



# Executive Summary of Strategic River Basin Plan for Awash Basin



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Awash Basin Authority

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# **1. INTRODUCTION**

Growing competition and stress on water resources in the Awash Basin has led Awash Basin river basin organization ( BHC and AWBA) to develop a strategic river basin plan addressing the emerging challenges and maintain sustainable development. In the coming years, River basin planning is an ongoing activity for Awash River Basin Organization to effectively implement integrated water resource management strategies in the basin. Corresponding to its mandate defined in the proclamation and discussion with stakeholders, the RBO with its stakeholder has identified major challenging issues. Accordingly, water allocation, water quality and watershed management, Flooding and Drought were came out as main strategic issues. This document is, therefore, a strategic river basin plan intended to promote and frame Integrated Water Resources Management (IWRM) in Awash Basin to achieve sustainable development in the basin.

## **1.1. Scope of this Plan**

To implement the principle of an integrated water resources management, River Basin High Council and Authorities were established under proclamation No. 534/2007. Awash Basin thus was instituted in accordance with Awash Basin High Council and Authorities establishment Council of Ministers Regulation No. 156/2008. Based on these proclamation and regulation, this plan presents the direction and implementation framework to achieve the goals for sustainable development of the basin. The scope of this plan covers the entire Awash River Basin with a time horizon of eight years commencing from 2010 to 2017 years.

# **2. OBJECTIVE AND SCOPE OF THE PLAN**

## **2.1. Objectives of the plan**

The overall objective of Strategic River Basin plan is to promote and monitor the Integrated Water Resources Management (IWRM) process in the Awash River Basin with a view of using the basins' water resources for the socio economic welfare of the people in an equitable and participatory manner, and without compromising the sustainability of the ecosystem.

**Specific Objectives:**

1. To reconcile different uses of water resources within a river basin to achieve a balance and sustainable development of water resources as economic as well as environmental resources.
2. To improve participation of the relevant stakeholders of a river basin in a coordinated manner in spite of their difference of approaches, interests and perceptions of the effects of their decisions, plans and activities on the hydrological cycle and on other users.
3. Develop a plan for efficient and stable mechanisms for the external promotion of equitable, rational and sustainable water use by joint management of all stakeholders.

**2.2. Methodology and Process of the Basin plan Preparation**

Integrated water resource management is a challenge to conventional practice, attitudes and professionals' certainties. Instead it requires the attitudes that the water resource is managed holistically for the benefit of all, moving from a centralized and controlled decision making towards sharing results and opportunities, transparent negotiation, cooperation and concerted action and moving from sectoral planning towards coordinated or fully integrated planning for water resources.

Due to the complexity, variability, limited understanding and non-uniformity in management options that are typical to most basins, Awashbasin planning approach is an inherently iterative and adaptive. Which means this plan is always dynamic and improved on agreed time scale. Since the entire process in Awash Basin cannot be mapped out in the beginning, a coherent procedure and method for iteratively screening information and focused planning was required to guide the basin plan preparation process. This Basin planning methodology was geared by iterative River Basin planning approach where experiences of the Dutch Water Authorities were thoroughly investigated. Hence, initial basin plan document on headlines was drafted founded on the existing knowledge, experiences and technical expertise of AwBA.

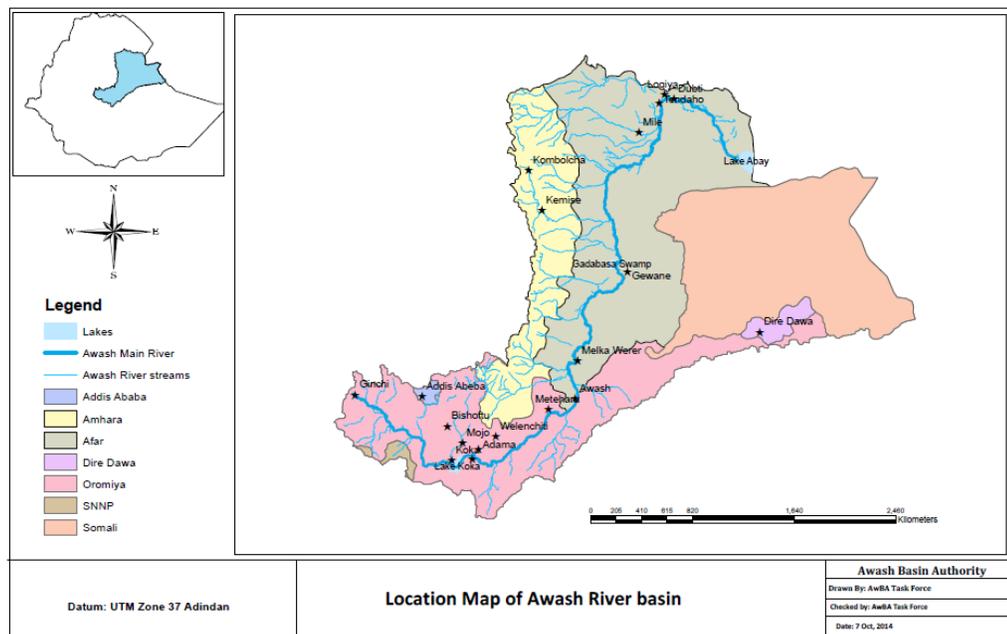
In due process, the review of national development policy, strategy, programs, sector proclamation and regulation of federal and regional governments in a relation toward developing and managing water resources, effort made in the accomplishment of GTP I and GTP II plan at both national and regional level, Awash basin surface water development master plan, Awash basin Integrated land use plan, Awash basin water audit document, water allocation model document, water quality model document, sediment load estimation model document, sectorial and detail design for Tendaho, Kesem, Middle Awash and Logia dams, literatures on Awash river basin in relation to the strategic issues, collection of relevant information, reconnaissance survey and visits to various stakeholders

were carried out and analyses on strategic issues were made using findings of the studies as well as consultation with stakeholders. In the planning process experts from different federal and Regional institution, universities and research centers were involved and their progress report were presented for stakeholders at all level including the natural resource management and environmental protection standing committee members from the house of people representatives at federal level and for regional/city council standing committee members in the basin. Although a detailed study is required for sound basin plan preparation and still open for further improvements, comments and suggestions captured from stakeholders consultation workshops are incorporated.

### 3. DESCRIPTION OF THE BASIN AND PLANNING AREAS

Strategic geographic location made Awash Basin to be a center for urbanization and its suitability enable it to become focus for agricultural and industrial development. In this section physical, socio economic, agricultural and water resources settings are described.

The Awash River Basin is the fourth largest catchment in Ethiopia in terms of area, following Wabi-Shebele, Abbay and Genale-Dawa River Basins. Awash Basin is located between 7<sup>0</sup>53'42'' to 12<sup>0</sup>07'20'' North and 37<sup>0</sup>56'56'' to 43<sup>0</sup>17'04'' East. The basin is bordered by Danakil, Abbay, Omo-Gibe, Rift-Valley lakes and Wabi-Shebele basins and Republic of Djibouti. The river originates near Ginchi in the central highlands of Ethiopia, and flows north east through the northern section of the Rift Valley to eventually discharging into Lake Abbe near Djibouti boarder, traveling a distance of about 1200km. The total catchment area of the basin is about 116,000 square kilometers.



**Figure 1: Location Map of Awash Basin**

To facilitate water resources planning, allocation and monitoring, the Awash Basin is sub divided into six planning areas, namely, Awash Upstream Koka, Awash Awash, Awash Halidebi, Awash Adaitu, Awash Terminal and Eastern sub basin. Awash US Koka sub basin comprises Awash Kuntre River, Mojo River and Akaki River. Awash at Awash sub basin includes Keleta-Werenso Rivers and Awash Arba 1 and 2 Rivers. Awash Halidebi sub basin contains Kesem-Kebena Rivers, AnkoberRiver,

Negeso-Gera River, Awadi River and Gedebasa Swamp. Awash Adaitu sub-basin includes Ataye River, Borkena River, Cheleleka River and Adaitu River. Awash Terminal sub-basin includes Mile River and Logia River.

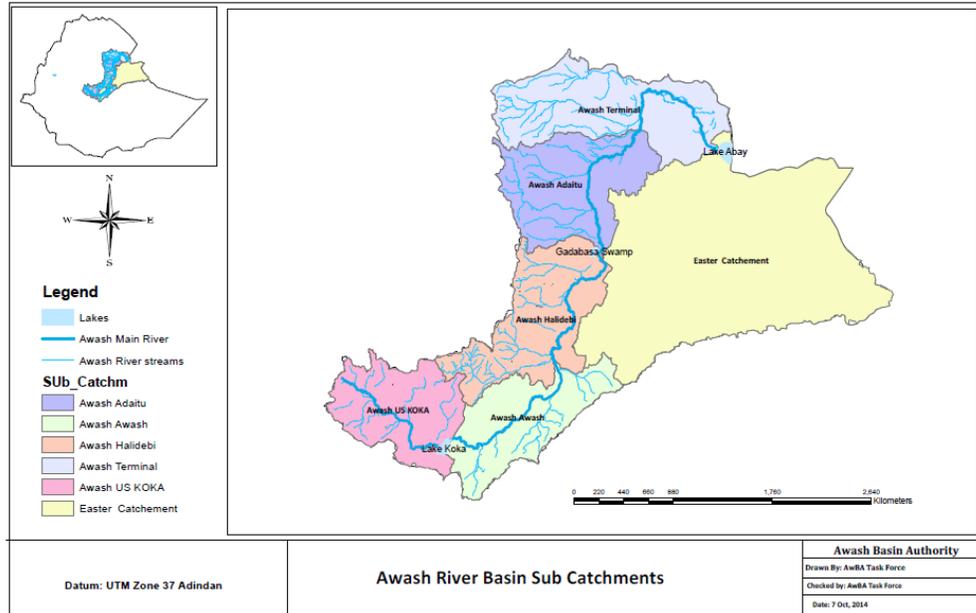


Figure 2: Awash River Basin Sub-Catchments

Awash Basin is the main population centers of the country in which Addis Ababa, Dire Dawa, Adama, Bishoftu, Dessie and Kombolcha lies in the Basin. The population of the Basin is currently estimated to be 18.3 million. This population is triggering pressure on the natural resources resulting in its degradation and pollution. Majority of this population is engaged in agriculture and animal husbandry.

The number of industrial firms in Ethiopia has tripled in the past four decades. More than sixty five percent of these industrial firms are located in the Awash Basin mainly along the Addis Ababa - Adama, Addis Ababa - Holeta and Addis Ababa - Sebata industrial development corridor (Tecsult and PPESA, 2010). In addition, Dire Dawa and Kombolcha are among the main industrial zones of the country which are also found in the basin.

Awash River basin ranks seventh from the twelve river basin of the country in terms of surface water resources. It is reported that the basin generates 4.65 BCM of annual runoff. Although the relative surface water resource is lesser than most of the basins in Ethiopia, Awash River basin is the most

developed and utilized basin. So far, there has never been a comprehensive study that characterizes the ground water potential of the basin. It is believed that a tremendous amount of ground water exists in the basin. For instance, Alaydege plain is said to have a potential to irrigate more than 200, 000 ha using groundwater resources.

According to Water Audit Report (2011), 77.4% of the irrigable land in the basin has been cultivated. This made Awash Basin to be the most developed basin in Ethiopia based on irrigation wise. Large scale mechanized state and private farms such as Ada'aBecho, Wonji-Shoa, Fental- Tibila, Metahara, Upper Awash Agro Industry, Kesem, Amibara, Gewane and Tendaho are found in this basin. A wide varieties of crops are cultivated ranging from cereals, vegetables, flowers, cotton to perennial fruit orchards and sugarcane. Currently, there is a shift in crop preference following the Government's interest in sugar production. The dominantly cotton cultivating middle and lower valley areas have now transformed to sugarcane production.

## **4. STRATEGIC ISSUES OF THE BASIN PLAN**

### **4.1. Water Allocation**

#### **4.1.1 Introduction**

There are twelve major river basins in Ethiopia of which Awash Basin is one and the most utilized river basin. Awash basin covers a total area of 114,123 km<sup>2</sup> that includes five regional states; Afar, Amhara, Oromia, SNNP, and Somali, two administrative councils (Addis Ababa and Dire Dawa). Awash Basin is the most developed basin in Ethiopia so far due to availability of suitable land and water resources for the development of irrigated agriculture (infrastructure and market accessibility). Historically, the famous hydroelectric and water supply dams, Aba Samuel (1932), Gefersa dam (1938) and Koka dam (1960) built in the basin. Similarly irrigation development progressively growth in the basin particularly, following the construction of Koka dam motivates downstream irrigation developments like Wonji and Metehara sugar plantations, upper, middle and, lower Awash state farms with fruits, vegetables and cotton plantations. The irrigation developments in the basin further flourished for the last three decades with the involvement of the private investors and local communities in the irrigation system. The current studies confirmed that the irrigated land in the basin reach about 200,000ha (AWBA, 2016). Due to the intensive irrigation development in the basin particularly along the Main Awash River line, there is high water stress during the pick irrigation time (April to June). On the other hand, flooding is other extreme event frequently observed at the basin in the rainy season (July to September).

In line with the economic development of the basin a number of institutional arrangements were implemented in the basin. Although, Awash Valley Authority (AVA), which was established in 1962 to plan and develop the water resources of the basin was the first river basin based organization in the country, the institutional turnover according to the socio-political situation of the country hadn't support it to deliver its full mandate. After long challenges the current institutional setup Awash Basin Authority (2011) has been formed with a number of mandates and responsibilities in relation with the basin's water resources development and management. In line with its mandate the Basin Authority initiates this 8 years River Basin Strategies Plan to develop and manage the water resources of the basin in coordinated manner. Water Allocation is one of the six thematic areas of the Basin plan, which targeted to develop and manage the water resources of the basin.

### **4.1.2 Basin Situation**

The basin has 21 sub basins( Awash water audit, 2011), which can be further characterized with different hydrological, administrative, economic and social situations. These categories and their interaction make the basin more complicated to plan in one system. Therefore, considering hydrological, administrative, economic and social boundaries the basin classified into six planning area; namely Awash upstream of Koka, Awash - Awash ,Awash-Halidebie, Awsah - Aditu, Awash Terminal and Easter catchment.

The basin receives 100 – 1700mm mean annual rainfall with its wide spatial and temporal variation. According to the annual water balance the basin generate 10.3BCM water for ground water recharge, 4.6BCM water as stream flow, and 3.6BCM water as stored in open water systems that include lakes, reservoirs and wetlands of the basin. Therefore the water potential of the basin can be accounted as 8.2BCM surface water potential and 10.3BCM ground water potential with 300m exploration( Awash water assessment report, 2010). It is obvious these water resources potential has temporal and spatial variation over the basin. Particularly, its temporal variation with 71% and 29% share for rainy season (June –October) and dry season (November – May) respectively has significance important to direct the water resources development of the basin to focus on water harvesting and storage structures.

The water usesin the basin can be categorized as irrigated agriculture, domestic, livestock and industrial. With these water use categories currently the basin provide annual water needs of 4.114BCM for 18.6 million human populations, 34.4 million livestock population, 199234 ha irrigated land ( accounts 83% of the total water use) and different commercial and industrial activities in the basin (AwBA, 2016). With the consideration of the future human and livestock population growth, irrigation and industrial expansion based on the Growth and Transformation Plan (GTP) the water demand of the basin estimated as 6.56 BCM (AWBA, 2016). Therefore, this water allocation strategic plan targeted to satisfy these demand with the next 8 years.

Water allocation is the process of sharing a limited water resource among different regions and competing users. Historically, there was a constant water releasing a (40 m<sup>3</sup>/sec) rule was adopted in related to the construction of Koka Damto produce regulated power throughout the year. Other basin water use didn't support with any allocation system simply the upstream users take the advantage to divert the water to their field and release their surplus water only for the downstream users. After the work of the joint project of ministry of water and Energy (MoWE) and Food and Agriculture

Organization (FAO) in 2012, new water releasing system introduced for Koka Dam, which gives priority for the downstream irrigation system. With a recent study (AWBA, 2016) an integrated water allocation system has developed for the whole basin to serve as decision support tools with three interfaces: simulation, operation and monitoring.

The temporal dynamisms of water demand have to monitor with strict and careful implementation of water permit system. The current institutional arrangement of the authority provides a good opportunity to realize a permitand charges system as a means to monitor the hysterical water uses. The current water permit application fee (ETB 87) and water use charge(3 ETB per 1,000 m<sup>3</sup> ) of water extraction is not support effective monitoring and also become difficult to monitor with an increasing number of water users. Moreover, the current permit system doesn't allow the priority setting for different users according to the national water use policy.

In the view of integrated water allocation system and IWRM, the FDRE Constitution (1995), the Water Resources Management Policy (2000), the Environmental Policy of Ethiopia (1997), the Water Resources Management Proclamation (197/2000), the Water Resources Management Regulations (115/2005), the River Basin Councils and Authorities Proclamation (534/2007), and other related strategic documents are an enabling environments to develop this basin strategic plan and its implementation.

Water related conflicts in Awash River Basin drawfrom the water resource base, technical/engineering factors, policy and institutional issues, communication and information management. Generally, conflicts in the basin can be categorized broadly as conflicts between users and conflicts between institutions. The conflict between water users emanate mainly from water stress and water quality issues and possibly mitigated with the implementation of this integrated water allocation strategic plan. Conflict between governmental institution mainly emanate from policy, regulatory and proclamations which directly related to the managing the water resource of the basin. It has to be one of the strategic points of the water allocation strategy plan to create enabling environments for all other actions and actives of the strategy plan.

This situation analysis identifies three major things as emerging issues that may have influences on the implementation of this strategic plan. The first one is the change of the priority from agricultural uses to other uses particularly industrial uses. This strategy assumes irrigation water use as a priority

economical use. But if this priority changed to industrial system, the allocation system will alter and need reviewing. Secondly, the production highly skilled manpower with the current education policy; 30 (social science) to 70 (natural science and engineering) ratio develop professionals that can directly or indirectly involve in the water resource development. Therefore, this strategic plan shall see this as a big opportunity in creating a job for these young professionals and soliciting their talent. The third emerging issue is regarding the Ethiopian vision of stopping to worry about El Niño and La Niña effects. The strategic plan shall seek to address the issue of stresses caused by this natural phenomenon. The overall situation of the basin as enabling and challenge environment will compel the development of the basin strategic plan.

### **4.1.3 Vision Goals, Objectives and Measures**

#### **Vision**

To realize integrated, equitable, efficient and sustainable water resources development and transparent management system for social, economic and environmental uses in Awash River Basin

#### **Goal**

The water allocation plan of the basin will targeted to provide water for the full coverage of the domestic, livestock, environmental and industrial water demand in the basin and forecasted irrigation (340,000ha) water demand with sustainable, equitable and rationally manner. The current and the forecasted annual water demand for the next 8 years with different water uses (irrigation, domestic, industry, and livestock) of Awash Basin are estimated as 4.114BCM and 6.56BCM respectively. Therefore, this water allocation plan targeted to avail this water need through three water development and management strategies.

- 3.271 BCM with full storage of the existing dams capacity
- 1.160 BCM with construction of new dams in the basin
- 1.289 BCM saved with water use efficiency improvement in irrigated agricultural system
- 1BCM from ground water development

## **Objective**

The vision and the targeted sets of water allocation plan can be attained through implementation of the following objectives

- Develop the entire water resource potential
- Introduce water-saving measures and reduce the water related conflict in the basin
- Create Transparent water allocation and permit system
- Build the capacity and develop innovated technologies

#### 4.1.4 Water Allocation Strategy Development Actions for the whole basin in 8 years

Sr.no	Main Actions	Description of activities	unit	Quantity	Budget in Million Birr	Action Owner	Collaborators
1	Managing Conflicts among Polices, regulations and institutes in Water Allocation system	Mitigate Conflicting terms and issues in water resource policy Proclamation, regulation, Basin Authority proclamation and regulation	%	100	6	HBC MOWIE, HRSC, RHR	AWBA, Water Bureaus, Universities , Research inst.
		Create awareness and transparency among decision makers and users	%	100	6	HBC, MOWIE	AWBA, WBs, Univ, Res. inst.
					12		
2	Store water at full capacity of the exiting reservoirs	Study, upgrade, and Maintain the water storage and delivery system of the reservoirs (Koka, Kesem and Tendaho)	No	3	45.3	MOWIE, AwBA, EWWCC-Dam Admin	AWBA, EEP,
		Prepare annual dynamic dam operation rule for Koka, Kesem and Tendaho	No	24	9	AWBA EWWCC-Dam Admin	MOWIE, EEP
					54.3		
3	Develop Surface water harvesting and Delivery Systems	Conducting the feasibility study and detail design for New Dams (Melka Kuntre, Borkena, Mile, Dire dawa ... )	No	4	28	OIDA, MoWIE, Regional WBs	AwBA, Regional agriculture bureau
		Manage reservoir Water for New Dams (M.Kunture, Kelete, Mid.Awash, Loggia, Dire dawa )	No	5	2	MOWIE AwBA OIDA	Regional WBs, Regional agriculture bureau
		Construction of Community based Water harvesting structures (Ponds, Haffir dams and Sediment storage SS dam)	No	341	682	OIDA, regional WBs, Regional Agriculture Bureau	AWBA, MOWIE,
		Finalize construction of Boset-Fentale irrigation project	No	1	100	OIDA	AwBA, MoWIE

Sr.no	Main Actions	Description of activities	unit	Quantity	Budget in Million Birr	Action Owner	Collaborators
					1118.6		
4	Develop Ground water resource	Conduct detail study for ground water potential assessment	%	100	6	MOWIE, AWBA	Regional WBs, Users
		Conduct detail study for ground water development	No	17	55.8	Water Bureaus	MOWIE, AWBA
		Develop ground water source (AdeaBecho, Wonji, Methara, upper Awash agro industry, Africa juice, Halidebie )	No	715	2216.5	Users, Regional WBs	AWBA, Regional Agriculture bureau
					2278.3		
5	Improve water use efficiency in irrigation schemes	Disseminate Drip technology (upstream koka, upper Awash,	ha	26860	2306.3	Users	AwBA, MOWIE, WBs
		Installing Sprinkler system (Wonji, upper Awash, Metehara)	ha	8650	530	Users	AwBA, MOWIE, WBs
		Install hydro flume irrigation system	ha	16750	737.5	Users	AwBA, MOWIE, WBs
		Change flood irrigation to furrow system	ha	34700	26.1	Users	AwBA, MOWIE, WBs
		Construct pipes and lined canal system (primary and secondary)	km	885	1250	Users	AwBA, MOWIE, WBs
		Upgrade and Rehabilitate existing Irrigation Schemes M	No	236	96	Users	AwBA, MOWIE, WBs
		Enhance alternate furrow, cut back flow and re-use system for furrow irrigation	ha	20025	29.5	Users	AwBA, MOWIE, WBs
		upgrade and modernize diversion weirs	No	4	22	Users	AwBA, MOWIE, RWBs
		Improving distribution system of urban water supply networks	No	6	6	City Admin. (Water utility)	AwBA, MOWIE, WBs
					5003.4		
6	Establishing Water use	Water allocation for various uses based on Annual rate	MC M	4850	12	AwBA	MOWIE, WBs

Sr.no	Main Actions	Description of activities	unit	Quantity	Budget in Million Birr	Action Owner	Collaborators
	administration system	Establish water users registration system	No	6	6	AwBA , RWBs	
		Collect water delivery fee	MC M	2425	24	AwBA, WBs	
		Strengthening Existing Water user Associations	NO	95	18	OIDA, MOWIE	AwBA,
		Establishing new Water user Associations	NO	275	24	OIDA, WBs MOWIE	AwBA,
					181.65		
7	Capacity building	Deliver multi-timing and type short term trainings	%	100	30	Universities, WLRC	AwBA, MOWIE, WBs
		Provide Long term trainings	%	100	24	Universities, WLRC	AwBA, MOWIE, WBs
		Facilitate material needs for knowledge development	%	100	30	Universities, WLRC	AwBA, MOWIE, WBs
					84		
8	Promote Research and technology innovation on water use efficiency and others	Identifying researchable issues and conduct researches on water use efficiency and other	%	100	7.2	AWBA, EWTI	WBs, Research inst. Univer.
		Technology identification on water use efficiency and other	%	100	6	AWBA, EWTI	WBs, Res. inst. universities
		Technology adaptation and evaluation on water use efficiency and other	%	100	36	AWBA, EWTI	WBs, Research inst. Univer.
		Technology dissemination on water use efficiency and other	%	100	12	AWBA, EWTI	RWBs, Res. inst. Univer.
		Establishment of current and past research data base	%	100	12	AWBA	
		Sub Total			68.4		
		<b>Grand Total</b>			<b>8703</b>		

## **4.2 Water Quality**

### **4.2.1 Introduction**

The Awash Basin is the most utilized river basin in Ethiopia with a number of small, medium and large scale irrigation schemes; industries located along the river; urban and rural water supply schemes. Many of the big industrial hotspots and corridors; big agro industries and highly populated cities and towns in the country are found inside the Awash Basin.

The quality of water resources is vulnerable to a wide range of chemical compounds including organic pollutants (materials), salts, nutrients, sediments, heavy metals etc. that are introduced from natural and anthropogenic sources. Some of the pollutants may expose human beings and other lives to series problems. The discharges of domestic, industrial and agricultural wastes definitely pollute fresh water systems of rivers and jeopardize their socio-economic and ecological values. For several socio-economic activities of the basin the Awash River is used as source for water consumption and as sink for disposing of their waste.

Therefore, in order to mitigate water quality problems in the Awash Basin, the strategic river basin water quality plan is prepared.

### **4.2.2 Situation analysis of water quality**

There are lots of enabling conditions to promote and implement the water quality strategic plan. The existing Laws, policies and regulations are the three pillars of the institutional framework for integrated water resources management (IWRM). Constitution of the Federal Democratic Republic of Ethiopia (FDRE) gives the Federal Government the mandate to manage and administer rivers and lakes linking two or more regional states or crossing the boundaries of the national territorial jurisdictions. The Ethiopian Water Resources Management Policy, which is backed by the Ethiopian Water Resources Management Proclamation, points out that as far as conditions permit, every Ethiopian citizen shall have access to sufficient water of acceptable quality, to satisfy basic human needs. Accordingly, to satisfy such basic needs the policy framed the following water resources protection principle which states that ‘create appropriate mechanism to protect the water resource of the country from pollution and depletion so as maintain sustainable development and utilization of water resource’.

The institutional framework for water resources management in a river basin consists of established rules, norms, practices and systems that provide a structure to actions related to water quality management. The Basin High Council and MoWIE (Ministry of Water, Irrigation and Electricity) are the decision making and advising arms on policy, strategic, technical and legal issues for federal and regional water sectors. AwBA (Awash Basin Authority), MoEFCC (Ministry of Environment, Forest and Climate Change) and Regional Environmental Agencies, Ethiopian Standards Agency, Urban and Rural Drinking Water Supply and Sewerage Services are the main government bodies who have responsibility for promoting and monitoring water quality issues, in line with IWRM, and related sustainable development goals.

The relatively good infrastructures and its proximity for large cities make Awash Basin highly valuable for investment. Accordingly, it is center for the development of industrial, agricultural and other economic activities. These activities have contributed much to the increment of population, expansion of urbanization, industrialization and agricultural mechanization that increase pollution from municipal, industrial, and agricultural sources which impose significant pressure on the water quality of the basin.

In the last seven years the basin population shows a 13.2% increment within limited resources that makes big pressure on water quality of the basin. Migration of population from rural to cities and towns increase the burden on the land use system of the basin which forced the land to be changed to settlements. The main population centers in the Awash Basin fall within the upstream side of the basin.

The overall sewage disposal systems in the big cities are on an infant stage. In major cities including the capital city Addis Ababa, the sewerage network coverage is small (or non-existent in others) and not fully interconnected. Raw, untreated wastewater from residents, various municipalities and industries within these areas are discharged directly into natural water courses. It is also observed that there are no controlled and regular services for solid waste and sludge disposal. As a result, tributary rivers flowing into the Awash River and shallow ground water schemes are highly polluted. This brings high impact on water quality of the basin.

The Upstream Koka, Awash - Awash, Awash Adaitu and Eastern Catchments are known for industry concentrations. Industrial facilities produce solid and liquid wastes that are disposed or discharged to the main river or streams. The solid industrial wastes are disposed into municipal dump sites or incinerated in open air. The liquid industrial wastes are released to the river, to its

tributaries or into closed valleys. In addition to polluting the surface water, these pollutants percolate into the subsurface, thus posing a threat to groundwater as well.

The middle and lower parts of the basin are characterized by large, medium and small agricultural activities. Such activities are highly dependent on the utilization of agricultural inputs. Fertilizers applied on the farmlands and pesticides sprayed onto the plants are finally washed down to rivers and streams and add organic and inorganic materials to the water system. Furthermore, the basin is host for the country's big agro industries that have significant effect on water quality.

In addition to the socio-economic pressures, environmental pressures also play a major role in the water quality of the basin. This is evidenced by the high fluoride, sodium, and potassium concentrations in rift valley soda springs, alkaline lakes and deep boreholes which are primarily related to reverse weathering or formation of aluminum silicates minerals.

#### **4.2.3 Future Scenario and Emerging Issues**

Developments in urbanization, industrialization and agriculture are still progressing and will pose greater risk on water quality of the basin. With these developments, more domestic wastes and effluents from industrial as well as agricultural activities will increase. At the same time water demand for domestic, industrial and agricultural purposes will increase. Reduction in the Awash River flow will have a direct impact on degrading the aquatic ecosystem and diminishing the dilution potential of the river.

Out of the 14 industrial parks to be established in the country 10 (~ 71 %) are to be built in the basin. Out of the total seventeen agro industry corridors, four (~ 24 %) are found in the basin.

One of the major risks in the basin is the expanding saline Lake Beseka. At present the expanding lake is less than 3 km away from the River Awash, which is the source of drinking and irrigation for millions of people downstream. This would be disastrous, as the quality of the river water will be deteriorated such that agricultural developments and domestic water use downstream would be at risk.

#### **4.2.4 Vision, and goal of the Plan**

##### **Vision**

The Water quality strategic plan vision is to see a model basin in which the surface and ground water shall have acceptable quality for intended purpose.

##### **Goal**

The overall goal of the Water quality strategic plan is to make the water quality of the basin suitable for intended use and improve its aquatic ecosystem by 2017 Ethiopian Calendar.

General Objectives of the water quality plan

The general objective of this strategic plan is consists of the following three objectives:

- To develop /update and implement a water quality monitoring program/strategy
- To establish permit system for treated waste water
- Implement waste removal and remediation plan

#### **4.2.5 Planning Assumptions**

The water quality strategic river basin plan has taken assumption of different enabling conditions, challenges and opportunities. The government's commitment towards ensuring sustainable development in the country as stipulated in the various federal and regional proclamations and regulations is the main enabling condition for the preparation and implementation of the plan. Expected challenges for the implementation of water quality strategic plan includes absence of accountability to implement regular measures and enforcement on waste discharge, occurrence of natural disaster, lack of awareness about water pollution, willingness problem to use new waste treatment and removal technologies, high cost for treatment plant construction and low implementation capacity. Some of the possible solutions for creating favorable environment for accelerated implementation of the strategic plan include proper implementation of water resource and basin management legal packages, dedication of the government and participation of community organizations, and providing capacity building to strengthen human and institutional resources.

**Table 1: Summary of Measures, Activities, Budget with Action Owners and Other Actors**

<i>Measure</i>	<i>Activity</i>	<i>8 Years Total budget 2010-2017 (in birr)</i>	<i>Action Owners</i>	<i>Other Actors</i>
Update or re-design the water quality monitoring program/strategy	Design the surface water quality monitoring network and determine the required monitoring stations.	16,504,124	AwBA, MoWIE, Regional Water Bureau, MEFCC, Regional EFCCB	Higher institutions, R&D institutions, ECWDC laboratories, BHC, Community, MoI, MoANR, MoLSF, and NGO.
	Strengthening the existing stations and establish additional groundwater monitoring stations	70,478,402.45	AwBA, MoWIE, Regional Water Bureau, MoEFCC, Regional EFCCB, State farms	Higher institutions, R&D laboratories, BHC, Community, investment agencies, MoI, MoANR, MoLSF, and NGO.
	Manage water pollution from point and nonpoint pollutant sources.	3,668,887,686.37	AwBA, MEFCC, Regional EFCCB, MoI	Textile, tannery, cotton, floriculture farms & pharmaceutical, Metal & chemical institutes Higher institutions, MoUD & HBC.
	Develop/adopt water quality standards.	9,085,440.00	MEFCC	MoI, MoH, MoWIE, MoUD & HBC. MoANR, MoLSF, Basin Authorities
	implement appropriate water quality modeling	1,125,000.00		
Establishing and upgrading water quality laboratories	Establish and upgrade water quality laboratories	476,634,953	AwBA, Regional water office, MEFCC & Institute of water	Higher institutions, R&D institutions, ECWDC laboratories,

<i>Measure</i>	<i>Activity</i>	<i>8 Years Total</i>	<i>Action Owners</i>	<i>Other Actors</i>
			resource	BHC,MoWIE,MoANR and NGO.
Capacitate and empower relevant stakeholders	Capacitate Water quality Experts.	26,990,546	AwBA, MoWIE,Regional Water Bureau, MEFCC, Regional EFCCB	Higher institutions, R&D institutions,ECWDC laboratories, BHC, MoI,MoANR,MoLSF, and NGO.
	Empower relevant Stakeholders.	223,744,440.12	AwBA,MoWIE,Regional Water Bureau, MEFCC, Regional EFCCB	Higher institutions,R&Dinstitutions,E CWDC laboratories ,BHC, , MoI,MoANR,MoLSF, and NGO.
Setting up and implement permit system for treated waste water discharge	Develop treated waste water discharge standards.	9,242,240.00	MEFCC	MoI,MoH,MoWIE,MoUD&H BC.MoANR,MoLSF,AwBA
	Setup treated waste water discharge permit system	8,268,941	AwBA	MoWIE,Regional Water Bureau,MEFCC ,Regional EFCCB
	Implement treated waste water discharge permit system.	6,122,194.60	AwBA, MEFCC	MoWIE,Regional Water Bureau,MEFCC ,Regional EFCCB
Establish/strengthen/coordinate regulatory inspection and enforcement mechanism	Develop /strengthen and implement Regulations, guidelines, directives,protocols and MoUs.	2,675,349.60	MEFCC	MoI,MoH,MoWIE,MoUD&H BC.MoANR,MoLSF,Basin Authorities
	Monitor and evaluate the	56,000.00	AwBA,Regional Water	MoI,MoH,MoWIE,MoUD&H

<i>Measure</i>	<i>Activity</i>	<i>8 Years Total</i>	<i>Action Owners</i>	<i>Other Actors</i>
	application of enforcement and compliance mechanisms		Bureau,MEFCC,Regional EFCCB	BC.MoANR,MoLSF
Establish complaint handling mechanism for the wastewater discharge permit	Preparation of compliant handling guideline	882,233.72	MoWIE, MoANR,	Higher institutions, R&D institutions, BHC,MEFCC.MoLSF
Enable Agricultural farms to have a functional drainage system	Preparation of irrigation guide line.	1,118,006.40	MoWIE, MoANR,	Higher institutions, R&D institutions, BHC,MEFCC.MoLSF
	Construct agricultural surface drainage systems	1,480,513,965	Irrigation farms	AwBA,MoANR,Investment Agency,MoLSF
Transfer new waste treatment technology to industries.	Identify industries and treatment technologies	1,039,402	MoI,AwBA, MEFCC	Textile Tannery, Cotton, Floriculture farms&Pharmaceuticals, Metal &chemical institute Higher institutions,MoUD&HBC.
	Promote and apply exemplary technologies	1,085,307,174	MoI,AwBA, MEFCC	Textile, Tannery, Cotton, Floriculture farms&Pharmaceuticals,Metal & Chemical institute, Higher Institutions,MoUD&HBC.
Ensure cities and big towns to have a sewerage and sewage treatment system	Assessment of sewerage and sewage treatment system	2,712,018	AwBA, MoUD,MEFCC ,Regional Water Bureau, Regional AWSSA,AA river safety project	Higher institutions, R&D institutions ,BHC, and MoWIE,
	Preparation of sewerage and	1,071,728.00	AwBA,	Higher institutions,

<i>Measure</i>	<i>Activity</i>	<i>8 Years Total</i>	<i>Action Owners</i>	<i>Other Actors</i>
	sewage treatment design guideline.		MoUD,MEFCC ,Regional Water Bureau, Regional MEFCC	MoH,R&D institutions ,BHC, and MoWIE,MoC
	Establish sewerage and sewage treatment system	2,657,559,174	MoUD,Regional Water Bureau,	Higher institutions, MoH,R&D institutions ,BHC, aMoWIE,MoC and NGOs
Ensure cities, industries and big towns to have integrated solid waste management system.	Preparation of solid & sludge waste management system design guideline .	2,084,154.	AwBA, MoUD,MEFCC , Regional MEFCC	Higher institutions, R&D institutions ,BHC, and MoWIE,MoC
	Construct solid and sludge waste management infrastructure & disposal system	2,585,234,693	AwBA, MoUD,MEFCC , Regional MEFCC , Concerned Municipalities , MoI	Higher institutions, R&D institutions ,BHC.MoLSF
	Establish remediation mechanism for polluted solid waste disposal sites	452,396,451.54	MoUD, MEFC,Conserved Municipalities, MoI	Higher institutions, MoH,R&D institutions ,BHC, and MoWIE,MoC and NGOs
	Controlling The Water Level and Monitoring The Water Quality of Lake Beseka	8,307,773	AwBA	Higher institutions
	Apply new technologies to use Lake Beseka for intended purpose	907,513,977	AwBA,Regional water berou,Regional EFCCB,	Higher institutions
	<b>Total</b>			<b>13,795,251,782</b>

## **4.3 Watershed Management**

### **4.3.1 Introduction**

Watershed degradation has increasingly been a major threat to socioeconomic development in the basin. The sources of degradation include unwise use of the available renewable natural resources including soil, water, forest and wildlife. Previous efforts in revising this tragedy did not succeed since they failed to consider a systematic and integrated approach in coordinating interventions. This has called for a more comprehensive and integrated approach to overcome the degradation problem and ensure sustainable use of natural resources in the basin. Therefore, this integrated watershed management strategic plan has been prepared to guide the actions of various stakeholders which are responsible to plan and implement activities that would contribute to the development of the basin watershed and its ecosystems.

The vision of this strategic plan is to see an environmentally sustainable, socially impartial and economically sound Awash River basin in which integrated watershed management is implemented with full human and capital resources, as well as involvement of all basin stakeholders is guaranteed by 2017. Its goal is to improve income and watershed ecosystem that will contribute to the enhancement of livelihoods of different communities in the Awash River Basin. In developing the plan, the growth and transformation plan document (GTP II) and the peculiar features of the different planning areas were considered.

### **4.3.2 Situation analysis**

To develop the plan, situations were analyzed with a focus on the legal and institutional framework such as Ethiopian National and Regional Policies Related to Watershed Management, The Ethiopian Environmental Policy Framework, Conservation Strategy of Ethiopia (CSE 1997), the Federal Rural Land Administration and Use Proclamation and the role of government institutions involved in watershed management. The document also contains the prevailing pressures on resources in the watershed emphasizing the social, economic and environmental dimensions. These dimensions were taken further to describe the existing scenario for each planning area, and the future scenario addressing general issues related to possible challenges in watershed management.

as attributed to increasing pressure from economic expansion and opportunities associated with economic development of the country. The current scenario shows that erosion rate can reach up to 176t/ha/year and total erosion up to 259 Mt/year contributing to high sedimentation. The current forest coverage of the basin is 156,848.8 ha.

As a planning tool, a logical framework approach was adopted having different components such as goal, objective, measures, activities and sub-activities, inputs, outputs, targets and monitoring and evaluation mechanisms and evaluation criteria. The measures, from which activities are generated, include:

- ***Development of watershed management plan*** – selecting and adopting best land use plan by gathering and analyzing socioeconomic and biophysical data, creating and preparing land use and land cover information and undertaking relevant studies
- ***Facilitation of physical and biological soil and water conservation program*** – which may involve construction of moisture retaining and flood control measures, gully rehabilitation measures, and nursery establishment and tree planting, and protection of planted trees, forest development by identifying forest areas, afforestation, and creating alternative energy sources.
- ***Enhance ecohydrology principles*** – the establishment of ecohydrology learning sites and development of guidelines
- ***Forest protection and rehabilitation***–the rehabilitation of degraded areas through participatory forest management where community can be organized into user-groups, and development of directives and guidelines for the administration of the resources
- ***Strengthening participatory rangeland management***– that include reseeding and enclosing the rangeland (20% of the bare land 2,583 ha), enclose degraded rangeland (5% of the 382,403 ha), practice agro-forestry (1% of 603, 441 ha), and
- ***Others*** – establishing land administration systems, strengthening the network among stakeholders, awareness creation, capacity building and developing strategies for generation of funds for the implementation of the activities are also additional measures considered for the plan period.

***Expected benefits:*** The implementation of the activities identified will lead to important outcomes. Among these are the reduction of gully affected areas by 35% , mean annual soil loss

by 30%, bare-land by 3% , expansion of *Prosopisjuliflora* by 25,000 ha per annum, sediment concentration by 40% and an increase in forest cover by 5% by the end of 2017. More useful benefits for the famers as a result of gully stabilization and a reduction in soil erosion will be an increase in yield and land productivity on farmers plot. For the pastoral and agro-pastoral communities, there will be a large increase in grazing land and rehabilitation of natural resources that can increase their capacity to withstand livestock feed stress. In addition to the components of the logical framework mentioned above, the watershed management strategic plan document provides detail action plan for each planning area (which are considered as sub-basins) such as action owner (primarily responsible for implementation of an activity and administering the budget), collaborator (closely working with action owner) and the estimated budget required to implement activities.

***Creation of an enabling environment:*** For the successful implementation of the planned activities, an enabling environment needs to be created. An enabling environment includes the improvement in the technical capacity of employees and in the incentive schemes to motivate them. One of the challenges in the public sector in the country is retaining qualified staff as attributed to poor work motivation. Therefore, it is assumed that there will be strong commitment on the part of the stakeholders, stability in the structure of government and low staff turnover, availability of adequate financial resources, willingness on the part of local community, green growth development strategy providing opportunity, and availability of research based evidence to support implementation of the activities.

***Expected challenges and possible solutions:*** One of the important characteristics of watershed management interventions is the difficulty in realizing results in a short-term and return to an investment is expected to occur in the long-term. Community mobilization is not easy since the results are not immediate. Farmers may not be able to value non-economic benefits from watershed management through increasing forest coverage. Then, there are some challenges expected in the process of implementing the plan as a result of limited awareness on the need to protect the environment. Limited capacity in the leadership in initiating and maintaining collective action among stakeholders to act jointly and in enhancing cooperation of stakeholders in the implementation of the activities can pose daunting challenges. The restricted nature of mandates among some stakeholders due to boundary of responsibility in undertaking certain

activities could affect cooperation. Moreover, the inadequate skills of the human resources in some sectors to implement and monitor progress and lack of inter-sectoral coordination could affect the successful implementation of the strategic plan.

What could be the solution to meet these anticipated challenges? The plan identified the precautionary measures or solutions to respond to the challenges. These include: (1) investment in awareness creation for relevant stakeholders through training and regular discussion forum, organizing exposure sharing visits to increase motivation,(2) institutional and human capacity development by identifying potential financial resources for watershed management and training of staff in the skills of community mobilization, (3) continued revision and updating of the plan in response to changes in the policy and biophysical factors, (4) developing an institutional framework for stakeholders' cooperation where they develop mechanisms for regular assessment of their activities jointly, share experiences, evaluate outcomes and adjust their plans within a specified period of time and (5) creation of a favorable environment to enhance motivation. Development of effective monitoring (supervision and feedback, review of reports and meetings of stakeholders) and evaluation (assessing the implementation process, periodic reports and reviews on performance, consultation by experts and of stakeholders at different levels, and final impact assessment) mechanisms may help in reaching the multiyear targets. Considering inflation (10,137,890,354 billion ETB, 7%) and contingency (2,112,060,490 billion ETB, 5%), and community contribution (8,448,241,961 billion ETB, 20%), the total estimated budget for the 8 planning years (2010-2017 E.C) over the planning area is 42,241,209,807 billion ETB.

2010-2017 Budget Summery by Measures Including Inflation and Contingency								Total Budget Summery	Action Owner	Collaborator
MEASURES	Unit	Awash up Koka	Awash at Awash	Awash Alidebi	Awash Adayto	Awash Terminal	Eastern Catchment	2010-2017		
Participatory Watershed Development Plan	ETB	66,973,005	80,260,099	63,045,652	52,221,874	38,136,638	57,425,725	358,062,993	BoANR , BoLF, EFCC, AARRDPO, BoLAU, AWBA	MoANR, MoWIE, MoLF, MoEFCC, NMA, and Universities and Research Centers
Physical and Biological SWC Programs	ETB	3,699,840,466	7,528,490,637	8,081,188,110	2,840,828,276	2,528,971,940	5,734,159,407	30,413,478,837	BoANR , BoLF, EFCC, AARRDPO,	AWBA, MoANR, MoWIE, MoLF, MoEFCC
Protection and Rehabilitation of Forest	ETB	46,235,426	44,051,531	39,138,637	39,823,709	24,449,154	39,400,033	233,098,490	BoANR, EFCC, BoRLAU	MoANR, MoWIE, MoLF, MoEFCC
Strengthen Participatory Rangeland Management	ETB	4,344,923	5,230,663	3,055,613,140	1,720,940,609	35,679,480	1,303,418,546	6,125,227,359	MoLF, BoANR, EFCC	MoANR, MoWIE, MoLF, MoEFCC, Respective Bureau and Universities and Research Centers
Ecohydrology	ETB	53,077,233	40,048,969	-	16,391,302	-	-	109,517,504	AwBA, MoANRMoWIE, AARRDPO, MoEFCC	Research institution and universities
Strengthen Existing Land Administration	ETB	1,601,339,394	144,120,545	122,769,354	71,693,203	95,242,447	129,392,391	2,164,557,333	BoRLAU	MoRLAU, AwBA

System										
Improve and Diversify Financial Mechanism	ETB	2,947,490	2,869,939	3,030,343	77,662,328	2,812,643	2,953,883	92,276,626	AwBA, MoANRMoWIE, MoFED, MoLF and MoEFCC	MoANRMoWIE, MoFED, MoLF and MoEFCC, AwBA, Fund raising committee
Build The Capacity of basin Relevant Stakeholders	ETB	444,457,647	212,484,931	344,576,126	250,120,093	193,249,607	366,603,438	1,811,491,842	MoANR, MoWIE, MoEFCC, MoLF	AWBA, RBoANR, MoANR, MoWIE, MoEFCC and NGOs
Create and Improve Awareness and Participation	ETB	201,132,549	196,043,053	157,909,037	114,925,355	89,754,180	165,887,707	925,651,881	AwBA, BoANR, EFCCA, MoFED and BHC and BoLF	MoANR, MoWIE, MoEFCC, MoLF and Research Centers
Strengthen Networking With Stakeholders	ETB	1,124,318	965,604	1,365,243	1,373,095	1,569,938	1,448,744	7,846,943	AwBA	MoANR, MoWIE, MoEFCC and MoLF
Total Budge	ETB	6,121,472,452	8,254,565,972	11,868,635,641	5,185,979,843	3,009,866,026	7,800,689,874	42,241,209,807		

## **4.4 Flood and Drought Management**

### **4.4.1 Introduction**

Flood & drought are the most common forms of natural disaster that disrupt human activities, cause loss of human lives & destroy properties. There are just two types of flood in general, namely, the floods that caused by extreme excess of precipitation on the catchment that contributed to the flood in the main and tributaries of the river, and floods owing to unexpected release of an excess amount of water from storage or dam. The flood in Awash River basin is due to the excess precipitation that occurred in the highland of the basin, and finally generates high flood on the downstream part of the basin. The basin originates from the highlands at above 3000masl receiving 2000mm of rainfall. The land use of the basin is characterized by extensive land use for agriculture, combined with urbanization and industrialization, is aggravating the generation of runoff. The basin is currently inhabited by 18 million people (growing at 2.9%) and supports 34 million livestock population putting immense pressure on the natural resource base. These factors contribute to severe land degradation, erosion, flooding and sedimentation. For example, the flood episode at Dire Dawa in 2006 that caused loss of lives and properties, and the frequent flood hazards at Amibara, Gewane, Logiya and Asaita are some of flood events in the basin.

Drought, as a recurrent phenomenon in the Awash Basin, had the most devastating effects in 1974 and 1984 that caused loss of human and livestock population. Droughts are caused due to the absence of rain, & thus grow & retreat in severity at rates measured by normal precipitation in an area. In general, there are four categories of drought, namely: meteorological, agricultural, hydrological & social-economic drought. Drought in Awash River basin is basically a meteorological drought, lack of enough rainfall, followed by hydrologic drought, and manifested as loss of stream flows and storage. In this case climate has the major influence on the occurrence of drought and flood in the basin. This is also reflected in the rise of temperature causing high evapotranspiration and extreme events of erratic and high rainfall.

In addition, the situation analysis of flood and drought shows that if the current situation continued without further intervention; the impacts worsen the condition of the environment,

social and economic development sectors of the basin. Therefore, in order to reduce the impact of food and drought risk, this strategic plan was developed which comprises of two goals, five objectives, and the detail action plan of the six planning areas of Awash River Basin. The detail action plan contains measures, activities, sub activities, targets, year of execution; action owners and budget allocated for each activity (see Table 1). The detail action plan for all planning areas comprises about 14 major activities and 27 sub activities that team developed to achieve the goal and objectives indicated below. These activities comprise study, implementation of flood controlling structures and drought resilience mechanisms, capacity building, and activities enabling to strengthen networking among stakeholders in the basin. The estimated total budget required implementing the strategic plan of flood and drought management for the coming eight years is 69.9 Billion ETB. In addition, the estimated cost for contingency and inflation considering 5% and 7% respectively are 3.5 Billion ETB and 28.3 Billion ETB.

#### **4.4.2 Vision, Goal and Objective**

##### **Vision**

The vision of flood and drought management strategic plan is to realize the capacity to withstand the adverse impact of drought and flood hazards that occurs at Awash River Basin by 2017. To achieve the vision of the flood and drought management strategic plan, it has its own general and specific objectives.

##### **Goal**

The goal of the flood and drought management strategic plan is to manage flood and drought disaster risks.

##### **General objective**

The general objective of the strategic plan is to reduce disaster risks and potential damages caused by drought and flood through comprehensive and coordinated interventions in the Awash basin.

## **Specific objectives**

The key objectives to meet the destined goals in basin planning for flood and drought are: to reduce drought risks by 15% at the end of 2017; to improve coordination and cooperation for drought risk; to reduce flood risks by 50% at the end of 2017; to improve coordination and cooperation for flood management; and to improve flood water utilization and sustain ecosystem.

## **Scope of the Plan**

The strategic plan of the basin is multi-partite and iterative implementations stretched over 8 years until 2017 Ethiopian Budget Year (EBY). The plan presents the details of actions and actors for the years 2010–2017 EBY inclusive. In this plan the first phase from 2010 – 2012 EBY have detail distributed activities, and the next phase 2013 – 2017 EBY will have indicative plan of activities.

### **4.4.3 Situation Analysis**

The basin exists in wide range of resource exploitations and natural phenomena that aggravate the existing and future situations of the basin. The current scenario describes existing state of the basin for risks and hazards of flood and drought while, the future aspects pronounce the effects of the current pressures on environment, social and economic settings of the basin, most importantly climate change and anthropogenic factors. Yet, there are visible burdens that emanate from social, economic and environmental setups of the basin as a whole. The legal and institutional frameworks, and significance (i.e., social, economic and environmental) pressures of the flood and draught management aspect of the basin were analyzed using the current and future situations of the basin. The legal framework consists of the constitution, policy, proclamation, regulation, and conventions such as Constitution of the Federal Democratic Republic of Ethiopia, 1994; Environment policy of Ethiopia; Ethiopia Water Sector Policy and Strategy, 2001; Ethiopian Water Resources' Management Proclamation No. 197/2000; Awash Basin High Council and Authority Establishment Council of Ministers Regulation No. 156/2008; United Nations Framework Convention for Climate Change (UNFCCC, 1994) were respectively considered.

The Institutional framework involves national and international institutions that work in flood and drought management that were ordered based on their contribution at different stages of risk and hazard preparedness, mitigation and response. With the increase in population, economic development activities, and the change in geomorphology of the river basin for instance, anthropogenic, urbanization, industrialization, large scale irrigation expansions and the natural topography have significance pressure on the natural environment within Awash River Basin. This has been a tendency to occupy the floodplains, often resulting in serious flood damages and drought hazard which in turn for the loss of physical properties and lives over the years.

**Current Scenario:** The current scenario indicates that flood and drought are the recurrent common phenomena of Awash River Basin, with devastating effect on environmental, social and economic loss. The most noticeable factors that cause these hydrologic risks are; deforestation, soil degradation, unmanageable urbanization and climate change etc. Frequently, the flood hazard is occurring in the basin during summer season specifically June-September, following heavy rains in the eastern highland and escarpment areas of north Shewa, Wollo, Western Hararge and Upstream of Koka Reservoir, draining to Eastwards that increase the water level of the Awash River in a short period of time. Most of the time the high and very high flood risks are in the downstream part of the basin, low-lying flat areas of the Awash River basin that are Amibara, Gewane and LogiyaWeredas. The coverage of summary flood hazard levels and coverage in Awash depicts nearly 32% (38,000 km<sup>2</sup>) of the basin area is highly to very highly hazard zone, while only about 15 % of the basin area is low hazard zone, leaving the rest in the moderate region.

The current situation indicates that drought occurs every two years in the area (Desalegn *et al*, 2006). Further, Desalegn *et al*, (2010) after analysis of drought in Awash River Basin, he indicates that droughts occur most frequently around two sites in the Middle Awash Basin (Hurso and Mieso areas), followed by Metehara, Nazareth and Holeta areas in the Upper Awash and Dubti, Mille and Cheffa areas in the Lower Basin. However, on 3- and 6-month time scales, areas most frequently hit by droughts of mild and above mild categories are those located in the Middle and Lower Awash Basin. The same research shows that hydrologic drought events of all severity level are observed in lower part of the basin, at Adaitu and

Dubti stations. Shishay, (2016) tried to map drought occurrence of Awash River Basin for September to overview spatial extents of severe and mild droughts. In view of that, extreme drought occurs in the lower of Koka dam and lower part of the basin especially to the north Wollo area. Mild drought occurs in higher percentage in almost all over the basin except in some basins of the upper and lower Awash (upstream Koka and upper most catchment of Awash Terminal). These and other observed facts, generally, reveal the basin faces frequent drought hazards, with severity level growing to the direction of the Awash River flow.

**Future Scenario:** The future scenarios of flood and drought analysis were analyzed from the long term meteorological trend analysis of temperature and precipitation data of the basin. These long term temperature and precipitation trends indicate the following major effects: precipitation decreases - a modest decrease in precipitation throughout the basin; temperature increase- a modest increase in temperature throughout the basin; Kiremt decrease- a five per cent decrease in rainfall during the rainy season; spatial distribution - a modest increase in precipitation in the upper river basin, accompanied by a decrease in precipitation in the lower basin to the east; and extended drought - an extended version of the ongoing 2015-2016 drought; extreme climatic events would be expected in the basin: and the consequences of climate variability and change could result in incidence of pests and diseases.

## Goal – Objective – Measure

The logical order and relationship among goals, objectives and measures is schematized in Figure1 below.

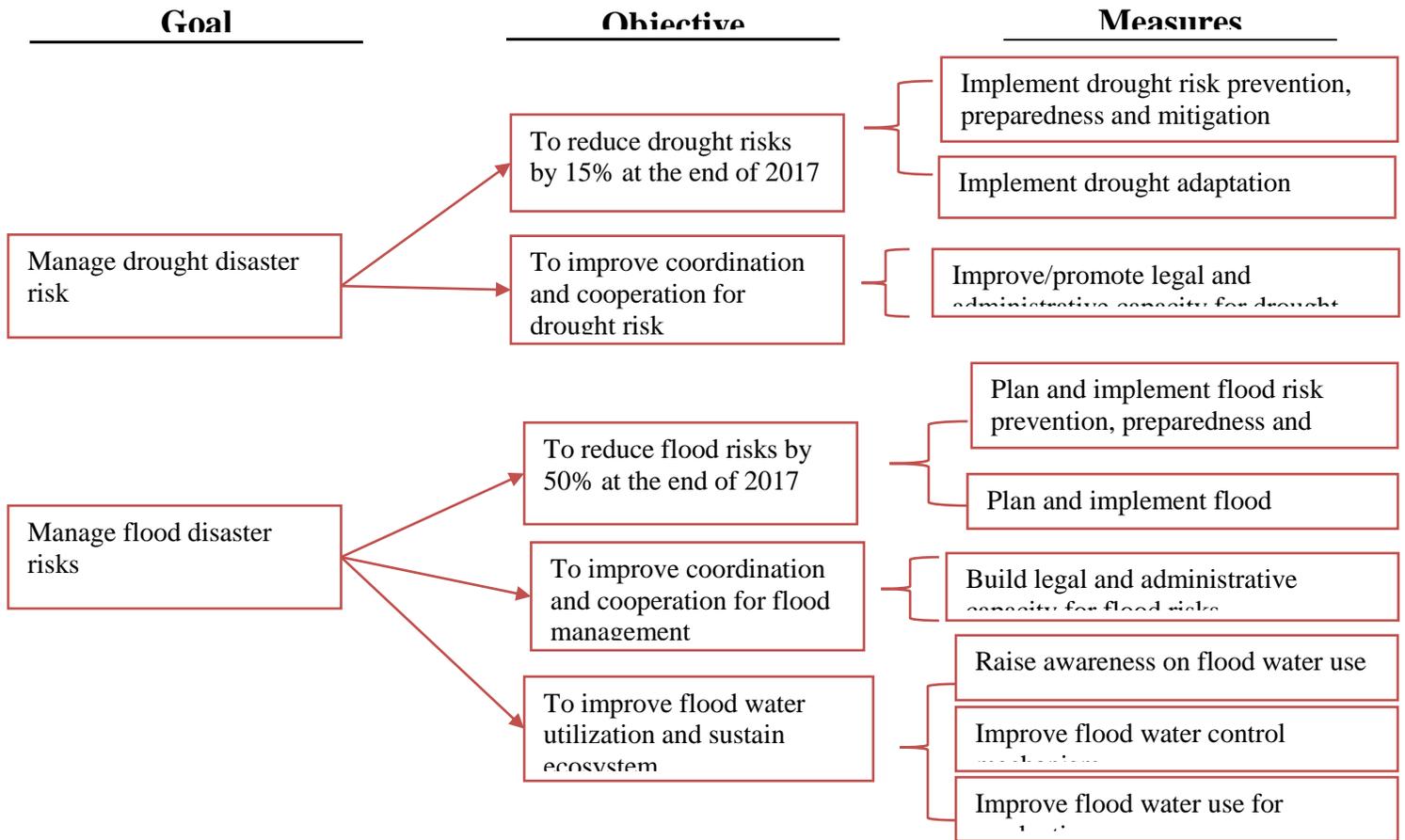


Figure1.Objective tree - logical connection among goals, objectives and measure

#### **4.4.4 Detail Action Plan**

The detail action plan of the flood and drought management contains measures, activities, sub activities, units, and targets, year of execution, action owners and budget. The detail action plan for all planning areas is summarized in Table 1. About 14 major activities and 27 sub activities are included to achieve the goal and objectives stated. In general, it comprises study, implementation, capacity building, methods to financial improvement and activities enabling to strengthen networking among stakeholders in the basin.

No	Activity	Sub-activity	Unit	Target	Total cost (x1000)	Action owner(s)	Collaborators
1	Conduct drought risk assessment, mapping and Develop risk management plan	Conduct drought risk assessment and mapping	%	100	8,124.67	NDRMC	NMA, MoANR, MoLF, MoWIE, UN Agencies, MoFAPC and respective buearux and offices
		Develop drought risk management plan	%	100	1,622.10	NDRMC	NMA, MoANR, MoLF, MoWIE, UN Agencies, MoFAPC and respective buearux and offices
2	Conduct drought risk mitigating activities	Develop ground/surface to Irrigation/ Domestic/livestock water supply	No	85	42,573.47	MoWIE, BoWR, BoANR	NMA, MoANR, MoLF, MoWIE, UN Agencies, MoFAPC and respective buearux and offices
		Improve/promote drought resilient crop/forage variety	Ha	4596	20,283.99	BoANR, MoLF	NMA, MoANR, MoLF, MoWIE, UN Agencies, MoFAPC and respective buearux and offices
		Improve livestock herding practices	No	86	16,044.10	MoLF	MoANR, MoWIE, University and research institute
3	Organize disaster risk reduction high council	Establish basin wide disaster risk reduction council and conduct meeting	No	8	2,037.40	AwBA and NDRMC	MoANR, MoEFCC, MoH, MoWIE, MoFAPC, MoT, MoME, MoND, MoUHC, MoE, Reginald and city Admin.
4	Conduct flood risk assessment, mapping and Develop risk management plan	Perform flood risk assessment and mapping	%	100	50,935.00	AwBA	MoWIE, NDRMC, NMA, Respective Reginald office
		Develop flood management plan	%	100	1,528.05	AwBA, NDRMC	MoWIE, NMA, Respective Reginald office
5	Strengthen flood and drought forecasting and early warning system	Establish institutional networking for flood and drought risk	%	100	458.42	AwBA	MoWIE, NMA, DRMC, Respective Reginald office
		Establish HIS - BIS for flood and drought	%	100	173,861.60	AwBA, NMA	MoWIE, Respective Reginal office, Ethio-tele, World Bank
		Provide Sub-basin level forecasts	Fre/yr	3	1,500.00	MoWIE, NMA	Mass media, Ethio-Tele, DRMC,
6	Implement flood control measures	construct Large flood control structures	No	7	46,961,763.76	MoWIE	AwBA, MoC, ELPA, Reginald Gov't
		River training works	Km	40	46,961,763.76	AwBA, BoWR	MoWIE
		Retention pond	No	21	52,500.00	AwBA, BoWR	MoC, MoWIE, MoANR
7	Implement flood rehabilitation and recovery activities	Prepare rehabilitation plan	%	100	1,528.05	DRMC and all regional dev't bureaux	MoWIE, MoH, MoLF, MoANR, MoFAPC, UN- Agencies, NGOs, MoE, MoLSA
8	Conduct awareness and training on adaptive technologies	Conduct trainings on adaptive technologies on flood risk management	No	8	1,848.65	AwBA & MoWIE	NDRMC, World bank, Universities, Research centers, MoANR, MoLF, MoH, MoFAPC, FAO
		Scale up adaptive flood management techniques	No	3	1,375.25	AwBA & MoWIE	NDRMC, World bank, Universities, Research centers, MoANR, MoLF, MoH, MoFAPC, FAO
9	Propose policy measures and legal frameworks on flood water management	Propose policy measures and legal frameworks on flood water management	Doc	1	1,018.70	AwBA & MoWIE	MoANR, MoEFCC, MoH, MoWIE, MoFAPC, MoT, MoME, MoND, MoUHC, MoE, MoJ, Regional and city Admin.

No	Activity	Sub-activity	Unit	Target	Total cost (x1000)	Action owner(s)	Collaborators
10	Establish and/or implement forums	conduct flood water user forum	No	7	3,237.47	AwBA & MoWIE	MoANR, MoLF, MoFAPC, DRMC, MoEFCC, MoH, MoE, National PARK ,Respective regional office Universities, NMA, Media
11	Undertake awareness campaigns	Hold joint seminars or symposium	No	4	3,244.20	AwBA	Research Centers, Universities, MoST, MoWIE, MoANR, MoLF, DRMC, UN Agencies, World bank, NGOs, GIZ, Private sectors
		Conduct regular observation on gap and success of response operation	Freq/yr	8	2,162.80	AwBA	Research Centers, Universities, MoST, MoWIE, MoANR, MoLF, DRMC, UN Agencies, World bank, NGOs, GIZ, Private sectors
12	Undertake local flood water harvesting	Construct large flood water harvesting ponds	No	10	100,000.00	BoWR/OIDA and PADC/BoPA D	MoWIE, MoANR, MoEFCC, MoLF, NGOs,
		Develop ground water recharge areas	No	14	35,000.00	BoWR, BoANR and PADC/BoPA D	MoWIE, MoANR, MoEFCC, MoLF, NGOs,
13	Store flood water at artificial reservoirs, lakes and wetlands	Store flood water at artificial reservoirs	No	7	1,283.18	AwBA	EPCO, MoWIE, RWB
		Store flood water at natural lakes and wetlands	No	11	27,500.00	AwBA	MoWIE, MoLF, MoANR, MoEFCC, Respective regional bureaux and Wereda office
14	Establish inundation irrigation scheme	Establish flood water agronomy scheme	No.	12	17,000.00	OIDA, BoWR	MoANR, MoEFCC, NGO
		Establish flood water based Pasture scheme	No.	12	17,000.00	MoLF, MoFAPC, PADC/BoPA D/BoLPD/LR DPA/BoANR	MoANR, MoEFCC, NGO
Total cost (x000 Birr)					69,947,007.78		
Contingency (5%)					3,496,997.04		
Inflation (7%)					28,282,207.67		
Grand total (x000 Birr)					101,726,212.49		

#### 4.4.5 Risk management

**Planning Assumption:** The enabling environments to implement the flood and drought strategic plans are: there is high commitment of all stakeholders, necessary budget is released from the government, timely decision making from decision makers, strong collaboration & cooperation among the actors and collaborators and the presence of good governance.

**Expected Challenge:** The expected challenges to implement the plan are: securing livelihoods for growing population of the basin through economical use of floodplains; absolute safety from

flooding is ideal because it is difficult to manage all floods as expected by the flood plain society; the effects of proposed flood management interventions on the floodplain aquatic ecosystem as these depend on flood events for survival; effects of climate change & variability; industrialization & development expansions may cause change in land use aggravates the flood; and reduced capacity of Koka Dam to handle the excess flood generated at upstream Koka.

**Possible Solutions:** Provide all stakeholders, including the public, with full opportunities to share their views & influence the outcome; raise awareness at the basin level & develop a host of preventive & mitigation measures against flood & droughts; build consensus & public support for the outcomes; build stakeholders' commitment; ensure implementation of basin flood management plans with full public support; ensure sustainability of plans & associated decisions; and build resilience of flood-prone communities

## **4.5 Basin Information Management and Communication Plan**

### **4.5.1. Introduction**

The Awash River Basin has significant water and land resource potential for wide variety of development activities. Its strategic location for development has made the basin corridor of intensive urbanization, industrialization and mechanized irrigation farming. Despite its immense possessions the basin has got intricate social, economic and environmental pressures which resulted in water resource degradation: water pollution, water scarcity, watershed degradation and flooding. On top of that, climate change as one the major global phenomenon has made the water resource system in the basin unconditionally dynamic and unpredictable, which remarks better knowledge of the overall basin water resource system changing aspects and determination of the resource distribution in space and with time.

There comes the need for information management and communication system as a decision tool for proper implementation of IWRM. It is the powerful instrument by which basin planning, resource allocation, and monitoring and evaluation can be realized. So, to realize Integrated Water Resources Management system and addressing aforementioned water resource challenges of the basin, developing and implementing long term basin wide Information management and communication system strategic plan will be crucial.

Integrated Water Resources Management is possible through Basin wide central information management and communication system. Therefore developing and implementing BIMCS plan is very essential for sound and rational planning management, development and research of the basins' water resources.

### **Vision**

The vision endowed to basin information management and communication system is realizing an integrated, standardized Basin Information Management and Communication System which brings effective Information & knowledge-based sustainable water resources development and management.

### **Objective**

The main objective of Awash Basin Information Management and Communication System is to establish and develop basin wide information management and communication strategy that enhance data management and capacity for better decision making and improve awareness on water resource system in the basin.

## **Scope**

This is a strategic and detailed Information Management and Communication System Plan of Awash River Basin that frameworks the strategic views for the eight years plan from the year 2010 to 2017EC, in alignment with the two successive GTPs that means the remaining three years of GTP II and the whole GTP III period. The plan is synthesized for the entire Awash River Basin with recognized six planning units.

### **4.5.2 Situational Analysis (Legal and Institutional)**

The enabling conditions like legal frameworks such as water resource policy, water resource management proclamation, and proclamation related to the establishment of Basin High Council, the proclamations related to the press freedom, and different institutes and stakeholders engaged on Information Management & Communication were identified and analyzed to be the major promoters for Basin based Information Management and Communication System. On the other side, there are duplications of efforts in collecting sorts of information in a given theme. Again, the participation of stakeholders in information generating and dissemination is not well developed.

### **4.5.3 Scenario Analysis (Current and Future)**

The improvement in life standard, the increasing demand towards learning about environment, information and technology based daily activities, and the participation on the global issues are the important social pressures that induce the realization of the implementation of basin Information Management and Communication System. For example, water scarcity and allocation procedures for increasing demand in the basin needs reliable and up-to-date information, and means of communication as well. The dynamic nature of the availability of water resources in time and place also requires sound and effective information management and communication system.

The yet-to-come consequence of significant pressures and the current conditions in ABIMCS impart significant challenges in overall performance of water resource administration in the basin. The growing need for development in water sector with no knowledge based decision aggravates the current water resource scarcity and deterioration resource qualities of the basin. This leads to, on one hand, retarded growth of water sector and then overall development. On the other hand, it results water crisis – as conflicts and social instability which toughens the general fear that water becomes the sole source of conflict, even in the globe.

The pressures to the environment due to less informed decisions on socio-economic interventions obstruct the implementation of IWRM with which issues of sustainability can uniquely be addressed. So, unacquainted/poorly informed/ choices on environment and its resources result in

environmental hazards like flood, loss of productivity and drought, above and beyond, marks total loss of resources: land, water and life/biodiversity.

Based on the vision, the aforementioned enabling environment, enforcing pressures in the basin on information management and communication system the overall goals of Awash BIMCS are drawn as:

1. Develop and implement basin information system for planning, research, development and management of basin's water resource
2. Develop and implement appropriate, effective and basin wide Water resources Information communication system.

The objectives are outlined as those aims that collectively statement the drawn goals of Awash BIMCS. These are:

1. Establish basin wide geo-spatial water and water related resources database;
2. Generate and organize basin water and water related resources information;
3. Organize and manage standards, guidelines, manuals and documents essential for basin WR administration;
4. Establish Develop and implement basin wide communication strategies;
5. Raising awareness of stakeholders and the general public;
6. Enhance information management capacity on water and water resource related issues; and
7. Enhancing capacity on effective communication methods/technics and technology

#### **4.5.4 Activities planned**

There are about 15 strategic measure are designed. Furthermore, the strategic measures disaggregate in to 78 subsequent action/activities and 180 sub activities with action calendars, estimated budget and actors (action owners and collaborators). Accordingly, for the remaining 3 years of GTP II about 391.3 million Eth Birr, for GTP III 503.3 million Eth Birr (including inflation and contingency estimates) is required for the implementation the plan.

No.	Measures	Budget (ETB)					8 YRS FINANCIAL TARGET
		2010	2011	2012	3 yrs budget	2013 - 2017	
1	Develop data and information collection, organization and retrieval system	33,936,553.35	15,242,597.53	10,047,251.42	59,226,402.29	61,541,575.09	136,634,527.38
2	Establish database system	841,501.50	900,406.61	963,435.07	2,705,343.17	5,901,246.93	18,441,940.10
3	Database management and user community information services	-	7,126,075.13	-	7,126,075.13	-	11,620,075.13
4	Collecting and produce reliable and representative watershed characteristic information	15,197,116.38	9,728,678.98	2,745,789.94	27,671,585.30	47,294,278.94	82,622,464.24
5	Generate and organize water resources related Agricultural information	12,243,846.83	17,577,223.22	1,204,293.83	31,025,363.88	7,376,558.66	39,384,985.04
6	Generate and organize water and water resources related Technology and research information	1,713,056.63	1,832,970.59	1,961,278.53	5,507,305.74	12,013,252.67	20,617,795.91
7	Developing and organizing basin wide water resources Infrastructure information (Drawing, figures, facts...)	5,651,524.07	9,326,668.87	5,466,805.84	20,444,998.79	5,091,933.06	26,849,725.85
8	Develop and organize basin wide water uses, users, and flows information	11,634,359.31	12,448,764.46	3,396,796.78	27,479,920.55	21,237,744.65	63,042,899.20
9	Produce and manage information on water use, waste water discharge, water resources development and water application rules	4,618,520.88	5,023,111.19	5,113,775.70	14,755,407.77	31,855,773.94	54,686,820.96
10	Development of geo-spatial data standard, mobile apps and documenting source codes	6,215,089.65	6,906,761.81	1,913,794.94	15,035,646.40	8,598,959.81	25,851,576.21
11	Develop and organize/manage operation and maintenance guidelines, manuals	6,100,885.88	12,895,108.88	516,125.93	19,512,120.68	3,161,382.28	23,488,565.46
12	Creating nomenclature for geo-locations and water resource infrastructures	91,879.94	60,674.54	55,741.60	208,296.08	-	208,296.08

13	Enhancing capacity on data and database mgmt	3,022,793.60	1,133,869.17	292,930.14	4,449,592.92	2,295,304.04	6,943,381.96
14	Technical capacity building on generation/producing information	1,713,657.70	841,687.23	861,655.03	3,416,999.96	5,336,076.08	9,768,495.34
15	Implement capacity building program on information management technologies and researches	327,103.65	525,001.37	936,252.44	1,788,357.46	2,955,513.07	4,964,301.22
16	Develop publications	5,247,362.93	6,052,018.68	5,374,591.34	16,673,972.95	35,584,518.96	58,210,259.41
17	Establish media relations	18,593,840.37	20,235,559.91	19,702,779.03	58,532,179.31	109,274,421.04	169,136,262.60
18	Establish and manage website	46,162.37	26,240.42	52,851.30	125,254.08	323,725.55	448,979.63
19	Establish feedback and learning mechanism	4,770,111.36	6,403,177.26	6,548,605.79	17,721,894.40	48,626,274.67	67,053,769.07
20	Awareness creation on water resource management system and water laws	11,558,546.16	12,772,955.99	17,362,524.56	41,694,026.70	104,663,125.32	149,711,899.92
21	Establish stakeholder consultation system	10,175,225.76	8,269,880.94	15,880,472.26	34,325,578.96	53,094,572.39	94,798,254.96
22	Enhance capacity on communication techniques, tools and technologies	526,779.94	413,158.00	2,220,029.66	3,159,967.60	6,327,148.35	11,037,770.65
23	Enhance capacity on IWRM and water resources systems for communicators and media experts	1,307,212.47	-	-	1,307,212.47	1,833,433.12	3,140,645.59
	<b>Activity cost</b>	<b>129,379,676.09</b>	<b>113,825,284.39</b>	<b>74,558,679.90</b>	<b>317,898,387.85</b>	<b>340,665,945.73</b>	<b>722,316,426.46</b>
	<b>Inflation</b>	<b>18,747,115.07</b>	<b>32,949,200.79</b>	<b>23,172,540.22</b>	<b>74,662,361.55</b>	<b>206,369,119.59</b>	<b>303,131,329.04</b>
	<b>Contigency</b>	<b>7,406,339.56</b>	<b>8,968,105.60</b>	<b>4,886,561.01</b>	<b>21,332,753.22</b>	<b>27,351,753.27</b>	<b>53,215,936.43</b>
	<b>Total</b>	<b>155,533,130.71</b>	<b>155,742,590.78</b>	<b>102,617,781.13</b>	<b>413,893,502.62</b>	<b>574,386,818.59</b>	<b>1,078,663,691.93</b>

#### **4.5.5 Planning Assumptions**

It is generally assumed that BIMCS plan is doubtlessly expected to be the plan of the basin itself and as much as possible centers on the interests of stakeholders and wider public. Again, it is believed that actors and collaborators of the plan are expected to have shared vision for the implementation IWRM in the basin. The advancements in application of ICT for water resource management is another issue that enables development of water resource information and communication system in water sector. Additionally, finance and technology can be limitations for complete implementation of the plan as the required level.

## **4.6 Stakeholder engagement**

### **4.6.1 Introduction**

Awash River Basin is laid in five regional states and two administrative cities. The administrative regions and cities that fall within the River Basin are Oromia, Amhara, South Nations and Nationalities People's, Afar, and Somalia Regional States and Addis Abeba and Dire Dawa Cities administrative. Stakeholders are all people, groups and organizations that could affect or be affected by the water resources management activities. These include Federal, Regional and Local governments, civil society organizations, water users and the general public.

Water resources competition among these regions and water users in the basin is increasing. However; the integration, cooperation and participation of the stakeholders is not adequate to address the emerging water resources competitions and maintain sustainable development. In the past, planning and implementation of water resources have been undertaken without adequate involvement of the stakeholders. Integrated river basin management is possible through partnership and networking with all stakeholders and institutions. Hence, establishing stakeholder's management plan is fundamental means to improve participation, cooperation, coordination and sharing responsibility.

### **4.6.2 Situation Analysis**

The plan is based on the framework of Ethiopian water resource management policy and River Basin Councils and Authorities Proclamation. The Ethiopian Water Resources Management policy considers stakeholders involvement as cross cutting issue to achieve its goal and objectives with create conducive situations, effective networking, coordination and smoothly functioning of stakeholder's. The River Basin Councils and Authorities Proclamation initiates the stakeholders of a river basin shall to act in a coordinated manner in spite of their differences of approaches, interests and perceptions of the effects of their decisions, plans and activities on the hydrological cycle and on other users.

Existence of stable institutions is indispensable to enhancement of linkages and partnership among stakeholders for the realization of efficient, sustainable and equitable water resources management.

Several federal and regional institutions have been established to implement integrated water resources management. However, the institutions structure lacks appropriate linkage, institutional stability and flexibility to increase participation of stakeholders.

Among stakeholder management pressures social, economic and environmental pressures were analyzed. Traditional beliefs such as “water as a gift of nature”, poor culture and trend of water use are among social pressures that hinder the stakeholder to collaborate and participate on water resources management activities. As a result interest conflict, lack of trust and motivations are evolved.

Budget constraint for stakeholder engagement, lack advanced communication infrastructure and communication channels are significant economic pressures. Existing infrastructures are mainly concentrated around bigger towns and cities. In addition to low accesses, little trained of utilization of technologies is another challenge of stakeholder’s involvement.

Pollution effect on human health and other lives may create dalliance in performance of integrated water resources management activities. Extreme events those drought and flood are recurrent in many parts of the basin with major impacts on lives, livelihoods, wellbeing and the productivity. Diversity of climatic conditions, geographical setup variations and wideness of the basin make interest disparity among the basin community. Generally, these phenomenons exert environmental pressure in the stakeholders’ involvement of the basin.

#### **4.6.3 Scenario Analysis**

Current situations of stakeholder awareness, interest and involvement on integrated water resources management vary within sub basins. For instance, in high land part of the basin have good awareness and participation in watershed management; however the action is not coordinated. Interest and participation of users regarding to legal water use, quality control and flood & drought management is weak, whereas regulators have high interest and commitment to coordinate and cooperate.

In the future motivation and participation on watershed management in high land part will continue increasingly. The Positive impact of participation gained from highland will be expected to motivate the low land users. The interest of regulators is high on water allocation,

water quality and flood & drought management but their commitment towards concrete action is inconsistent and seasonal. The interest and involvement of users is very weak due to ambitious expectation from government. In general weak participation of users remains challenge in the future.

#### **4.6.4 Vision, Goal, Objectives and Measures**

##### **Vision**

The vision of stakeholder management plan is to see well-coordinated, highly satisfied and self-mobilized stakeholders in basin issues.

##### **Goal**

This plan is prepared with a goal of **“to bring integrated participation and empowerment of multi-stakeholders for sustainable River Basin Management”**.

##### **Objectives**

The plan has two main objectives.

- ❖ Enhancing interconnectivity and participation of stakeholders for efficient, equitable and sustainable RBM
- ❖ Empowering stakeholders in decision making process and enhance their contribution to sustainable RBM.

##### **Measures**

To realize these objectives five measures are identified.

- Ensuring participation of key stakeholders
- Establishing multi-stakeholders interconnectivity
- Develop Stakeholders Interconnectivity Data Management and Networking
- Stakeholder’s capacity building
- Develop Joint Stakeholders Decision Support System (DSS)

To attain the proposed measures 8 major activities and 18 sub-activities with action owners and collaborators are developed. The total budget of the plan is estimated about 37,408,618 (thirty seven million four hundred eight thousand six hundred eighteen) ET. Birr. The plan duration is expected to last years (from 2010 E.C. to 2017 E.C).

### Major Activity and Sub Activity per Sub-Basin for 8 years

Activities	Sub activities	Unit	2010-2017	(Action Owner)	Collaborators	Budget
Organize stakeholders meetings	Identify participating key stakeholders	No	3840	AwBA	MoWIE	19960047
	Organize and facilitate field visits, and organizing and disseminating minutes at different levels	No	48	AwBA	Regional Water burea, MoWIE	
Develop multi-stakeholders interconnectivity documents	Prepare MoU documents	No	5	AwBA	Regional Water burea', DWB, Universty, MoWIE	2080282
	Prepare stakeholder's platforms	No	5	AwBA	Regional Water burea', DWB, Universty, MoWIE	2182333
	Prepare stakeholder's Protocols	No	3	AwBA	Regional Water burea', DWB, Universty, MoWIE	115146
Develop Stakeholders Interconnectivity Data Management System (database)	Training on stakeholders database management & Networking system	No	90	AwBA	Regional Water burea', DWB, Universty, MoWIE	624579
	Develop the appropriate database system and Operational Manual	No	1	AwBA	Regional Water burea', DWB, INSA, CSA, Universty, MoWIE, Mofcc	601073
	Collect, organize and entry the stakeholders data	No	5	AwBA	Regional Water burea' MoWIE, Mofcc	153923
Human Resource Development	Short Term training for Stakeholders (Experience sharing, On job training...)	No	264	AwBA, Regional Water burea', MoWIE, Mofcc	DWB, Universty,	1837081

### Major Activity and Sub Activity per Sub-Basin for 8 years

Activities	Sub activities	Unit	2010-2017	(Action Owner)	Collaborators	Budget
	Long Term Training (BSc, MSc, PhD Training)	No	9	AwBA, Regional Water burea', MoWIE, Mofcc	DWB, Universty	630816
Institutional Capacity Building	Infrastructure and Facility Development (Branch office)	No	3	AwBA	Regional burea', MoWIE, MoPCS, MOFEC	360644
	Strengthen Multi-stakeholders Interconnectivity Structure		9	AwBA, Regional Water burea', MoWIE, Mofcc	MoPCS, MOFEC	121425
Improve Financial Mechanism &Mg't systems	Adequate Funding for Stakeholders Management Activities (Sugar corporation,Donors, Ethio-Wetland )	Birr	3,840,000	MOFEC, AwBA, Regional Water burea', MoWIE, MoEFCC	Sugar corporation, Donors, Ethio-Wetland,	438935
	Support stakeholders meeting Local financing	Birr	384,000	AwBA, Regional Water burea', MoWIE, MoEFCC	Users	
Develop and Implement Joint Stakeholders DSS	Develop relevant DSS tools	No	5	AwBA	Regional Water burea', DWB, Universty, MoWIE, MoEFCC	1501502
	Adopt and Implement DSS	No	5	AwBA	Regional Water burea', DWB, Universty, MoWIE, MoEFCC	

#### **4.6.5 Planning Assumptions**

The existing potential opportunities in the basin have been considered as enabling environments for smooth implementation of the plan. These enabling environments are listed as follows.

- Existence of high basin council and working to ensuring IWRM in the country.
- Political support from decision makers/ Executives bodies
- A continuous ongoing infrastructure development in urban and rural areas (road, electricity, etc.)
- Industries - universities linkage help as an input in capacity building/ technical support, experience sharing, knowledge transfer/ on basin plan implementation

#### **Expected Challenges**

- Lack of inter- sartorial coordination among the water related sectors
- Unrealistic expectation of stake holders from basin authority (Flood management)
- Lack of trust on stakeholder's participation and miss interpretation
- Insufficient budget allocation for stake holders' engagement
- Institutional and manpower capacity gap

#### **Possible Solutions**

- Conducting continuous awareness creation for stakeholder at all level to build trust.
- Setting stake holder's engagement platform on each strategic issue to attain their role responsibility and accountability.
- Searching alternative budget support from stake holders on their concern to enhance their engagement.
- Encourage key stake holders to assign focal person responsible for stake holders networking.
- Establish stake holders technical advisory committee responsible to advice on key basin issues for decision makers

## 5. REPORTING, EVALUATION AND MONITORING OF THE PLAN

The main objective of monitoring and evaluation system is to ensure implementation of strategic plan. Monitoring and evaluation reviews progress, effectiveness, impact and outcome of the plan via collection and analysis of data. This can be realized with detail and pre-agreed indicators, criteria, actors, calendars and budget. Self and jointly monitoring will be conducted quarterly and annually respectively. Self-monitoring will be done by action owner itself, while joint monitoring will be conducted by relevant stakeholders. Monitoring feedback will be forwarded once by the end of physical year.

Joint evaluation will be conducted by executive's bodies, involving action owners, and users. It will be done on midterm and by the end of strategic plan year. In this regards Awash Basin Authority is responsible to initiate and coordinate monitoring and evaluation process. Action owners prepare and submit annual progress reports, to Awash Basin Authority, which serves as a basis for the reports prepared by Awash Basin Authority.

This Strategy is 'owned' by different federal and regional institutes as listed in the strategic action table in the above. It also invites the involvement of many collaborative players and stakeholders throughout the basin. Therefore, it will need 'partnerships' to be developed, networks to be created and genuine desire for transparent and 'real' consultation and participation. The primary role in water resource management will always rest with ***national governments***, which have responsibility for all aspects of policy, strategy, planning and legislative and institutional reform. With its legislative power, FDRE, Awash Basin Authority delegated to translate the national policy and strategy into sustainable development and management at basin level, with a large amount of stakeholder and community involvement, in a form that suits each region. It is the base mandate of the Authority to motivate the development of the basin strategic plan. Regional bureaus/agencies with their respective spatial space have responsibility to integrate the basin wide strategic activities and issues with their regional development plan within the framework of growth and transformation program of the country.

### **Periodic Review and Updating**

It is logical to assess the progress on the implementation of the strategy, and of its appropriateness for the next future period, as part of the regular national, regional and basin authority annual planning processes. And every annual planning process has to be endorsed by the Basin High council for its addressing the parts and parts of this basin strategic plan. So the present strategy will guide the next Growth and Transformation Plan (GTP 3). The next formal update would then be considered during at the end of the year 2017.