WATER GOVERNANCE MAPPING REPORT: TEXTILE INDUSTRY WATER USE IN ETHIOPIA

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Executive Summary

Ethiopia remarkably strong development trajectory has placed itself as one of the fastest growing economies in the world, with an average economic growth of 10.6% a year since 2004, doubling income per capita in real terms; while reducing poverty level to 29.6% and keeping inequality low with Gini coefficient of 0.30 in 2010. Although the agriculture sector remains to be the backbone of the Ethiopian economy, the industrial sector's contribution continues to grow significantly.

In line with the growth, the country is considered to be a rising star for textile sourcing and production due to its cheap labour wage compared to competitive countries and abundant resources for cotton farming. In its infant stage, the sector has already contributed to substantial employment generation of 48,000 people in the factories, 52,000 smallholder farmers in cotton production and potentially 60,000 employment opportunities for the construction of Hawassa industrial park. According to the Textile Industry Development Institute (ETIDI), current GDP contribution was 1.6% of nominal GDP and 12.4% of industrial output in 2010 with export contribution of around 100 million USD in 2012/13. It is the third largest manufacturing industry after food processing and leather industry.

The government of Ethiopia anticipate an annual 1 billion USD export earnings only from Hawassa Industrial Park, which is about tenfold of the current textile and garment export in 2014/15. The growth of the textile industry hinges on water security and it poses further challenges on sustainable water management in Ethiopia. Despite its abundant endowment of water resources, Ethiopia's water management is characterised by extreme hydrological variability and seasonality, which manifest in endemic, devastating droughts and floods, as well its international nature of its most significant surface water resources.

Water governance becomes the key to ensure water security for all different sectoral water needs at different time and spatial scale. Coordinated polices and investments are required in improving resilient water infrastructures, building strong institutions and enhancing capacities to manage water in sustainable, equitable, and efficient manner. In this light, this report aims to: 1) assess physical pertaining to the textile industry in Ethiopia.; Investigate water governance landscape and governance related (regulatory) water risks in relation to the textile industry in Ethiopia; and provide recommendations for capacity building in sustainable water management in the textile industry.

Overall, the sector faces higher water pollution risks than water quantity risks. Textile and garment units meets their water needs independently through groundwater resources. Since industrial water use currently accounts for merely 0.4% of the country's water use, water availability is not much of risk issue at the moment. Expected future sectoral growth may imply significant growth of future water demand that may increase the industry's water scarcity risk. Water pollution from textile effluents in Ethiopia is possibly the largest source of industrial soil and water pollution. Many textile and garment factories in Ethiopia are not equipped with any effluent treatment plants and discharge their effluent directly to surrounding soil and river bodies. Existing studies find that textile effluents from factories and ambient water quality of rivers around the factories exceed the standards from the Federal Environmental Protection Authority. This pollution poses a substantial risk to the communities and aquatic habitat and endanger the downstream users of the head of Blue Nile River. Weak enforcement of existing regulations does not provide incentives for environmental compliance.

Textile industry's water risks need to be placed in the context of Ethiopia's challenges in water resource management. The extreme hydrological variability, seasonality and international nature of its surface water resources are Ethiopia's main water resource management challenges. With currently under utilisation of its water resource potential (20% of South Africa's) , the country is pursuing water projects in hydropower

generation, irrigation and other water infrastructures, with the Great Ethiopian Renaissance Dam (GERD) as the most prominent one. Climate change impacts will exacerbate drought, flooding and soil erosion, which may lead to lower agricultural outputs. Low level of income and weak adaptive mechanisms will increase the country's vulnerability to climate shocks and its reliance on international aids. Uncertainties in the prediction of the future rainfall behaviour and pattern in Ethiopia is a significant challenge in understanding and planning climate change risks.

The Water Sector Development Program in 2002 is part of the country's Poverty Reduction Strategy. Though key regulatory and policy framework for water governance exist and are strategically anchored to its overarching growth and transformation plan, there are substantial implementation challenges that can magnify the physical water risks faced by the country. Industrial sectoral is currently still a minor sectoral water user compared to agriculture and hydropower; thus has received little attention in the overall water governance landscape in Ethiopia. As GTP II targets increasing GDP contribution from manufacturing sector, the impacts of regulatory water risks are envisaged to be greater in the next five years.

This report finds that the key identified regulatory water risks to a sustainable industrial water management are:

1) Lack of clarity in defining water rights, key institutional roles and responsibilities regarding industrial water use.
2) Absence of an integrated information system related to water resource management
3) High set up costs undermine the incentives for the industry to move to industrial parks that provide water supply and wastewater services.
4) Lack of awareness on mitigation of environmental impacts and risks.

Based on the identified physical water risks and regulatory water risks pertaining to the industrial water use in Ethiopia, this report recommends the following areas for improving sustainable textile water use:

1) Higher investments in institutional capacities of industrial water governance in Ethiopia to balance the country's infrastructure investments, especially for water resource planning and coordination. Of high priority are the update of basin development master plan and clarification on water governance responsibilities related to industrial water abstraction and wastewater treatment.

2) Provide a broader range of align incentives for textile units to adopt cleaner technologies and practices. This includes better incentives for relocation to industrial parks as well as other industrial policy incentives (custom duty exemption, lower import taxes, or lower credit interest rates) that target green technologies and expertise for sustainable textile water management.

3) Improve awareness of the textile units to adopt cleaner technologies and practices through capacity building activities (training, workshops, exchange programs, and international fairs) on Environmental Impact Assessments, improving resource efficiency, and mitigating and managing water risks.

4) Provide a multi stakeholder platform to encourage knowledge sharing on green technologies and practices. The platform should gather public and private sectors to encourage better interaction, synergies and coordination across various actors within the textile and water domains.

Table of Contents

Tables

Figures

Abbreviations

AFDB	African Development Bank
AGOA	African Growth and Opportunity Act
COMESA	Common Markets of East Africa
CSA	Central Statistical Agency of Ethiopia
DBE	Development Bank of Ethiopia
EIA	Environmental Impact Assessment
ENA	Ethiopian News Agency
ENGDA	Ethiopian National Groundwater Database
EGRAP	Ethiopian Groundwater Resources Assessment Program
ETIDI	Ethiopian Textile Industry Development Institute
FAO	Food and Agriculture Organization of the United Nations
FDI	Foreign Direct Investment
EPA	Environmental Protection Authority
FEPA	Federal Environmental Protection Authority
GDP	Gross Domestic Product
GERD	Great Ethiopian Renaissance Dam
GFDRR	Global Facility for Disaster Reduction and Recovery
GTP	Growth and Transformation Plan
IPDC	Industrial Parks Development Corporation
MoWIE	Ministry of Water, Irrigation and Electricity
UNEP	United Nations Environment Programme
USD	United States Dollar

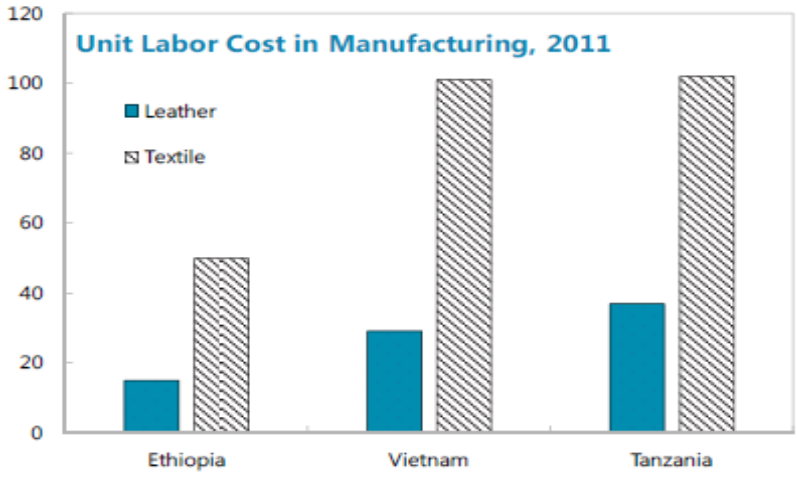
Chapter 1 Introduction

1.1. Background

As the second most populous nation in Africa after Nigeria with around 99 million people, Ethiopia has embarked on a strong development trajectory since 2004, recorded an average economic growth of 10.6% a year, service and industrial sector growth of 10% a year, and an increase of Foreign Direct Investment (World Bank, 2012). The IMF ranks Ethiopia as one of the fastest growing economies in the world, doubling income per capita in real terms since 2004/05 while reducing poverty level to 29.6% in 2010 and keeping inequality low with Gini coefficient of 0.30 in 2010 (IMF, 2015).

Although the agriculture sector remains to be the backbone of the Ethiopian economy, the industrial sector's contribution continues to grow significantly. During 2013/2014 industrial sector grew by 21.2% to contributing 14.4% of GDP, driven by construction, mining and manufacturing. In its latest development blueprint, the Second Growth and Transformation Plan (GTP II), the government aims to achieve an annual average of GDP growth rate of 11% within stable macroeconomic environment while at the same time pursuing aggressive measures toward rapid industrialisation and structural transformation (Ethiopia National Planning Commission, 2015). Garment, textile and leather are part of the government's targeted light manufacturing industries to boost jobs and increase value added.

Ethiopia is said to be a rising star for textile sourcing and production due to its cheap labour wage compared to competitive countries (Fig 1) and abundant resources for cotton farming. According to the Textile Industry Development Institute (ETIDI), currently the industry contributed to 1.6% of nominal GDP and 12.4% of industrial output in 2010 (ETIDI, 2014). It is the third largest manufacturing industry after food processing and leather industry.



Sources: IMF, 2015.

Figure 1 Unit Labour Cost Manufacturing

The government has set a very ambitious goal of achieving export revenue of USD one billion in 2014/2015, which will create 40000 new jobs; a much increase from the targeted USD 500 million export revenue in 2013/2014 (Textile Future). This target is higher than the current capacity of the textile sector. Nevertheless, the sector still shows a rapidly increasing trend and this trend is highly reliant on the ability to expand water-intensive cotton farming to support the industry.

The growth of the textile industry hinges on water security and it poses further challenges on sustainable water management in Ethiopia. Despite its abundant endowment of water resources, Ethiopia's water management is characterised by extreme hydrological variability and seasonality, which manifest in endemic, devastating droughts and floods, as well its international nature of its most significant surface water resources (World Bank 2006). A growing textile industry does not only necessitate reliable water supply to meet its need for clean water, but also appropriate sewage and wastewater treatment system.

Increasing industrial water use will need to be balanced against other industrial water uses as well as household and agricultural purposes. The governance of water becomes the key to ensure water security for all these needs at different time and spatial scale. Coordinated polices and investments are required in improving resilient water infrastructures, building strong institutions and enhancing capacities to manage water in sustainable, equitable, and efficient manner.

1.2. Objective

This report aims to:

1) Assess physical pertaining to the textile industry in Ethiopia.
2) Investigate water governance landscape and governance related (regulatory) water risks in relation to the textile industry in Ethiopia.
3) Provide recommendations for capacity building in sustainable water management in the textile industry.

1.3. Methodology and Focus

The information, analysis and recommendation in this report are built on comprehensive desk research and data review of international and local sources. The report uses the term 'textile' sector in general to refer to both the textile and apparel/garment industry.

Chapter 2 Textile Industry in Ethiopia

2.1. Economic Importance of Ethiopia's Textile Industry

Ethiopia as most sub Sharan African countries, has a weak industrial sector and low developed economy. Its economy is mainly dependent on subsistence agriculture, and coffee, which is considered as a green gold of the country, takes the lion's share of its export. In the last decade; however, Ethiopia has shown a keen interest in diversifying and developing its economy and has made a significant progress in many development areas.

Textile and garment industry has a long history in Ethiopia. Dire Dawa textile mile which was established in 1939 is the first modern industrial textile factory in Ethiopia (Mehari, Gebremedhin, & Ayele, 2013). Before that textiles were produced mainly in peoples home and in small traditional cottage industries. In spite of modern textile industry introduced to the country nearly 80 years ago, through the years the technological advancement and scale of production of the sector is not robust. By year 2014 the country has a total number of 61 textile and garment factories of which 26 are textile factories, 31 are garment assembly plants and 8 are vertically integrated textile and garment factories (AFDB, 2014).

From 2010 Ethiopia's development is guided by a national growth strategy plan called Growth & Transformation Plan (GTP). This plan is formulated by the government of Ethiopia to help it through implementing and managing the overall development of the country through various strategies and policies. The overarching objective of GTP is to maintain the current growth trajectory and align Ethiopia among the lower middle income countries by 2025. Phase one of the Growth and Transformation plan, which is commonly named as GTP-1, was an ambitious five years plan which projected to increase Ethiopia's annual average real GDP growth between 11% and 15% during 2010 to 2015. GTP-2 which is developed by taking into account the experience of GTP-1 and designed for the fiscal years 2015 - 2020 aims to maintain double digit growth while at the same time pursuing aggressive measures for faster industrialization and structural transformation (Ethiopia National Planning Commission, 2015).

Understanding that textile and garment industry has played a big role in transforming many economies in different parts of the world, the government of Ethiopia has given a maximum focus of the textile and garment sector in its GTP. The government gives quite generous incentives for both local and foreign companies who are willing to invest in the textile and garment sector. These includes importation of duty free machineries, equipment, construction materials and vehicles which will be used for the construction and operation of factories. A range of tax holidays which includes exemptions of income tax and custom tax and duties on raw materials are among the operational incentives. Land is usually given to investors in various regional states with 0-3 USD/m^2 lease fee and 60-80 years lease period. In addition, the Development Bank of Ethiopia (DBE) provides a 70% loan against investors 30% equity contribution in cash for new establishments (ETIDI, 2014).

2.2. Economic Contribution of the Textile Industry

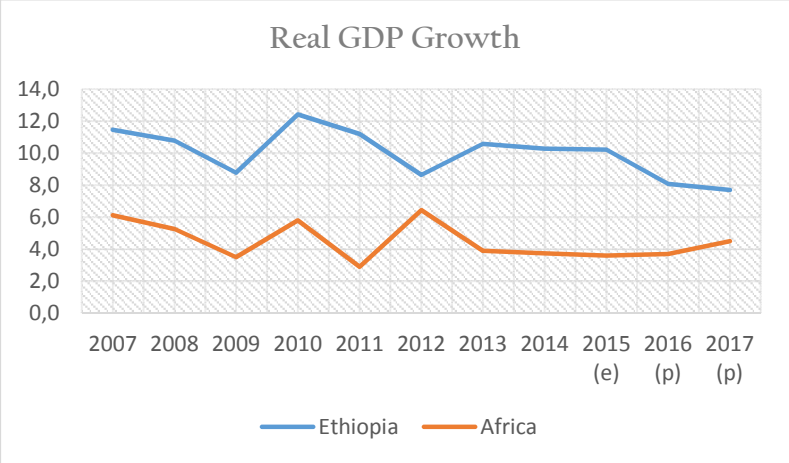
2.2.1. Employment Contribution

On its 2016 unemployment survey report, Central Statistical Agency (CSA) reveals that the national urban level unemployment rate in Ethiopia is 16.9% (CSA, 2016). Textile and garment sectors are commonly labour intensive. In countries like Bangladesh, in addition to its higher contribution to the national export earning, the textile industry is the largest employer after agriculture (Keane & Velde, 2008). The government of Ethiopia understands that enhancing the development of this sector could ease the high unemployment rate of the country.

The textile industry employs about 48,000 people in Ethiopia (ETIDI, 2014) and the number of smallholder farmers who engaged in cotton production is estimated to be more than 52,000 (Bayrau, Bekele, Assefa, & Mihiretu, 2014). Currently Ethiopia is building various industrial zones, of which some are specifically allocated for textile and garment production. As these industrial zones are very large in size, when they are fully operational the employment contribution of the textile and garment sector will be sky rocketed. The Hawassa industrial park alone, in which phase one of its construction inaugurated in July 2016, is expected to generate 60,000 employment opportunities when it is fully operational (ENA, 2016).

2.2.2. GDP and Export Contribution

According to the World Bank and many other developmental organizations, Ethiopia has been recording a double digit GDP growth in most of the years from 2004 to 2015 and currently the country is one of the fastest growing economies in Africa. This growth is broad based and almost every sectors have shown significant progress. During this period the industry sector has recorded an average annual growth of 12.9% (AFDB, 2016).



Notes: Estimates (e); projections (p),
Source: AFDB, 2015

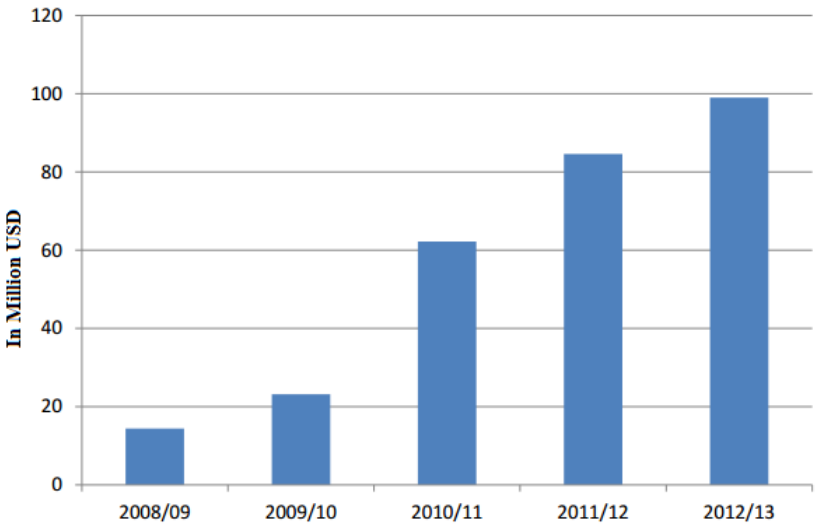
Figure 2. Annual Ethiopia Real GDP growth

Source: UNCTAD, 2015

Figure 3. Evolution of Ethiopian Economy

Textile and garment sector is one of the most important components of the industry sector in the country. The GDP (nominal) contribution of the textile and garment sector in 2010 was 1.6% and it accounted for 12.4% of the total industrial output in value terms (ETIDI, 2014).

Though the textile and garment sector in Ethiopia is having a major expansion, its annual export contribution is still at its infancy. In the year 2012/13 the export contribution of the textile and garment sector was just under 100 million USD (Fig. 4). However, the annual growth trend is promising and the chances that textile and leather export become the major export earnings for Ethiopia in the years to come is plausible. Germany, Turkey, Italy, Sudan, China and the US are the main destination countries for textile and garment export from Ethiopia (fibre2fashion.com, 2014).



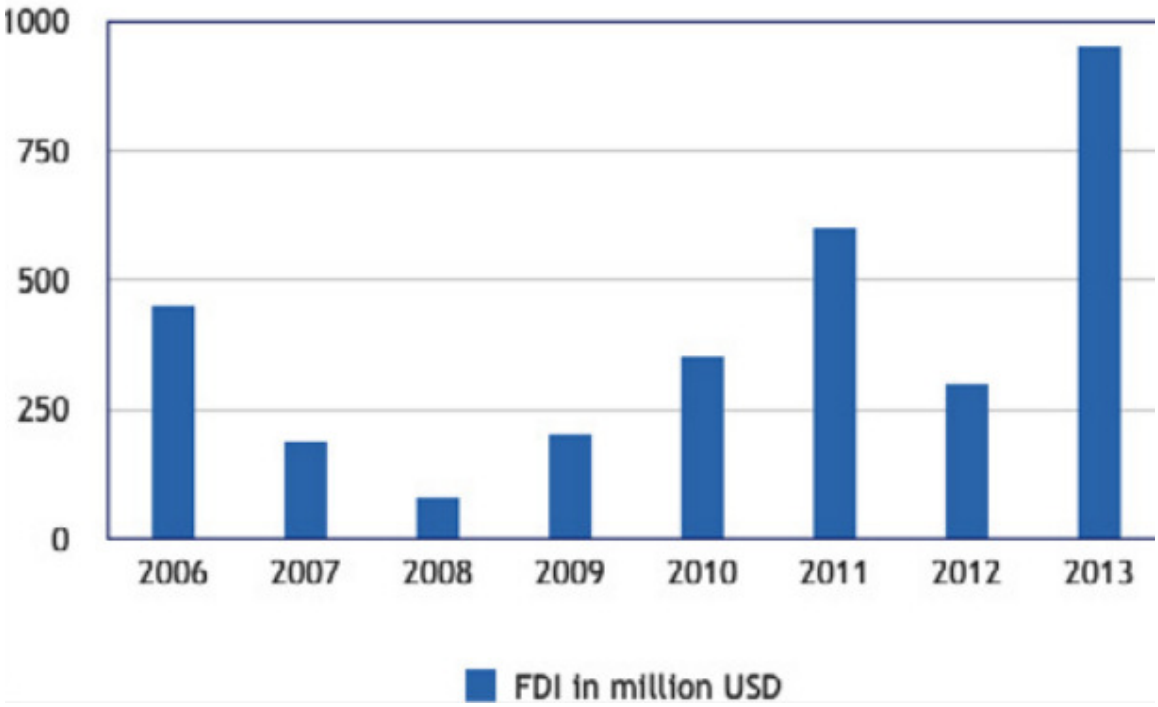
Source: Tadesse, 2004.

Figure 4. Trends in Textile and garment Export of Ethiopia

2.2.3. Foreign Direct Investment (FDI) Contribution

As it is mentioned earlier in this report, agriculture is currently the back bone of Ethiopia's economy and the country's industry is in its initial industrial development stage. The Ethiopian government is trying to change this fact and sees industrialization as a key to achieve its goal of making the country into a middle income country in the decade to come. Through its industrialization processes, Ethiopia has been working hard to appeal foreign companies to invest in the country.

Due to generous government incentives, vast available land for cotton production, cheap labour, and other low operational costs, many foreign companies have their attention to Ethiopia as their next spot for establishing their manufacturing plants. Moreover; existing initiatives like African Growth and Opportunity Act (AGOA), Common Markets of East Africa (COMESA) and other bilateral agreements gives free trade benefits and access to global and regional markets for textile and garment products which are produced in Ethiopia (Ziethen, 2016). As a result, in recent years Ethiopia is becoming the new attractive investment hub for textile and garment manufacturing in Africa and the FDI coming from the sectors has been showing a robust growth (Fig. 5). Moreover, a number of European and American big brands including H&M, Tesco and Walmart have already started sourcing textile products from Ethiopian manufacturing plants (Bussiness Sweden, 2016).



Source: UNCTAD

Figure 5. FDI in Textile and Garment Sector in Ethiopia

2.3. Economic Development Outlook and Expected Growth

Ethiopia's current economic outlook seems to be rosy and the country is striding to maintain the success achieved in recent years. For enhancing export promotion, increasing economic land use and creating safe working environment, Ethiopia is building a number of world class industrial parks

(IPDC, 2016). Currently Addis Industrial Village and Bole Lemi Industrial Park Phase I are the only industrial parks which are operational. Addis Industrial village, which was built in 1980, is the first industrial park in the country. Bole Lemi Industrial Park Phase 1 was built in 2014 and currently rented out to more than 12 companies which came from Taiwan, China, India and South Korea and which all are working in the textile and garment sector (Embassy of Ethiopia in Brussels, 2015).

In July, 2016 Ethiopia inaugurated Hawassa Industrial Park, which is mainly designated for textile and garment manufacturing. The Hawassa industrial park which is reported to be the largest of its kind in Africa, costed the country 250 million USD to build. When it is fully operational the park is expected to generate more than 50,000 jobs which is more than the current employment created by all the existing textile and garment factories in the country combined (ENA, 2016). The government of Ethiopia anticipate an annual 1 billion USD export earnings only from Hawassa Industrial Park, which is about tenfold the 110 million USD that was earned from textile and garment export in 2014/2015 fiscal year. This could possibly play a considerable role for the economic transformation the country.

2.4. Existing Challenges

The main challenges in Ethiopia's textile and garment sector are lack of skilled man power, weak infrastructure, high cost of transportation, low foreign currency reserve, and bureaucratic investment processes (Textiletoday.com, 2015). Ethiopia is a landlocked country and uses Djibouti port for the majority of its import and export. In 2014 the time to import and export a container takes an average 44 days which is slow even in African standard (Minney, 2014). The newly built rail way line between Ethiopia and Djibouti is anticipated to decrease the cost and time of goods transport to and from the country. In addition, the country has been very keen in developing its road and energy infrastructure and it is investing billions of dollars annually to alleviate issues related to energy, logistic and transport. The already established support institutions like the Textile Industry Development Institute, and educational programs that focuses on textile and garment studies in various technical vocational training colleges and universities, could possibly help in addressing the current lack of skilled man power in the sector.

The process of land allocation to investors seems to lack an in-depth stakeholder consultation and participation. There are reports which describe farmers' complaints regarding the amount and level of compensation which is given to them when they are displaced from their land. The land owners are often left up with a much smaller land which can be used for agricultural purposes and this creates food insecurity in their community. In addition, the employment which is created by the manufacturing industries are not stable and fail to provide enough salary to satisfy the livelihood of the farmers (Dadi, Stellmacher, Senbeta, Passel, & Azadi, 2016).

Though Ethiopia has been a pioneer example for other African countries in its recent development successes, the country experiences a high level of human right breaches. After going through more than a decade long political stability, in late 2015 Ethiopia exhibited a number of widespread public protests. These protests which focused mainly on broader political and socio-economic issues began largely in a peaceful manner in parts of the Oromia regional state. However, the protests eventually spread throughout the country and turned violent to the extent of destroying factories and other public infrastructure. Some textile and garment establishments were among those, which were affected by this instability. As a result of the widespread nature of the problem, the government had

a hard time containing the protests and introduced a six-month state of emergency in September 2016. After the state of emergency, the country is currently getting back to relative stability and the protests have stopped in many parts of the country. Whether these recent public uproars would affect Ethiopia's increasing FDI and recent robust GDP growth is a scenario that remains to be seen in the near future.

Chapter 3 Water Resources Situations in Ethiopia

3.1. Current Water Resources Situations

In spite of the fact that the water resource per capita share of Ethiopia is higher than most of the sub-Saharan African countries, the country has had a vicious experience in extreme drought and famine. The country is endowed with rich water resource potential in which its distribution in time and space is highly variable. This spatiotemporal variability is mainly attributed by the diverse climate conditions and multi-weather system of the country (UN-Water, 2004). Ethiopia has utilized only a small amount of its water resource potential for economic development efforts. The extreme hydrological variability, seasonality and international nature of its surface water resources are Ethiopia's main water resource management challenges (World Bank, 2006).

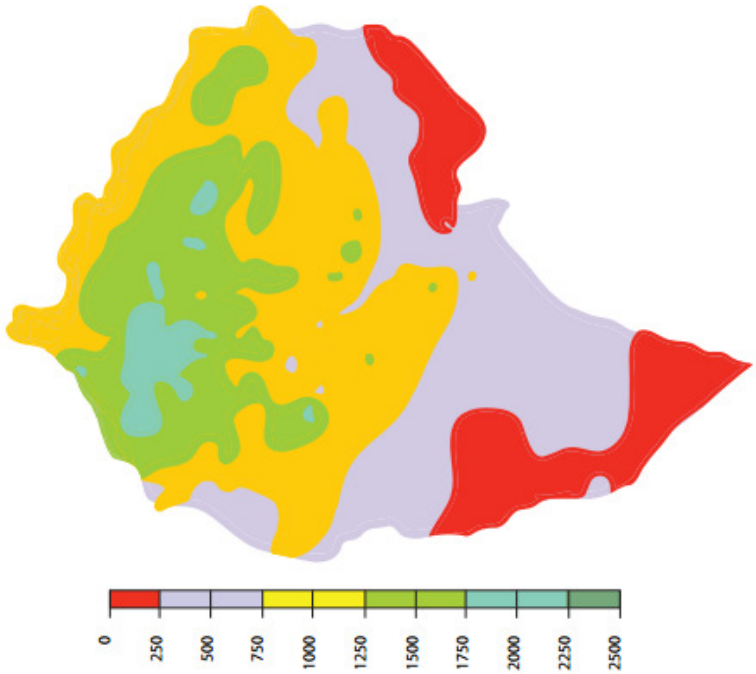
Currently Ethiopia has inadequate water storage infrastructure which can provide enough water resource supply to its citizen and the higher demand coming from its growing economy. While the country possesses abundant water resources, its current per capita water storage capacity is just 160m^3, which is just 20% of South Africa's (Awulachew, 2010). There are, however, a number of recently completed and ongoing mega projects in the area of hydropower generation, irrigation and other water infrastructures. Among the Mega projects the government is undertaking, the Great Ethiopian Renaissance Dam (GERD) is the most prominent one. GERD is being built on the River Nile course and upon completion it will have a power generation capacity of 6,000 MW which makes it the largest of its kind in Africa (Salini-impregilo, 2016). Currently close to 60% of the GERD is completed and 750 MW of electricity is expected to be generated from two of its turbines in 2017 (Walta Information Center, 2016).

3.1.1. Rainfall

Agriculture is Ethiopia's major economic income and according to World Bank estimates it contributed about 41% of the total GDP in 2015 (World Bank, 2016) . Ethiopia has mainly subsistence and rainfed agriculture, which employs more than 80% of the labour force. As a result of this, during years when there is no sufficient rainfall, the agricultural production of the country greatly impacted and often leads the economy to suffer. Moreover, in some areas with low or no rainfall years, drought and famine is a common occurrence. Therefore, a good understanding of the rainfall pattern and its variability is very important for economic planning and the livelihood of the people.

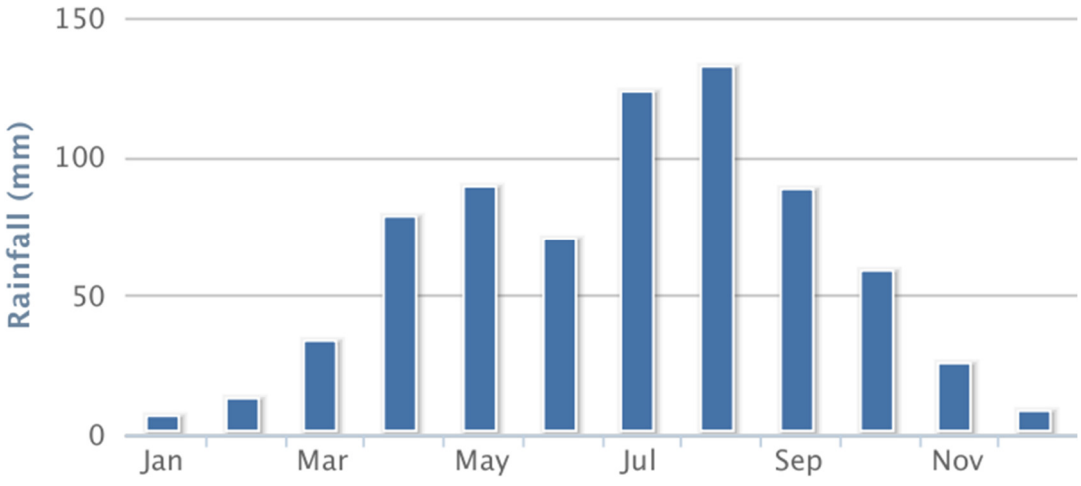
The country receives an annual rainfall as high as 2500mm in its south-western part and less than 200mm in the south Easter region (Fig 6). Ethiopia receives the majority of its rainfall during Belg (February - May) and Kiremt (June - mid September) seasons, however the amount and seasonality differs place to place based on topography. Kiremt has longer heavy rains and moderate rain falls exhibits during Belg season. Most of the western and south-western part of the country has a unimodal rainfall pattern (February to October/November), while the central and eastern parts have both Belg and Kiremt rains (Diro et al, 2009). The south and south eastern parts has bimodal rainy

periods during March to May and September to November and the low lands in the North eastern part of the country has only one little to moderate rainfall season between November and February (ecotravelworldwide, 2016).



Source: UNDP, 2009

Figure 6. Mean Annual Rainfall (mm)



Source: *(World Bank, 2016)*

Figure 7. Ethiopia Average monthly rainfall (1900-2012)

3.1.2. Surface Water Resources

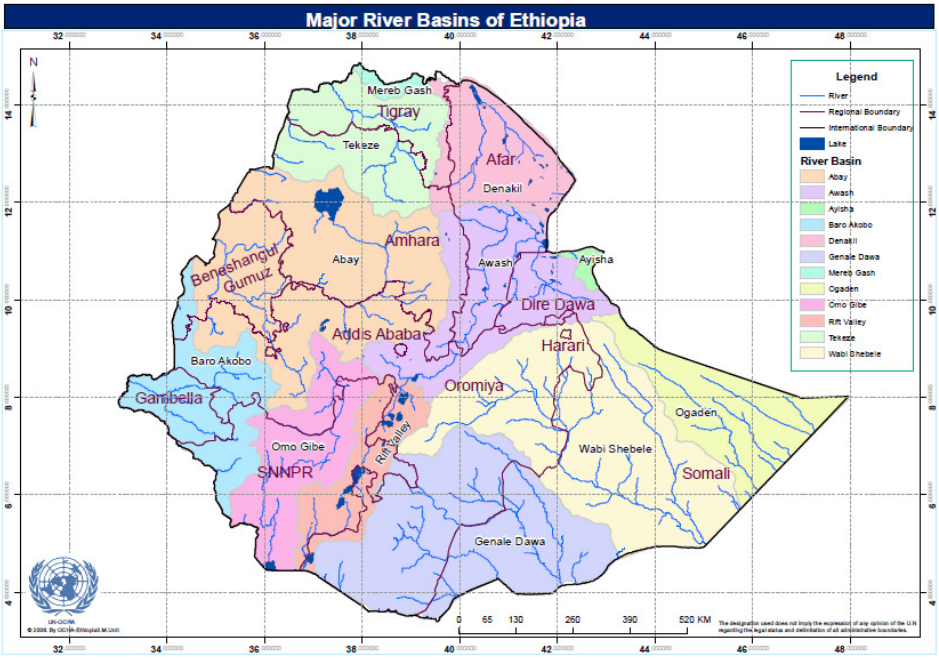
Ethiopia possess 12 major River Basins (Table 1) out of which 3 of them has insignificant water flow (MoWIE, 2014). These basins form four drainage systems which are the Blue Nile/Abbay, Rift Valley, Shebelli-Juba and North-East Coast (FAO, 2016).

Table 1. Physical Characteristics of the Basins in Ethiopia.

Basin Name	Type	Source	Area (km^2)	Surface Water Potential (Bm^3)	Rainfall (mm)			Terminal (Flow Final Destination)
					Max.	Min.	Ave.	
Wabishebelle	R	Bale Highland	202220	3.4	1563	223	425	Indian Ocean
Abbay/Blue Nile	R	West, Southwest HL	199912	54.4	2220	800	1420	Mediterranean Sea
Genale Dawa	R	Bale Highland	172259	6.0	1200	200	528	Indian Ocean
Awash	R	Central Highland	110000	4.9	1600	160	557	Terminal Lakes (Internal)
Tekeze	R	North Wollo HL	82350	8.2	1200	600	1300	Mediterranean Sea
Denakil	D	North Wollo Highland	64380	0.86	1500	100	na	Internal
Ogaden	D	No flow	77120	0	800	200	400	Internal
Omo-Ghibe	R	Central, Western HL	79000	16.6	1900	400	1140	Lake Turkana
Baro-Akobo	R	Western Highland	75912	23.23	3000	600	1419	Mediterranean Sea
Rift Valley Lakes	L	Arsi and Central HL	52000	5.64	1800	300	na	Chew Bahir
Mereb	R	Adigirat HL	5900	0.72	2000	680	na	Swamp in Sudan
Aysha	D	No flow	2223	0	500	120	na	Internal

Notes: HL-Highland D-Dry R-River L- Lake NF-No flow
Source: MoWIE, 2014.

Most of the river basins are transboundary and 97% the total estimated basins annual discharge flows to the adjoining countries while the remaining 3% remains inside the country (Belete et al., 2014). As a result of this Ethiopia is the main source of freshwater and large amount of weathered alluvial soil to its neighbouring countries and northeast Africa. In addition, 11major freshwater lakes, 9 saline lakes and over 12major wetland areas are found in the country (FAO, 2016). Though there is no precise figure that shows the surface water potential of the country, in different studies it is estimated between 110 and 125 Bm^3. The country mainly uses its surface water resources for irrigating farmlands and hydropower generating purposes.



Source: UN-OCHA, 2008

Figure 8. Major River Basins of Ethiopia

3.1.3. Groundwater Resources

In Ethiopia, drilling of underground wells dated back to the 19th century. Norton Tube Wells (Abyssinian Wells) are the first machined drilled wells in Ethiopia and they are believed to have been drilled by the British Military in 1867-1868 (Kebede, 2013). Currently the country uses its groundwater resources mainly for municipal water supplies and its industries. However most of the groundwater resources still untapped and it has a huge potential in playing a big role in supporting the development effort of the country.

The amount of groundwater resources in Ethiopia are more profound than the surface water resources. According to MoWIE preliminary estimates, the annual groundwater recharge of the country is about 2.8 billion m3; nevertheless, some other recent studies shows that this figure is underestimated and the actual amount could be much higher than this (MoWIE, 2014). There is a clear lack of detailed studies and information regarding the groundwater resources of the country. So far, most of the area of the country do not have detailed hydrogeological studies. This resulted in an absence of a comprehensive monitoring and regulatory framework in developing and managing the groundwater resources. The government has attempted to resolve the issue by implementing different nationwide programs.

Since 2003, together with Addis Ababa University and Geological survey of Ethiopia, the MoWIE has been implementing Ethiopian National Groundwater Database (ENGDA). Regional Water Resources Development Bureaus, Water Work Enterprises and NGOs are also close collaborators in the development of the database. ENGDA stores and analyses site information, water-level, water quality and other related information in more than 5000 boreholes which has been drilled in

different parts of the country (Belete et al., 2014). In addition, Ethiopia has also started a more comprehensive Ethiopian Groundwater Resources Assessment Program (EGRAP) in 2013. EGRAP aims to undertake a detailed hydrogeological study covering the entire area of the country. If EGRAP implementation is going to be a success, the country will have a much better understanding of its groundwater resources in about a decade to come.

3.2. Climate Change Effects on the Hydrological Systems

Due to the high spatiotemporal variability of rainfall, change in global atmospheric oscillation and climate change induced impacts, extreme hydroclimate events are common occurrences in Ethiopia. These occurrences mainly cause drought, flooding and soil erosion which in turn leads to low level of agricultural outputs. Ethiopia is a country of Farmers, where more than 80% of the citizen's livelihood is dependent on Agriculture. As it is discussed earlier in this report most of the agricultural practices in Ethiopia are subsistence and depends on rainfall. Therefore, when rain fails, the already existing food insecurity worsen.

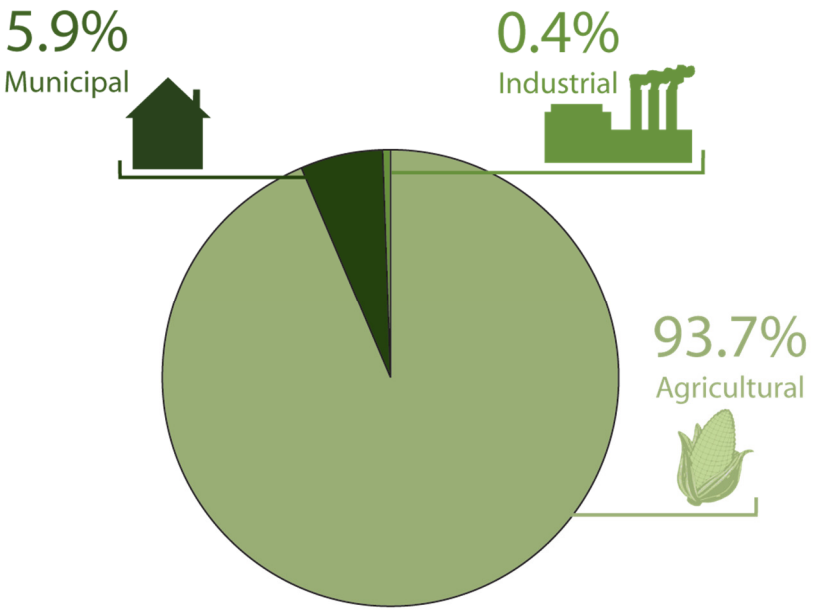
Though Ethiopia has a long history of recurring drought, the magnitude, frequency and the level of impact intensified since the 1970s (GFDRR, 2013). During 2015-2016, Ethiopia was exposed to a massive food insecurity caused by extreme drought in many parts of the country. This drought was the worst in decades and triggered by the 2015 El Niño, poor and erratic rainfall and climate change (Oxfam, 2016). As a result of low level of income and weak adaptive mechanisms the livelihood of farmers in Ethiopia are very prone to be affected by these climate shocks and the country need to receive food aid from international donors. However, in comparison with the 1984 drought which paralyzed the entire country, currently Ethiopia drought coping capacity greatly improved.

Interestingly enough, there are some studies, which predict that Ethiopia might end up benefited paradoxically by climate change. Among recent publications (Wagena, 2016), a climate change impact assessment study made by a team of researchers from Virginia Tech University concludes that the Blue Nile basin water discharge, which is the largest in Ethiopia, is projected to increase due to climate change. The inadequate rainfall records and the strong inter-annual and inter-decadal variability makes it harder for climate researchers to predict Ethiopia's long term precipitation trends (McSweeney et al, 2008). Uncertainties in the prediction of the future rainfall behaviour and pattern in Ethiopia is a significant challenge in understanding and planning climate change risks (Conway & Schipper, 2010).

Chapter 4 Physical Water Risk Outlook of Ethiopia's Textile Industry

4.1. Water Use in Textile and Garment Industry

Compare to other sectors, the industrial sector in Ethiopia consumes the least amount of water. According to UNEP Ethiopia country profile report (Fig. 8) the industrial water use in 2002 was 0.4% of the total water use (UNEP, 2012). Due to recent growth in the industrial sector in general and the textile and garment industry in particular, this number could be much higher now. The fact that the country does not possess well-developed large scale manufacturing establishments could be the reason for the low consumption of water in the industry sector. Currently, most of the textile industries in Ethiopia are either small or medium scale.



Source: UNEP, *2002*

Figure 9. Water Withdrawal by Sector

Self-supplied groundwater is the main source of water for the industrial sector that includes the textile industries in Ethiopia (Kebede, 2013). There are also a small number of factories which tap water from surrounding surface water sources and municipal water supplies. As the number and scale of the textile industry in Ethiopia is at its infancy, currently fulfilling the water demand of the industry sector is not a big issue. However, the textile and garment industry in Ethiopia is at its

booming stage and heavy extraction of the groundwater and other water sources will be needed to fulfil the future surge in water demand.

4.2. Water Pollution from the Textile Industry

Water pollution from manufacturing plants is a big concern in most developing countries. Textile and garment manufacturing plants demand a high amount of water for their production processes. As a result, the textile and garment sector generates a high amount of liquid waste. Many of the standalone textile and garment factories in Ethiopia do not have any effluent treatment plants as part of their waste disposal processes. They merely dispose their effluent directly to the ambient environment, which in most cases are river bodies, without a due treatment procedure. Though the country has legal procedures and regulations for controlling the environmental impacts from industrial wastes, lack of strong commitment in enforcing them and poor government supervision exacerbate the situation.

To date, there are hardly any detailed and comprehensive national water risk assessment studies conducted on Ethiopia's textile and garment sector. Thus, knowledge of impacts from industrial effluent on humans and surrounding environment is very limited. There are however some studies, which are based on a small number of individual textile factories. In most of these studies, it is reported that the wastewater from the textile and garment sector in Ethiopia is possibly the largest source of industrial soil and water pollution.

A 2015 study (Mehari, Gebremedhin, & Ayele, 2013) made in Bahir Dar Textile Factory, which is located in Amhara regional state, shows that the liquid waste that is disposed from the factory poses a substantial risk to the aquatic habitat which in turn endanger the downstream users of the head of Blue Nile River. Another study (Dadi, Stellmacher, Senbeta, Passel, & Azadi, 2016) that looked into environmental and health impacts of effluents from four different textile and garment plants in the town of Gelan and Dukem of Oromia reginal states, also reveals the risks that the factories posed to communities and the surrounding environment. The study analysed the effluent from the four factories and concluded that the physiochemical and bacteriological pollutants in the effluent are higher than the permissible limit given by the Federal Environmental Protection Authority (FEPA). Another study shows that the physiochemical characteristics of effluents from Hawassa Textile Industry and the surrounding water bodies have higher values than the permissible limit (Tafesse, Yetemegne, & Kumar, 2015). A broader understanding of the problem in the country requires a more comprehensive and nationwide study.

To address industrial water pollution, the existing industrial zones are designed with some level of common effluent treatment plant. The Hawassa Industrial Park, which is yet to be operational, is also an industrial zone that will have a zero-liquid discharge. In addition, the first denim manufacturing plant, which has a modern effluent treatment system that enables it to have a zero liquid discharge, started its operation in late 2015 (Kanoria Africa , 2015). The denim manufacturing plant is owned by Kanoria Africa textile PLC, which is established by its flagship company Kanoria Chemicals and Industries Limited, which is based in India. According to Jay Soyantar, Kanoria Africa chief marketing officer, they chose to build the modern effluent treatment plant out of their own initiative and no incentive was given to them for having a zero-liquid discharge factory. Kanoria

Africa could be a role model for other manufacturing plants and show them that environmentally friendly investments bring benefits to the company.

Source: Kanoria-Africa website.

Figure 10. Kanoria-Africa Effluent Treatment Plant

Chapter 5 Water Governance Landscape in Ethiopia

5.1. Ethiopia's Landscape of Water Governance

Ethiopia's remarkable economic growth has moved the country nine places up in 2014 from being the second poorest in the world in 2000. This growth, built on agricultural and services sector, has resulted in some substantial progress toward the attainment of Millenium Development Goals (MDG), especially on water access. By 2014, the proportion of the rural population with access to potable water had risen to 75.5% from 46% in 2006. The government has aimed to reach 98.5% national target by 2015 (Zerihun Wondifraw et al 2015).

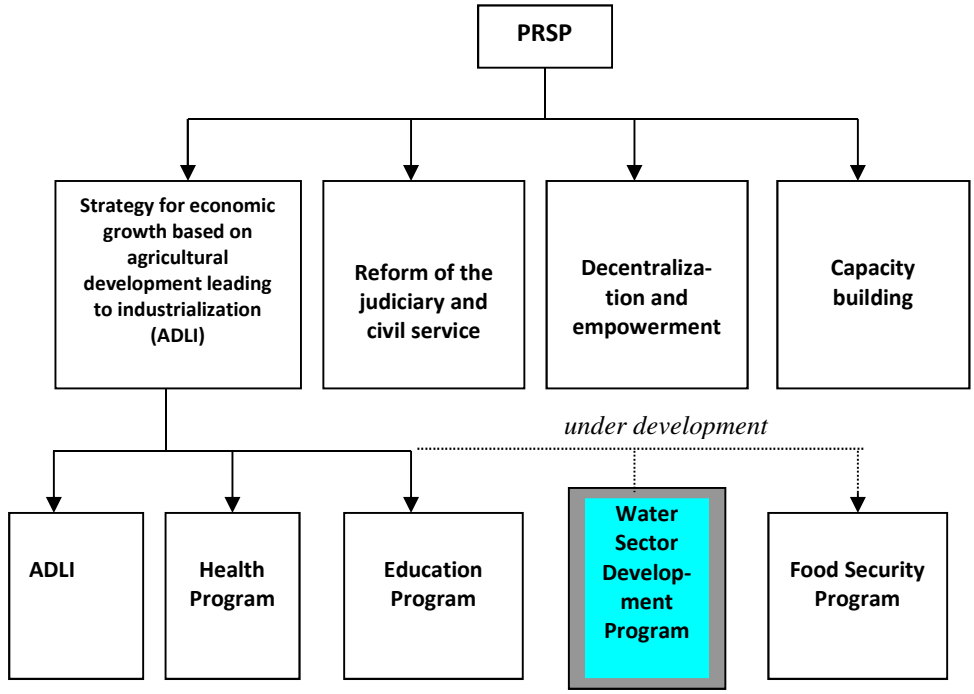
Nevertheless, Ethiopia still underperforms on access to safe water, especially in rural areas and the bottom 40% income group. Evidence has shown that improving access to clean water reduces poverty by improving health and nutrition as well as increasing agricultural productivity, especially for female-headed households by reducing their time burden for accessing water. (World Bank Group, 2016).

To support the country's growth and transformation goals, water resources management has focused much on water development projects, such as the expansion of hydropower and medium as well as large scale irrigation schemes. In line with poverty reduction efforts, water, sanitation and hygiene (WASH) issues are also high on the agenda. Thus, industrial water use in Ethiopia has only received minor attention. The industrial sector is mostly heavily reliant on groundwater resources. In urban areas, groundwater abstractions has caused a significant stress on the existing domestic water supply (MacAlister *et al*. 2012).

5.1.1. Water Governance Structure

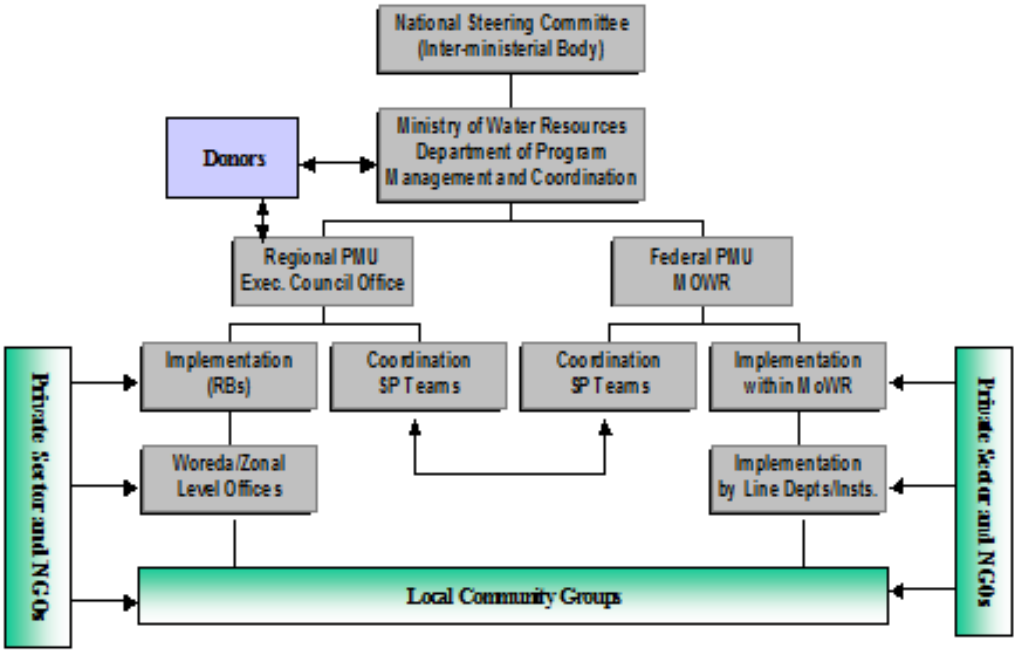
Water governance in Ethiopia, i.e. the institutional framework that sets 'the rules of the game' in managing and allocating the country's water resources to meet its development goals, is currently in the early stage of development, moving from fragmented approaches toward more integrated approaches.

Considering that Ethiopia's primary development challenge is poverty alleviation, the Water Sector Development Program in 2002 is one of the country's sectoral program that contributes to the "strategy for economic growth based on agricultural development leading to industrialization" as one of the building blocks of the Ethiopia's Poverty Reduction Strategy Paper (PRSP).



Source: Ethiopia's Water Sector Development Program 2002

Figure 11. Water Sector Contribution to Poverty Reduction Strategy Paper



Source: Ethiopia's Water Sector Development Program 2002

Figure 12. Water Governance in Ethiopia

Ethiopia employs integrated water resource management (IWRM) approach by, among others, establishing River Basin Authorities (RBAs). Out of eight basins currently setting up RBAs, three of

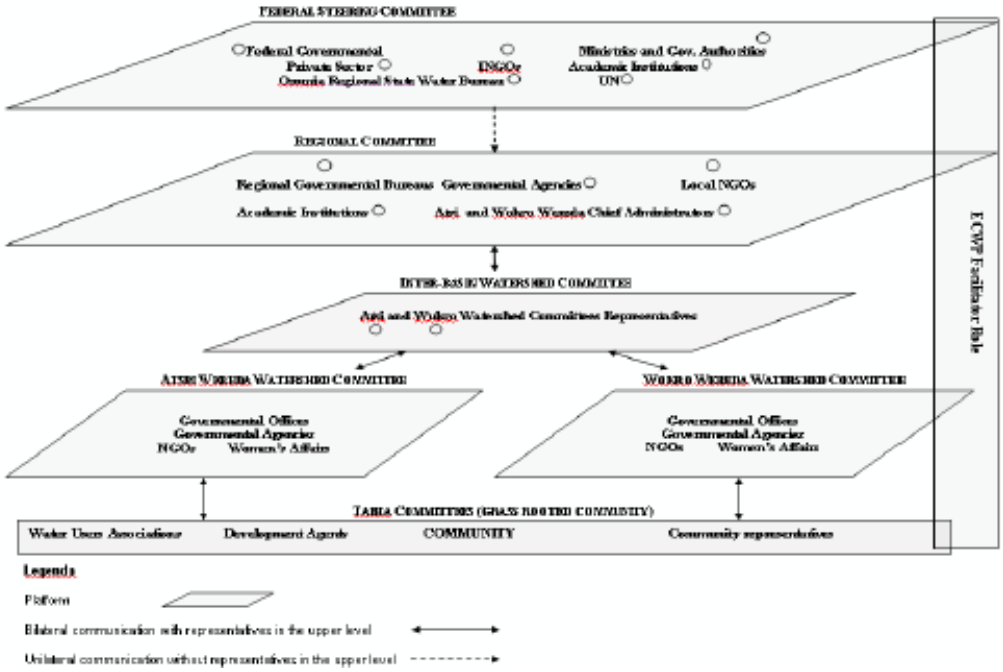
them have functional RBAs that practice coordination of water resource management at the basin level (Table 2). At the same time, the country also improves the delivery of basic WASH services through a highly decentralised governance system that includes progressive devolution of implementation responsibilities to regional and district (*woreda*) level. A suggested stakeholder platform for a water governance model based on IWRM implementation from the federal level to watershed level is presented in Figure 13.

Table 2. River Basin Authorities in Ethiopia.

River Basin	Water Management Issues	Scale of issues	RBA Status
Awash	Water scarcity, salinity, pollution, flooding	Community, regional	1
Abbay	Flooding, sectoral competition (hydropower, tourism, navigation, irrigation), pollution	Community, regional, international	1
Rift Valley Lakes	Water scarcity, salinity, pollution, declining water availability and groundwater table	Community, regional	2
Omo-Ghibe	Downstream impacts of upstream dam and irrigation projects; flooding, salinity	Regional and international	3
Baro-Akobo	Pollution and degradation of wetlands; water and land use planning; water use competition (natural systems vs planned large-scale irrigation); flooding	Regional and international	3
Tekeze	Water scarcity	Community, regional	3
Wabi Shebele	Flooding, water scarcity, salinity	Community	3
Genale - Dawa	Flooding, water scarcity, salinity	Community	3

Note: 1 = Basin Authority is formally established by proclamation, and the RBA runs offices and operations and has started practicing water management in the Basin; 2 = Basin Authority is formally established by proclamation, exercising WRM mandate yet to start; 3 = No RBA established.

Source: Modified from Alamirew and Kebede, 2014.



Source: GWP Eastern Africa, 2009.

Figure 13. Multi Stakeholder Platform of Water Governance

5.1.2. Key Actors

The following table list key actors of water governance in Ethiopia and their corresponding responsibilities.

Table 3. Key Water Governance Actors in Ethiopia

Actors	Responsibilities
Ministry of Water, Irrigation and Electricity (MoWIE)	Established in 2010 by the Federal Democratic Republic of Ethiopia (FDRE) proclamation number 691/ 2010. Develop policies, strategies, national programs and standards; overall planning and coordination of multi regional programs at national level; monitoring the implementation of water resource management and development programmes; issue licenses for large and medium scale irrigation schemes, provide capacity building; and identify funding for rural water supply.
Ministry of Finance and Economic Development (MoFED)	Responsible for signing agreements with donors and overseeing their implementations; allocating resources to line ministries related to water resource management and development, including investments under the Water Master Plan.
Ministry of Environment and Forestry (MEF), previously Environmental Protection Authority	Established in 1995 by FDRE Proclamation No. 9/1995 Develop an Environmental Impact Assessment (EIA) guideline and decide on EIAs for projects that are likely to produce trans-regional impacts. Provide technical approach and system for implementation coordination and monitoring of Climate Resilient Green Economy (CRGE) Strategy
Ministry of Health (MoH)	Through the Hygiene and Environmental Health Dept. (HEHD) develop and implement health policies related to sanitation and hygiene. Coordinates with MEF on sanitation issues.
Ministry of Trade and Industry (MoTI)	Issues licenses and permits to industrial development projects.
Ministry of Agriculture (MoA)	Responsibility for watershed management, water harvesting and small-scale irrigation schemes
The Ethiopian Electric Power Corporation (EEPCo)	A government-owned utility responsible for the generation, transmission, distribution and sale of electric energy throughout Ethiopia 'in accordance with economic and social development policies' (EEPCo, 2014). The main energy source of the national grid is hydropower plants.
Regional Authorities	According to the Ethiopian Constitution (art. 52 c), states have the power to administer land and natural resources in accordance with laws enacted by the Federal Government. Proclamation 197/2000. Manage water and other resources in regional states.
River Basin High Councils (RBHCs) and River Basin Authorities (RBAs)	Management and regulatory functions according to FDRE Proclamation 534/2007: • RBHCs: prepare the basin plan in a participatory way and submit it to the government for approval; final responsibility for coordination of stakeholders at basin level. • RBAs: implement the basin plan, coordinate water-related interventions at basin level, and manage permit and information system.
Woreda Water Desks	Planning, managing, monitoring and evaluation of local service providers set-up at Woreda and community level. Decentralization. Coordinates non governmental organisations (NGOs).

Sources: Beyene, 2016; Mosello et al., 2015; MoWIE website.

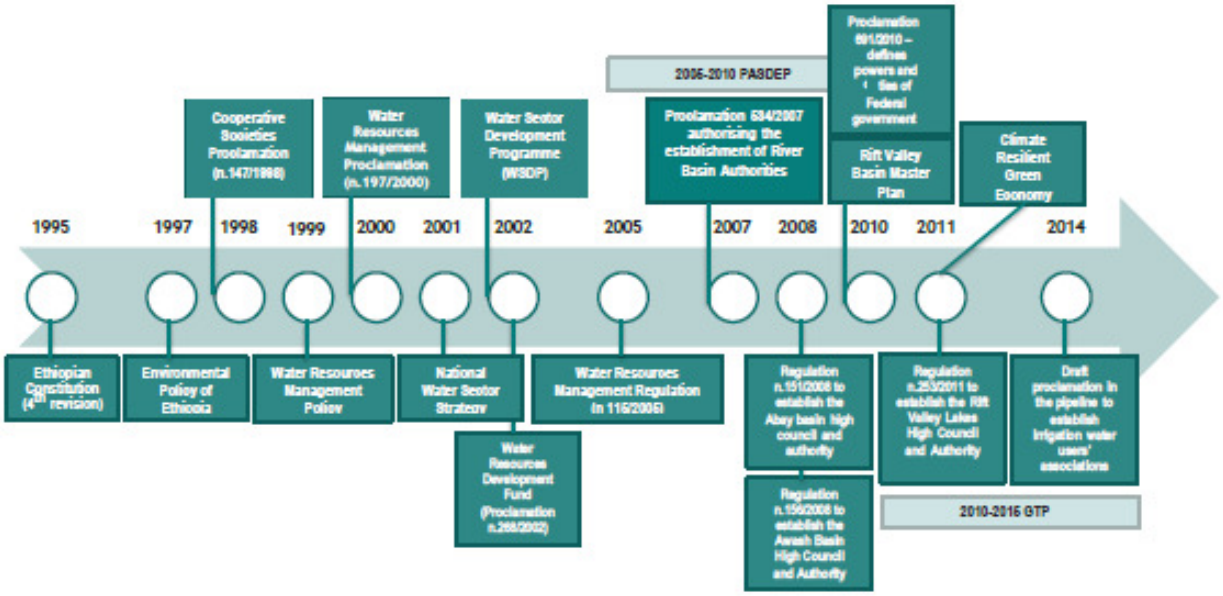
5.1.3. Key Regulations and Policies

The Government of Ethiopia has developed some specific water regulations and policies as well as broader development strategy that affect water resource management in the country. The following table highlights key regulations, policies and strategy that are related to water governance issues.

Table 4. Key Water Related Regulations and Policies in Ethiopia

Regulations	Description
Ethiopian Water Resources Management Policy 1999 and Water Strategy	The Water Resource Management Policy (WRMP) aims to enhance and promote all national efforts towards the efficient, equitable and optimum utilization of the available Water Resources of Ethiopia for significant socioeconomic development on sustainable basis. In 2001 the Ethiopia Water Strategy was adopted, with priority issues of the priority in terms of IWRM was water allocation for drinking and sanitation purposes, followed by water requirements for livestock.
Water Sector Development Program (WSDP) 2002	The WSDP provides basin level water resource management and sets a planning horizon of 15 years, divided into three 5-year periods of the short-term (2002-2006), medium-term (2007-2011), and long-term (2012-2016) in line with the five-year development plans of Regional and Federal institutions. The national and regional priorities reflected in the WSDP relate largely to: (a) developing water resources for different uses; and (b) meeting national and regional development objectives that reinforce prospects for successful WSDP outcomes. The WSDP focuses particularly on water availability for drinking and sanitation, livestock and industrial development; extending irrigation; expanding generation capacity for hydroelectricity.
Proclamation 197/2000 Ethiopian Water Recourses Management Proclamation	The regulation ensures that the water resources of the country are protected and used for the highest social and economic benefits of the people of Ethiopia. Proclamation 197/2000 defined activities within WRM that include water resources development, use, conservation, protection and control. It provides the mandate to the Ministry of Water Resources (currently MoWIE) for management of the water sector, the power to issue permits for water use, the power to determine allocation and use, and the establishment of quality standards.
Proclamation 534/2007 River Basin Councils and Authorities Proclamation	The Proclamation establishes River Basin High Councils (RBHCs) and RBAs for each of Ethiopia's major river basins, which aim at promoting and monitoring the integrated resources management process in the river basins. RBHCs provide policy guidance and planning oversight to ensure coordination among stakeholders for IWRM implementation as well as submit River Basin Master Plan for Federal Government's approval. RBA is mandated with the implementation of the Master Plan in line with IWRM.
Environmental Standards for Industrial Pollution Control	The Environmental Policy of Ethiopia was launched in April 1997. The environmental standards for industrial pollution control is one of the implementations of the Policy. The standards include industrial effluents. The regional states can establish more stringent standards considering particular ecological conditions in their localities provided that these federal standards are used as the minimum.
The Growth and Transformation Plan (GTP) I and II	The GTP is Ethiopia's five year poverty reduction focused development plan that will facilitate Ethiopia to achieve its vision of transforming into a middle income country by 2020-2023. GTP I (2010-2015) aimed to maintain annual growth rate of 11% to increase real GDP growth through agricultural and industrial sector. GTP II (2016-2020) maintains 11% economic growth target while improving productivity, quality and competitiveness of domestic productive sectors (agriculture and manufacturing), through 8% agriculture growth and 21.9% industrial growth.
The Climate Resilient Green Economy (CRGE) Strategy	Launched in 2011, CGRE aims to identify green opportunities to help Ethiopia become a middle-income country by 2020-2023 under the presence of climate change. CRGE recognizes water management as a key to achieving green economy due to its role in underpinning hydropower and agricultural development.
Ethiopian Industrial Development Zones Cooperation	Established in 2014, more industrial zones and 11 industrial parks are planned but only two industrial parks are operational and the rests are planned to be operational in 2016/2017. Eight of these parks are eligible for textiles and apparel industry and provide industrial water supply and wastewater services.

The history of main water policies in Ethiopia is summarized in the diagram below.



Source: Mosello *et al.*, 2015.

Figure 14. Chronology of Regulations and Policies for Water Resources Management in Ethiopia

No	Name of parks	Site & Location from Addis Ababa	Kms from Addis Ababa	Proximity to the port (Djibouti)	delimited land (hectare)	Phase I (hectare)	Eligible industries (only major ones)	completion period of Phase I
1	Addis Industry village	Addis Ababa	Addis Ababa	863	8.7	8.7	Apparel	operational
2	Bole lemi I	Addis Ababa	Addis Ababa	863	156	156	Apparel	operational
3	Bole lemi II	Addis Ababa	Addis Ababa	863	186	186	Textile & Apparel	2017
4	Kilinto	Addis Ababa	Addis Ababa	863	337	337	Food processing, pharmaceutical, furniture, house appliance, electronic & electrical	2017
5	Hawassa	South	275	998	300	100	Textile & Apparel	2016
6	Dire Dawa	East	473	380	1500	150	Textile and Apparel, vehicles assembly and Food processing	2016
7	Kombolcha	North-East	380	480	700	50	Textile & Apparel, Food processing,	2016
8	Mekelle	North	760	750	1000	50	Textile & Apparel, Food processing,	2016
9	Adama	South-East	74	678	2000	100	Textile & Apparel, vehicles assembly and Food processing	2016
10	Bahir Dar	North-West	578	985	1000	50	Textile & Apparel, Food processing,	2016/2017
11	Jimma	South-West	346	1098	500	50	Textile & Apparel, Food processing,	2016/2017

Source: Industrial Park Development Corporation.

Figure 15. Planned and Operational Industrial Parks in Ethiopia

5.1.4. Programmes

The Government of Ethiopia has engaged in numerous projects in water resource management with international assistance, most of which are funded by development partners. These water projects are within the area of urban and rural water supply and sanitation, drought resilience, sustainable land management, institutional capacity building, water resource planning, water resource development, irrigation, and hydropower. The following table lists some of the projects that focus more on WASH issues, institutional capacities, and drought resilience.

Table 5. Selected Water Projects in Ethiopia

Project/Programme	Development Partners	Descriptions
Harar Water Supply Project	AfDB	Provided safe water supply for more than 250,000 people in Harar and four neighboring towns and improved the livelihoods of women and the youth through, among others, increased employment opportunities due to the thriving of commercial enterprises such as hotels
Rural Water Supply and Sanitation Project (RWSSP)	AfDB	Contributed to increased access to water supply and sanitation services for rural populations, in about 125 woredas and supporting the establishment of a sustainable service provision framework across all levels
Promoting Basic Services (PBS) II and III	AfDB, WB, EU, DfID, Austria, Italy, Ireland Dev. Cooperation, Spain	Contributing to poverty reduction and improving living standards by expanding access and enhancing the quality of the decentralized delivery of services in education, health, agriculture, water supply and sanitation; and rural roads while continuing to deepen local accountability and transparency in basic service delivery
Solar &Wind for Water	Africa Water Facility (AWF)	Piloting and promoting use of solar and wind energy for water pumping in rural areas and development. The project will result in an increased and sustained supply of water at lower financial, economic, environmental and social costs.
Ethiopia Water Supply and Sanitation Project	World Bank and DfID	Contributed to increased access to water supply and sanitation services for rural and urban populations, including creation of woreda water and sanitation programs (in 230 woredas) and establishment of water boards in 50 towns; including establishing of sector M&E framework
Ethiopia Water Supply, Sanitation and Hygiene Project	World Bank	Will increase access to improved water supply and sanitation services for residents in participating woredas/towns and communities in Ethiopia
Public Sector Capacity Building Program Support Project (PSCAP); I and II	EU, World Bank, DfID, Ireland Dev. Cooperation	Governance and Decentralized Service Delivery: development of human resources, working systems and effective organizational structures to improve the scale, efficiency and responsiveness of public service delivery at the federal, regional, and local level; empower citizens to participate more effectively in shaping their own development; and promote good governance and accountability
Drought Resilience and Sustainable Livelihoods Program for the Horn of Africa (HoA)	AfDB	Developing regional systems to alleviate the negative impacts of deteriorating environmental conditions in the HoA. Among the activities will be development of water storage and other related infrastructure; protection of water reservoirs and conservation of water catchment areas; development of market infrastructure and communication and information systems for selected pastoralist woredas.
Environment and Sanitation	UNICEF	Supports humanitarian WASH, School WASH, WASH MIS, Education MIS, Health MIS, technical Assistance; WASH sector standards and manuals; CLTHS, water conservation and reuse; supports both rural and urban WASH interventions
Rural water supply, sanitation and hygiene programme in Benishangul Gumuz region	Finland	Institutionalizing community-based water planning, development, management and reinvestment using a Community Development Fund in Benishangul Gumuz Region; Finland also provides support to Civil Society
Multi-Annual Strategic Plans (2012-15) of the Netherlands Embassy	Netherlands	Addresses water within the framework of water for food and water for health; mostly in collaboration with other partners like UNICEF, SNV, etc.
Support to water, energy and urban infrastructure	AFD	Upgrading of water supply in Addis Ababa ; Supporting increased access to water and sanitation in rural areas; Sustainable management of water resources to support the Nile Basin Initiative

Source: African Development Bank, 2015.

5.2. Regulatory Water Risks

Ethiopia has a water governance structure supported with key regulatory and policy framework, which is strategically anchored to its overarching growth and transformation plan. The

implementation of the regulatory framework still faces substantial challenges that can magnify the physical water risks faced by the country. Industrial sectoral is currently still a minor sectoral water user compared to agriculture and hydropower; thus has received little attention in the overall water governance landscape in Ethiopia. As GTP II targets increasing GDP contribution from manufacturing sector, the impacts of regulatory water risks are envisaged to be greater in the next five years. The key identified barriers that constitute regulatory water risks to a sustainable industrial water management are as follows:

1) **Lack of clarity in defining water rights, key institutional roles and responsibilities regarding industrial water use.**

   According to Ethiopian Water Resource Management Proclamation No. 197/2000 (FDRE, 2000), the Ministry of Water Resources (or MoWIE) is the main supervising body which is responsible for planning, management, utilization and protection of water resources of the country. In another proclamation which is enacted in 2002, Environmental Impact Assessment Proclamation No. 299/2002, Environmental Protection Agency (EPA) is the main regulatory body for preparing procedures, regulations, guideline and standards for implementing and enforcing EIA proclamations in industrial development and other sectors (EPA, 2004). There is however a lack of clear roles and responsibilities in overseeing quality control of textile and garment industry effluents that flows to river systems.

   As it is discussed earlier in this report, there are different studies which reports effluents from textile and garment industries and surrounding water bodies having higher values in physicochemical characteristics than the permissible limit set by FEPA. However, it is not common to see implementation of penalties and other correction measures which are described under the above proclamations.

   Similarly, water use permits from RBAs are required only for large scale irrigation schemes and the permits are delivered after land permits are secured from other relevant ministry at regional or federal level. This means that other sectoral water users can abstract water without permits and for industrial units water rights are embedded into the licences for land and industrial development, which are issued by regional governments (Mosello *et al.* 2015). As a result, industrial water abstraction is largely unregulated and monitored.

   Overall, existing system of defining property rights of water through permit system and water allocation is still a work in progress. Permit is currently viewed only as a registration and fee collection exercise rather than a mechanism for defining, allocating and monitoring water resources to various water users.

   The lack or absence of coordination among key government institutes in water governance in general is also contributed to the fact that most of Ethiopia's integrated basin development master plans are 15 years old are not aligned with current developments in water related sectors, such as irrigation, hydropower and industrial activities. At the moment, regional governments undertake water resource development and management in without coordination with the RBA and existing master plan. Even the regional water bureaus are not necessarily aware of the existence of a master plan.

This lack of clarity in basic aspects of industrial water use renders minimal or even an absence of monitoring and enforcement of policies and regulations. As a result, overexploitation of groundwater resources and degradation of surface water quality due to industrial water pollution issues are likely to be increasing in the future.

2) **Absence of an integrated information system related to water resource management.**

Ethiopian Water Resources Management Proclamation NO. 197/2000 indicates the requirements of water resource inventory, water bank management and prevention of harmful effects for water resources in the country (FDRE, 2000). However, currently Ethiopia lacks a detail assessment of state and nation wide water use and allocation for the industrial sector in general and the textile sector in particular. Once the government approves and gives license for ground water extraction and the number of boreholes the investors can dig to individual manufacturing plants, there is no follow-up in mapping the amount and frequency of the water use. As a result, the country does not have a precise estimate of the total water use for the textile industry sector. This problem is more profound in standalone manufacturing plants and in recent years the government is making extensive investment in building industrial parks in different parts of the country.

3) **High set up costs undermine the incentives for the industry to move to industrial parks that provide water supply and wastewater services**.

In addition to efficient and one-stop government services within the parks premises, the new industrial parks are planned to have a zero liquid discharge technology, by far would make them more environmental friendly establishments than most of the standalone manufacturing plants. The government would prefer the standalone manufacturing plants to move to the industrial parks. However due to higher cost of moving their factories to the industrial parks, factory owners are not keen enough to do so. Understanding this challenge and seeing the need to boost the number of FDI, the government currently focuses mainly on attracting new local and foreign investors to the newly built industrial parks. Introduction of incentives and different support mechanizes would possibly encourage the standalone factories to move to the new industrial parks.

4) **Lack of awareness on mitigation of environmental impacts and risks**

According to the regulation, Environmental Impact Assessments (EIAs) should accompany all permit requests, generally include environmental and social criteria as well as consideration of the project's impact on communities and provisions for compensation and resettlement. Nevertheless, as of 2013 approximately only 30 EIAs were conducted at the federal level annually. This is very low considering that EIAs should be conducted at the regional level. The underlying reasons for the low exercise of EIAs are time consuming administrative process, limited experts with EIA competence, and the regulation is only applicable to new facilities and not to existing ones. A study finds that there is generally a lack of awareness and widespread misconception about the need for EIA in Ethiopia (Cesar and Ekbom 2013).

Chapter 6 Conclusions and Recommendations

6.1. Conclusions

In its infancy stage, the textile sector has made substantial employment generation (48,000 people in factories, 52,000 smallholder farmers in cotton production and potentially 60,000 employment opportunities for the construction of the Hawassa industrial park) as well as GDP contribution (1.6% in 2010), 12.4% of the total industrial output value, and export contribution (100 million USD in 2012/13). The government of Ethiopia anticipate an annual 1 billion USD export earnings only from Hawassa Industrial Park. Nevertheless, the sector faces key challenges of lack of skilled labour, weak infrastructure, high cost of transportation, low foreign currency reserve, bureaucratic investment processes and recent political instability.

To date, there are hardly any detailed water risk assessment studies conducted on Ethiopia's textile and garment sector. Overall, the sector faces higher water pollution risks than water quantity risks. Textile and garment units meets their water needs independently through groundwater resources. Since industrial water use currently accounts for merely 0.4% of the country's water use, water availability is not much of risk issue at the moment. However industry's booming and expected growth means that there will be significant growth of water demand in the future that may increase the industry's water scarcity risk.

Water pollution from textile effluents in Ethiopia is possibly the largest source of industrial soil and water pollution. Many textile and garment factories in Ethiopia are not equipped with any effluent treatment plants and discharge their effluent directly to surrounding soil and river bodies. Existing studies find that textile effluents from factories and ambient water quality of rivers around the factories exceed the standards from the Federal Environmental Protection Authority. This pollution poses a substantial risk to the communities and aquatic habitat and endanger the downstream users of the head of Blue Nile River. Weak enforcement of existing regulations does not provide incentives for environmental compliance.

Water governance in Ethiopia is part of its Poverty Reduction Strategy. Though key regulatory and policy framework for water governance exist and are strategically anchored to its overarching growth and transformation plan, there are substantial implementation challenges that can magnify the physical water risks faced by the country. Industrial sectoral is currently still a minor sectoral water user compared to agriculture and hydropower; thus has received little attention in the overall water governance landscape in Ethiopia.

This report finds that the key identified regulatory water risks to a sustainable industrial water management are:

1) Lack of clarity in defining water rights, key institutional roles and responsibilities regarding industrial water use.
2) Absence of an integrated information system related to water resource management

3) High set up costs undermine the incentives for the industry to move to industrial parks that provide water supply and wastewater services.
4) Lack of awareness on mitigation of environmental impacts and risks.

6.2. Recommendations

Based on the identified physical water risks and regulatory water risks pertaining to the industrial water use in Ethiopia in general and textile water use in particular, the recommended areas for capacity building are as follows:

1) Higher investments in institutional capacities of industrial water governance in Ethiopia to balance the country's infrastructure investments, especially for water resource planning and coordination.
   Of high priority are the update of basin development master plan and clarification on water governance responsibilities related to industrial water abstraction and wastewater treatment. Improved institutional capacities will also ensure higher effectiveness, resilience, and sustainability of existing and future water infrastructures. The updated basin development master plan can also improve inter ministerial coordination regarding information gathering, policy implementation, monitoring and enforcement.

2) Provide a broader range of align incentives for textile units to adopt cleaner technologies and practices.
   The government should provide better incentives for small and medium enterprises to relocate to industrial parks so that the industrial parks can serve its purposes. At the same time other industrial policy incentives, such as custom duty exemption, lower import taxes for certain machineries or experts, or lower credit interest rates, can also be targeted toward green technologies and expertise for sustainable textile water management.

3) Improve awareness of the textile units to adopt cleaner technologies and practices.
   Capacity building activities, such as training and workshops, exchange programs, exhibitions, and international fairs, can be very valuable to improve industry's awareness and knowledge sharing on the importance of performing EIAs, improving resource efficiency, and mitigating and managing water risks.

4) Provide a multi stakeholder platform to encourage knowledge sharing on green technologies and practices.
   The platform should gather public and private sectors to encourage better interaction, synergies and coordination across various actors within the textile and water domains. Such platform was recently launched in Bangladesh under the government's leadership to catalyse concrete actions through a broad engagement of different groups in the society. This broad engagement can complement the more formal industrial water governance structure and provide opportunities for better resource consolidation to address the shortcoming of resource constraints in water governance.

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