as illustrated in Figure 10.

The DWASA are currently planning to construct six new surface water treatment plants by 2035 in order to meet the additional domestic water demand. These will deliver a total supply capacity of approximately 3,000 MLD at an estimated cost of over $4.1 billion.[22] DWASA expects that this additional surface water capacity will reduce the long term reliance on groundwater from 80% to approximately 20% of the water supply. If the anticipated textile industry growth materialises, by 2030 the increased water demand in the wider Dhaka area for this sector alone could exceed 7,500 MLD.

125

Litres per person per day is the average domestic water use in Dhaka

$4.1bn

Estimated cost for six new surface water treatment plants to be built by 2035

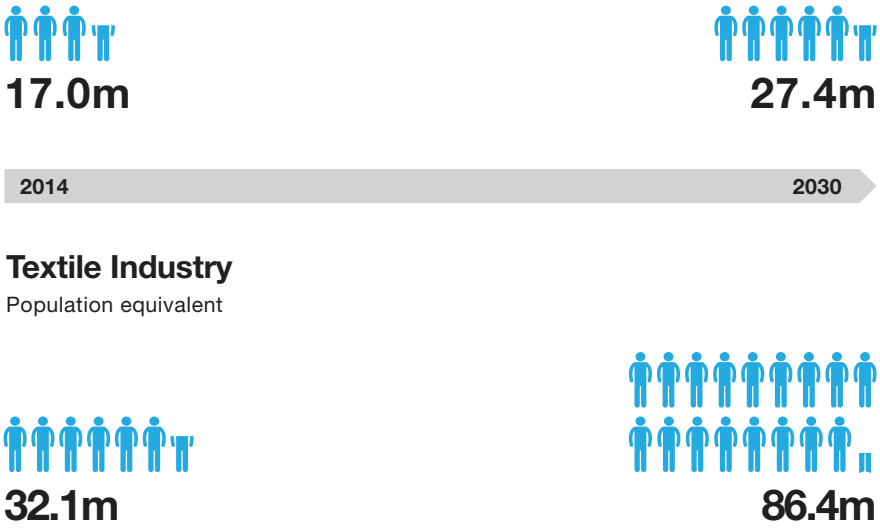


Figure 10: Greater Dhaka area population compared with textile industry water demand nationally, expressed as population equivalent

3.3 Groundwater abstraction

Both the textile and the leather sectors are currently predominantly using abstracted groundwater to meet their water demand through unmetered self supply. The BADC updated the groundwater zoning map of Bangladesh in 2010.[23] Alarming drops 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 (Figure 9).

A BADC Groundwater Monitoring Survey report for Dhaka, indicates that the groundwater level dropped by 40m between 1996 and 2009. A study by the Institute of Water Modelling has also estimated that heavy water usage is contributing to groundwater over-exploitation, with yields falling and the water table declining by up to three meters a year in some locations.[24]

The data provides an early warning on the adverse impact of increased withdrawal of groundwater without proper planning. In some areas it is now accepted that current rates of abstraction are not sustainable.[25] Any additional abstraction associated with future water demand will exacerbate the groundwater issue and increase the risk to domestic and industrial water supplies.

To cope with the decline, DWASA and private well owners are drilling deeper to meet their water demands but groundwater extraction is becoming more difficult and costly. The DWASA shift towards surface water sources to reduce the reliance on groundwater in Dhaka is appropriate. However, the poor water quality of the peripheral rivers together with illegal encroachments have forced DWASA to investigate options long distances upstream which will increase the required investment costs.

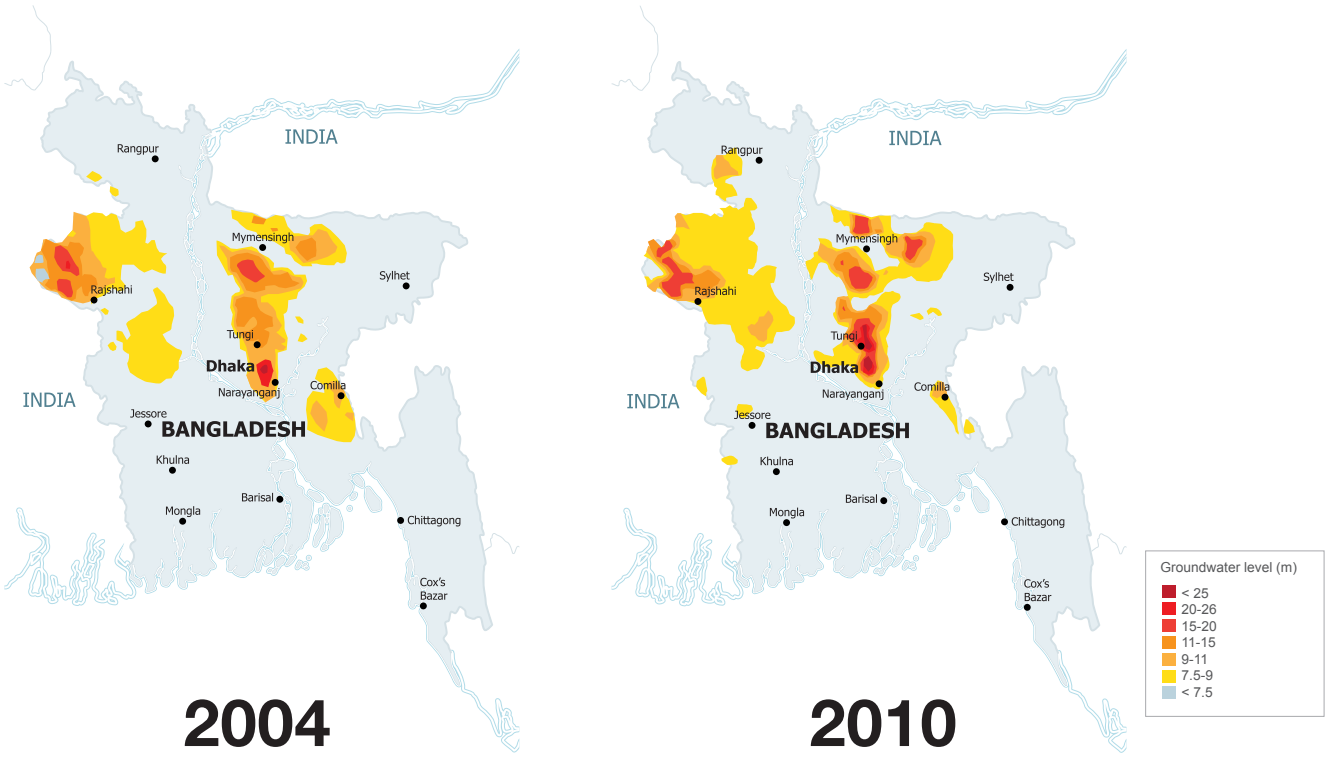


Figure 11: Groundwater zoning maps in 2004 and 2010
(Adapted from Bangladesh Agricultural Development Corporation)

3.4 Water pollution

3.4.1 Background

Over the last twenty years surface water quality in Dhaka has deteriorated due to unregulated industrial expansion, urbanisation, encroachment of the rivers, overloading of infrastructure, confusion about the institutional responsibility for the quality of Dhaka's water bodies and weak enforcement of environmental regulations.

There is only one wastewater treatment plant at Pagla, which is currently operating below capacity because of sewerage system failures, and few industries operate ETPs. Almost all the waste from humans, industry, and farm animals, along with tonnes of pesticides and fertilisers from agriculture are discharged into Dhaka's watershed without treatment impacting on surface and groundwater quality.

Studies carried out in 2006-07 estimated that industrial pollution accounts for more than 60% of the organic pollution load in the Dhaka catchment area; typically concentrated in dense, informal, unplanned industrial clusters located along the major rivers.[26]

Domestic effluent treatment in Dhaka

The only plant has the capacity to treat only 10% of the total domestic sewage. It is also under utilised due to system failures and operates at about 30% of its capacity. The remaining sewage in Dhaka is discharged directly into open water bodies.

3.4.2 Contribution of textile and tannery sectors

Both the textile and leather sectors discharge highly polluted effluent which has the potential to harm humans and pollute the environment if discharged untreated. Textile factories discharge a range of chemicals including salts, dyes and bleaches, while effluent from tanneries is significantly stronger and contains a range of heavy metals, including chromium, see Figure 12.[27 28 29]

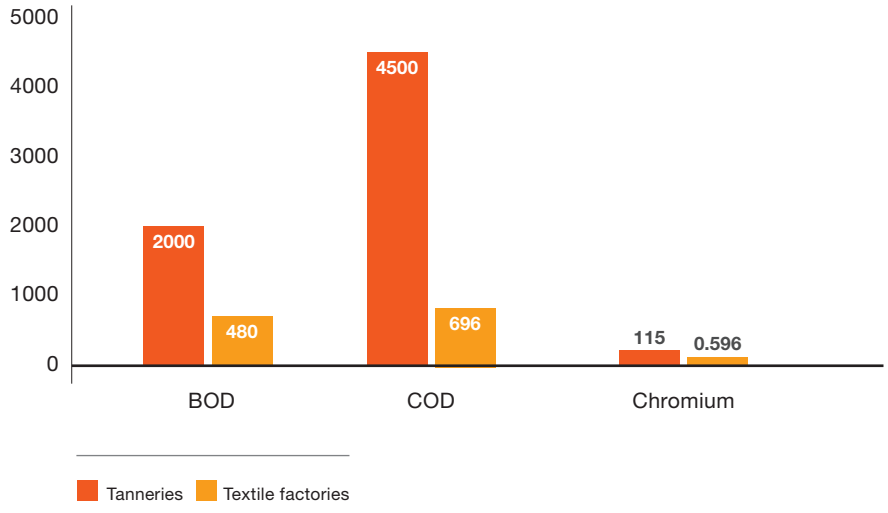
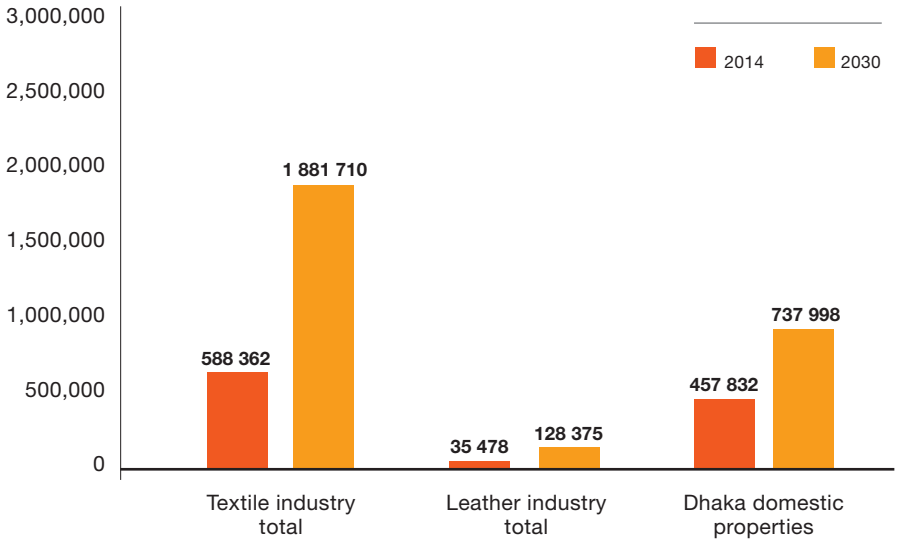


Figure 12: Comparison of typical raw wastewater quality from tanneries and textile factories (in mg/l)

Most of the industrial effluents and domestic sewage are discharged to the environment without treatment. Factories have a reluctance to invest money in effluent treatment as it is considered that it is a non-productive use of investment in a highly competitive local and global market.[30]

Even where industries have effluent treatment plants, there is an unwillingness to operate the plant appropriately to reduce operational costs. The industry itself acknowledges the lack of experience and knowledge to install and run ETPs effectively.

The analysis shows that the total pollution discharged into the Bangladeshi rivers from the textile factories is many magnitudes greater than from the tanneries. This is due to the larger size of the textile industry. As a comparison, the pollution discharged from textile factories in Bangladesh is currently greater than the water pollution discharged from domestic properties in Dhaka. As Figure 13 illustrates, if business as usual continues, the gap is expected to grow further by 2030.



*COD (Chemical Oxygen Demand) is used as indicator

Figure 13: Comparison of pollution* in 2014 and 2030
(in tonnes per year)

Monitoring data from 2011 indicates that the water quality of rivers near industrial areas is poor during the dry season. For example, the Buriganga River receives direct discharges of untreated effluent from domestic properties and industries including tanneries and textile factories.

DO levels were almost zero at eight sampling locations for a period of four months in 2011 and only narrowly met the relevant EQS of 5.0 mg/l at some locations in October 2011.[31]

Such low levels of dissolved oxygen have a devastating impact on aquatic life. Dissolved oxygen levels below 5.0 mg/l, put aquatic life under stress. Oxygen levels that remain below 1-2 mg/l for a few hours can result in large fish kills.

The long term trends are of a grave concern. As illustrated in Figure 14, the DO levels have deteriorated at an alarming rate since 2000.[13] If the situation is not reversed soon, the serious water pollution and environmental degradation of Buriganga, Sitalakhya and other watercources is likely to have long term public health, environmental and socio- economic consequences. In its current condition the water is not "available" to support other uses.

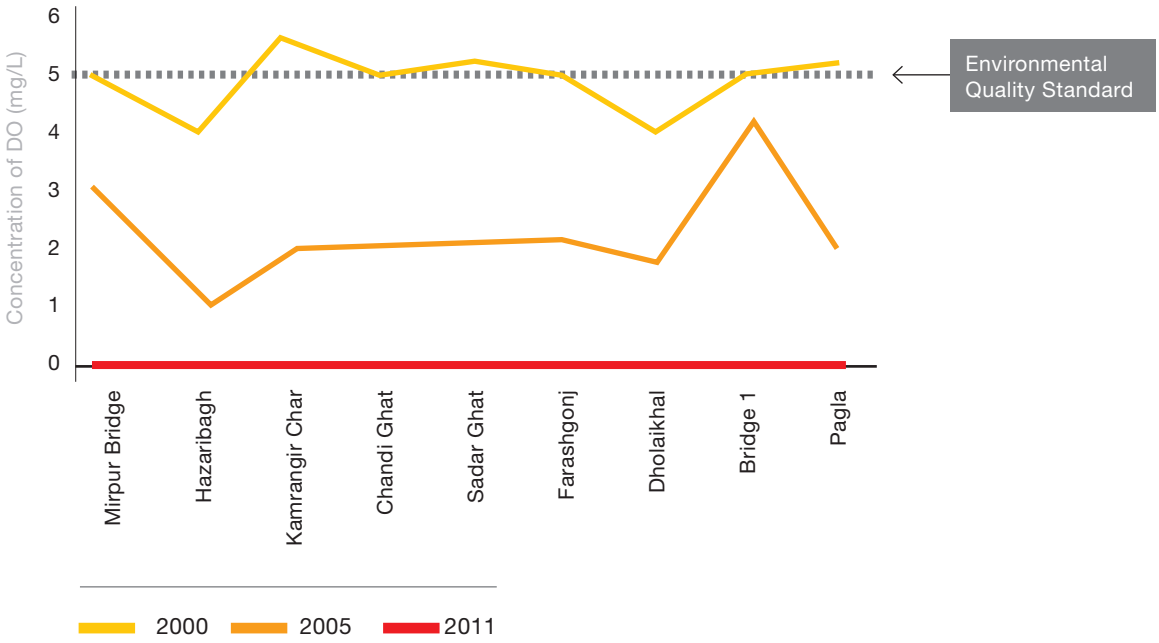


Figure 14: Comparison of the DO value changes in Buriganga at critical locations in January 2000, 2005 and 2011

3.5 Water governance and industries

Following the Water Act 2013, strategic direction on national water resources planning and policy-making is provided by the inter-ministerial NWRC and its Executive Committee.

The MoWR through several of its agencies, particularly the WARPO and the BWDB, are responsible for most forms of water management in Bangladesh. The BWDB is principally responsible for implementation, operation and maintenance of water related projects.

The WARPO is tasked with the macro-level water resources planning and management and the preparation of the National Water Resources Plan. WARPO also has a mandate to plan the location of new industries on the basis of water availability and effluent discharge requirements.

The Ministry of Local Government, Regional Development and Cooperatives implements water supply and sanitation policies through local government departments.

Responsibility for control and abatement of water pollution falls to the DoE within the MoEF. The Ministry of Industry is not empowered to have a lead role on water issues despite the impact of industrial units on water use and river water quality.

"The low level of penalties in the Water Act 2013 will encourage offenders to pay the penalty than abide with the law"

Feedback from stakeholder consultation

Broadly, DoE is mandated to set and enforce environmental regulations for all forms of pollution (air, water and soil). Specifically in relation to water pollution, DoE are responsible for: pollution control; setting EQSs for water use and discharge; defining EIA procedures; issuing environmental clearance permits; and declaring and protecting degraded ecosystems.

The existing set of environmental policies and legislation provides a framework for water resources management and industrial pollution control. For example, the Bangladesh Environment Conservation Act 1995 and the Environment Conservation Rules 1997 have a strong focus on industrial pollution prevention and control and specify appropriate effluent discharge standards for industries.

This framework has recently been supplemented by the Bangladesh Water Act 2013, initiated by the MoWR. The Ministry has empowered WARPO to spearhead its implementation.

Within the Water Act 2013, water quality degradation caused by industrial discharge and other sources of pollution are deferred to the provisions of the Environmental Protection Act of 1995 without additional clarifications.

The Act includes several provisions of enforcement such as compliance orders, protection orders, removal orders, imprisonment and compensation. The maximum penalty for violations is set to five years of imprisonment and/or monetary penalty of less than $130 (Tk 10,000). The benefit from non compliance for offenders often far outweighs the potential penalty (if caught), providing them with a strong incentive to ignore the law.[32]

For detailed analysis of the institutional and policy challenges and opportunities as well as a road map for change, please refer to a recent report by WWF and H&M titled 'Water Governance in Bangladesh' (March 2015) which was delivered in parallel to this report.

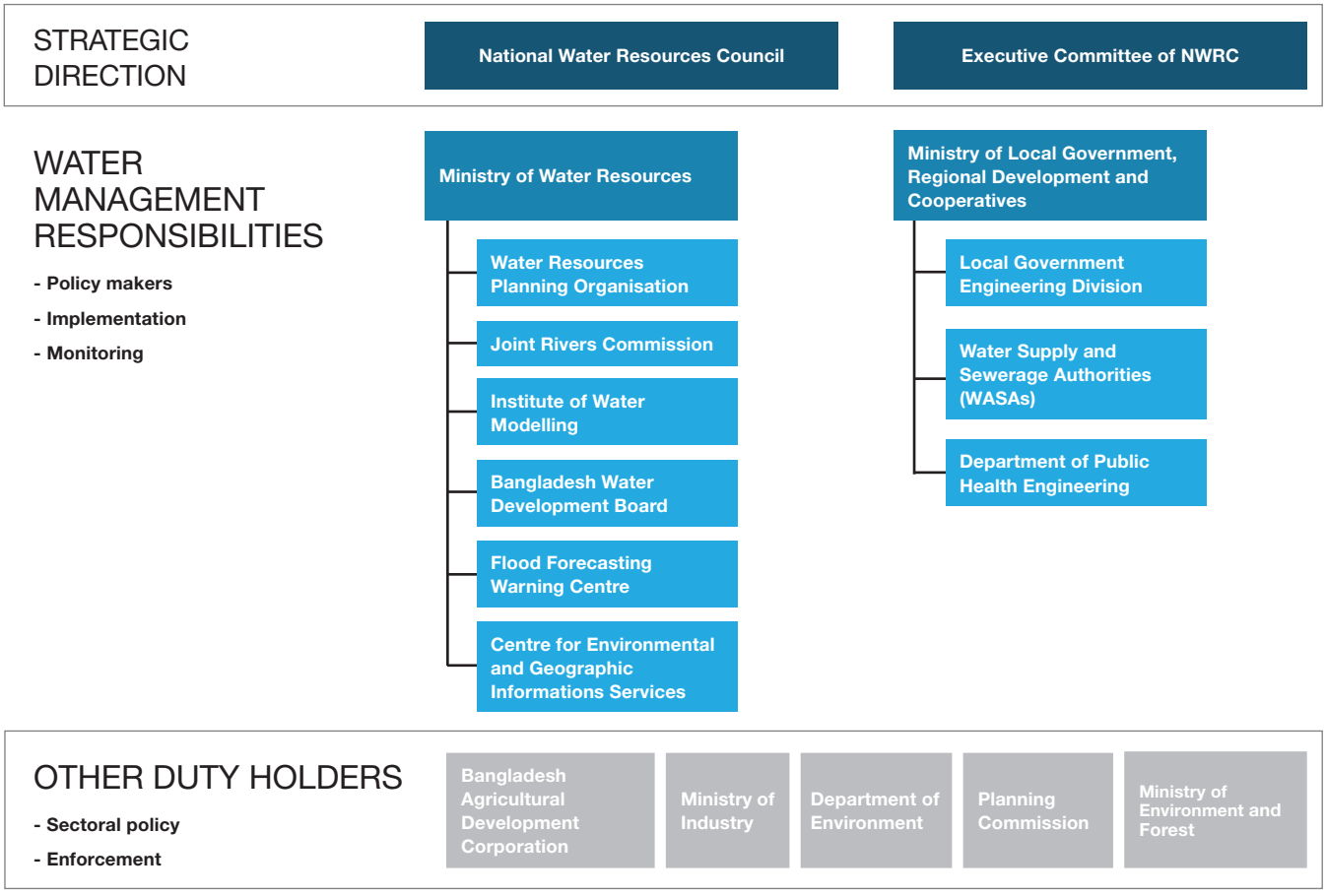


Figure 15: Bodies involved in water resources management in Bangladesh

The textile industry is vital to the Bangladeshi economy

Industrial effluent treatment improvements

The total number of industrial ETPs has increased from 233 in 2008 to 1045 in 2014.

3.6 Enforcement

Interviews and data gathering have demonstrated the lack of accurate and reliable data which is critical to assessing the issues in detail and developing appropriate corrective actions and initiatives. For example, the percentage of textile factories fitted with ETPs was highly debated. It is widely accepted, though, that even where ETPs exist, they are rarely operated correctly. The DoE only holds summary data on the total numbers of industrial ETPs. However, a more detailed sectoral database is currently under development. In Dhaka, DWASA licences more than 2,000 private wells but the figure greatly underestimates the wells in existence.

There are recognised constraints in terms of human resources and monitoring systems which prevent the DoE, DWASA and other duty holders from effectively delivering on their enforcement role.[33] In addition to these operational challenges, it was also reported that a lack of incentives for front-line staff can make them vulnerable to vested interests.

The DoE was unable to provide data on the current compliance of the textile industry with effluent discharge standards. However, the DoE advised that the total amount of fines and penalties imposed to polluting industries from 2010-2014 is circa $1.5 billion (Tk118.98 billion).[34] It was not possible to confirm the amount of fines actually paid by polluters following the appeal process.

All leading trade associations at both the textile and the leather sectors acknowledge that compliance with effluent standards is poor but they state that they are not in a position to influence their membership to improve performance outright without any incentives.[30 35 36] The potential impact of enforcement actions such as fines, closures and prosecutions is not fully appreciated, probably due to the rare ad hoc implementation of the legislation.

It is often left to the international brands and buyers to improve compliance of factories through their Corporate Compliance Initiatives or buying power. For example, due to pressure applied by H&M, their supply chain has constructed 65 new ETPs in the last 12 months.[37]

Water pollution from tanneries affecting business

The Bangladeshi leather sector is under pressure from global markets and in particular the European Union to take preventive steps with regard to the release of untreated effluent and pollution to the Buriganga River.

3.7 Reputational risks

In recent years, international brands and buyers have been under increasing pressure from their customers, shareholders and the public to improve the environmental and social compliance of their supply chains.

There is a mutual agreement that “Bangladesh needs the foreign buyers and brands as much as they need Bangladesh” and a willingness at the top management level to work together to address the issues. It is also acknowledged that the government has a key role to play in this.

Following the 2013 Rana Plaza disaster, there has been a focus on Fire and Building Safety in the Bangladesh textile sector. Over 150 global retailers from 20 countries have signed up to the Accord agreement which is designed to improve the safety of the supply chain in Bangladesh. It includes independent factory safety inspections, public disclosure of the findings and the undertaking of appropriate remedial works.

Textile trade associations acknowledge that water and energy are emerging issues and improved performance will be required by brands and buyers in the next 2-3 years. However, unless the risk of losing business increases, it is felt that the membership has little or no incentive to improve water management at factories.[30]

Leather trade associations confirmed that finished leather goods and footwear are under scrutiny from foreign buyers and the business environment is challenging. They believe that the relocation to the proposed leather industrial estate in Savar will improve business and unlock new opportunities.[38]

Apex, one the leading manufacturers and exporters of leather footwear in Bangladesh, advised that they import the majority of their leather from Italy, Pakistan and Australia to satisfy their buyers that their leather products are environmentally compliant.[39]

Several brands and buyers interviewed during the study expressed an interest in sourcing Bangladeshi leather once the relocation to Savar has taken place and environmental and social standards improve. International donors have also confirmed that as a result of the planned relocation they are exploring opportunities to invest in the leather sector in the next couple of years.[40]

3.8 Summary of water risks

Industrial water demand in Bangladesh, in terms of direct water withdrawals, is expected to increase two-fold by year 2030.[41] Industries will require a reliable water supply of certain quality for their operations, and it is unlikely that groundwater abstraction will meet that demand. Poor water availability and deteriorating quality pose significant risks for companies which will be looking for alternative water supplies.

Untreated effluent discharge is one of the main causes of deteriorating water quality and a key risk for the industrial sectors. Future effluent discharges will deteriorate the situation further.

Understanding the water risk is vital; both at an individual facility level but also across the wider river basin. These shared water risks can only be effectively addressed following discussions, and in collaboration, with local stakeholders, communities and the government. Possible responses to the water risks are analysed in Section 4.

"Bangladesh needs the brands as much as the brands need Bangladesh. It makes sense to work together to address the challenging water and environmental issues."

Feedback from international brand

Table 2: Summary of water risks and possible responses

Description	Risk	Business risks	River basin risks	Response
Physical	Physical demand gap due to resource and infrastructure limitations	Limits to sector growth Impact on rate of growth Reduced productivity Investment needed to secure new resource	Potential for unsustainable abstraction: - Impacting on communities and ecosystems - Competing demands for limited resource; industry, agriculture and municipal - Significant shift to surface water resource	Strategic water planning: - Water efficiency interventions - Water and effluent treatment strategies Information and awareness initiatives: - Reliable data collection - Capacity building and research
	Poor water quality associated with sector pollution	Business continuity Managing unreliable source water	Degradation of ecosystems	
Regulatory	Weak and ineffective enforcement of water abstraction and pollution controls Lack of sectoral water resources plan	Inconsistent enforcement resulting in inertia in delivering ETPs Reactive investment, rather than planned	As above Poor stakeholder engagement	Reforms in groundwater licencing Improvements in enforcement Strategic water planning
Reputational	Increasing oversight of supplier capacity to manage water	Switch to other local suppliers in the short term Drift over the longer term to other countries		Information and awareness initiatives: - Reliable data collection - Capacity building and research - Public disclosure

04 Responses to the challenges

Water resources management is multi-dimensional and multi-disciplinary and needs coordinated action at a river basin level to achieve desirable outcomes. Responses to the challenges are therefore likely to be more effective if carried out through a multi-stakeholder approach, bringing together the private and public sectors and civil society.

The actors could assume different roles in addressing water issues in the industrial sectors in Bangladesh based on their area of influence and their incentive to drive change.

Table 3: Role of key actors in responding to the water issues

	Strategic water planning				Information and awareness			Environmental regulation and enforcement	
Actor	Water efficiency interventions	Water and effluent treatment strategies	Alternative Water sources	Access to finance	Lack of sufficient data and evidence base	Capacity building and research	Public disclosure	Groundwater licencing	Weak enforcement
Public sector	✓	✓	✓	✓	✓	✓	✓	✓	✓
Private sector	✓	✓	✓	✓	✓	✓	✓		✓
Civil society		✓	✓			✓	✓		

✓ Lead ✓ Supporting

The following sections highlight some of our key findings in addressing the key challenges in the textile and leather sectors. These are common themes that would also apply to other industrial sectors in Bangladesh.

4.1 Strategic water planning

Water and energy

Reduced water availability increases pumping costs. Water and effluent treatment processes are also energy intensive. Energy (pumping) and water purification (softening) result in water input costs for textile mills of around $12-40 per tonne fabric.[44]

Water intensive industries in Bangladesh including the textile mills and tanneries predominantly rely on unmetered private supplies of groundwater. This creates the view that water is abundant and virtually cost free. Furthermore, even water supplied through water authorities in Bangladesh is under priced compared to international prices. For example, Dhaka WASA currently charges $0.1/m^3 for domestic use and $0.3/m^3 for industrial use.[42] For comparison, the average global water and wastewater tariff in 2012 was $1.98/m^3.[43]

In the current environment developing the business case for individual factories to invest in water efficiency interventions based on the cost of water alone is challenging. A stronger case can be made around the potential energy and chemical use savings associated with reduced water use.[45] Textile trade associations advised that their members are willing to invest in resource efficiency measures if payback periods are up to a maximum of ten years but ideally no more than five years.[30 36]

Due to the lack of metering in industries, it is difficult to define the water use baseline and measure performance. There is currently very limited reliable data on the water use and water efficiency interventions in the textile and the leather sectors in Bangladesh. Typical water interventions and payback periods for textile factories are presented below.

Table 4: Typical costs and payback periods for water interventions in textile factories

Intervention	Cost	Payback
Metering, leak detection, maintenance, housekeeping	Small	1 month or less
Reuse cooling water	Small	1 month or less
Reuse process water from rinsing	Moderate	5 months
Improve washing ratio	Moderate / High	1 month or less

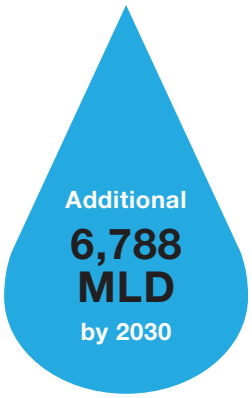
4.1.1 Textile sector analysis

4.1.1.1 Business as usual

At a macro level, the textile industry will require considerable additional volumes of water to grow to $50 billion by 2021 and $66.25 billion by 2030. We estimate that for the BAU water demand scenario, an additional water supply of 6,788 MLD is required in 2030 to meet the sector's aspirations.

Falling groundwater tables combined with the projected increased water abstraction rates are likely to threaten industrial production. The cost of developing alternative water sources is substantial and could hinder growth.

The total capital and operational costs to meet the water demand and effluent discharge standards to 2030 for the BAU scenario are in the region of $19-30 billion (Figure 16). The costs include an estimate of investment required for new water treatment and wastewater treatment infrastructure by existing factories to comply with environmental standards. The analysis is based upon the data and assumptions listed in Appendix D.



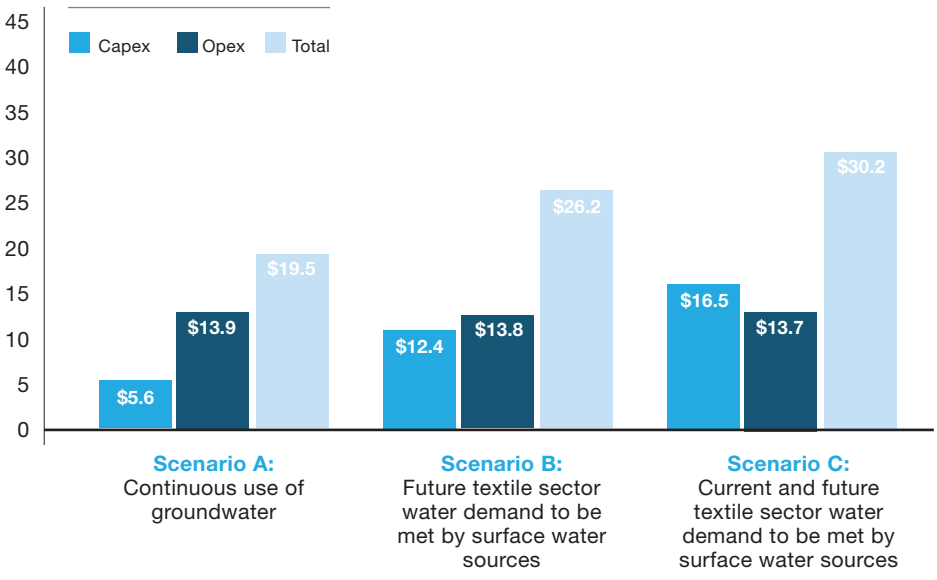


Figure 16: Projected water related costs for the textile sector to year 2030
(in $bn)

Water and chemical use

Reduced water use could also reduce use of chemicals and effluent treatment costs in the textile sector. It is estimated that a 20% reduction in water usage could result in 10% reduction in chemical usage, assuming 650 kilograms of chemical per tonne of textiles.[40]

"Factories need to see investment in water as an opportunity, not an expenditure."

Feedback from international brand

The total water related costs to 2030 are projected to be between 2.4 and 3.7% of the total sector revenue. This represents a significant cost to a sector that views water as a free resource. The analysis highlights opportunities to reduce the water security risks and costs to the textile sector.

Due to the previously documented constraints with future groundwater supply, the most likely future BAU scenario involves meeting the future textile water demand by developing surface water sources. Therefore, this scenario, with a total cost of $26 billion (3.25% of the total sector revenue) is used as the baseline against which interventions have been examined.

4.1.1.2 Potential of water efficiency interventions

Water efficiency measures at factory level have the potential to reduce both water supply and effluent treatment costs. In addition, they could also defer the significant investment to develop alternative water resources for the industry.

There is limited data from the textile sector in Bangladesh on water use and the effectiveness of water efficiency measures.[46] The industry must take action and record water use appropriately as this data could provide an invaluable evidence base for detailed cost benefit analysis of water efficiency interventions. A high level analysis of existing data complemented with some data from Chinese mills indicates that there are opportunities to reduce water use by up to 20% at a relatively small cost.

Indicative measures to achieve different water use reductions are presented in Figure 17. The effectiveness of water saving measures is likely to vary considerably from factory to factory and must be assessed specifically prior to undertaking any action.

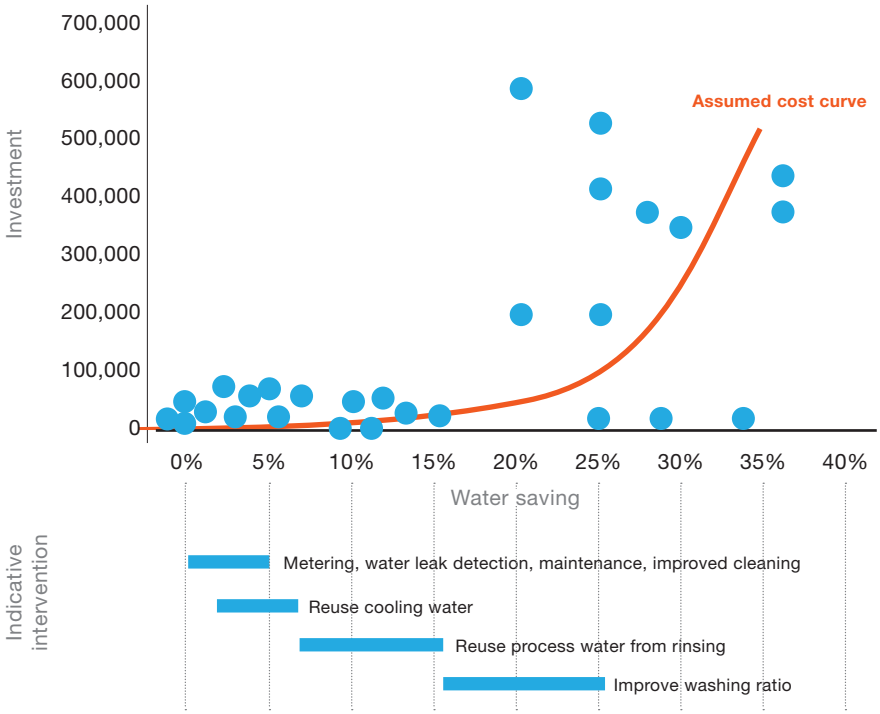


Figure 17: Indicative cost curve for interventions which reduce water abstractions (in $)

The available data has been used to estimate the cost effectiveness of interventions based on the projected growth to 2030.

Table 5: Description of future water efficiency scenarios for the textile sector

Scenarios	Description
0	Business as usual
1	Implementation of interventions which reduce water use by 20%
2	Implementation of interventions which reduce water use by 35%

Our analysis shows that there is a strong case to invest on interventions which reduce water use by up to 20%. The ROI over the next 16 years to 2030 is estimated to be up to 10,000%. There is less certainty on the cost of interventions which have resulted in greater water use reductions but they still have a ROI of up to 1,175%.

Table 6: Cost benefit analysis of future scenarios for the textile sector.

Scenarios	Average reduction in water abstraction (MLD)	Cost of intervention ($bn)	Potential total benefit ($bn)	Potential benefit per annum ($bn)	Return on investment (%)
1 Water use reduction by 20%	1,641	0.06	5.81	0.36	10,172
2 Water use reduction by 35%	2,872	0.81	9.46	0.59	1,175

Moderate increases to energy prices by 3% per annum increase the ROI for water reductions of up to 20% to 10,240%.

4.1.1.3 Centralised effluent treatment

Immediate scaling-up efforts should focus on opportunities to provide more affordable effluent treatment as this will have a significant positive impact on health and the environment.

Textile trade associations confirmed that the sector is supportive of the concept of CETPs as long as development costs are paid by a third party. It is envisaged that connected factories will pay the CETP operators an agreed rate for the volume of treated effluent. There are uncertainties, though, with regard to the overall costs involved.

CETP operators, on the other hand, highlight that there are difficulties in bringing together stakeholders such as factory owners, trading associations and the government.

CETP solutions require land availability ideally at close proximity to wastewater sources to reduce the size of wastewater collection systems and the need for extensive associated power infrastructure.

Although costs for CETPs are significant, economies of scale could make them more efficient than decentralised systems both in terms of capital investment and energy efficiency. There are also added benefits in terms of integrated maintenance, operational and management arrangements.

"Clustering of industries is key in creating the business case of water interventions."

Feedback from textile trade association

The benefits have been recognised by the Government of Bangladesh and a CETP solution has been implemented for the relocation of the leather industry to the Savar industrial estate. More details on the feasibility of CETPs for industries in Bangladesh are presented in Appendix E.

A high level comparison of the total costs of effluent treatment requirements to 2030 for the textile industry indicates that CETPs could provide more cost effective solutions for treatment capacity.

Table 7: Comparison of future effluent treatment costs for the textile sector

Scenario	Decentralised treatment ($bn)	Centralised treatment ($bn)	Cost ratio
0 Business as usual	14.46	7.30	1.98
1 Water use reduction by 20%	10.94	5.51	1.99
2 Water use reduction by 35%	8.30	4.17	1.99

The CETP cost figures exclude land purchase, construction of collector systems and/or possible relocation costs as these will be project specific. Inclusion of this costs will reduce the cost gap. Nevertheless, CETPs have the potential to reduce considerably the future textile sector water related investment to 2030.

A detailed feasibility study which identifies opportunities and possible locations for centralised treatment for existing industrial clusters could act as a catalyst to initiate action in this area.

4.1.1.4 Zero discharge in the textile sector

Zero discharge initiatives are gathering momentum in Bangladesh. Textile trade associations confirmed that the Government of Bangladesh has recently issued a letter to them stating that such strategies will be part of future policy and should be implemented in the next five years.[36] Furthermore, global brands under the ZDHC programme held a first stakeholder engagement workshop in Dhaka in September 2014.[47]

The implementation of a zero discharge standard has appeal to both the government and brands. It provides easier means of enforcing compliance and reducing discharges of chemicals into the environment. From a water perspective, zero discharge measures could reduce water abstractions by up to 75%, however, they do not affect non consumptive use and have the potential to reduce return flows to the environment. Their implementation must be considered carefully at a local, location specific, context.

The apparel industry's Zero Discharge of Hazardous Chemicals (ZDHC) roadmap

The ZDHC initiative was formed in 2011 by major apparel and footwear brands and retailers as a response to a publication by Greenpeace highlighting the widespread discharge of untreated chemicals by textile companies into Chinese waterways.

Members, including Adidas, NIKE and H&M, made a shared commitment to help lead the industry towards zero discharge of hazardous chemicals by 2020, the first step of which included the publication of a Joint Roadmap in 2020. It is highly ambitious and sets a new standard of environmental performance for the global apparel and footwear industry and includes specific commitments and timelines to realise this shared goal.

Zero discharge measures require significant initial capital investment and high ongoing operational expenditure. As there is lack of cost data from Bangladesh, we have obtained and used recent data from India for centralised zero discharge treatment of existing textile industry clusters.[48] For comparison, the costs used are 50% lower than those presented in a textile industry case study in the 2030 WRG "Managing water Use in Scarce Environments" catalogue.[49]

We estimate that the total capital and operational costs for centralised zero discharge interventions to 2030 is in the region of $31.3 billion for the BAU scenario. This is 20% more expensive than the cost of the BAU scenario which includes decentralised effluent treatment. Possible economies of scale achieved by centralised treatment plants, are likely to make centralised zero discharge interventions look even more cost effective.

In addition, as an energy intensive process, operational costs are higher and more sensitive to energy price fluctuations. A modest annual 3% inflation in energy prices is estimated to increase the total water costs for the textile industry from $31.3 to $35.1 billion by 2030.

Table 8: Description of future ZD scenarios for the textile sector

Scenarios	Description
3	Implementation of ZD measures on business as usual scenario
4	Implementation of ZD measures and interventions which reduce water use by 20%
5	Implementation of ZD measures and interventions which reduce water use by 35%

Zero discharge measures are more cost effective if water saving interventions are implemented first, as the size of the plant and operational costs decrease considerably.

Table 9: Future ZD scenarios cost benefit analysis and the impact of future energy price increases on textile sector scenarios

Scenario	Projected total water costs to 2030 ($bn) – no energy price increase	Projected total water costs to 2030 ($bn) – annual 3% energy price increase	Reduced average water abstraction (MLD)
0 BAU	26.2	28.4	-
1 Water use reduction by 20%	20.4	22.1	1,641
2 Water use reduction by 35%	16.7	18.7	2,872
3 Zero discharge (ZD) measures on BAU scenario	31.3	35.1	6,154
4 ZD measures and water use reduction by 20%	25.0	28.1	6,564
5 ZD measures and water use reduction by 35%	20.3	22.8	6,872

A pilot study in Bangladesh could obtain more accurate local data on the cost of the intervention but an assessment of the impact of reduced return flows to the environment should also be undertaken in parallel.

4.1.2 Leather sector analysis

The relocation of the leather industry from Hazaribagh to Savar will drive the replacement of existing antiquated processes with modern equipment. This is a unique opportunity for the industry to adopt responsible environmental management practices and to benefit from the financial gains associated with reduced water use in the long term.

Water abstraction and effluent treatment are included in the relocation project costs for a period of two years. There is currently uncertainty on the future operational and maintenance arrangements but it appears that a public private partnership is favoured by the stakeholders.

Assuming that the leather industry will grow to $8.25 billion by the year 2030, an additional water supply of 76 MLD is required. The projected water demand from the leather sector is minimal in comparison to the textile sector and water demand should be easily met.

Table 10: Description of future water efficiency scenarios for the leather sector

Scenarios	Description
A	Business as usual
B	Implementation of interventions which reduce water use by 20%
C	Implementation of interventions which reduce water use by 35%

The total water related costs for the leather industry to 2030 for the BAU scenario are in the region of $130 million which is less than 0.5% of the total sector revenue (Figure 18).

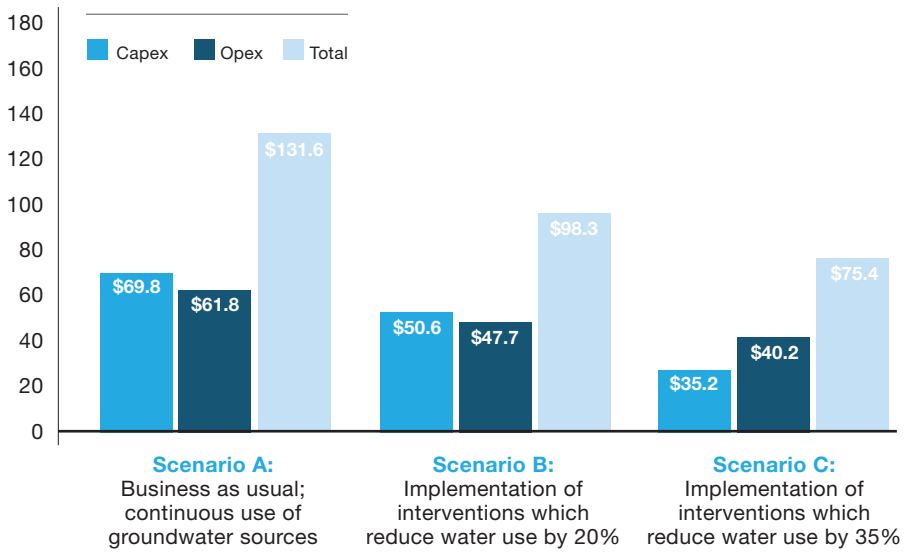


Figure 18: Projected water related costs for the leather sector to year 2030
(in $m)

Water efficiency measures are still very relevant as they could reduce operational costs following the completion of the relocation project and defer the need for future capital investment on water supply and effluent treatment. The figures exclude land purchase and possible relocation costs.

Table 11: Cost benefit analysis of future scenarios for the leather sector

Scenario	Projected total water costs to 2030 ($m)	Potential benefit per annum ($m)	Average reduction in water abstraction (MLD)
A Business as usual	131.6	-	-
B water use reduction by 20%	98.2	2.1	10.4
C water use reduction by 35%	75.3	3.5	18.1

4.1.3 Alternative water sources

While using water efficiently should remain the top priority, alternative sources need to be explored including those that could be harvested at building level.

4.1.3.1 Wastewater reuse

The treatment of process effluents for reuse is an alternative approach that can offer savings of energy, water and chemicals. Various industrial wet processes are influenced in different ways by the presence of impurities in the water supply and therefore quality standards are required to generate confidence that the alternative water supply is safe, clean and suitable for the intended use.

A key issue is the availability of suitable end-users for reclaimed water. The successful implementation of large scale projects require water-intensive industrial customers that can use non-potable water to be located in proximity to reclaimed water sources.

Ningbo Sihua hosiery dyeing and finishing plant in Zhejang province, P.R. China

A hosiery dyeing and finishing plant in China constructed a pilot wastewater reclamation plant with a capacity to treat 600 m^3/day of effluent from the dyeing process, in three stages.

The treated effluent was then used in the dyeing process over the course of a year. Sampling showed that there is a slight difference between the colours when comparing reclaimed water to fresh water; this is only noticeable when dyeing by light colours and therefore reclaimed water cannot be used for this purpose. When using darker colours however there was no discernible difference between the fresh water and reclaimed wastewater.

During the experimentation it was established that reclaimed water can be used in all steps of the dyeing process except for the last rinse- thus maximising the opportunities for reuse. The cost of using reclaimed water was estimated to be in the region of 0.25 $/$m^3$.

Wastewater reuse projects could also be implemented for agricultural irrigation to meet increasing agricultural water demand. For example, industrial crops could be irrigated with secondary effluent after storage and polishing in open lagoons.

The promotion of water reuse opportunities requires:

- partnerships between stakeholders across sectors to develop sustainable and collaborative business models,
- clear demonstration of the value of water reuse through the adoption of smart solutions and new approaches and the implementation of best practice pilot projects.

Alternative water sources

Research is required to assess the feasibility and cost effectiveness of options like rainwater harvesting and artificial groundwater recharge.

4.1.3.2 Rainwater harvesting

As an alternative to using groundwater or distant water resources, part of the water demand may be supplied by a portfolio of local water sources including rainwater. In simple terms, rainwater harvesting is a means for diverting rainwater that falls on roofs, or other collection surfaces of a property or factory, and storing it for later use on-site with the installation of relatively simple technologies. Some treatment may be required prior to use by industries. More complex installations that collect water from a cluster of buildings and factories are also feasible.

The use of local water resources such as rainwater harvesting is also linked to urban sustainability which recognises the importance of local solutions and the key role of local governments, industries and the society in the search of sustainable development.

The main inconvenience of rainwater harvesting is the unpredictability of reliable water supply. However, even if rainwater harvesting may not be an absolute solution for the industries, it could meet part of the water demand, especially during the wet season.

4.1.3.3 Groundwater recharge

Natural replenishment of ground water reservoirs is slow and unable to keep pace with the excessive continued exploitation of ground water resources in various parts of Bangladesh. In order to augment the natural supply of groundwater, artificial recharge of groundwater sources from storm water runoff from urban areas could be used. This involves the augmentation of natural movement of surface water into ground water reservoir through suitable civil structures.

Extensive groundwater recharge projects are popular in water scarce regions such as Australia, India and the United States. Some limited work has been carried out in Bangladesh to improve water access in coastal areas. The Government of Bangladesh should explore whether a national programme of large scale aquifer storage and recharge schemes could improve the groundwater situation. As an added benefit, such schemes improve storm water infiltration and could significantly reduce flooding in some cases.

4.1.4 Access to finance and market policies

Water investment needs in particular in the textile industry are sizable and considerably greater than current spending. Investment will need to increase by several times in order to meet effluent standard targets and ensure future water supply to meet the anticipated growth. There will also need to be additional investment in future operation, maintenance and monitoring commitments.

Although access to finance should not be a constraint for the low and medium-cost interventions at factory level, more ambitious plans will benefit from affordable finance at low interest rates. In addition, small and medium enterprises may have limited or no access to credit.

The Government of Bangladesh should consider waiving or reducing import duties on water meters, eco-friendly chemicals and dyes and selected water technology to encourage investment from the private sector for best practice interventions.

Incentivisation schemes for industries to improve environmental compliance should also be explored. These could include VAT breaks for industrial production that exceeds appropriate water and environmental standards.

Progressing large centralised water supply and effluent treatment projects and associated infrastructure could attract public private partnerships with the participation of international financial institutions to ensure that appropriate technical, environmental and social due diligence is carried out.

Access to Green Finance

The Bangladesh Bank recognised the environmental challenges in Bangladesh and launched an ambitious green banking programme of $25 million (Tk 2 bn) in 2009. The initial programme focussed on funding of solar panels, biogas plants and industrial ETPs to help reduce industrial pollution and increase the power supply. To date, the central bank has identified 47 green products under the refinance scheme.

Under the scheme, the Bangladesh Bank is currently providing funds to banks and financial institutions at 5% interest. Banks are committed to keeping the interest rate to below 10% for loans to customers.

In February 2015, the Bangladesh Bank disclosed the development of a new EDF worth about $500 million to support environment friendly industrial and development projects.

The current disbursement of the Green Fund has proven ineffective with limited interest from commercial banks. Investors, particularly in the textile sector, find the funding procedures and guidance to be complex.

An initial assessment has identified several barriers and opportunities on the current Bangladesh Bank Green Finance arrangements and initiatives (refer to Appendix F).

4.1.5 Summary of strategic water planning

If the sector is to achieve its growth aspirations it needs to strategically plan the development of its water resource. Decision making on a suitable strategy should be based upon detailed water resource planning and understanding of the specific local context. Prioritisation should be given to interventions that focus on reducing water use and wastewater pollution.

Low-cost interventions could provide a range of quantifiable benefits to the industries. Significant water and effluent treatment benefits may be possible through large-scale implementation. Such interventions will require access to finance and partnerships between the public and private sector.

"The private sector needs champions, to advocate with the government, rather than be a union."

Feedback from stakeholder consultation

4.2 Information and awareness

4.2.1 Data management

There is insufficient and sometimes contradicting data available on industrial water use and effluent discharges in Bangladesh. There is a heavy reliance on out-of-date information and both the sectors and the government are failing to deliver robust data. The interviews indicated that these data challenges adversely affect water management.

The DoE has cited lack of resources and appropriate infrastructure while the industries have little incentive to gather, manage and share water data. Data is often not shared between government agencies and officials are often unaware of datasets collected by the private sector and non-government sources. The leaderships of the textile and leather sectors have a desire to learn from best practice in order to improve their business but knowledge transfer opportunities are limited.

Data collection

Reliable and accurate date is vital to inform stakeholder decision making and generate sustainable actions in water management.

Data collection improvements and effective dissemination are vital components of informed policy making by the government and decision making by the industries. Therefore, establishing nationally accepted standards of water data measurements in industries is of key importance. A common database repository for this information would create a robust and modern evidence base for the benefit of all stakeholders involved in water management. For example, the public sector and the civil society could continuously monitor and evaluate performance, and industries would be able to set clear targets and benchmarks for sustainable water use at factory level and build business cases for cost beneficial water management interventions.

The Bangladesh Water PaCT: Partnership for Cleaner Textile

This programme brings together buyers, factories, civil society, and technical specialists. It aims to reduce environmental and related social impacts resulting from prevailing practices in textile wet processing, particularly excessive groundwater extraction and surface water pollution. A critical component is the implementation of cleaner production assessments and reporting of reliable data on water use at factory level. In addition, a cluster-level WFA was conducted for the textile industry cluster area, Konabari, in the Greater Dhaka area as an instrument to engage multi- stakeholders in support of cleaner textile.

4.2.2 Capacity building and research

The industries themselves acknowledge that there are significant gaps in their capacity to conduct research, training and experimental development of innovative techniques to modernise their processes. This prevents the sectors from operating efficiently at factory level and is partly responsible for the poor environmental and water performance.

This is evident in the leather sector in particular where availability of resources has traditionally been limited. The most recent UNIDO project looking into the reduction of environmental risks was completed in 2012 and, although its water element was limited, it raised awareness and increased capacity building in the sector. BTA confirmed that they now aspire to establish a leading research and testing centre following the relocation of the industry in Savar.[36]

The industry's aspirations should be supported by the public sector and the civil society. International donors have confirmed that the successful completion of the relocation to Savar is likely to reignite their interest in the leather sector.[40]

The leather industry could take inspiration from the NITER in Bangladesh which is a PPP Education and Research Institute in the textile industry with international links and reach.

NITER

NITER is affiliated by the University of Dhaka, run by the BTMA under the Ministry of Textiles and Jute, Government of Bangladesh. NITER has a close relationship with international education and research institutions, universities as well as globally active development organisations in the textile sector. In November 2014 NITER signed a Memorandum of Understanding with the Wuhan Textile University in China to identify knowledge transfer and joint research opportunities.

4.2.3 Community engagement and public disclosure

Community engagement in water management should be encouraged as it is integral in addressing local water-related issues effectively. It should also be recognised that greater transparency leads to the development of more robust approaches to water management which enable the mitigation of risks and the identification of win-win opportunities for all stakeholders.

Civil society organisations can play an important role in water management in Bangladesh by advocating for change, raising awareness and promoting transparency in the industrial sector. This could be achieved through the development of a water supply metering and effluent compliance database which is managed by an independent organisation. Incentives for the participation of factories in this database could be provided and brands could also encourage participation of their supply chains. Such a database would allow transparent reporting and knowledge transfer and highlight success stories, to which the rest of the industry can aspire to.

Need for reforms

Reforms on groundwater licencing arrangements and better enforcement of effluent standards are necessary to improve water management in Bangladesh.

4.3 Environmental regulation and enforcement

Effective regulation to sustain water withdrawals and control pollution is paramount to sustainable water management in Bangladesh. While instruments such as planning approvals and environmental impact assessments could be deployed to limit non licenced water abstractions and the discharge of untreated effluent into water bodies, enforcement of regulations is not effective.

A review of current groundwater licencing arrangements is likely to reveal hundreds or thousands of private industrial wells which are not licenced. In addition, abstraction rates from licensed wells should be better controlled.

Promotion of monitoring of large industrial water users is necessary to obtain reliable data on actual water usage and establish the evidence base for taking action. Improved metering is expected to reduce dependency on groundwater sources and slow the rate of their depletion.

Reforms are required to improve the capacity of the DoE, WARPO or other appropriate agencies to enforce effluent compliance with existing monitoring guidelines and regulations. This could involve the availability of additional human and technological resources along with the provision of appropriate training. Consideration should also be given to innovative ways of incentivising staff to improve their performance and operational efficiency. International brands and buyers could indirectly enforce compliance by demanding factories to comply with recognised certification standards. Although this would create challenges for both the buyers and the factories, it could also represent an opportunity for the industries of Bangladesh to gain access to new overseas markets.

Finally, there may be opportunities for local civil societies and the private sector to actively participate in enforcing and monitoring compliance of industries with relevant water and environmental standards.

A recent report by WWF and H&M titled ‘Water Governance in Bangladesh’ provides detailed responses on environmental regulation and enforcement issues. [31]

Tanneries discharge highly polluted effluent to the environment

Enforcement of regulations in Bangladesh is ineffective

05
Specific recommendations

There are some specific key focus areas within the industrial water sector where a 2030WRG Bangladesh partnership could add value. It is envisaged that these recommendations will be delivered as part of a multi-stakeholder platform approach, with participation from the public and private sectors and the civil society.

Responding to strategic water planning issues

Recommendations	Lead Partners	Outcomes
Facilitate a review to identify opportunities and possible locations for CETPs for existing industrial clusters. The review should also explore opportunities for Public Private Partnerships in effluent treatment.	- DoE - BSCIC - Planning Commission - Local authorities - BGMEA - Brands - CETP operators	- Feasibility study for CETPs in the industrial clusters in and around Dhaka city area completed. CETP pilot study outside EPZ and BEPZA estates. - Identification of potential investors and operators for CETPs. - Land allocated by the government and agreement signed between CETP investors and the textile industry to implement and operate the CETP. - Review the potential for efficient resource recovery and a 'circular economy.'
Engage with policy makers and commercial banks to improve disbursement of the Green Fund.	- Bangladesh Bank - Planning Commission - Ministry of Finance - BGMEA - BFLLGFEA - Brands - Technical specialists - Ministry of Industry - Ministry of Commerce	- Review of the Green Finance guidelines and preparation of sectoral guidelines for the textile and leather industries. - Capacity building to commercial banks and financial institutions will be required on how to implement the Green Finance guidelines. - Policy statement on eligibility of large scale industrial projects (e.g. CETPs) for Green Finance.
Assist in the development of a pilot project on the potential of zero discharge measures in the textile sector.	- DoE - Brands - BGMEA - CETP operators	- Identification of potential participating factories and partners. - Detailed investigation of capital and operational costs. - Assessment of potential risks due to reduced environmental flows.
Support the review of alternative water sources for use in industrial clusters.	- Planning Commission - BRAC University - BGMEA - BSCIC - Local authorities	- Study examining the feasibility of alternative water sources such as rainwater harvesting measures and aquifer recharge schemes. - Options for wastewater re-use in different industries.
Work with stakeholders to promote water efficiency equipment and stimulate the cleaner production market.	- Ministry of Industry - Ministry of Finance - BGMEA - BFLLGFEA - Brands	- Identification of opportunities to reduce or waive import duties on water meters, water minimisation/ conservation equipment and eco-friendly chemicals and dyes. - Increased competition in the water marker and reduced cost of water and effluent treatment.

Responding to information and awareness challenges

Recommendations	Lead Partners	Outcomes
Promote the need for standardised data collection and reporting to enable accurate monitoring of industrial water use and the impact on water abstractions, effluent discharges and return flows to the environment.	- DoE - BGMEA - BFLLGFEA - Brands - NGOs - Water authorities - ETP operators	- Preparation of the conceptual framework for data collection. - Identification of potential partners for data collection and reporting. - Proposed incentives for data sharing amongst the actors.
Gather local knowledge and establish the evidence base on the impact and cost of water saving and effluent treatment interventions to inform action by the industrial sectors.	- DoE - BGMEA - BFLLGFEA - Brands - ETP operators	- Robust information and data on capital and operational costs. - Calculation of payback periods for new technology. - Production of specific research and development proposals.
Facilitate capacity building in sustainable water management and cleaner production at factory level.	- BGMEA - BFLLGFEA - Brands - ETP operators	- Identification of potential partners for pilot trials. - Training and capacity development for factory employees.
Increase public and industry awareness on implications of future "business as usual" scenarios through sensitisation and marketing campaigns.	- DoE - BGMEA - BFLLGFEA - Brands - NGOs	- Working with new actors from the civil society and local pressure groups. - Advanced public and stakeholder awareness.

Responding to environmental regulation and enforcement constraints

Recommendations	Lead Partners	Outcomes
Promote improvements to the groundwater licencing for industrial users.	- DoE - Water Authorities - Ministry of Water resources	- Changes to groundwater licencing to include compulsory metering of water abstraction. - Industries pay water charges based on actual water use.
Support stakeholders with the identification of incentives for the textile factories and other industrial sectors to reduce water use and untreated effluent discharges to surface waters.	- Planning Commission - Ministry of Finance - DoE - BGMEA - BFLLGFEA - Brands	- Agreement of harmonised standards for water use. - Benchmarking of environmental performance and compliance. - Recommendations for mechanisms and models that could improve environmental compliance of industries.
Encourage involvement of the civil society in the enforcement of environmental regulation and effluent discharge standards.	- DoE - BGMEA - BFLLGFEA - Brands - NGOs	- Identification of possible roles for civil society and pressure groups. - Trial study which assesses effectiveness of proposed arrangements.
Facilitate discussions on the post relocation operational arrangements at the Savar industrial estate.	- DoE - BSCIC - BFLLGFEA - CETP operators	- Agreement of long term operational arrangements with the leather industry and the Government of Bangladesh.
Promote the implementation of water certification schemes in the industrial sector	- BGMEA - BFLLGFEA - Ministry of Industry - DoE - Brands	- Pilot trial on the benefits of accreditation for the textile and leather sectors.

Appendix A

Stakeholder consultations: List of interviewees

Organisation	Contact	Designation of actor	Position
IFC	Sayef Tanzeem Qayyum, Mohammad Lutfullah, Mrinal Sircar	International institution	Programme Managers/Operations Officers
Textile Technology Business Centre	Tanvir Al-Fazal	International institution	Knowledge Management Officer
Leather Sector Research and Development Centre	Mr. Akteruzzaman	Private company	Program Co-ordinator
C3ER	Prof Ainun Nishat	Academic institution	Professor Emeritus
BTA	BTA secretariat	Trade Association	BTA secretariat
DFID	Helen O'Connor and Md. Liakath Ali	Development Agency	Climate Change & Environment Advisers
UNIDO	Zaki Uz Zaman	International institution	Head of UNIDO Operations in Bangladesh
Carrefour Trading Asia Ltd (Carrefour)	Mrs. Kareen Cappai	Private company	Regional CSR Manager for Bangladesh, India and Pakistan
BGMEA	Md. Shahidullah Azim	Trade Association	Vice President
giz	Elke Shrestha	Development Agency	Senior Advisor, Promotion of Social and Environmental Standards in the Industry
Apex Footwear Ltd	Syed Gias Hossain	Private company	Assistant Managing Director
H&M	Roger Hubert	Private company	Regional Head H&M Bangladesh and Pakistan
GAP international Sourcing (BD) Pvt ltd.	Tamanna Sarwar	Private company	Manager, Global Responsibility Department
BFLLGFEA	Eng. Md. Abu Taher	Trade Association	Chairman of BFLLFEA and Fortuna Group
Embassy of Kingdom of Netherlands	Carel de Groot	Development Agency	First Secretary, Water Section
BTMA	Mr Jahangir Alamin	Trade Association	President of BTMA
The Asia Foundation	Nayef Ahmad	NGO	Senior Program Officer
DWASA	Md. Bazlur Rahman	Water authority	Chief Engineer
Ministry of Industry, BSCIC	Md. Sirajul Haider	Government department	Project Director (Joint Secretary), Tannery Industrial Estate, Dhaka
DoE	Maududur Rashid Safdar	Government department	Director

Organisation	Contact	Designation of actor	Position
BELA	Syeda Rizwana Hasan	NGO	Chief Executive
C&A	Leslie Sridaran Durairaja	Private company	Senior Manager Sustainable Supply Chain
IWM, Water Resource Planning Division	Mr. S M Mahbubur Rahman	Government department	Director
WARPO	Md. Salim Bhuiyan	Government department	Director General
Gazipur City	Md. Nazrul Islam	Local authority	Water Superintendent
Office of Department of Environment, Gazipur District	Ms Anita Shosh	Government department	Inspector, Gazipur District
Bank of Bangladesh	Manoj Kumar Biswas, General Manager	Financial institution	Green Banking and CSR Department - General Manager
Jiangsu Lingzhi Environmental Protection Co. Ltd. & Development Constructions Ltd. Joint Venture	Mr Min Zhou	CETP contractor	Savar Industrial Estate, Project Director and Authorised Representative
National Environmental Controls Bd	Jim Silverman	CETP Operator	Dhaka EPZ, Managing Director
DoE	Dr Md. Sohrab Ali	Government department	Deputy Director (Technical)

Appendix B

List of Water Resources Management Projects

This appendix summarises water initiatives in Bangladesh as of September 2014. These were identified during the stakeholder engagement study following consultation with the Embassy of the Kingdom of Netherlands.

Part A - Projects Under Implementation

Sl. No	Project Title	Objectives / Brief description	Country coverage	Duration	Project Cost	DP Financing	Impl. Agency	Status
1	Water Management Improvement Project (WMIP)	Improve performance of the existing water infrastructure with due regards to the right of all water users.	National	2007- 2015	US$ 114.30m	WB	BWDB	Ongoing
2	Southwest Area Integrated Water Resources Planning and Management Project	Regional water resources development in the Southwest region	Regional	2006 - 2014	US$ 40.58m	ADB / GoN	BWDB	Ongoing
3	Blue Gold Program (BWDB Component)	Integrated Sustainable Economic development by Improving the Water and Productive Sectors in Selected Coastal Polders	Southwest & Southern Coastal areas	2013 - 2018	US$ 70.5m (Tk. 56,396.00 lac)	GoN + GoB matching fund	BWDB & DAE (with DoF, DoL, DoC via TA)	Ongoing
4	Char Development and Settlement Project - IV (CDSP IV)	Integrated Coastal Zone Development: The overall objective is to reduce poverty and hunger for poor people living on newly accreted coastal chars. This would be achieved via improved and more secured livelihoods which would be provided via climate resilient infrastructures and by providing poor households with legal title to land.	Regional / South East	2011- 2016	US$ 81m	IFAD / GoN	BWDB (Lead), MoL, DAE, DoF, LGED, DPHE	Ongoing
5	Emergency 2007 Cyclone Recovery & Restoration Project [ECRRP BWDB Part] (Component C & Sub-Component D2)	Rehabilitate/repair the BWDB infrastructures damaged by Cyclone SIDR of 15 November 2007 and Cyclone Aila of 25 May 2009	National	2008 - 2014	US$ 49.20m (BDT 33923.40)	IDA	BWDB	Ongoing
6	Secondary Towns Integrated Flood Protection (Phase-II) Project (STIFPP-II)	The project will promote economic growth and alleviate poverty in the nine selected towns in Bangladesh by providing a flood-free and secure living environment within the framework of integrated flood protection.	National (Kushtia, Rajshahi, Gaibandah, Jamalpur, Mymensingh, Manikganj, Munshiganj, Brahmanbaria & Sunamganj)	2004 - 2005 to 2012 - 2013	US$ 89m	ADB / OPEC	BWDB, LGED	Ongoing
7	Dialogue on Transboundary River Management	Support a dialogue between riparian states on integrated river basin management of the GBM river basin	Regional India, Bangladesh	2009 - 2013	US$ 6,2m	GoN	IUCN ARO	Ongoing
8	Irrigation Management Improvement Investment Program (PPTA-IMIIP)	Updated Feasibility study of gorai river Restoration Project. Modernization of Hydromet Network of Bangladesh	5 upazila of Feni and 1 upzila of Chittagong District	2012-2013	US$ 0.85m (Tk. 698.16 lac)	ADB	BWDB	Ongoing
9	Bangladesh River Information and Conservation (BRIC) Program	Updated Feasibility study of gorai river Restoration Project. Modernization of Hydromet Network of Bangladesh	National	2011-2012	(Tk. 1164.34 lac)	WB	BWDB	Merged in ECRRP

Sl. No	Project Title	Objectives / Brief description	Country coverage	Duration	Project Cost	DP Financing	Impl. Agency	Status
10	Main River Flood and Bank Erosion Risk management Program. (PPTA -8054)	The PPTA objective is to ensure long term planning horizon and reach-wise protection activities and to establish more effective linkages among structural and non structural measures, and to enhance capacity of the executing agency to achieve it. The Consultants under PPTA will study the scope of Erosion Protection reaches along Jamuna river from Down Stream (D/S) of Jamuna bridge to Aricha, Ganges river from D/S of Proposed Ganges barrage to Aricha and Padma river from Aricha to U/S of Meghna. The main task of the Study is to prepare and recommend a detail Feasibility Report for formulation of an Investment Project.	Along the both bank of River Jamuna (Downstream of Jamuna bridge to Aricha), Ganges (Downstream of proposed Ganges Barrage to Aricha) and Padma (Up to upper Meghna)	2013 - 2014	BDT 1569.69 lakh (Project Aid US$ 1.20m)	ADB	BWDB	Final PPTA report submitted
11	Rehabilitation Water Management Infrastructure Bhola	The main long term objective of the project is to protect the citizens of Bhola against flooding, salinity and loss of land due to the rising level of the Bengal Sea, increased River flows and erosion and the increasing strength of seasonal typhoons.	National	2013 - 2014	1,364,644 + GoB matching fund	GoN (ORIO)	GoN (ORIO)	Ongoing
12	Participatory Small-scale Water Resources Sector Development Project	Small-scale water resources development through PWM	National	2009 - 2016	US$ 100m	ADB / IFAD	LGED	Ongoing
13	Urban WASH	Improve WASH facilities in Urban areas	Urban areas	2013 - 2017	US$ 10m	GoN	DWASA	Ongoing
14	Market Infrastructure Development Project in Char Lands (MIDPCR)	Improvement of market access and infrastructure	Coastal chars	2006 - 2013	US$ 5m	IFAD/GON	Water LGED	Closed
15	Enhancing Food Security through improved crop water management practices in the Southern Coastal areas of Bangladesh	Improve food security and increase agriculture production in the southern coastal region of Bangladesh by strengthening capabilities on-farm water management practices	Southern and south-western coastal region of Bangladesh	2013 - 2014	US$ 3m	GoN	FAO and Ministry of Agriculture (DAE)	Ongoing
16	Coastal Climate Resilient Infrastructure Project (CCRIP)	Building Climate resilient infrastructure (roads, markets, cyclone shelters)	Coastal chars	2013 - 2019	US$ 150m	IFAD/ADB/ KfW	LGED	Ongoing
17	Sunamganj Community-Based Resource Management Project (SCBRMP)	The objective of this component is to improve the livelihood of poor rural households engaged in fishing by improving their access to fish resources, increase in fish production and the fish species in the water bodies or Jalmohals in the Haor region	Sumanganj (HAOR)	2003 - 2014	US$ 27m	IFAD/GON	LGED	Closed
18	Haor Infrastructure and Livelihoods Improvement Project (HILIP)	Following up on SCBRMP, HILIP will strengthen the institutional arrangements for Beel management and invest resources in developing water bodies to improve their productivity and biodiversity	Haor region	2012 - 2019	US$ 120m	IFAD/ Spain	LGED	Ongoing
19	Building Community Resilience through Integrated Water Management	Output 5.1.2 - Community and local institutions have greater capacity on disaster risk reduction and climate change adaptation; and Output 5.1.3 - Communities, local and national governments have greater capacity to respond and to provide basic services in emergencies and early recovery.	Coastal and Haor areas	2012 - 2014	US$ 7.9m	GoN	UNDP, WFP & ILO	Ongoing

Sl. No	Project Title	Objectives / Brief description	Country coverage	Duration	Project Cost	DP Financing	Impl. Agency	Status
20	UNDAF-UNICEF WASH	Component 1 - store/recover fresh water in the coastal area where all groundwater is saline and ponds are regularly flooded by storm surges; Component 2 - supply safe water/ other WASH services in Narail; and Component 3 – provide safe and appropriate WASH facilities and services in schools and health clinics with sustainable hygiene message dissemination, in addition to rehabilitating WASH facilities in the Nayapara and Kutupalong refugee camps in Cox's Bazar.	Narail, Cox's Bazar and hill districts	2012 - 2014	US$ 7m	GoN	UNICEF, WHO, UNHCR	Ongoing
21	Climate-Resilient Ecosystems and Livelihoods (CREL)	The CREL project will promote sound natural resource management and biodiversity conservation by working with community co-management organizations, the GOB Ministries, and technical agencies. The objectives of the project are to: improve governance of natural resources and biodiversity, enhance knowledge and capacity of key stakeholders, strengthen planning and implementation of climate-resilient natural resources management, and assist project beneficiaries to develop livelihoods that are environmentally sustainable and resilient to climate change.	Northeast, Southeast, and the Sundarbans.	2012 - 2017	US$ 32.6m	USAID	USAID	Ongoing
22	Chittagong Hill Tracts (CHT) Watershed Co-Management Activity	USAID's CHT Watershed Co-Management project will sustain biodiversity and promote climate change resilient livelihoods in protected areas using a community co-management approach. The project will build the capacity of GOB institutions and local communities in the Chittagong Hill Tracts.	Chittagong Hill Tracts	2013 – 2017	US$ 8.0m	USAID	USAID, UNDP Adaptive Environmental Governance for the Poor Program (AEGP)	Ongoing
23	Arannayk Foundation Small Grants	The Arannayk Foundation is a grant-giving organization that supports tropical forest conservation. The Foundation is implemented under the Tropical Forest Conservation Act (TFCA) debt-for-nature-swap and agreements between the U.S. Government and the GOB. The objective of the Foundation is to provide financial grants to qualified organizations or entities (including those sponsored by the GOB) that engaged in activities to conserve Bangladesh's tropical forests and biodiversity.	Arannayk Foundation	2000 – 2018		USAID	USAID	Ongoing
24	Adviser on River Management to BWDB		National	2009 - 2015	US$ 5m	JICA	BWDB	Ongoing
25	Capacity Development of Management for Water Related Infrastructures	1. To improve the capacities of BWDB on Embankment Engineering in terms of Design, Construction and operation & Maintenance methods 2. To achieve water-related disaster risk reduction through proper management of the infrastructures	National	2013 - 2016	Flexible	JICA	BWDB	Ongoing
26	Small-scale Water Resources Sector Development Project	Small-scale water resources development through PWM	National	2009 - 2015	US$ 55m	JICA	LGED	Ongoing

Part B - Projects Under Preparation

Sl. No	Project Title	Objectives / Brief description	Country coverage	Duration	Project Cost	DP Financing	Impl. Agency	Status
1	Bangladesh Delta Plan 2100	50-100 years perspective plan for development of Bangladesh Delta having an holistic development approach amongst all relevant sectors	National	2014 - 2016	US$ 9.6m	GoN	GED, Planning Comm.	Under preparation
2	Coastal Embankment Improvement Project- Phase-1 (CEIP-1)	The overall project development objective is to increase the resilience of coastal population to natural disasters and climate change. This objective will be achieved by taking an integrated approach to rehabilitating and improving the polder system in the coastal area	Southwest & south-central Coastal areas	2013 - 2020	US$ 400m	WB	BWDB	Under preparation
3	Flood protection and River bank Erosion Risk Management Program (ADB's programme no. 44167-013)	To ascertain livelihood securities of the People of the Erosion Affected area by providing river bank erosion works with flood protection and other non-structural works	Along the both bank of River Jamuna (Downstream of Jamuna bridge to Aricha), Ganges (Downstream of proposed Ganges Barrage to Aricha) and Padma (Upto upper Meghna)	2014 - 2024	US$ 250m + GoB matching fund (10% to 20% of Project cost)	GoB / ADB	BWDB	Investment programme to be prepared
4	Planning for Flood Management in Bangladesh	The overall long term objective of this project is to develop an integrated plan and system for flood management and risk reduction in Bangladesh, based on the current needs and flood management situation.	National	2013 - 2015	US$ 6.01m + GoB matching fund	GoN	BWDB	In the pipeline
5	Enhancing Resilience (ER) to Natural Disasters and the Effects of Climate Change	To enhance the resilience of ultra-poor households and communities, with a strong focus on women, and to break the cycle of reliance on negative coping strategies for reoccurring shocks	Disaster and poverty prone regions of north-west flood plains and southern coastal belt of Bangladesh	2014 - 2015	US$ 1.6m + GoB matching fund	GoN	WFP, LGED	In the pipeline
6	Haor flood Management and livelihood Improvement project	To reduce the damages from flood and improve living conditions by rehabiliting and constructing the flood management facilities and rural infrastructures and implementing livelihood improvement activities in the Haor areas of upper Meghna River Basin, thereby contributing to the economic development and poverty reduction of the target areas	Haor region (7 districts)	2015 - 2023	US$ 150m	JICA	BWDB , LGED	Under preparation

Appendix C

Water use data in textile factories

IFC's Water PaCT programme has collated the most comprehensive water use data in textile factories in Bangladesh. The table below summarises the use of water and other resources per kg of fabric produced both before and after the implementation of cleaner production interventions. The names of the factories have been removed due to confidentiality reasons.

Factory	Location	Type of Industry	Daily Average Finished Production (kg/day)	Pre-Implementation				Post-Implementation			
				Water (litres)	Power (kWh)	Natural Gas (m^3)	Steam (kg)	Water (litres)	Power (kWh)	Natural Gas (m^3)	Steam (kg)
Factory 1	Mirpur, Dhaka	Garment Washing Industry	2,300	81	0.46	0.92	8.7	53.85	-	0.78	8.46
Factory 2	Savar, Dhaka	Garment Washing Industry	5,300	167.93	1.34	1.52	16.99	160.91	0.81	1.18	13.29
Factory 3	CEPZ, Chittagong	Garment Washing Industry	23,750	144.34	1.36	1.25	13.66	71.77	1.14	1.07	11.99
Factory 4	Sreepur, Gazipur	Garment Washing Industry	30,550	176.96	0.64	1.09	3.47	137.23	0.51	0.87	2.87
Factory 5	Savar, Dhaka	Garment Washing Industry	33,450	69.01	0.28	0.29	2.27	49	0.28	0.25	2.85
Factory 6	Ashulia, Dhaka	Garment Washing Industry	8,400	176	1.16	0.62	5.69	88.81	0.51	0.31	2.73
Factory 7	Ashulia	Garment Washing Industry	18,550	105	0.44	0.65	5.01	74	0.37	0.43	3.22
Factory 8	Savar, Dhaka	Garment Washing Industry	30,100	116.75	0.86	0.77	12.38	102.19	0.77	0.43	4.3
Factory 9	Konabari, Gazipur	Garment Washing Industry	22,100	166.05	0.47	0.79	7.93	213	0.47	0.97	7.77
Factory 10	Tongi, Gazipur	Home Textile Woven, dyeing, printing industry	90,650	126.36	1.93	3.18	17.03	100.79	1.8	3.06	14.85
Factory 11	Kashimpur, Gazipur	Knit dyeing, finishing & printing garment industry	6,200	189.6	1.3	2.3	14.8	190.4	-	1.56	10.19
Factory 12	Joydebpur, Gazipur	Knit dyeing, finishing & printing garment industry	73,500	146	1.06	1.64	8.6	102.37	0.75	1.96	9.6
Factory 13	Kaliakoir, Gazipur	Knit dyeing, finishing & printing garment industry	12,450	300	1.89	1.83	15.11	281.74	1.78	1.72	14.19
Factory 14	Fatullah, Narayanganj	Knit dyeing, finishing & printing garment industry	24,150	63.11	1.13	1.48	12.622	33.71	1.01	0.84	6.78
Factory 15	Rupjonj, Narayangonj	Knit dyeing, finishing & printing garment industry	11,400	151.62	1.48	1.92	12.38	138.44	1.22	1.64	11.76
Factory 16	Joydevpur, Gazipur	Knit dyeing, finishing & printing garment industry	16,450	91.86	1.36	1.13	10.19	57.35	0.27	1.2	8.59

Factory	Location	Type of Industry	Daily Average Finished Production (kg/day)	Pre-Implementation				Post-Implementation			
				Water (litres)	Power (kWh)	Natural Gas (m^3)	Steam (kg)	Water (litres)	Power (kWh)	Natural Gas (m^3)	Steam (kg)
Factory 17	Chapra, Patiya, Chittagong	Knit dyeing, finishing & printing garment industry	17,700	192.42	1.19	1.26	6.82	157.61	1.06	1.23	6.4
Factory 18	Mirzapur, Tangail	Knit dyeing, finishing & printing garment industry	9,950	168	1.87	1.44	9.55	145	1.62	1.24	8.24
Factory 19	Valuka, Mymensingh	Knit dyeing, finishing & printing garment industry	26,000	102.95	1.51	2.76	10.22	63.51	1.31	2.09	10.21
Factory 20	Kaliakoir, Gazipur	Knit dyeing, finishing & printing garment industry	13,000	267.98	1.41	2.38	13.38	264.5	1.21	2	12.04
Factory 21	Fatullah, Narayanganj	Knit dyeing, finishing & printing garment industry	4,550	259.29	1.48	2.56	9.66	253.65	1.35	0.97	7.76
Factory 22	Jogirchala, Gazipur	Knit dyeing, finishing & printing garment industry	42,400	365.46	3.36	1.98	20.03	333.33	0.66	0.66	10.96
Factory 23	Gazipur	Knit dyeing, finishing & printing garment industry	12,300	142.34	1.29	1.15	7.29	122.3	0.95	1.31	5.02
Factory 24	Tangail	Knit dyeing, finishing & printing garment industry	13,850	-	1.53	-	-	-	-	-	-
Factory 25	Tangail	Knit dyeing, finishing & printing garment industry	14,100	215	2	1.77	8.44	217.8	-	1.35	7.63
Factory 26	Fatullah, Narayanganj	Knit dyeing, finishing & printing garment industry	16,450	208	2.11	3.1	18.27	174	1.38	2.44	14.63
Factory 27	Sreepur, Gazipur	Knit dyeing, finishing & printing garment industry	15,800	153	1.61	1.71	11.7	119.78	0.89	1.41	11.9
Factory 28	Savar, Dhaka	Knit dyeing, finishing & printing garment industry	11,900	144	1.6	1.2	8.3	112.72	1.12	1.14	8.09
Factory 29	Kaliakoir, Gazipur	Knit dyeing, finishing & printing garment industry	43,450								
Factory 30	Rajendrapur, Gazipur	Knit, dyeing, finishing & printing garment industry	15,750	204	2.01	1.83	11.5	181.92	1.95	1.63	10.53
Factory 31	Savar, Dhaka	Sweater Garment Washing Industry	4,000	70.12	0.27	1.33	9.98	62.11	0.15	0.85	9.04
Factory 32	Joydevpur, Gazipur	Sweater Yarn Dyeing, Printing Garment Industry	11,500	138.6	0.86	0.74	5.58	133.16	0.74	0.65	4.87
Factory 33	CEPZ, Chittagong	Towel dyeing, finishing & stitching industry	23,200	82.6	0.69	1.07	7.95	52.91	0.59	0.85	6.95

Appendix D

Data and assumptions used in the analysis

Sectors and water use

Parameter	Value	Unit	Reference
Textile Industry value in 2021	50,000,000,000	$	BGMEA
Maximum textile Industry value in 2030	82,500,000,000	$	Arup projection
Maximum leather Industry value in 2030	10,000,000,000	$	Arup projection
Domestic Dhaka Population in 2011	14,543,123	Population	United Nations World Urbanization Prospects 2014 Revision
Domestic Dhaka Population in 2014	16,982,000	Population	United Nations World Urbanization Prospects 2014 Revision
Domestic Dhaka Population in 2030	27,374,000	Population	United Nations World Urbanization Prospects 2014 Revision
Domestic water use in Dhaka	125	l/p/day	DWASA
Water abstractions for textile industry per kg fabric produced (2014)	250	m^3/tonne	Personal communication with BGMEA and BTMA. The World Bank suggests a figure of 300m^3/tonne ("The Bangladesh Responsible Sourcing Initiative, "A new model for green growth", South Asia Environment and Water Resources Unit)
Percentage of textile industry located in Dhaka	70	percent	ADSL. 2009. SEDF Baseline Surveys and Sector Studies in Agribusiness, Light Engineering and Textiles and Apparel Sectors in Bangladesh. Final Report. Dhaka: International Finance Corporation, South Asia Enterprise Development Fund.
Percentage of textile factories with effective Effluent Treatment Plant (2014)	40%	of factories	Prof Ainun Nishat, personal communication
Water abstractions for leather industry per tonne hyde produced (2014)	40	m^3/tonne hyde	United Nations Industrial Development Organisation, Regional Programme for Pollution Control in the Tanning Industry in South-East Asia, Mass Balance in Leather Processing, August 2000.

Water quality

	Untreated Effluent parameters (in mg/l)			
Sector	BOD	COD	Chromium	References
Tanneries	2000	4500	115	UNIDO article on Leather International magazine, April 2010.
Textile factories	480	696	0.596	IWM 2007, Industrial environmental compliance and pollution control in Greater Dhaka - Phase 1 report
Dhaka domestic	320	640	-	Based on Arup assumptions of BOD5 of 40g/capita/d and water use of 125l/capita/day
	Treated Effluent parameters (in mg/l)			
Sector	BOD	COD	Chromium	References
Tanneries	25	240	1.5	UNIDO article on Leather International magazine, April 2010.
Textile factories	190	294	-	IWM 2007, Industrial environmental compliance and pollution control in Greater Dhaka - Phase 1 report
Dhaka domestic	20	40	-	Arup assumption

Currency Conversions

Currency	Value	Unit	Reference
BDT (taka) to USD $ currency conversion (November 2014)	77.5	BDT:USD	SIX Financial Information
Rs (rupees) to USD $ currency conversion (November 2014)	61.72	Rs:USD	SIX Financial Information

Costing

Parameter	Value	Unit	Reference
Energy and purification costs for groundwater abstraction (low)	12	$/tonne fabric produced	Ecopsis. 2011. Production Efficiency/Pollution Prevention Factory Assessments for Fabric Mills and Dye Houses in Bangladesh
Energy and purification costs for groundwater abstraction (high)	40	$/tonne fabric produced	Ecopsis. 2011. Production Efficiency/Pollution Prevention Factory Assessments for Fabric Mills and Dye Houses in Bangladesh
Average energy and purification costs for groundwater abstraction	0.104	$/m^3	Arup calculation
Capital cost for additional groundwater abstraction	1075	$/m^3/min	PwC assumption in 2030WRG Bangladesh report (BDT 250,000 for a flowrate of 3m^3 per minute)
Operational costs for Chemical Effluent Treatment Plant	0.34	$/m^3	World Bank. 2014. The Bangladesh Responsible Sourcing Initiative, “A new model for green growth”, South Asia Environment and water resources unit
Operational costs for Biological Effluent Treatment Plant	0.21	$/m^3	World Bank. 2014. The Bangladesh Responsible Sourcing Initiative, “A new model for green growth”, South Asia Environment and water resources unit
Percentage of textile factories with chemical ETP	75%		Arup estimate
Percentage of textile factories with biological ETP	25%		Arup estimate
Weighted average operational cost for Effluent Treatment Plant	0.308	$/m^3	Arup calculation
Capital and operational expenditure for ETP & CETP	-	-	Calculations based on Wastewater handbook, Chapter 10 - Integrated cost-based design and operation, 2007, pages 457 - 462
Estimated leather industry operational expenditure for wastewater treatment	0.127	$/m^3	Arup calculation based on figures provided by BSCIC for the Savar industrial estate.
Capital unit cost for Zero Discharge measures (2014)	2.286	$/m^3/day	Arup calculation based on data from India for a 5,500m^3/d plant; I. Sajid Hussain, Case study of a zero liquid discharge facility in textile dyeing effluents at Tiripur, National workshop on CETPs – Hyderabad, 23 November 2012.
Operational unit cost for Zero Discharge measures	2.64	$/m^3	Arup calculation based on data from India for a 5,500m^3/d plant; I. Sajid Hussain, Case study of a zero liquid discharge facility in textile dyeing effluents at Tiripur, National workshop on CETPs – Hyderabad, 23 November 2012.
Surface water treatment works opex	0.1	$/m^3	The IBNET Water Supply and Sanitation Blue Book 2014, The International Benchmarking Network for Water and Sanitation Utilities Databook
Surface water treatment works capex	148	$/PE	Regional and global costs of attaining the water supply and sanitation target (target 10) of the Millennium Development Goals, WHO, 2008. Cost Base 2005.
Surface water treatment works capex	202	$/PE	Arup projection to 2014 cost base

Appendix E

CETPs for industrial clusters

E1 Introduction

Hasty and unplanned growth of industries in Bangladesh has led to adverse environmental issues. Poor environmental compliance has resulted in large quantity of water from dyeing and textile factories and tanneries being released untreated into surface waters polluting the environment and threatening public health. It is estimated that over 625,000 tonnes of COD load from the textile and leather industries enters the rivers every year.

The DoE's data indicates that the total number of industrial ETPs in 2008 was 1045. Although there is no specific data on the number of ETPs operating in the textile sector, it is recognised that a large number of factories are operating without ETPs and those that have been installed may be poorly designed or inadequately operated and maintained. There is increasing pressure from the Government, civil society and international buyers to improve environmental performance and clean up the rivers in Bangladesh from industrial discharges.

This note summarises the findings of a preliminary investigation into the feasibility of establishing CETPs for industrial clusters in Bangladesh with a focus on the textile sector. It highlights existing initiatives, identifies barriers, discusses potential delivery models and presents some thoughts on future work streams to help define the potential in more detail.

E2 Why CETPs?

Feedback from consultations with the industrial sector suggests that the industries are not installing or operating ETPs properly because of the perceived costs, limitations on space, a lack of technical understanding and poor awareness of the wider impacts of poor water quality to society and the industry itself.

The promotion of CETPs offers the potential of improved compliance with environmental standards and is a cost effective abatement measure for managing the pollution originating from industry clusters. The approach offers a number of advantages:

- Reduced capital cost of construction and maintenance due to economies of scale
- Potential for improved monitoring and enforcement of compliance with environmental standards
- Opportunity for cost effective recycling and reuse of effluent.
- More efficient use of land and man-power
- Potential to recover resource streams e.g. energy, nutrients, sludges (dependent on effluent characteristics)

However in developing any proposals for CETPS the nature of the effluents to be treated should be well understood, to both ensure that the "mix" is suitable for cost efficient treatment and that any beneficial uses of the effluent and sludges may not be compromised e.g. heavy metals impacting on future sludge use.

E3 The Need/Opportunity

The analysis presented in this report identifies the "cost" to the textiles and leather sector in developing the asset base it will need to support growth aspirations whilst ensuring effective environmental management. Increasing effluent treatment capacity across the sector will be a key element of this asset base. The estimates presented in this report identify a potential investment in effluent treatment plant of $14.5 billion over the next 15 years through to 2030. CETPs are an opportunity to deliver considerable cost efficiency. Initial best case estimates are that this efficiency would be of the order of $7 billion, noting that actual savings would be dependent on site specific investigation.

E4 Key Stakeholders

Planning for and delivering a strategy for developing CETPs will require a multi-stakeholder approach, encompassing the public sector, the private sector and civic society, as summarised in Figure 19.

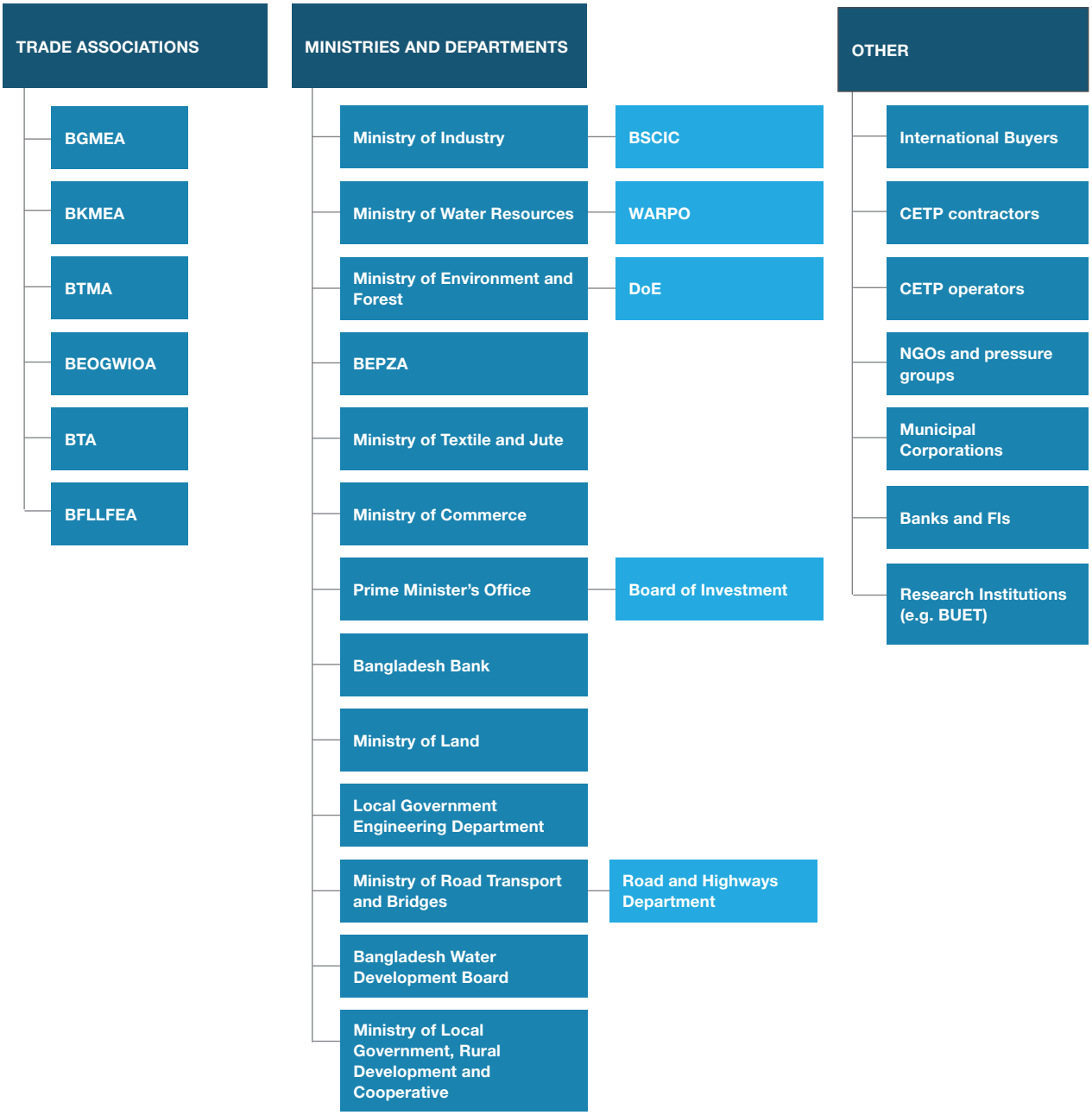


Figure 19. Potential stakeholders in the CETP workstream

E5 Examples of existing CETPs

E5.1 Dhaka BSCIC

In March 2009 the Bangladeshi Joint Export Processing Zone Authority (BEPZA) contracted Flagship Ecosystems Investment (FESI), through a local Joint Venture company, to undertake a 30-year Build Own Operate (BOO) project for the CETP at its Dhaka Export Processing Zone (EPZ). The construction of the CETP was completed in September 2011 and commercial operations commenced in February 2012. The CETP capacity has just been expanded to 43,000m^3 per day. The total construction costs were $10.4m. The operating costs are estimated to be $0.23/$m^3$ of treated effluent. The wastewater tariff currently stands at $0.4/$m^3$ (Tk31/m^3) treated. The total payback period has been calculated at approximately 9 years.

E5.2 Savar industrial estate CETP

For comparison, the CETP under construction at the Savar leather industrial park of the new CETP has a capacity of 25,000 m^3 per day. The construction work will be completed by June 2015. The contractor will operate it for a period of two years prior to handing it over to BSCIC. The construction costs are $64.5m including $5.5m for operating the plant for the first two years. The operating costs are estimated to be $0.4/$m^3$ (Tk31/m^3) of treated effluent

E6 Views of textile trade associations and review of current initiatives

Textile trade associations and factory owners are supportive of the concept of CETPs provided that a third party (government or private sector) funds the initial development costs and invests the capital investment required. They envisage that a CETP operator would be paid on a 'volume and pollution concentration basis' by the factories discharging to the plant.

The status of CETP initiatives in Bangladesh is summarised in Table 12 below.

Table 12: Status of ongoing CETP opportunities in Bangladesh

Area	Status	Source
Gazipur	The Gazipur Mayor has informally offered land for a CETP but these early discussions have not progressed further. No land has been made available and funding is not confirmed. Note that WDF factories in Gazipur are probably too widely dispersed to make a CETP financially viable. It is advised to focus on certain industrial clusters such as Tongi and Konabari BSCIC.	Md. Shahidullah Azim, BGMEA Vice President
Tongi BSCIC	Tongi BSCIC has agreed to buy a plot of land near the river for $2m to locate a CETP. A prefeasibility study (including topographical surveys, identification of possible pipeline routes from different industries to the proposed CETP location and general arrangements plans) has been carried out for a 14,400 m3 per day plant. This will receive discharges from 35 factories. The construction costs are estimated at $4m and could be completed within two years. The Tongi BSCIC has agreed to fund 25% of the project. The main barrier to the project is the high initial capital investment requirements.	Mr Moihuiddin Sekh, Tongi CETP "working group"
Konabari BSCIC	Although there are no ongoing plans for a CETP, A geo-spatial database capturing the clusters geo-spatial, physical characteristics and water/ wastewater drainage locations has been prepared. 27 wet processing factories are located in a relatively small area.	The Bangladesh Water PaCT: Partnership for Cleaner Textile
Narayanganj BSCIC	CETP for textile and pharmaceutical factories is under development in the Narayanganj BSCIC area. This initiative is still in early "concept" stage	Anecdotal evidence from Md. Shahidullah Azim, BGMEA Vice President, that has not been confirmed by Narayanganj BSCIC.
Outside BSCIC or EPZ estates	There are no ongoing initiatives	Discussions with trade associations (BGMEA, BKMEA and BEOGWIOA).

E7 Barriers to the implementation of CETPs

The consultation process has identified a number of perceived barriers to the strategic development of CETPS:

Engaging multiple stakeholders: specialised effluent treatment and management companies have noted that there are difficulties in bringing together stakeholders such as factory owners, trading associations, finance and the government to join the CETP and share the costs.

Land availability and acquisition: related to the high cost of land and the lack of any strategic planning for CETP constraining its development. Land may be also needed for infrastructure associated with the CETP such as pumping stations collecting effluent from different parts of the network.

Finance: limited access to finance to help facilitate development of CETPs and effluent collection systems.

Enforcement: lack of any effective enforcement for ETPs acts as a deterrent in the market.

Tariff acceptance: tariffs need to be affordable, sustainable and enhance the willingness of the factories to connect to the CETPs. This would require formulating equitable tariffs that would apportion volume and pollution load. If it was perceived to be too expensive, large factories, in particular, may be reluctant to close their ETPs and connect to the CETPs.

Sludge management: lack of existing infrastructure to process and recycle sludge produced by effluent treatment.

Table 12 indicates that there is growing appreciation of the potential benefits of CETPs within estates/enterprise zones. CETP projects outside of EPZ or BSCIC estates can be financially viable but will require all concerned factories in an industrial cluster commit to join the initiative. This will necessitate the engagement of local authorities and associations, who could guarantee the use of the CETP and prompt payments for use. It will also require strategic planning, engaging the range of stakeholders identified in Figure 1 to actively plan for the delivery of a CETP programme.

E8 CETP Business models

E8.1 Ownership

CETPs could be owned and managed fully by government, jointly by government and private partnership or fully by the private sector. There is also the potential to link a CETP strategy with expansion of urban wastewater treatment plant (WWTP) infrastructure. Potential delivery models are summarised in Table 13.

Table 13: CETP Delivery Models

Investor	Delivery mechanism	Tariff
Public sector	CETP constructed and managed by the government	CETP could operate on “no profit no loss” basis. Tariff is fixed on the basis of actual Capital and Operational costs and the tariffs are adjusted every year on the basis of actual operational cost after evaluation by audit.
Public Private Partnership	Creation of a separate entity (involving the public sector and industrial partners). This company is formed solely for the construction and management of the CETP.	Industries are charged based on their effluent discharge volume and load. Annual tariffs set through a 25 or 30-year agreement.
Private sector	Formation of a co-operative to construct and manage the CETP (BOO) CETP operation contracted out to specialised effluent treatment and management companies.	Industries are charged based on their effluent discharge volume and load. Tariffs could be adjusted every year on the basis of actual cost of treatment or annual tariffs could be set through a 25 or 30-year agreement (eg BEPZA).

Proposed garment industrial park at Bausia in Munshiganj

BGMEA and Oriental International Holding from China have signed an MoU for developing a new garment industrial park in Munshiganj. The proposed Joint Venture will purchase the required land and develop all infrastructure facilities including a CETP. BGMEA members which own non-compliant and vulnerable garment factories, will be given priority to relocate their factories in the industrial park. It is estimated that approximately 500 knit, woven, dyeing, sweater, accessories factories will be set up in an area of 492 acres. BGMEA estimates that the commissioning of this industrial park will boost the country's GDP by about $3 billion per annum. Factory owners will pay a contribution towards the purchase of their plot and rates for the provided services. BGMEA expects that the construction work will commence in July 2015.

E9 Finance

In order to overcome the barriers of the high initial capital expenditure and tariff acceptance in developing countries, innovative technical and financial support schemes may be used where financial assistance is partly provided by the public sector as follows:

- Central Government subsidy;
- Local Government subsidy;
- Factory contribution; and
- Loan from financial institution.

A CETP contractor advised that a private CETP contract of $7m could cost up to $50m if land acquisition, construction, equipment and start up were taken through a full international tendering process by a Government body.

Operational costs should be paid by the polluting industries to the entity/co-operative designated to manage and operate the CETP. The tariff should be set at a sustainable and fair level which allows the long term operation of the CETP facility.

Green Finance and ETPs

BB recognises that the textile industry is unlikely to achieve the target of $50b RMG exports by 2021 without adopting environmental practices. To this effect, in February 2015 BB announced the creation of a new Export Development Fund (EDF) specifically for the Textile Sector worth $500m. This is intended to help factories adopt environment-friendly technologies and practices and will be in addition to the existing EDF of $1.5bn. There may be opportunities to use green finance for the delivery of CETPs but BB should clarify their position on whether green finance could be used for such large scale industrial projects. Please refer to Appendix F for further details on how green finance could support good water and environmental management.

E10 Tariffs

The treatment costs can vary dramatically for different CETP facilities due to the treatment processes selected, the facility location and other technical considerations. Therefore, it is not possible to recommend a single tariff pattern for all CETPs. In most cases, tariff charge is likely to vary with the volume and pollutant load of the effluent, especially if effluent from different industries is received and treated by the CETP.

Effluent collection and treatment fees are usually collected through the standard water bills or directly through CETP association/co-operative through a separate billing system. Simple volume discharges are based on actual effluent meter readings or can be calculated as a percentage of total raw water consumption by each factory.

E11 Proposed road map and future opportunities

The government, the textile industry and other stakeholders recognise the need for CETPs. However, effort is required to market the implementation of CETPs outside EPZ and BEPZA estates, in particular in industrial clusters in and around the greater Dhaka watershed area.

Collaboration is required among the key public sector players, investors and CETP operators to discuss investment and operational parameters, and to review the applicability of the delivery models presented here in order to implement CETPs effectively.

Recommendations	Lead Partners	Outcomes
Facilitate a review to identify opportunities and possible locations for CETPs for existing industrial clusters. The review should also explore opportunities for Public Private Partnerships in effluent treatment.	DoE BSCIC Planning Commission City and municipal corporations Ministry of Local Government, Rural Development and Cooperative (MLGRDC) BGMEA Brands CETP operators	Feasibility study for CETPs in the industrial clusters in and around Dhaka city area completed. CETP pilot study outside EPZ and BEPZA estates. Identification of potential investors and operators for CETPs. Land allocated by the government and agreement signed between CETP investors and the textile industry to implement and operate the CETP. Review the potential for efficient resource recovery and i 'circular economy.'

Appendix F

Access to Green Finance

F1 Introduction

Significant investment in new assets is required to support sustainable growth, cleaner production and good water and environmental management. For the textile industry, this is estimated to be in the order of $19 to $30 billion through to 2030 under a “business as usual” scenario.

The relocation of the tanneries to the Savar industrial estate also requires investment. Tanners claim that the government compensation of $32 million (Tk 2.5 billion) is not sufficient and additional compensation is needed, as well as a $705 million (Tk 55 billion) soft loan.

Feedback from the textile and leather sectors indicates that there are barriers to accessing low interest rate finance and rates of 8 or 9% are not affordable. Instead, it is suggested that lower interest rates of 5% and extended repayment periods of 15 years or more could result in improved uptake and better environmental performance.

So far, water has not been regarded by the Bangladesh Bank as a ‘thrust sector’. Instead the bank’s main focus has been on renewable energy and energy efficiency projects. The success in this area is reflected in recent figures published by the International Renewable Energy Agency (IRENA). Small photovoltaic systems are currently installed at a rate of 80,000 a month and the number of solar-related jobs nearly doubled between 2011 and 2013. Bangladeshi is now the worldwide leader in installations of small solar home systems. Their number has risen from 25,000 to 2.8 million in the last decade.

F2 Green Banking in Bangladesh

The Bank of Bangladesh recognises the environmental challenges in Bangladesh and as a response it launched in 2011 an ambitious green banking programme. It is being implemented in three distinct phases as summarised below.

Table 14. Timetable for green banking programme

Phase 1 (by 30 June 2014)	Phase 2 (by 31 December 2014)	Phase 3 (by 30 June 2015)
Policy formulation and governance	Sector specific environmental policies	Design and introduction of innovative products
Incorporation of Environmental Risk Management in Credit Risk Management	Green strategic planning	Reporting in standard format with external verification
In-house environment management	Setting up of green branches	Reporting of green banking practices quarterly
Introduction of green finance	Improved in-house environment management	
Creation of climate risk fund	Formulation of bank specific environmental risk management plan and guidelines	
Introduction of green marketing	Publication of independent green banking and sustainability reports	
Online banking		
Employee training and consumer awareness		
Disclosure and reporting of green banking activities		

Two key elements of the programme are of relevance to supporting improvement in the environmental performance of the industrial sector, including textiles and leather:

Green Finance; a commitment that environmental friendly activities and energy efficient industries will be given preference in financing by FIs.

Environmental Risk Management (ERM); which is incorporated into the traditional Credit Risk Management with the objective of:

- examining the environmental issues and concerns associated with potential business activities proposed for financing;
- identifying, evaluating and managing the environmental risks and associated financial implications arising from the environmental issues and concerns; and
- enhancing the credit risk appraisal process.

F3 Green Finance

There are a number of streams of Green Finance that are available for potentially supporting environmental management in the industrial sectors, namely:

- Direct/indirect green finance
- Refinance schemes for green products/ sectors
- Green export development fund

These categories are discussed further below.

F3.1 Direct and Indirect Green Finance

The Bangladesh Bank defines two components of green finance:

Direct green finance: which is for the direct financing of specified plant, defined as ETP installations, bio-gas plant, solar panels/renewable energy plant, bio-fertilizer plant and hybrid hoffham kilns (HHK).

Indirect green finance: which refers to financing projects that have, within the overall project, an element an ETP or similar system.

The Bangladesh Bank has imposed minimum targets for direct green finance in 2015. These are 3 and 4% of the total disbursement of funded loans for banks and FIs respectively. From January 2016 all banks and FIs must allocate at least 5% of their loanable funds to direct green finance.

Table 15. Direct and indirect finance in financial years 2012-2014

Year	Direct Green Finance ($ bn)	Indirect Green Finance ($ bn)	Total ($ bn)
2012	0.153	3.368	3.522
2013	0.386	4.139	4.525
2014	0.573	4.605	5.177

F3.2 Refinance Schemes for Green Products/Sectors

To broaden the financing avenue for green products the Bangladesh Bank launched a revolving refinance scheme in 2009 amounting to $25 million (Tk 2 billion) for six green products. Under the scheme, Bangladesh Bank provides loans for commercial banks and FIs at an interest rate of between 5% and 12% for direct refinancing projects. Banks and FIs add a margin of 4% prior to lending to factories and investors.

By 2015 the Bangladesh Bank has enhanced the product line to 47 green products under 11 categories which are: renewable energy, energy efficiency, solid waste management, liquid waste management, alternative energy, fire burnt brick, non fire block brick, recycling & recyclable product and “miscellaneous”. As illustrated in Figure 20 a significant focus of the refinance fund is on solar energy and biogas.

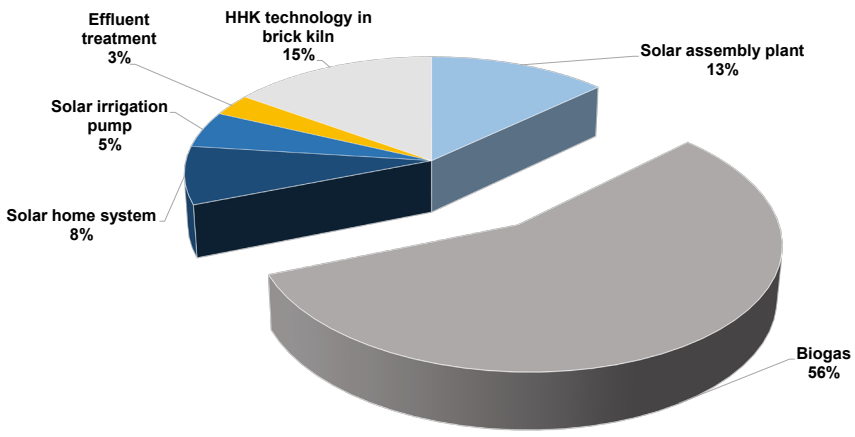


Figure 20. Shares of green products in refinancing for FY 14

The Bangladesh Bank advised that it is open to proposals for inclusion of new products such as water minimisation technologies in the qualified green product category.

Total disbursement of the refinance scheme for green products through the Bangladesh Bank decreased by 25% to $5 million in FY14 as shown in Table 16.

Table 16. Utilisation trend of refinance scheme for green products ($)

Category	FY10	FY11	FY12	FY13	FY14
Biogas	24,700	652,600	1,731,600	1,476,800	2,766,400
Solar home system	0	772,200	136,500	522,600	418,860
Solar irrigation pump	40,300	161,200	109,200	0	232,700
Effluent treatment plant	0	140,400	288,600	746,200	130,000
HHK technology in brick kiln	0	0	715,000	2,238,600	767,000
Solar assembly plant	0	0	3,234,400	1,595,100	644,800
	65,000	**1,726,400**	**6,215,300**	**6,579,300**	**4,959,760**

The Bangladesh Bank has no data on the uptake of green finance from specific industries but they estimate that the uptake from textile factories and tanneries is likely to be minimal (significantly less than 10%). The Bangladesh Bank was not able to confirm the exact number of ETPs in the textile and leather sectors funded under the scheme to date but commented that they expect to be very low.

The maximum credit facility for ETPs is currently set at $130,000 (Tk 1 million) with a repayment period of 5 years. This actual figure is based on the treatment capacity of the ETP. An increased maximum credit facility could allow more and larger ETP projects to be considered for refinance.

This would be in line with the views of the Governor of the Bangladesh Bank who is committed to enhancing the size of the refinance scheme to allow the facilitation of large scale “green” infrastructure investments.

F3.3 Green Export Development Fund

In February 2015 the Bangladesh Bank (BB) announced the creation of a new Export Development Fund (EDF) for the Textile Sector worth $500 million to help factories to adopt support environment-friendly technologies and practices. This fund is intended to support the achievement of $50 billion RMG exports by 2021 and will be in addition to the existing EDF of $1.5 billion. BB is currently offering the EDF to exporters at the 6-month a rate of LIBOR (London Interbank Offered Rate) rate plus 2.5% for six months. This fund is unlikely to be applicable for the funding of CETPs.

F4 Environmental Risk Management (ERM)

The ERM guideline was created in January 2011 to encourage banks and financial institutions in Bangladesh to adopt risk management practices in safeguarding environmental concerns. Since July 2011 the Environmental Risk Rating for each financial proposal is presented alongside the credit risk rating.

Commercial banks and financial institutions have a key role in the implementation of ERM and their ability and capacity to assess green lending proposals is of paramount importance.

F4.1 ERM elements and methodology

The Bangladesh Environmental Conservation Act (ECA) 1995 and the Environment Conservation Rules (ECR) 1997 contain provisions regarding conservation of environment, improvement of standards and control of environmental pollution from various sources and provide the framework of environmental regulations relevant to industries. ECR 1997 prescribes various legal performance standards requirements including sector specific water and effluent discharges.

As part of the Act and the Rules, no industrial activity can be established or undertaken without obtaining an Environmental Clearance Certificate for the DoE.

Upon receipt of the lending proposals, banks and financial institutions should conduct a preliminary environmental risk review using Environmental Due Diligence (EDD) checklists and review copies of documents submitted to DoE by the potential borrowers for obtaining the Environmental Clearance Certificate.

The overall Environmental Risk Rating (EnvRR) combines both the outcomes of the general and sectoral EDD checklists as per the table below.

General EDD	Sectoral EDD	Total score	Outcome
Low	Low	Low	Financing decision can be undertaken on the basis of the usual credit risk management guidelines
Moderate/Low	Moderate/Low	Moderate	Financing decision can be undertaken on the basis of the usual credit risk management guidelines
If any one or both the General and Sector-specific EDD checklists is indicated as "High"		High	Financing will have to be approved by the bank or FI Board or its Executive Committee

A detailed environmental risk review carried out by specialist consultants is required for all business activities identified in the Red Category under the ECR 1997. The review should be based on Environmental Impact Assessment and Environmental Management Plan information and assess all environmental risks, their likelihood of occurrence and impact for the Banks/FIs. Following the completion of the study, the consultant should advise on the appropriate overall EnvRR.

F5 Barriers to implementation of Green Financing

The consultation has identified numerous perceived barriers to the implementation of Green Financing:

1. Access to sufficient levels of affordable finance:

As highlighted in the main report, significant water and environmental benefits can be achieved through the implementation of low-cost best practices. More advanced cleaner production measures require increased credit which is often unavailable or too expensive to small and medium enterprises. Currently it is not feasible to access finance for large scale projects such as CETPs.

2. Inconsistent credit/ Investment Management:

The Bangladesh Bank believes that few banks apply consistently the environmental risk rating (EnvRR) in their core risk management (ERR). This stems from an inability to competently assess green lending proposals. Qualitative interviews carried out by IFC (Moving Forward with Environmental and Social Risk Management, Findings from IFC Country Baseline Surveys) confirm that the FIs in Bangladesh do not have a common understanding of the ERM Guidelines and apply different standards in the assessment of E&S risks. Furthermore, FIs have difficulties in preparing sector-specific policies and in complying with internationally acceptable reporting standards, which are both requirements of the ERM Guidelines.

The current EnvRR scoring system is based on a basic checklist which addresses E&S compliance with regulation. For example, water use and associated efficiency/minimisation measures are not reviewed as part of the scoring system. Furthermore, no rewards or incentives are given to drive E&S outperformance of the minimum regulatory requirements.

3. Improved attitude toward green financing:

The Bangladesh Bank has highlighted that there is lack of environmental culture within banks and FIs and environmental guidelines are perceived to prevent growth of the business.

4. Mass awareness about green financing:

Factory owners and investors, especially in the textile sector, are not well acquainted with green financing and should be encouraged to invest in cleaner production. The lack of specific guidelines for the textile and leather industries is an important issue as factory owners wrongly assume that green finance is only available for renewable energy schemes or they are unable to produce project proposals in sufficient detail.

5. Cost of environmentally friendly technology:

Bank managers and investors claim that the high cost of installation and complex maintenance are the major obstacle to water conservation and effluent treatment technologies. Even energy and water meters cost up to twice as much in Bangladesh than in nearby China. Competent authorities could offer tax waiver or more subsidies over costs that would encourage adopting and green financing of such technologies.

6. Environmental governance within banks and FIs:

Although commercial banks and FIs have a Green Banking Units at their head offices, few banks have capacity at branch level to implement green financing and monitor performance.

7. Environmental awareness and capacity building among bank employees:

Bank employees should be environmentally aware to be able to convey the green financing concepts to factory owners and investors. Banks should arrange regular training and workshops for staff on green issues.

F6 Specific opportunities to improve disbursement of green funds

Capacity building, training and improved dissemination; increased collaboration among the Bangladesh Bank, FIs, ministries and trade associations could improve capacity building and investor awareness on opportunities around green finance.

Development of relevant sectoral guidelines;

FIs need to engage with the central bank, environmental authorities, industry experts and trade associations in order to develop relevant water and environmental guidance. Sharing knowledge (e.g. development of a database for technical assistance and resolving issues) and communication of technical “know how” with peer groups could also lead to significant improvements to the existing situation.

Rewarding best practice;

The Bangladesh Bank is prepared to consider in certain cases, a slight reduction of the green banking interest rate as an incentive to encourage factories to move from ‘green to greener’. For example, going beyond the DoE effluent discharge standards or introducing water recycling or process efficiencies. This could provide an opportunity to develop an Environmental and Social Scoring System tied to the Pricing Policy for Green Financing which aims at encouraging adoption of Best Available Practices beyond the minimum requirements.

Access to green finance for large scale projects;

The construction of CETPs and/or the relocation of polluting industries could have a significant positive impact in watersheds in Bangladesh. CETPs could also provide cost effective effluent treatment due to economies of scale but the high capital cost is a barrier to their implementation, especially outside EPZs or BEPZAs. The Bangladesh Bank and the FIs should clarify their green finance position on large scale industrial projects of strategic importance to the country which may require longer repayment periods. In parallel, opportunities to fund these projects by accessing attractively priced foreign (both debt and equity) funds need to be explored further.

The above opportunities should be further explored in partnership with key stakeholders to enable improved disbursement of green funds and facilitate enhanced water and environmental management.

Recommendations	Lead Partners	Outcome
Engage with policy makers and commercial banks to improve disbursement of the Green Fund.	Bangladesh Bank Planning Commission Ministry of Finance BGMEA BFLLGFEA Financial Institutions Technical specialists Ministry of Industry Ministry of Commerce	Review of the Green Finance guidelines and preparation of relevant sectoral guidelines for the textile and leather industries. Capacity building to commercial banks and financial institutions will be required on how to implement the Green Finance guidelines. Policy statement on eligibility of large scale industrial projects (e.g. CETPs) for Green Finance.

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