ARUP

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

Contents

Executive summary

The objective of the study is to create a knowledge base on the Impact of industrialisation on water security in Bangladesh with a focus on the textile and leather industries.

BGMEA has recently set an ambitious target for the textile sector to reach $50 billion of exports by 2021 and a projected $82.5 billion by 2030. If business as usual continues, this will result in an additional water demand of over 3,400 billion litres by 2030 which is equivalent to the annual water needs of a population of approximately 75 million people. Current groundwater abstraction rates are close to their limit and growth will require the development of new sustainable water supplies and effluent treatment facilities. Pollution is a key issue for the textile sector, and is a result of the weak enforcement of regulation, an inertia to changing behaviours and limited technical capacity and knowledge within the sector itself. Current levels of pollution of surface waters are impacting on water availability.

The implementation of cleaner production measures will positively impact on the overall costs of water supply and pollution control. For example, simple and low cost measures could reduce water use by up to 20% and lower future infrastructure investment and operational expenditure by up to $650 million per annum compared to the business as usual scenario.

The textile sector needs to develop its capacity to improve water management and operate cleaner production practices. There is recognition from the industry of the need to take action and invest more, but a lack of knowledge and the absence of a credible evidence base on the impact and cost of measures inhibits the sector from acting. This could be addressed by the standardisation of data collection and reporting and by research into the cost benefit of interventions.

As part of the strategic water planning for the industrial sectors, opportunities for alternative water sources should be assessed. Options could include wastewater reuse between different industries and the adoption of rainwater harvesting schemes, linked to aquifer recharge. There is also a need for a specific pilot study to examine the effectiveness of a zero discharge policy and to establish the local factors that would make such a policy beneficial. Finally, it is considered that undertaking a review of possible locations for centralised effluent treatment and surface water plants for existing industrial clusters could provide opportunities for lower expenditure, possibly linked to Public Private Partnerships in water supply and effluent treatment.

Numerous reforms are required respond to the environmental regulation and enforcement constraints. These should involve changes to the existing groundwater licencing arrangements and the identification of incentives for industries to comply with current environmental legislation.

With regards to the leather industry, the key issue is the relocation of the tanneries from Hazaribagh to the purpose built “Savar Leather Industrial Park”. It is imperative that the relocation to Savar is completed as soon as possible to address the local water issues and provide opportunities for the sector to adopt responsible environmental and water management practices. The Bangladesh Tanners Association estimates that the relocation to Savar could boost the industry’s export revenues from $1 billion to $5 billion in the next five years.

Post relocation operational arrangements must be agreed between the leather industry and the Government of Bangladesh to ensure the long term success of the industrial estate.

01 Introduction

Objectives of the report

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 the water security challenge is addressed. This is increasingly recognised by the Government of Bangladesh at the highest level. Prime Minister Sheikh Hasina has recently highlighted the need for joint initiatives in the management of water resources and called for the authorities to ensure that effluent treatment from industry is addressed as a priority.[1]

The objective of this report is to provide an analysis on the impact of industrialisation on water security in Bangladesh with a focus on two industries, textile and leather. It documents relevant data and information sets and identifies opportunities to reduce water use while achieving the aspirations of growth from the industries.

The report also aims to raise awareness of the scale and urgency of the water challenge facing the industrial sector in Bangladesh and facilitate the engagement of new stakeholders in the discussion on the future management of water. Finally, it provides a number of additional insights to support the active stakeholders by recommending key focus areas within the industrial-water sector where a 2030 Water Resources Group (2030WRG) Bangladesh partnership could add value.

Methodology

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

- Extensive field work including interviews and discussions with more than 25 key stakeholders from the public, private and civil society sectors. Stakeholders included government ministries and organizations, trade associations, multinational brands, non-governmental organizations (NGOs), international organizations and academia.
- 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.

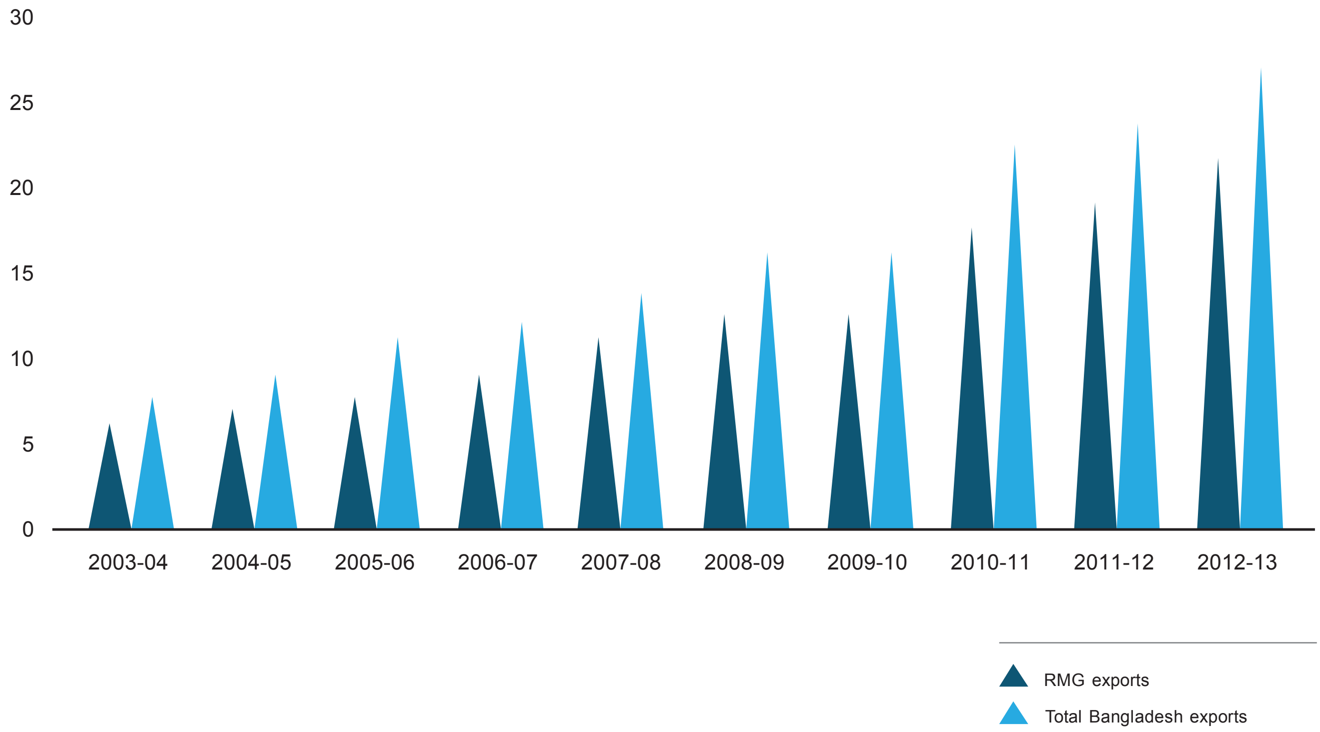
02 Industrial sectors in Bangladesh

Textile industry

The value of the global ready-made garment (RMG) market was estimated at $376 billion in 2010. Bangladesh is currently one of the world's biggest exporters of ready-made garments with a global market share of about 5%.[2] The sector accounts for more than 85% 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.[3]

The sector's exports have risen rapidly over the last 30 years and have exceeded $20 billion as illustrated in Figure 1 below.

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



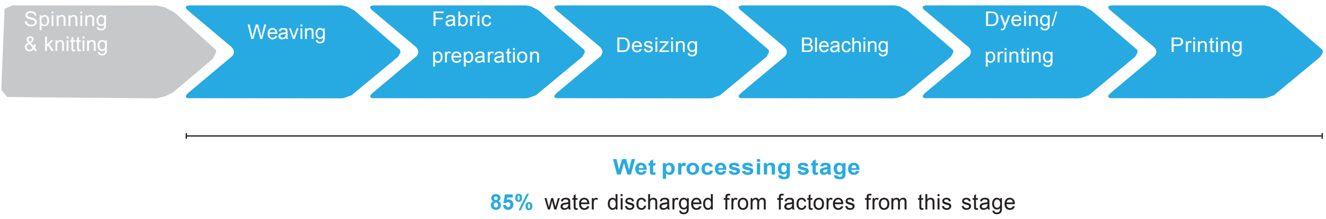
There are currently more than 5,000 cutting and sewing of garments factories and around 1,700 wet processing units in Bangladesh. The local industry is increasingly moving towards higher value textile production processes including the washing, dyeing and finishing (WDF) of textiles and the number of 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.[4] Bangladesh Garment Manufacturers and Exporters Association (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.[5] The assumption for our analysis is that the export values will reach $50 billion by 2021 and continue at the same growth rate to reach $82.5 billion by 2030.

Textiles and water use

Water is a key input in the textile industry and large quantities are consumed in the direct operations and supply chain. Approximately 85% of the water used and discharged from factories is in the wet processing stage, as shown in Figure 2.

Figure 2: Flow diagram of wet processing stage



The average factory water consumption in Bangladesh is estimated to be around 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.

For comparison, the global benchmark for fabric production is 100 litres of water per kilogram.[6]

In terms of the overall supply chain for textile garments the water used in the processing and garment production phase has previously been estimated to be close to 50% of the overall water use[7] (refer to Figure 3).

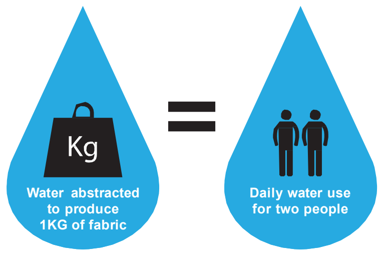


Figure 3: Water intensity across the textile and apparel sector value chain

	Agriculture and petrochemical supplies	Dyeing and fabric finishing	Confection of clothing and apparel	Transport	Shops	Washing
	Yam/fibre producting/ 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

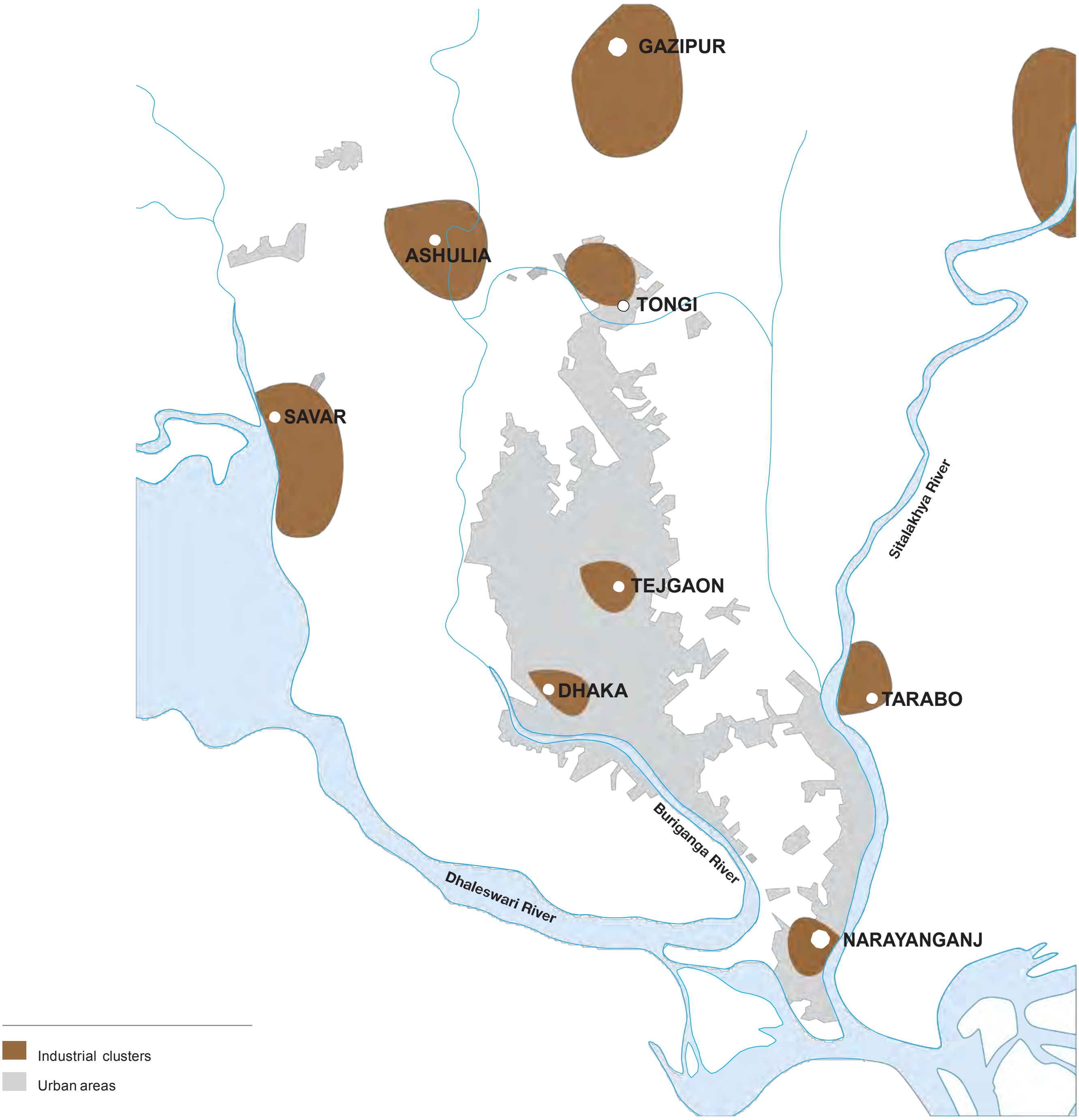
"Water scarcity is not seen as an issue…brands are currently focusing on building and fire safety, but pressure is mounting..."

Feedback from textile trade association

The effluent discharges from the WDF factories, in particular, are heavily polluted with high levels of dissolved solids and chemicals. Estimates on the number of factories with Effluent Treatment Plants (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.[8]

It is estimated that around 70% of the 1,700 WDF textile processing units which are responsible for considerable portion of the water demand and water pollution are located in the Greater Dhaka area[9] (Figure 4). The remaining units are located in Mymansingh (north of Dhaka) and in Chittagong.

Figure 4: Industrial clusters in the Greater Dhaka area

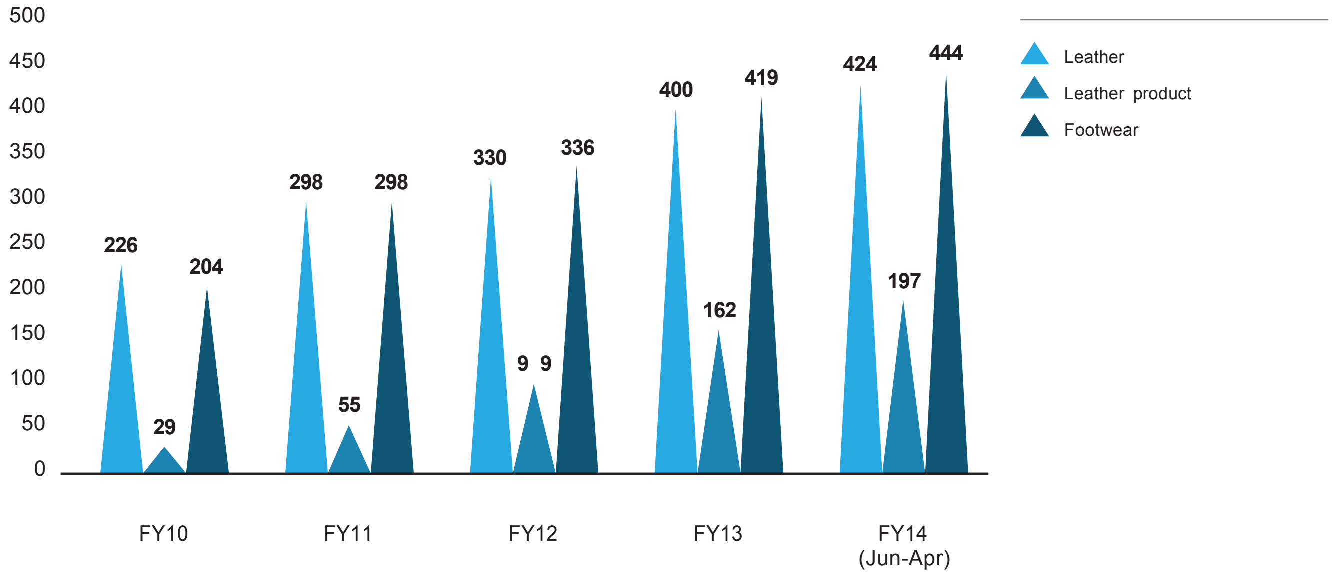


Leather industry

The Bangladesh leather sector is one of the country's oldest industries and supplies approximately 0.5% of the world's leather trade, which is worth $75 billion. It is estimated that the sector directly or indirectly employs approximately 750,000 workers. The figure includes the finished leather goods industry and service industries supporting the tanneries.[10]

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

Figure 5: Bangladesh leather industry exports
(total exports in $m)



200
tanneries in Bangladesh

Over
90%
of the tanneries are located in

the Hazaribagh area

There are reportedly around 200 tanneries in Bangladesh but not all of them are in effective operation. 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.[11]

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 as part finished leather which has a lower value.

Relocation of 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 kilometres outside Dhaka. The new location would allow operations to be conducted in accordance with appropriate international environmental and safety standards. Ten years on, the process of relocating the tanneries from Hazaribagh to Savar is still on-going and a deadline of March 2015 has recently been set to compete the transfer process. This deadline is unlikely to be met as the infrastructure required for the relocation is not yet in place. In addition, only 15 out of the total 155 tanneries have started construction of their buildings.[12]

If the environmental performance improves, exports are expected to increase significantly as multinational brands and buyers are likely to renew their interest in Bangladeshi leather. The president of the Bangladesh Tanners Association (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.[13] Our analysis assumes that the leather industry export value will continue at the same growth rate to reach $10 billion by 2030.

Leather and water use

It is estimated that approximately 40 cubic metres of water is required to process a tonne of wet salted hides (Figure 6). For comparison, modern processes utilised in Europe are able to reduce the water use to 20 cubic metres or less.[14] 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.[15]

Figure 6: Water withdrawals across the leather sector value chain

	Raw hide production (animals)	Curing hides	Leather processing	Finished product manufacture	Distribution & warehousing	Marketing & sales	Consumer
	Animal water consumption	Curing process	Tanning	Finishing	Transport	Shops	Washing
		Storage	Post-tanning	Confection of clothing and apparel	Stock/man management	Marketing/ advertising	
Withdrawal (m^3 per tonne of hide)		20 - 25	1 - 3	12 - 13	No data	No data	

Area of interest for our analysis (highlighted stages: Curing hides, Leather processing, Finished product manufacture)

The estimated amount of effluent discharged from the tanneries is 20,000 cubic metres per day which is in line with the capacity of the new centralised effluent treatment plant (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 issues.

40

cubic metres of water to process one tonne of salted wet hides

20,000

cubic metres of untreated effluent discharged from tanneries every day

03 Water risk analysis

Situation in Bangladesh

Recent analysis undertaken by 2030WRG highlights that Bangladesh will have a water supply deficit during the dry season of up to 26% by 2030. This is due to the high seasonality of water availability, limited surface water storage and water quality issues.[16] 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.[17]

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 issues.[18] However, the availability of water is often overlooked as it is considered to be in abundance and obtained at "low" or "no" cost.

Hydro-economic analysis

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.

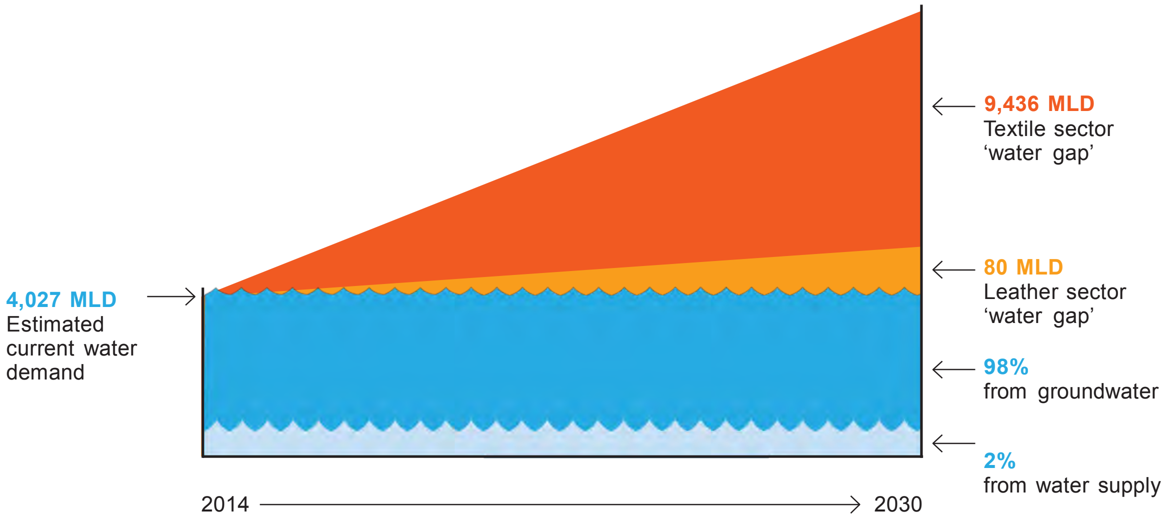
$82.5bn
assumed value of textile sector exports by 2030

For the purpose of the hydro-economic analysis, it was assumed that the textile and the leather industries will reach $82.5 and $10 billion exports respectively by 2030. These are modest targets which the industries consider achievable. The findings of the analysis are presented throughout remaining of this report.

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.

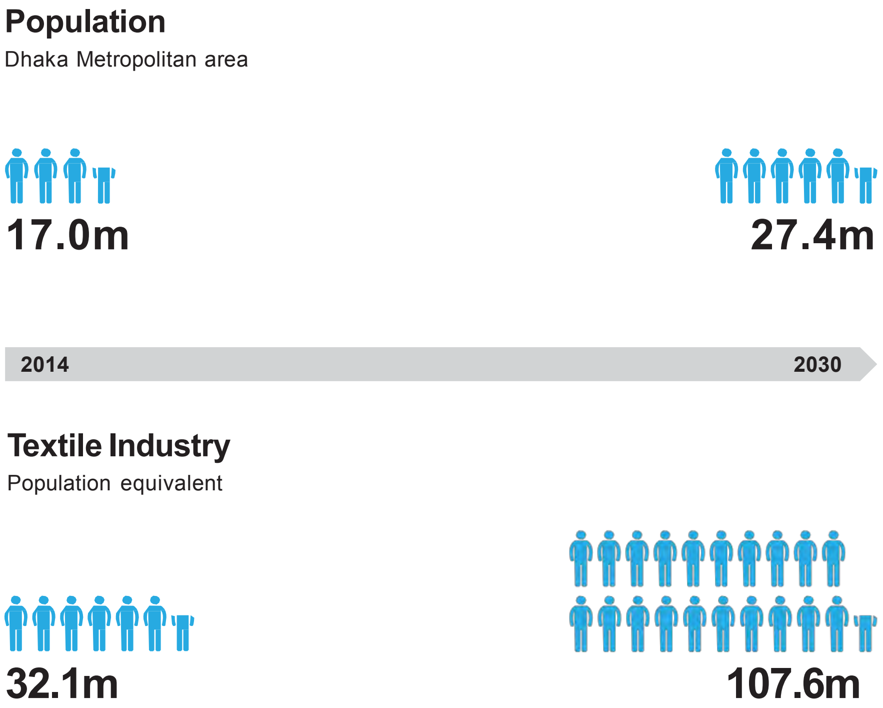
Figure 7: Projected water gap in 2030 for the textile and leather sectors
(2014-2030 in megalitres per day (MLD))



Based on projections published by the United Nations, the population of the Greater Dhaka area is currently estimated to be 17.0 million and will reach more than 27 million by 2030.[19] Dhaka will then be the sixth largest urban metropolitan area in the world. The challenge to provide adequate water supply for the increased urban population is significant.

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 alone is projected to be almost three times the future domestic water demand in Dhaka, as illustrated in Figure 8.

Figure 8: Greater Dhaka area population compared with textile industry water demand, expressed as population equivalent



125

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

Dhaka WASA 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 megalitres per day (MLD) at an estimated cost of over $4.1 billion.[20] Dhaka WASA expects that this additional surface water capacity will reduce the long term reliance on groundwater 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 9,500 MLD.

$4.1bn

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

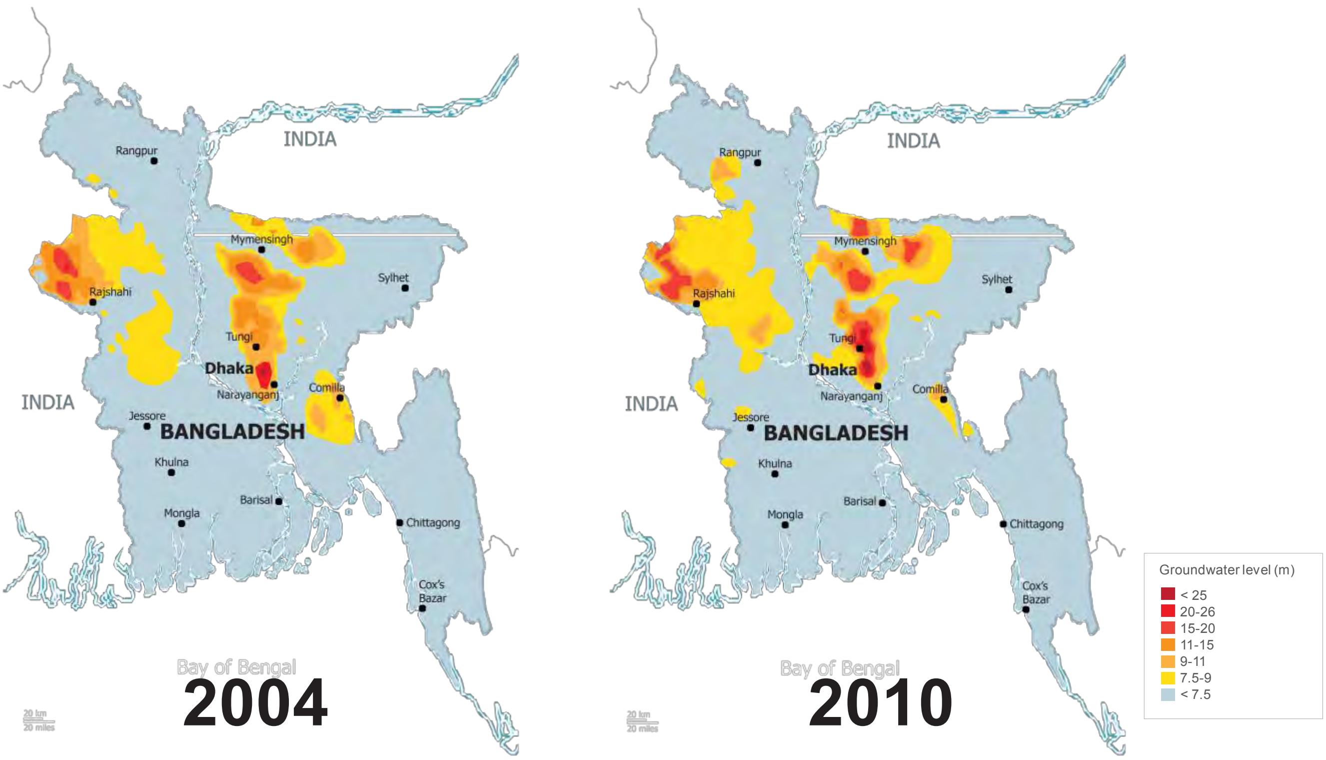
Groundwater abstraction

Both the textile and the leather sectors are currently predominantly using abstracted groundwater to meet their water demand. The Bangladesh Agricultural Development Corporation (BADC) updated the groundwater zoning map of Bangladesh in 2010.[21] Significant changes in groundwater levels have taken place between 2004 and 2010, especially in areas where industries are located, to the north of the Greater Dhaka area (Figure 9).

Another study has 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.[22]

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.[23] Any additional abstraction associated with future water demand will exacerbate the groundwater issue.

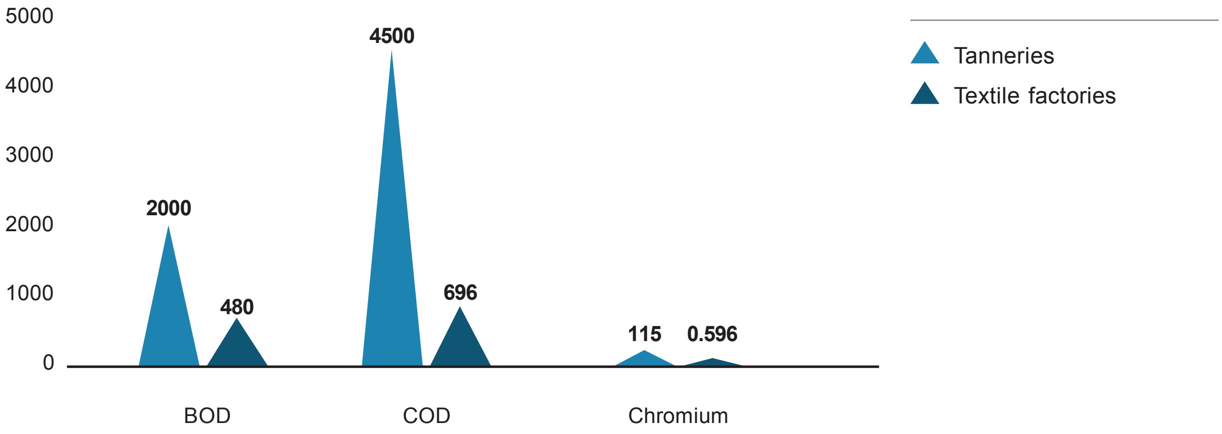
Figure 9: Groundwater zoning maps in 2004 and 2010
(adapted from Bangladesh Agricultural Development Corporation)



Water pollution

Both the textile and tannery sectors discharge highly polluted effluent which has the potential to harm humans and pollute the environment if discharged untreated. Textile factories discharge chemicals including salts, dyes and bleaches, while effluent from tanneries is significantly stronger and contains a range of heavy metals, including chromium, as Figure 10 illustrates.[24 25 26]

Figure 10: 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 show 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.[27]

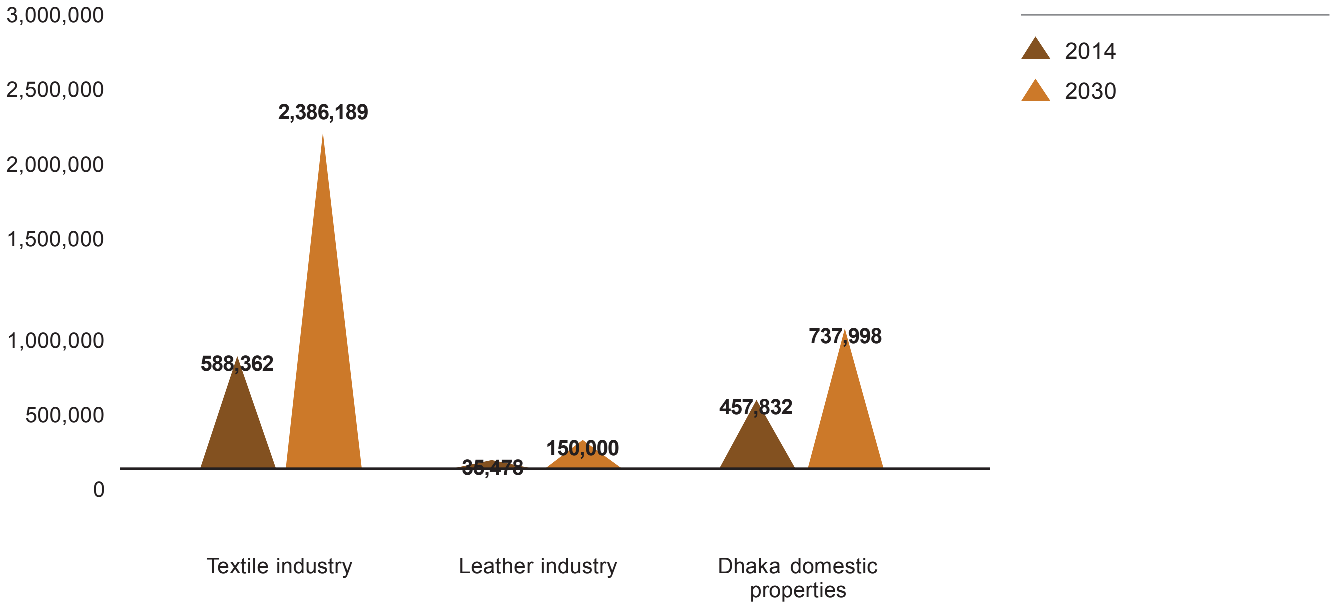
Even where industries have effluent treatment plants, there is an unwillingness to operate the plant appropriately to reduce operational costs. The industry itself acknowledges the lack of experience and knowledge to effectively install and run ETPs.

Domestic effluent treatment in Dhaka

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

Our analysis shows that the total pollution discharged into the Bangladeshi rivers from the textile factories is many magnitudes greater than the tanneries. This is due to the larger size of the textile industry. As a comparison, the pollution discharged from textile factories is currently even greater than the water pollution discharged from domestic properties in Dhaka. As Figure 11 illustrates, if business as usual continues, the gap is expected to grow further by 2030.

Figure 11: Comparison of pollution* in 2014 and 2030
(in tonnes per year)



*COD (Chemical Oxygen Demand) is used as indicator

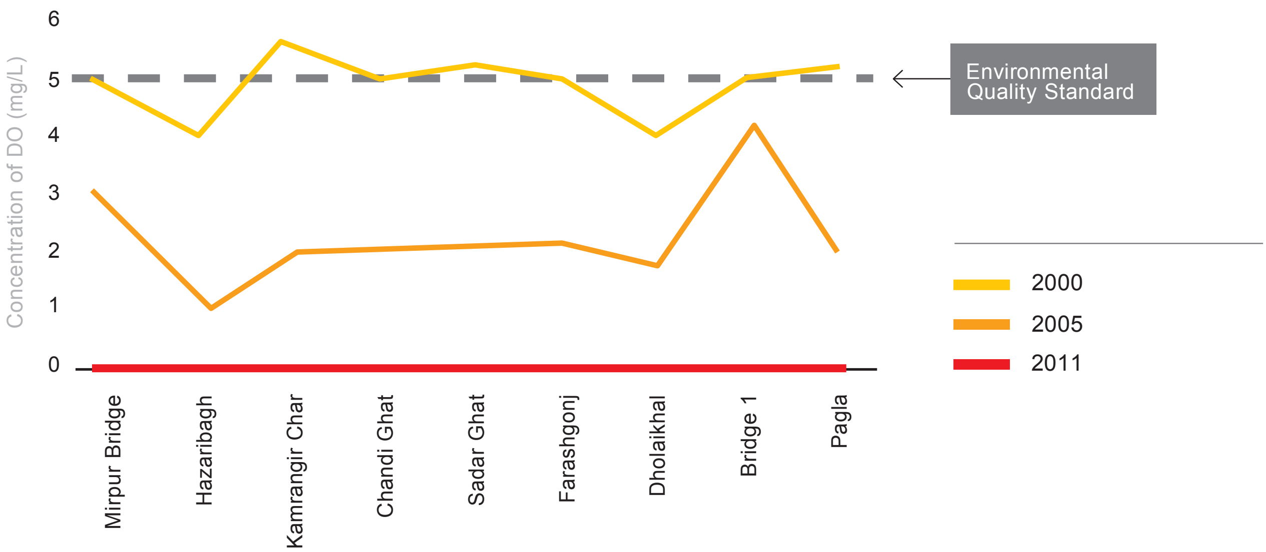
Monitoring data from 2011 indicate that the water quality of rivers near industrial areas is poor during the dry season. For example, the Buriganga River receives direct discharges of untreated effluent from domestic properties and industries including tanneries and textile factories.

Dissolved oxygen (DO) levels were almost zero at eight sampling locations for a period of 4 months in 2011 and only narrowly met the relevant Environmental Quality Standard (EQS) of 5.0 mg/l at some locations in October 2011.[28]

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 12, the DO levels have deteriorated at an alarming rate since 2000.[29] If the situation is not reversed soon, the serious water pollution and environmental degradation of Buriganga 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 12: Comparison of the DO value changes in Buriganga at critical locations in January 2000, 2005 and 2011



Water governance

The existing set of environmental policies and legislation provide a framework for water resources management and industrial pollution control. For example, the Bangladesh Environment Conservation Act 1995 has a strong focus on industrial pollution prevention and control. The Department of Environment (DoE) has responsibility for the issue of environmental permits for factories, monitoring compliance and enforcing environmental standards.

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

It is not clear whether the DoE will continue with their responsibilities or whether WARPO will be the body which ensures that the appropriate Environmental Quality Standards are met. Similarly, within the Water Act 2013, there are several provisions of enforcement such as compliance orders, protection orders, removal orders, imprisonment and compensation but implementation is vague.

Overall, there are too many institutions with unclear, and sometimes overlapping, roles and responsibilities. This environment creates confusion and results in coordination issues which impact on effective water resources management planning.

"It is not entirely clear who is responsible for managing the rivers and the environment."

Feedback from stakeholder consultation

Enforcement

The 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 with figures varying from 40 to 80%. It is widely accepted, though, that even where ETPs exist, they are rarely operated correctly.

Currently, the main responsibility for environmental, and therefore water, compliance is with the DoE. There are recognised constraints in terms of human resources and monitoring systems which prevent the DoE from effectively delivering on this challenging role.[30] 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.

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.[27 31 32] 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 multinational brands and buyers to improve compliance of factories through their Corporate Social Responsibility 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.[33]

Reputational risks

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.

In recent years, multinational 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.[27]

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.[34]

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.[35]

Several brands and buyers interviewed during our 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.[36]

Summary of water risks

Industrial water demand in Bangladesh, in terms of direct water withdrawals, is expected to increase by two-fold by year 2030.[37] 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 also pose significant risks for companies who will be looking for alternative water supplies. In addition, industrial effluent discharges are one of the main causes of deteriorating water quality.

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.

"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

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 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

Responses to water risks

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.

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

✓ 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.

Strategic water planning

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 per cubic metre for domestic use and \$0.3 per cubic metre for industrial use.[38] For comparison, the average global water and wastewater tariff in 2012 was \$1.98 per cubic metre.[39]

In the current environment developing the business case for individual factories to invest in water efficiency interventions based on water alone is challenging. A stronger case can be made around the potential energy and chemical use savings associated with reduced water use.[40] Textile trade associations advised that their members are willing to invest on resource efficiency measures if payback periods are up to a maximum of 10 years but ideally no more than five years.[27 32]

Water and energy

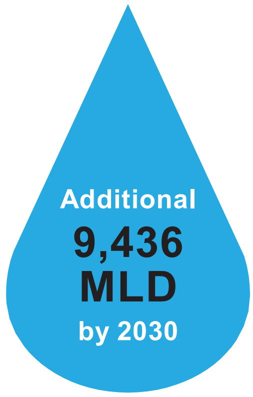
Reduced water availability increases pumping costs. Water and effluent treatment processes are also energy intensive. Energy (pumping) and water purification (softening) result in water input costs for textile mills of around \$12-40 per tonne fabric.[40]

Lack of metering in industries means that it is difficult to define the water use baseline and measure performance. There is currently limited reliable data on the water use and water efficiency interventions in the textile and the leather sectors in Bangladesh.

Textile sector analysis

Business as usual

At macro level, the textile industry will require considerable additional volumes of water to grow to $50 billion by 2021 and $82.5 billion by 2030. We estimate that for the "business as usual" (BAU) water demand scenario, an additional water supply of 9,436 MLD is required in 2030 to meet the sector's aspirations.

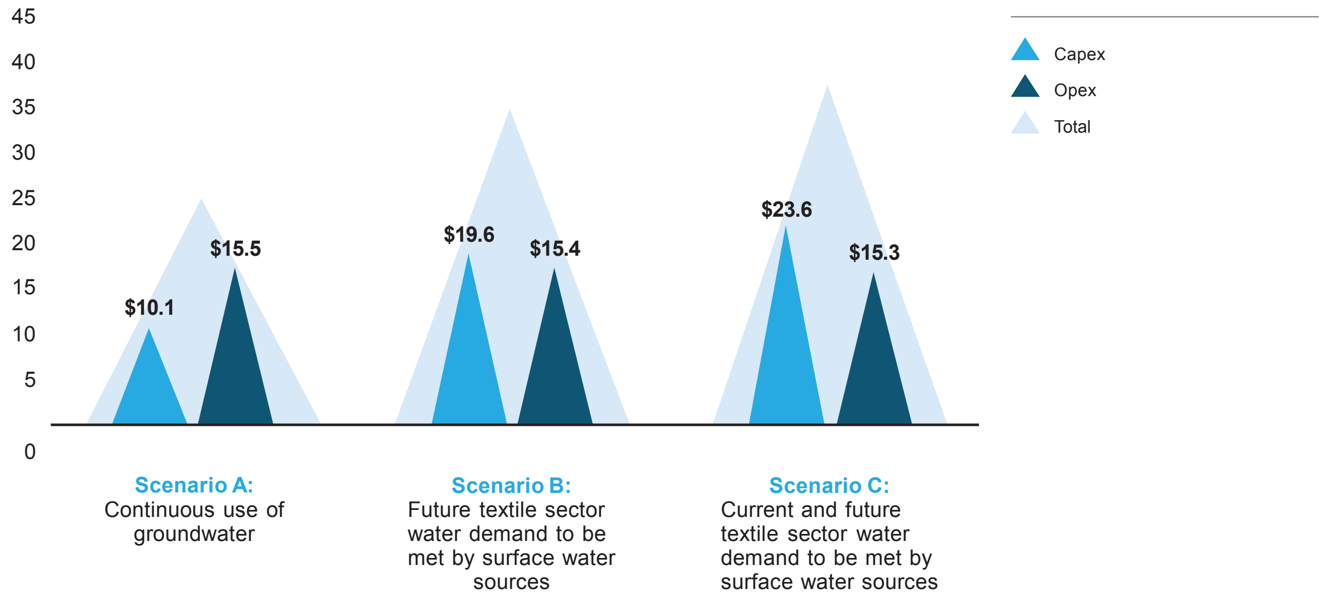


Falling groundwater tables combined with the projected increased water abstraction rates are likely to threaten industrial production. The cost of developing alternative water sources is substantial and could hinder growth.

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 $25-39 billion (Figure 13). The costs include an estimate of investment required by existing factories to comply with environmental standards.

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 $25-39 billion. The figures include an estimate of investment required by existing factories to comply with environmental standards.

Figure 13: 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 3 and 4.5% of the total sector revenue. This represents a significant cost to a sector that views water as a free resource. Our 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 $35 billion (3.94% of the total sector revenue) is used as the baseline against which interventions have been examined.

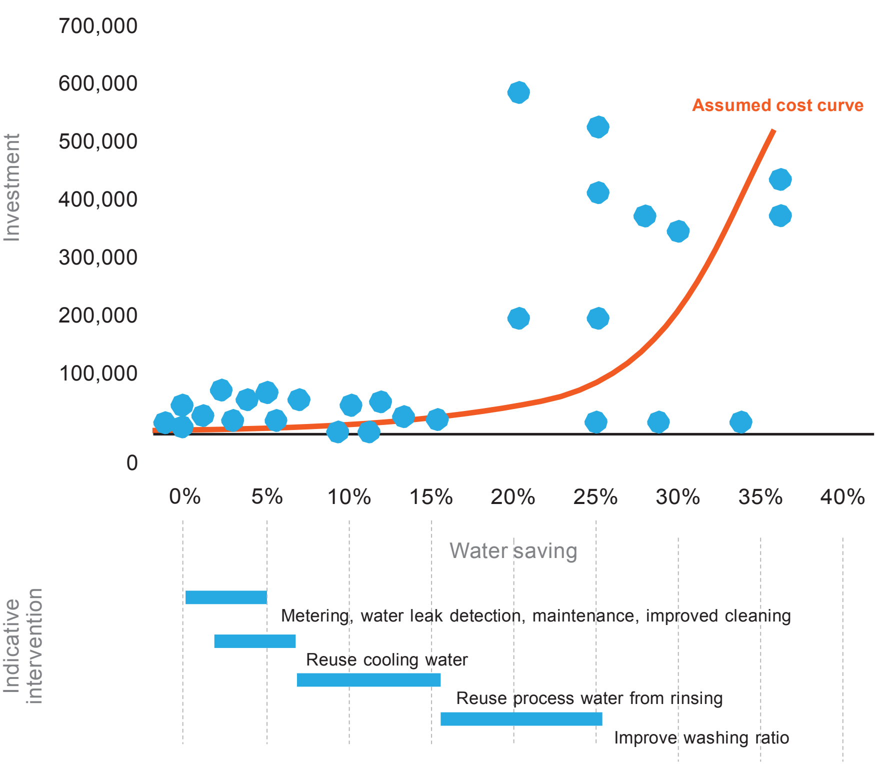
Potential of water efficiency interventions

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.[41 42] 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 14. 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 14: 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.

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 Return of Investment (ROI) over the next 16 years to 2030 is estimated to be up to 2,994%. 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 284%.

Scenarios	Average reduction in water abstraction (MLD)	Cost of intervention ($m)	Potential total benefit ($bn)	Potential benefit per annum ($bn)	Return on investment (%)
1 Water use reduction by 20%	1,807	0.25	7.45	0.47	2,994
2 Water use reduction by 35%	3,162	3.51	9.96	0.62	284

Moderate increases to energy prices by 3% per annum make the business case for water reductions of up to 20% even stronger with an ROI of 3,222%.

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 willing to fund centralised water treatment plants and ETPs provided that land is made available by the Government of Bangladesh. There are uncertainties, though, with regard to the overall costs involved.

Centralised effluent treatment solutions require land 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 centralised facilities are high in absolute figures, 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.

The benefits have been recognised by the Government of Bangladesh and a centralised treatment solution has been utilised for the relocation of the leather industry to the Savar industrial estate.

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

Feedback from textile trade association

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

Scenario	Decentralised treatment ($b)	Centralised treatment ($b)	Cost ratio
0 Business as usual	20.05	6.82	2.94
1 Water use reduction by 20%	10.52	5.22	2.02
2 Water use reduction by 35%	8.05	4.02	2.00

The centralised 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, centralised treatment plants have the potential to reduce significantly the future textile sector water investment of $35b 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 the area.

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 written to them with the view to implementing such a strategy in the next five years.[32] Furthermore, global brands under the Zero Discharge of Hazardous Chemicals (ZDHC) programme held a first stakeholder engagement workshop in Dhaka in September 2014.[43] The Department of Environment advised that they are about to commence a pilot study on zero discharge with the participation of the industry and brands.[44]

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

The Zero Discharge of Hazardous Chemicals (ZDHC) 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.

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.

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.[45] For comparison, the costs used are less expensive than those presented in a textile industry case study in the 2030 WRG the "Managing water Use in Scarce Environments" catalogue.[46]

We estimate that the total capital and operational costs for centralised zero discharge interventions to 2030 is in the region of $35.6 billion for the BAU scenario. This is comparable with the cost of the BAU scenario which includes decentralised effluent treatment. Possible economies of scale achieved by centralised treatment plants, are likely to make zero discharge interventions look relatively expensive.

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 $35.6 to $40 billion by 2030.

Scenarios	Description
3	Implementation of zero discharge (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.

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	35.0	37.5	-
1 Water use reduction by 20%	27.5	29.5	1,807
2 Water use reduction by 35%	25.0	26.5	3,162
3 Zero discharge (ZD) measures on BAU scenario	35.6	40.0	6,775
4 ZD measures and water use reduction by 20%	28.5	32.0	7,226
5 ZD measures and water use reduction by 35%	23.1	26.0	7,565

A pilot study in Bangladesh would 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.

Leather sector analysis

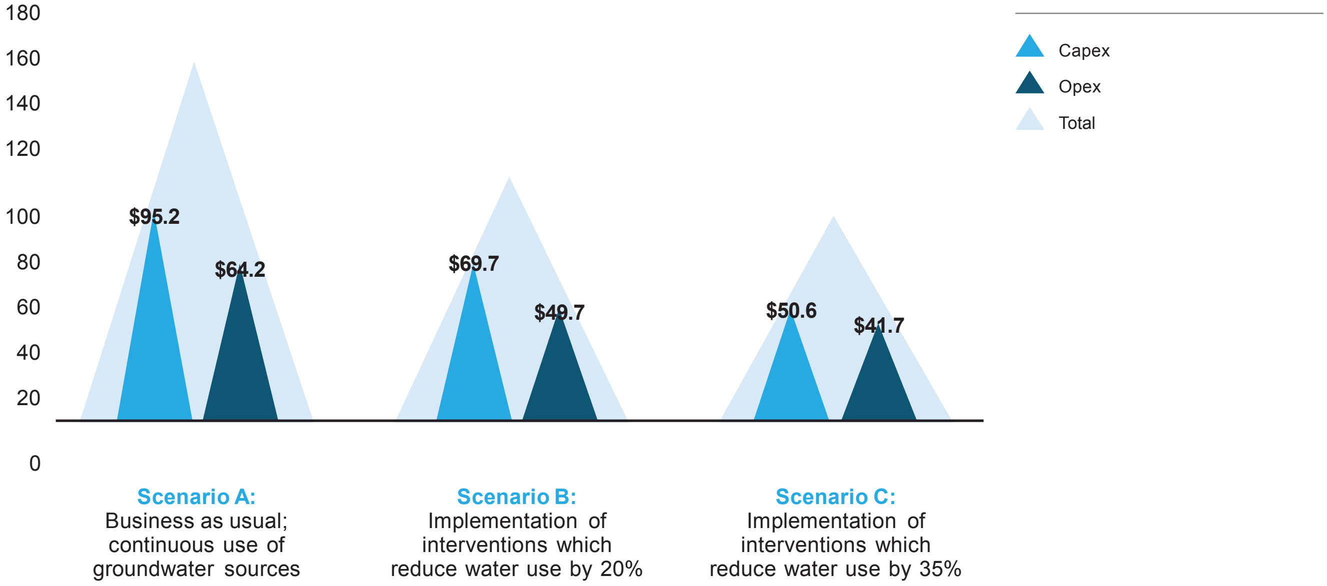
The relocation of the leather industry from Hazaribagh to Savar will drive replacement of existing antiquated processes with modern equipment. This is a unique opportunity for the industry to adopt responsible environmental management practices and benefit long term from the financial gains associated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

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 currently favoured by the stakeholders.

Assuming that the leather industry will grow to $10 billion by year 2030, an additional water supply of 43 MLD on average 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.

The total water related costs for the leather industry to 2030 for the BAU scenario are in the region of $160 million which is less than 0.5% of the total sector revenue (Figure 15).

Figure 15: 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.

Scenario	Projected total water costs to 2030 ($m)	Potential benefit per annum ($m)	Average reduction in water abstraction (MLD)
A	159.4	-	-
B	119.4	2.5	11
C	92.3	4.2	19

Alternative water sources

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

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 reused 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 the available reclaimed water.

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 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.

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 reuse 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.

Groundwater recharge

Natural replenishment of ground water reservoir 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.

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-cost interventions at factory level, more ambitious plans which require purchase of new equipment 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.

Incentivisation schemes for industries to improve environmental compliance should also be explored. These could include Value Added Tax (VAT) breaks for industrial production that meets 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.

Summary

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 are likely to require 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

Information and awareness

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, 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 are 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 Water Footprint Assessment (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.

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 sector 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 in Savar following the relocation of the industry there.[31]

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.[36]

The leather industry could take inspiration from the National Institute of Textile Engineering and Research (NITER) in Bangladesh which is a public-private partnership (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 Bangladesh Textile Mills Association (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.

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 to can aspire to.

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.

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.

Need for reforms

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

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.

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.

05 Specific recommen-dations

There are some specific key focus areas within the industrial water sector where a 2030 Water Resources Group (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	Implementation timescale
Facilitate a review to identify opportunities and possible locations for centralised effluent treatment and surface water plants for existing industrial clusters. The review should also explore opportunities for Public Private Partnerships in both water supply and effluent treatment.	**0-6 months**
Develop a pilot project on the potential of zero discharge measures in the textile sector in collaboration with the Department of Environment, factories and brands. This should include a detailed investigation of capital and operational costs and an assessment of potential risks due to reduced environmental flows.	**0-6 months**
Support a review of opportunities for alternative water sources in collaboration with the government, industries, academia and local stakeholders. This could include wastewater re-use between different industries, adaptation of rainwater harvesting measures and aquifer recharge schemes.	**6-12 months**
Work with the Government of Bangladesh to promote water efficiency equipment and stimulate the cleaner production market. This could include identification of opportunities: - to reduce or waive import duties on water meters and water saving equipment - to access finance at affordable interest rates for water efficient manufacturing equipment - increase competition in the water marker to reduce the cost of water and effluent treatment.	**12+ months**

Responding to information and awareness challenges	Implementation timescale
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.	**0-6 months**
Create the conceptual framework for data collection and identify incentives for data sharing amongst the actors.	**0-6 months**
Gather 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. This should include robust information on capital and operational costs and calculation of payback periods for new technology.	**6-12 months**
Facilitate capacity building for industries to improve water management and cleaner production	practices.

6-12 months

Increase public and industry awareness on implications of future business as usual scenarios through sensitisation and marketing campaigns which will encourage the private sector to invest.

12+ months

Responding to environmental regulation and enforcement constraints	Implementation timescale
Promote improvements to the groundwater licencing for industrial users to include compulsory metering of water abstraction.	**0-6 months**
Assist in the development of mechanisms and models that incentivise the textile industry and other industrial sectors to reduce water use and untreated effluent discharges to surface waters.	**0-6 months**
Work with the multinational brands and the Government of Bangladesh to agree harmonised standards for the textiles and leather industries with regard to water use and water pollution.	**0-6 months**
Encourage involvement of the civil society in the enforcement of environmental regulation and effluent discharge standards.	**6-12 months**
Facilitate discussions on the post relocation operational arrangements at the Savar industrial estate. These need to be agreed with the leather industry and the Government of Bangladesh to ensure the long term success of the industrial estate.	**6-12 months**
Recommend policies to the Government of Bangladesh that lead to increased public and private spending on water supply and effluent treatment for industries, in particular near industrial clusters.	**12+ months**

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