



Federal Democratic Republic of Ethiopia  
Ministry of Water, Irrigation and Energy



# CLIMATE RESILIENT WATER SAFETY

## STRATEGIC FRAMEWORK

JULY 2015 ADDIS ABABA, ETHIOPIA



# **CLIMATE RESILIENT WATER SAFETY**

## **STRATEGIC FRAMEWORK**

JULY 2015 ADDIS ABABA, ETHIOPIA





## Acknowledgement

The Federal Ministry of Water, Irrigation and Energy (MoWIE) would like to extend its gratitude to World Health Organization (WHO), Ethiopia Country Office and Headquarters (HQ) for their generous financial and technical support starting from the development of the concept note to preparation of the national Climate Resilient Water Safety Strategic Framework. Special thanks goes to Ms. Jennifer De France, WHO Geneva, Water, Sanitation and Health Technical Officer, for availing financial support from WHO HQ and for her continuous follow-up and guidance throughout the process.

Furthermore, MoWIE greatly acknowledges, Mr. Waltaji, Terfa, WHO Ethiopia Country Office, Ms. Angella Rinehold, WHO Geneva, Consultant and Ms. Elena Villalobos Prats, WHO Geneva Technical Officer for initiating the process, developing concept note, and consultant terms of reference and guiding the consultant in developing this strategic framework and providing series of comments and inputs from zero draft up to final version. Ms. Angella further contributed from her wealth of WSPs experience from different countries and shared a lot of useful materials which made this document user-friendly. The development of this document was shouldered by Mr. Yared Legesse, WHO consultant, thus, MoWIE is highly appreciative and thankful for his effort and preparation of the National Climate Resilient Water Safety Strategic Framework.

Finally, MoWIE extends its gratitude to the following professionals who have contributed in commenting on the first draft:

**Mrs. Semunesh Gola (Director of Hydrology and Water Quality)**

**Mr. Eyob Tesgaye (Core Process owner, Hydrology and Water Quality)**

**Mr. Arto Suominen (Manager of COWASH)**

**Mr. Ana Belay (Water and Sanitation Officer)**

**Mr. Balew Yibel (Hydrology and Water Quality Officer)**

**Mr. Osman Yiha (WHO Ethiopia, Public Health and Environment Consultant)**

**Ms. Bettina Rickert, National and International Advancement of Drinking-Water Hygiene, WHO Collaborating Centre for Research on Drinking-Water Hygiene, Berlin – Germany**

## Foreword

Water is primarily essential for life, health and for human dignity; hence, the health of any community entirely depends on the availability of safe and adequate water. In addition to public health benefits, all people have the right to safe and adequate water accessed in equitable manner for drinking, cooking and for personal and domestic hygiene. Both safety and adequacy of drinking water are essential as they are equally important to reduce the occurrence of water-related health problems.

Cognizant of these facts, the Government of Ethiopia designed Water Sector Policy and Water Sector Development Universal Access Plan (UAP) I and revised UAP II, and hence, achieved significant progress in the provision of safe water supply both in the urban and the rural settings in the past 20 years. The policy was well-articulated in terms of water availability, quality, continuity and suitability including watershed management and prevention of water source pollution.

Though, good enabling policy environment is in place, the major challenges are the underserved one third of the population, safety of the improved water source from source to point of use, and minimal capacity to address the risks posed to the drinking-water due to climate change. To address the regulatory issue of drinking water, National Drinking Water Quality Standard Specification was issued in 2001 covering microbiological and physicochemical parameters. However, in Ethiopia, systematic and comprehensive drinking water quality monitoring and regulator are still lacking.

Taking these facts into consideration, the Water Supply, Sanitation and Hygiene (WASH) sector in collaboration with development partners conducted a Joint Technical Review on Water Quality and Safety in Oromia Regional State in May 2012 to see the implementation status of policies and strategies on drinking water quality and safety monitoring. The major gaps identified during the review were associated with various reasons including capacity gaps at all levels, weak coordination between sectors at all levels, and lack of financial and material resources. These issues were presented on the 5<sup>th</sup> WASH Multi-stakeholders' Forum (MSF-5, Nov 2012) and Water Safety Plan was identified as one of the five major undertakings to be implemented in Ethiopia. The Ministry of Water, Irrigation, and Energy believes that it is a high time to have a roadmap for assurance of drinking-water safety from source to point of use. Thus, the development of this Climate Resilient Water Safety Plans Strategic Framework aimed at giving guidance for implementation of risk assessment and risk management approach for improvement of drinking water safety as integral part of drinking water supply system. This Framework will serve as a roadmap for CR-WSPs implementation in Ethiopia from January 2015- December 2019.

Finally, on top of its commitment, the Ministry of Water, Irrigation, and Energy calls for support from other government sectors and development partners in terms of resource allocation (human, financial and logistics), coordination, joint planning and monitoring so that the implementation of this strategic framework achieves its intended goal, i.e., provision of good safe drinking water that has the trust of the consumers and meets health-based water quality target.

**H.E. Ato Kebede Garba**

**State Minister of Water, Irrigation, and Energy**

**Federal Democratic Republic of Ethiopia**

## Executive Summary

The quality of drinking-water is a powerful environmental determinant of health. Assurance of drinking-water safety is a foundation for the prevention and control of waterborne diseases. The WHO 3<sup>rd</sup> (2004) and 4<sup>th</sup> (2011) editions of the Guidelines for Drinking-water Quality, outline a preventive management “framework for safe drinking-water” aiming at health-based water quality target which diverge from the traditional thinking and focus of testing end pipe drinking water. Preventive management “framework for safe drinking-water” can be achieved through preparation and implementation of Water Safety Plans (CR-WSPs) which is risk assessment and risk-based management of drinking-water from source to consumers.

Mindful of the above fact, provision safe drinking water supply has been given due attention being one of the essentials for health, welfare and livelihood of Ethiopian population in the constitution, policies and different strategies of Ethiopia. As the result, over the last 20 years, a remarkable progress has been achieved both in rural and urban settings of the country.

However, the challenge now is how to provide higher levels of service with systems that provide good quality drinking water to a growing population in a sustainable manner. Among others, these challenges are likely due to rapid rate of population growth, backsliding of coverage achieved owing to weak operation and maintenance, and lowering of deep boreholes water tables and drying of shallow wells in drought affected areas and water infrastructure damages in flood-prone areas and high demand of water for other economic activities linked to current rapid development of infrastructure and agriculture.

Therefore, this Climate Resilient CR-WSPs framework is believed to raise awareness and understanding of risk issues from catchment to mouth, and designate measures to be taken to provide safe drinking water in a systematic way in Ethiopia. It further indicates existing opportunities for realization of proposed key millstones aimed at improving water quantity, quality and the whole water supply system through Climate Resilient CR-WSPs implementation using the existing structure from national up to household levels.

Furthermore, this framework outlines Ethiopia’s water quality status and challenges, key enabling environment, how these can be used for adoption of CR-WSPs in Ethiopia and realization of safe water supply. It further discusses use of existing institutional arrangement, role and responsibility with detail activities, capacity building needs, alignment, coordination and partnership, monitoring and evaluation, and the need of financial investment for CR-WSPs within the existing context of ONE WASH Program and wider WASH investment plan.



## List of Tables

<b>Table 1</b>	Description of the scope of the water supply schemes
<b>Table 2</b>	Advocacy level, target and engagement mechanism
<b>Table 3</b>	Capacity building needs and participants at different Levels
<b>Table 4</b>	WSP implementation roles and responsibilities of stakeholders at all levels
<b>Table 5</b>	Core activities, key milestones and implementation timeline

## List of Figures

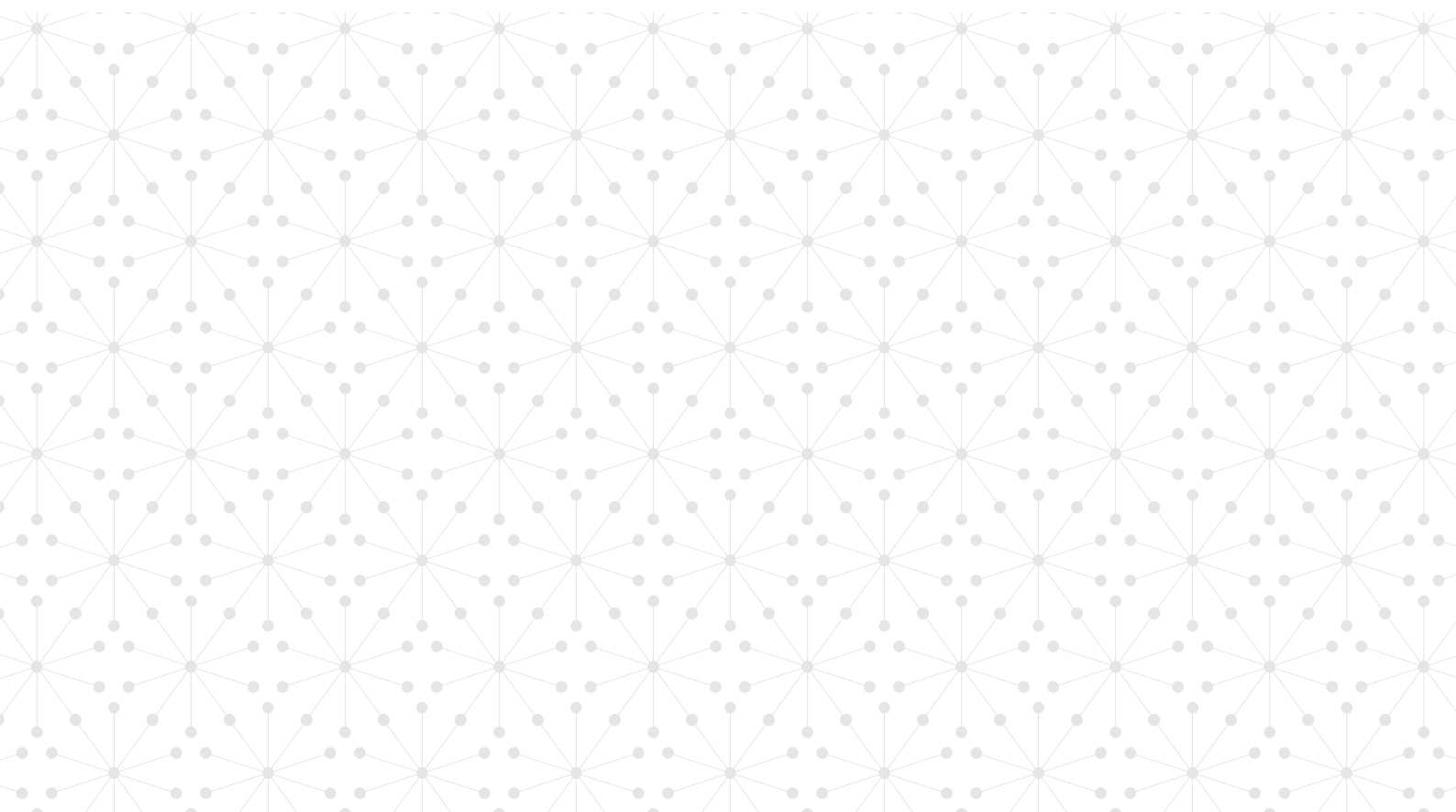
<b>Figure 1</b>	Coordination and partnership for climate resilient Water Safety Plans
<b>Figure 2</b>	Monitoring and evaluation schematic with input, output, outcome and impact
<b>Figure 3</b>	Participatory WSPs strategic framework implementation monitoring and evaluation and feedback mechanism

## Acronyms

<b>ASL</b>	Above Sea Level	<b>HMIS</b>	Health Management Information System
<b>ASPIF</b>	Agriculture Sector Policy and Investment Framework	<b>HSDP</b>	Health Sector Development Program
<b>AWD</b>	Acute Watery Diarrhea	<b>IWA</b>	International Water Association
<b>CBOs</b>	Community Based Organizations	<b>JMP</b>	Joint Monitoring Program
<b>CESDWS</b>	Compulsory Ethiopian Standard Drinking Water Specification	<b>MDG</b>	Millennium Development Goals
<b>COWASH</b>	Government of Finland Water Supply, Sanitation and Hygiene Program	<b>MSF-5</b>	Multi-Stakeholders' Forum- 5 <sup>th</sup>
<b>CR-WSPs</b>	Climate Resilient Water Safety Plans	<b>NGOs</b>	Non-Governmental Organizations
<b>CSOs</b>	Civil Society Organizations	<b>NWI</b>	National WASH Inventory
<b>EDHS</b>	Ethiopian Demographic and Health Survey	<b>OWNP</b>	One WASH National Program
<b>ESA</b>	Ethiopian Standards Authority	<b>PHEM</b>	Public Health Emergency and Management
<b>FDRE</b>	Federal Democratic Republic of Ethiopia	<b>PSNP</b>	Productive Safety Net Program
<b>FMHACA</b>	Food, Medicine, Healthcare Control Authority	<b>TVET</b>	Technical, Vocational Education and Training
<b>FMoA</b>	Federal Ministry of Agriculture	<b>UAP</b>	Universal Access Plan
<b>FMoE</b>	Federal Ministry of Education	<b>UNICEF</b>	United Nations Children's Fund
<b>FMoH</b>	Federal Ministry of Health	<b>WASHCO</b>	WASH Committee
<b>FMoWIE</b>	Federal Ministry of Water Resources, Irrigation and Energy	<b>WASH-MIS</b>	WASH management Information System
<b>GTP</b>	Growth and Transformation Plan	<b>WCO</b>	WASH Coordination Office
<b>HDAs</b>	Health Development Armies	<b>WHO</b>	World Health Organization
<b>HEP</b>	Health Extension Program/Package	<b>WHOIS</b>	WHO Information System
<b>HEWs</b>	Health Extension Workers	<b>WSDP</b>	Water Sector Development Program
		<b>WSSS</b>	Water Supply and Sanitation Services
		<b>WWT</b>	Woreda WASH Team

# **1** **CHAPTER** **1**

## **INTRODUCTION**





## 1.1. Background information

### 1.1.1 Geography, Climate and water resources potential

Ethiopia is located between 3-15° N latitude and 33-48° E longitude. The total surface area of the country is about 1.1 million Km<sup>2</sup>. The highland plateau that ranges between 2000-3000 meters above sea level is dissected by the Great Rift Valley and escarpments. It borders with Eritrea in the North, Djibouti and Somalia in the East, South Sudan and Sudan in the West and Kenya in the south.

There are three broad climatic zones in the country depending on the altitude. The Kolla or hot zone is found below at altitude of 1,500 meters above sea level (ASL), the Weyna Dega zone is between 1500 -2400 meters ASL and the Dega or highlands is 2500m ASL. The mean annual temperature ranges from 10-16 °C in the Dega zone, 16 -29°C in the Weyna Dega and 23-33°C in the Kolla zone. The mean annual rainfall in the highlands is about 500-2000 mm and 300 -700mm for the Weyna Dega zone (Berhane, 2006).

Ethiopia is characterized with high and ragged mountains, flat-topped plateaus, deep gorges, river valleys, and plains having 12 major river basins, with the capacity of annual surface water and ground water resources potential of about 122 Billion m<sup>3</sup> and 36 Bm<sup>3</sup>, respectively. (FMoWIE, 2014)

### 1.1.2. Climate change and its impacts on the water supply services

Water is a primary medium through which climate change influences earths' eco-system, and thus, the livelihood and wellbeing of the societies.

Ethiopia has one of the most complex and varied climate in the world due to its diverse geography resulting in drought and flood which has a direct negative impact on the quantity and quality of water for drinking, domestic use and agriculture. Furthermore, these impacts exacerbated water borne diseases prevalence and epidemics.

Increasing access to affordable and sustainable drinking water is central to building household resilience and reducing poverty and Ethiopia is on track to meet MDG goal target for drinking water supply (WHO/UNICEF JMP, 2013). However, existing water sources are under strain from increased demands for water services due to increasing population and climate change affecting both quality and quantity. In addition, studies have shown that many of the WASH services in developing countries including in Ethiopia are not resilient to climate change (WHO/DFID, Vision 2030).

Over the last five decades, the temperature in Ethiopia increased at about 0.37°c per decade. Though annual average precipitation for the same period over much of the country remained stable, it showed a 15-20% decreasing trend in the eastern and south eastern semi-arid and arid regions of the country with increased frequency of drought. On the other hand, other areas of the country had experienced increased precipitation, causing an increase in the frequency of flush and river floods in different parts of the country.

Ethiopia has been experiencing impacts of climate change related weather variability such major seasonal flush and river floods due to heavy rainfall events which have resulted in life and property losses in different zones of Oromia, Afar, Dire Dawa, Gambela, Amhara, and SNNP regions among communities living along Awash, Baro-Akobo, Blue Nile, Wabi-Shebele, and Omo-Gibe rivers. Flood events have also been identified as being one of the major risk factors for spread of diarrheal diseases such as acute watery diarrhea (AWD) in these regions due to microbial contamination of drinking water. Similarly, existing records have shown that the major drought events in 1983/1984 have affected more than 8 million people and have claimed many lives (NAPA 2007).

In addition, weather prediction made by WHO/DFID indicates (Vision 2030), average temperature and rainfall are likely to increase east African countries including Ethiopian highlands and, consequently, there might be increased frequency of extreme weather events such as flood and drought, which might pose negative impacts on water supplies.

Though predictions indicate the likelihood of occurrence of extreme weather events, most of the population rely on shallow ground water sources (hand dug and shallow boreholes) that are highly vulnerable to effects of

climate change. Furthermore, quality of the existing water sources is under threat as a result of poor sanitation, open defecation (exclusively practiced by 34% (WHO/UNICEF 2014) of the population), and intensive use of fertilizers.

It is to be noted that existing shallow water wells and springs are vulnerable to microbial contamination due to runoff during rainy seasons in flood prone and water logged areas. On the other hand, shallow ground water sources in arid and semi-arid areas most frequently suffer from lowering of the water table, decreased discharge rate (quantity) and drying due to high temperature and evapo-transpiration.

In addition, utilities are aware of the impact of climate change and have noticed its current and potential impacts on the urban water supply systems. Reportedly, algal blooming and eutrophication of the raw water sources, which are associated with increased temperature and pollution, are being identified to be one of the major problems of Adama and Zway water treatment plants in Oromia region (personal communication with Oromia Water Resources and Energy Bureau).

In general, the urban and rural water supplies are exposed to effects of climate change which compromises sustainability of the services. Therefore, adoption of the climate resilient water safety plan approach to both urban and rural water supplies can ensure safety and sustainability of the drinking water supplies.

### 1.1.3 Access to safe water supplies

Among other services, drinking water supply has been given due attention being one of the essentials for health, welfare and livelihood of Ethiopian population. In addition, it is well understood that increased access and improved water supply services contribute to higher level of school achievement and, consequently, to improved economic productivity. Based on the policy frameworks, the Ethiopian government has developed Water Sector Development Plan (WSDP) and Universal Access Plan (UAP-2), and it has been implementing these frameworks to increase urban and rural communities' access to safe drinking water supply services.

According to the National WASH Inventory Report (NWI 2012), the overall drinking water supply coverage has achieved 68.4% with an average per capita conception liter per person per day. The coverage level varies between urban 74.64% and rural 48.85% and between regions of the country. The main sources of drinking water for most of the urban communities include treated surface water and deep boreholes distributed with conventional water supply systems which are managed by urban utilities. Whereas, the main water supply for communities of rural areas and some of the small towns and schools include deep and shallow boreholes, spot and gravity springs and hand dug wells fitted with hand pumps which are managed by communities. Yet, too many people, 31.6%, exclusively depend on unsafe water for drinking and domestic use from unimproved sources such as rivers, unprotected springs, open hand dug wells (self-supply) and ponds.

In Ethiopia, there are established systems for operation and management of urban and rural water supplies aimed at ensuring continuous supply of water to the community taking environmental, financial, and economic sustainability into consideration. Urban water supply systems are managed by legally established boards/water supply and sewerage services (WSSS) staffed by technical and support personnel with technical and management support from regional water resource bureaus, zonal and woreda water resources offices. In rural areas, operation and management of the community water supply schemes is the responsibility of Water Supply, Sanitation and Hygiene Committee (WASH Com) and by rural WASH boards democratically elected by the users.

Despite the presence of such institutional arrangements across all areas in the country, 20% of the community managed water supply schemes are not operating consistently throughout the year (FDRE GTP 2011). The existing operation and maintenance practices are reactive and are exercised after the supply system breaks and stop providing services, and the system may be maintained and operational depending on the availability of materials and capacity of the operators. In most of the cases, system remains dysfunctional over long period of time (NWI 2012) due to various reasons including; lack of ownership due to inadequate community involvement/participation during system development, lack of spare parts supply chain, poor operation and maintenance likely due to lack of capacity, availability of the alternative unsafe sources, system abandonment as a result of floods, drought (dry up) and increased concentration of geo-chemicals (fluoride), etc.



#### 1.1.4 Status of drinking water quality

To ensure safety of water for drinking and domestic uses, the Ethiopian government took a number of actions including setting standard values for microbiological and physico-chemical quality of water (CESDWS 2013), and undergone a number of capacity building activities. These, among others, include: national water quality assessment (FMOH 2010), training of health and water professionals at national, regional/zonal and woreda on water quality monitoring and surveillance, supply of portable water quality testing kits and development of the draft strategic plan to continuously monitor quality of drinking water based on the standard guidelines (FMOH 2011) in collaboration with WHO, and participation of UNICEF and World Bank Ethiopia Country offices.

According to rapid drinking water quality assessment (WHO/UNICEF 2010), about one-third of 1,602 tested water samples (32%) from improved sources did not comply the national and WHO standards for microbiological quality. The problem is more severe among samples collected/tested from the community managed boreholes, protected springs and hand dug wells fitted with hand pumps compared to piped systems. Furthermore, studies conducted by the FMOH with the support of UNICEF and WHO in 2013 indicated that high concentration of fluoride above permissible upper limit (1.5 mg/L) is detected from a number of rural and urban water supply sources in the rift valley Woredas of Oromia, SNNPR, Somali and Afar Regions (FMOH 2013). In general, despite efforts made by the government and partner organizations to ensure safety of drinking water, it remains a major problem and needs appropriate response through water safety plan approach to ensure microbiological and chemical quality of drinking water in a sustainable manner. In addition, results of different ad hoc studies conducted in the country show similar findings that contamination occurs at either of points in the water supply systems.

#### 1.1.5 Burden of WASH attributable diseases

Communicable diseases associated with drinking of unsafe water, inadequate sanitation and poor hygiene such as diarrheal diseases, intestinal parasitic infection, and trachoma remain the most prevailing public health problems in the country and are among the ten top leading causes of morbidities. Between the years 2006-2011, there was an outbreak of acute watery diarrhea (AWD) in Ethiopia which resulted in a number of morbidities and deaths in different parts of the country. Even though there observed a declining trend in infant and child mortality over the past 15 years (EDHS 2000, 2005 and 2011), yet diarrheal diseases remain the third leading causes of under-five mortality in the country accounting for 19.97% of all deaths (WHO, 2013). A similar finding is reported by the demographic and health survey also confirms that 17% of childhood deaths are associated with diarrhea (EDHS 2011). Risk assessments of AWD outbreaks have identified that contamination of water supply sources due to poor operation and maintenance, unsafe water storage practices at household level and inadequate sanitation and poor hygiene were among other responsible associated factors including institutional, environmental and behavioral factors.

In addition, more than eight million populations in rift valley Woredas of Ethiopia are affected with dental and skeletal fluorosis mainly due to high concentration of fluoride in drinking water sources above the national water quality standard specification, 1.5mg/L (CESDWS 2013) (FMOH 2013). Studies conducted in the central rift valley areas have also indicated that daily fluoride intake per person ranging from 4mg to 54 mg which is above the WHO recommendation (R. Tewodros, and et al, 2012; D. Meseret and Z. Feleke, 2013).

### 1.2 Rational for development of WSP for Ethiopia

Public health challenges attributable to poor quality of drinking water supply remain pressing issue. Empirical evidence generated from reviews of intervention studies in developing countries have shown benefits of improved water quality in reducing childhood diarrheal disease morbidity by 31% (Fewtrell L., and et al, 2005). Evidences from rapid water quality assessment and ad hoc studies in the country have shown presence of bacteriological water quality problem both at source and point of use (WHO/UNICEF 2010).

The poor quality status of drinking water attracted government and of the WASH development partners to bring the water quality issue upfront for discussion on MSF-5 and reached consensus to develop national

strategic framework for water safety plans so as to address the above mentioned challenges.

Furthermore, the project on building adaptation to climate change in health in least developed countries through resilient WASH with the financial support of DFID and technical support of World Health Organization identified climate resilient WSP as one of the outputs. Thus, the development of this strategic framework responds to challenges of drinking water supply sustainability and contributes to the above project output.

### 1.3 Overview of WSP

#### 1.3.1 Evolution of water quality monitoring and WSP global practices

Drinking-water suppliers are usually required to verify that the quality of water supplied to consumers meets specific numerical standards set by the national standard and quality authority. Yet, by the time tests are completed and results indicate the water is not safe to drink; thousands of people may have already consumed the water and become sick. Notification comes too late. Moreover, even with frequent monitoring, the vast majority of water distributed to consumers will never be tested. Therefore, an over reliance on so called end-of-pipe monitoring only through laboratory quality testing is both inadequate and can be expensive. Furthermore, this challenge is exacerbated in developing countries with nonexistence of end-of-pipe monitoring due to its expensiveness, requiring well functional laboratories and human capacity. Thus, most of the time ad hoc testing is conducted following outbreak of water- borne diseases.

For these reasons, the WHO Guidelines for Drinking-water Quality 3<sup>rd</sup> and 4<sup>th</sup> Edition and the International Water Association (IWA) Bonn Charter recommend pro-active efforts to reduce risks and prevent contamination before water reaches the consumer. This can be achieved by shifting emphasis of drinking-water quality management to a holistic risk-based approach called Water Safety Plans (WSPs) that covers catchment-to-consumers. The WHO Guidelines also place WSPs within a larger “framework for safe drinking-water” that includes the public health context and health outcomes and also contains health-based targets and drinking water quality (WHO 2011). Widespread implementation of WSPs can contribute to reducing the portion of the global disease burden attributed to poor drinking-water and inadequate sanitation and hygiene. Benefits of Water Safety Plan beyond reducing the portion of the global disease burden can be summarized into the following four major categories (WHO and IWA 2010):

**Decision-making framework for all stakeholders:** WSP approach allows for appropriate institutions to work together to make well-informed decisions related to the strategic, financial, operational and legal aspects of drinking-water quality management. Such stakeholder cooperation that is an implicit part of CR-WSPs, for example, facilitates the identification of appropriate barriers to contamination that does not overly focus on expensive treatment processes, but rather considers a range of options that may result in improved raw water quality and maintenance of quality post-treatment.

**Enhancing existing practice for water suppliers:** Some components of a WSP – such as the establishment of standard operating procedures – are common practice to many water suppliers; however they are often developed in isolation without consulting key stakeholders or considering the entire water supply chain from catchment-to-consumer. Furthermore, formal documentation and clear allocation of responsibilities of such procedures are sometimes lacking. Implementation of CR-WSPs can help a water supplier to establish more efficient operational procedures, respond quicker to incidences and improve knowledge management of the entire water supply system.

**Practice-oriented standards and regulations to better protect public health:** Incorporating the WSP approach into policies, legislations and regulations can complement existing standards and regulations which specify microbial, chemical and physical parameters for drinking-water quality. Such a shift in standards or regulations will require an appropriate surveillance agency to not only monitor against numerical standards but also audit drinking-water quality management practices to ensure compliance. In contrast to traditional monitoring, the WSP approach enables feedback to ensure that the water supplier’s ability to manage risks to human health continuously improves. It also provides a more certain indication that the supplied water is indeed safe.





**Informing capital investment requirements:** Implementation of WSPs will include the production of an investment/upgrade plan. Such a plan will identify short, medium and long-term improvement needs which can include upgrading existing water supply systems to ensure drinking water quality is not compromised due to inadequate infrastructure. As this identification is based on a robust risk assessment of the system, it provides a reliable means for governments, donor agencies and international financing institutes to better maximize capital investments

WSPs approach follows series steps as the most effective means of consistently ensuring the safety of a drinking-water supply. WSPs require risk assessment encompassing all steps in water supply from catchment to consumer, following implementation and monitoring of risk management control measures through continuous cycle. It also applies to all types of water supply systems including utility managed piped water supplies and community managed rural water supplies. Climate Resilient WSPs should be implemented within a public health context, responding to clear health-based targets and quality-check through independent surveillance.

### 1.3.2 Ethiopia Water Quality and Safety related policies and WSPs initiatives

#### Constitution of the Federal Democratic Republic of Ethiopia (FDRE)

As a groundwork for Climate Resilient Water Safety Plan Strategy Framework development existing policy documents were reviewed including water resource management policy, health sector policy, environmental protection policies and related legislations so as to identify the extent to which these documents set ground for Climate resilient water safety Plans.

The Federal Democratic Republic of Ethiopia (FDRE) is committed to safeguard health and wellbeing of its population by establishing a number of policies, strategies, legislatives and institutional arrangements for policy implementation with clear mandates, roles and responsibilities. The commitments of the FDRE started by giving due consideration on the importance of healthy and safe environment for the citizens (Article 44:2). Based on the constitution different policies and legislations are developed to prohibit malpractices that alter conditions of the environments where people live in, including sources of water for drinking and domestic use, food, etc., to safeguard health of the citizens.

#### The FDRE Water Resources Management Policy (1999)

The FDRE water sector policy and water sector development of the Federal Ministry of Water, Irrigation and Energy (FMoWIE) has been implemented to ensure access to sufficient water of adequate quantity and acceptable quality to satisfy basic human needs and give due emphasis to development and quality of the domestic water supply and sanitation services.

Among other elements of the water resource management policy, development of water quality standards, guidelines and ensuring its implementation addresses creation of appropriate mechanisms to protect the water resources of the country from pollution and depletion. This, in turn, helps to maintain sustainable development and utilization of water resources by setting legal limits to control indiscriminate discharge of pollutants and development of appropriate national water pollution prevention and control strategies as prominent government commitments to ensure safety of water for domestic use.

The water resource management policy also ensures watershed management practices as one of its integral parts so as to maintain sustainable development and utilization of water resources, and safe water management from source to point of use. It is to be noted that, the water sector policy provides clear direction for maintaining yield and quality through watershed management which is part of the water safety plan. Moreover, to safeguard ground water from depletion and ensure its safety, the Ethiopian government promulgated the regulation to be respected by all sectors involved in ground water abstraction for drinking, agriculture and industrial purposes (The Ethiopian Councils of Ministers Regulation on Water Resources Management No. 115/2005 Article 16 testing of ground water quality and Article 17).

### The FDRE Health Policy (1993) and related Strategies

At the very beginning, the health policy of the FDRE acknowledges lack/inadequate environmental sanitation, poor personal hygiene, inadequate nutrition, and lack of awareness about health are identified to be the major determinants for majority of prevailing communicable diseases. To address these problems, the Federal Ministry of Health (FMOH) has developed and been implementing different disease prevention and health promotion strategies such as Health Sector Development Plan (HSDP), Hygiene and Sanitation Strategy, Water Quality Monitoring and Surveillance Strategy and corresponding programs and plans.

The national hygiene and sanitation strategy and action plan for 2011-2015 has incorporated the need to ensure quality of water for drinking and domestic use and set target to be achieved by the end of the plan period. In addition, the national drinking water quality monitoring and surveillance strategy (May 2011) has been developed as an integral element of the HSDP and promotes health and prevent disease transmission through promotion of safe water from source to point of use as one of initiative in its integral part of health extension program at community and household level. The strategy clearly identified the need for strengthening of the system for monitoring of drinking water quality on a regular basis and has described roles and responsibilities of the FMOH (supply agency) and the FMOH (surveillance agency) at all levels and the mechanisms how both agencies work together so as to ensure safety of drinking water from source to point of consumption through employing multiple barrier approaches.

### The FDRE, Agriculture Sector Policy and Investment Framework (ASPIF-2010)

The Federal Agricultural Sector Policy and Investment Framework (ASPIF 2010-2020) give due consideration for sustainable and productive use and management of natural resources including land and water resources. Conservation and efficient use of water resources through watershed management initiatives are stated in the policy to ensure availability and sustainable supply of water for agricultural production. The Agricultural sector policy and ASPIF believed to have contribution to water safety plan as management of the watershed of the drinking water sources is an important component of the WSP. The ASPIF identified climate change as one of the current and future challenges to the farmers and pastoral areas in Ethiopia. The existing situation indicates drier areas become hotter and arid which might result in increased frequencies of climate related extreme events including droughts which consequently result in depletion of drinking water sources and could result in deterioration of chemical quality of water including increased concentration of fluoride in the rift valley areas of the country due to increased evaporation.

### The FRDE National climate change Adaptation Program of Action (NAPA 2007)

The National climate change Adaptation Program of Action which is jointly developed by the National Meteorology Agency (NMA) and the FMOH, with the involvement of different sector ministries and support from Global Climate Facility (GCF) and United nations Development Program (UNDP), has identified that agriculture, water and health sectors are mostly vulnerable to climate change variability mainly by flood and drought (FDRE NAPA 2007). Recurrent drought, floods, and water pollution, in general, are identified being one of the problems that affect millions of people in Ethiopia year after year. The program (NAPA) is coordinated by the NMA and the priority projects are implemented by different sector ministries including, agriculture, health, water, environment and forestry, and the NAM.

The following climate adaptation options that are relevant to ensure quality and quantities of water are identified in the NAPA document includes: water resource mapping including inventory of water quality and quantity mapping; introduction of water quality monitoring; improving under-ground water resource potential, and promotion of hygiene and environmental health among other relevant climate change adaptation options; introduction of integrated watershed management to abate erosion and siltation of water bodies; regulation and prevention of discharge of domestic and industrial wastes (organic and chemical pollutants) that cause hazards from entering water bodies; sectoral capacity building; and public awareness creation on climate change etc. Even though, the aforementioned adaptation activities directly and indirectly contribute to the reduction of the impacts of climate change on the drinking water sources, the program action plan did not identify improved access to drinking water being one of the top priority projects.





### 1.3.3. Analysis of and Institutional Arrangement

In order to realize the above commitment the Government of the FDRE, there are established institutional arrangements which can be classified into seven categories: (i) government (Federal, Regional, Woreda level, water utility management board and Water Committee (WASHCO); (ii) mass organizations including CBOs; (iii) private institutions; (iv) civil society organizations (CSOs), and (v) donors (bilateral/multilateral); and UN agencies. The role of these institutions and their expected synergy is highlighted in the ONE WASH Program (OWNP) of the Country. Multilateral and bilateral donors are recognized as essential development partners in the execution of policies and strategies, while CSOs are stakeholders and implementing bodies working in line with FDRE policies and strategies. Private sector organizations are also stakeholders and beneficiaries of the ONE WASH Program.

Direct provision of safe water supply to the citizen of Ethiopia is managed by FMoWIE and the regional water bureaus through urban water supply utilities. Development, operation and management of the urban water supplies is the responsibility of the urban water supply and sewerage services (UWSSS) with technical and management support from respective regional water resource bureaus. The UWSSS is responsible to supply safe water to the households, private, government and nongovernmental organizations based on tariff policy set by the government.

As a supplier the UWSSS treat raw water (based on the type of source), and regularly check / monitor mainly the microbiological quality and residual chlorine level of the water before distribution to the public. For validation purposes, the respective regional water resources bureaus (RWRIEB) have an institutional set up (water quality testing laboratories), and periodically check the quality against the national standard water quality standard specification and advise the UWSSS for possible corrective measures to be taken in case of non compliance is detected.

Drinking water supplies in rural areas are managed by WASH Committees (WASHCOM) elected by the users. In some rural communities where a water supply scheme serving a number of communities (like gravity springs), management of the system is carried out by the rural WASH boards which is democratically elected from the WASH committees.

On the other hand, Water quality surveillance /verification and surveillance is the responsibility of FMoH through its legally established institutional arrangements; namely, Food, Medicine Health Administrative and Control Authority (FMHACA) at national level, the regional health bureaus (regulatory unit) and regional and sub-regional public health laboratories, and the woreda health offices. In addition, promotion of the safe water storage at household is one of the routine activities of the health extension program.

### 1.3.4. Coordination Mechanism for WASH in Ethiopia

Ethiopia endorsed ONE WASH Program September 2013 which is a road to sector wide approach facilitating better integration, harmonization, alignment and partnership to be implemented by WASH Coordination Office coordinating four sector ministries namely: Ministry of Water, Irrigation, Ministry of Health, Ministry of Education and Ministry of Finance and Economic Development and supported by development partners. ONE WASH National Program is divided into two phases (Phase I until end of 2015 and Phase II 2016-2020). Among, the major components of this program, sustainability and reliability of water supply services' rehabilitation, post construction support, catchment management/environmental safeguard, water quality monitoring, program management and capacity building were identified and an earmarked budget is allocated to environmental sustainability of the drinking water sources.

### 1.3.5 The status of the water quality and safety monitoring initiatives in Ethiopia

The Compulsory Ethiopian Standard Drinking water specification (CESDWS 2013) was as issued in 2013 covering microbiological and physicochemical parameters. However, in Ethiopia, systematic and comprehensive water quality assessment is lacking. Around 12 institutions are involved in water quality activities including the Federal Ministry of Water, Irrigation and Energy (FMoWIE) and Ministry of Health (FMoH). Nonetheless, continuous and comprehensive water quality monitoring and a surveillance activity have not been undertaken

by these organizations and institutions, and, therefore, do not provide information whether safe water chain is maintained from source to the point of consumption.

Therefore, there is a need to ensure safety of the drinking water from its source to point of consumption by employing a systematic assessment of the whole system to identify existing problems and to take corrective actions followed by testing of the quality of water to verify/validate whether it meets the national water quality standard specification.

Taking these facts into consideration, the Water Supply, Sanitation and Hygiene (WASH) sector collaborated with development partners to conduct the Joint Technical Review on Water Quality and Safety in Oromia Regional State, Ethiopia in May 2012 as a base to see the implementation status of policies and strategies on drink water quality and safety monitoring. The major identified gaps were associated with various reasons including capacity gaps at all levels, weak coordination between sectors at all levels, and lack of financial and material resources. This issue was presented on the 5<sup>th</sup> WASH multi-stakeholders' forum (MSF-5, Nov 2012) and considered Water Safety Plan as one the five major undertakings to be implemented in Ethiopia.

Under the Water Safety Plan undertaking, the following major activities were identified to be implemented by government and development partners: development of water and sanitation safety framework, capacity building, development of guidelines, standards and procedures and establish a system for water and improved sanitation safety management for Ethiopia; prepare national level plan to support regions on water and improved sanitation safety management including linkages of activities between FMoWIE, FMoH, FMoE, regional bureaus and the regulator include: the water and improved sanitation safety management in the region work plans supported by budget, activity and time line, increased involvement of development partners (donors, CSOs and private sector) in water and improved sanitation safety development as part of on-going WASH sector support in terms of budget and capacity building and piloting risk based management of water quality and safety in utilities and small community water supply.

Following the above undertakings, Water Safety Plan trainings were conducted with the support of partners such as COWASH, German Agro-Action and Help for Drop of Water in collaboration with WHO Ethiopia. Over 80 participants were attending the training, having public health and engineering background both from health and water sectors. For the first time in Ethiopia, pilot Water Safety Plan was started in 2013 in Oromia, Tigray and Amhara regions with rural/ community water supplies. Furthermore, recently capacity building training was provided with the support of WHO Geneva capacity building training for implementation of building adaptation to climate change in health in least developed countries through resilient WASH for 25 participants from government sectors and development partners. The training focused on how to conduct vulnerability and adaptation assessment, climate resilient water safety plans and disaster risk assessment.

### 1.3.6 Challenges related to ensuring safety of drinking water in Ethiopia

There is no doubt that Ethiopia has been successful in providing access to basic water supply services and on track to meet MDG targets. Under the universal access plan (UAP-2), Ethiopia made good progress in terms of coverage. The challenge now is how to provide higher levels of service with systems that provide good quality drinking water to a growing population in a sustainable manner.

The root causes of these challenges are likely due to rapid rate of population growth, backsliding of coverage achieved due to weak operation and maintenance, poor management of agricultural and industrial wastes and due to lowering of deep boreholes water tables and drying of shallow wells in drought affected areas and water infrastructure damaged in flood prone areas. The following summary presents major challenges in Ethiopia related to water quality and safety:

- Limited adaptive capacity of the utility and WASH committee managed water supply systems to actual and predicted climate changes. Repair of infrastructure damaged by flood may take more than a year owing to the fact that the operators have no technical and financial capacity. In addition, flooding may cause contamination of the small sources (springs and shallow wells).
- In drought affected areas like Somali and Afar Regions, and some zones in Oromia, SNNPR, and Tigray



Regions, people suffer from water shortage during dry seasons and are forced to rely on seasonal water tracking

- Other economic activities such as demand of land and water (uphill of the drinking water sources) for agriculture have a direct negative effect on the availability and microbial, chemical and physical quality of water for drinking and may end up with disruption of the water supply
- Use of alternative water sources (private ponds, hand dug wells, vendors during supply interruption) and simultaneous use of multiple water sources
- Use of the same storage container for water collected from safe sources and unsafe sources
- Lack of data/information on the layout of the water supply distribution systems and pipe networks (old systems)
- Urban utilities managed water supply systems are not resilient as a result of excessive leakage and intermittent supply
- Increased informal urban settlements and street dwellers with no water supply and sanitation services
- Lack of knowhow and skills on how to use HH water treatment technologies and effectiveness of the technologies in different climates
- Community managed rural water supplies experience frequent failure (high down time) due to lack of adequate operation and maintenance and consequently prone to contamination.
- Existing household latrine infrastructure and road side public latrines in ODF communities/Kebeles are not climate resilient (mostly latrine for one rainy season), public latrines are in poor operation and maintenance. In addition, open defecation is widely practiced in most urban and rural areas of the country increasing risk of soil, ground and surface water contamination and remains potential health hazards

Furthermore, likelihood of microbiological contamination of the drinking water source and in the household is very high due to lack of adequate sanitation facilities and poor hygiene practices both in urban and rural communities. As a result, diseases associated with unsafe water and poor sanitation/hygiene remains in ten top leading causes of morbidities.

In addition, population in the rift valley areas (more than 10% of total population) suffer from health problems associated with use of chemically unsafe drinking water. The main sources of water in these areas are deeper boreholes with high concentration of fluoride far above permissible limits (1.5mg/l), and concentration of fluoride is more exacerbated as temperature increase in drought prone areas

Regular water quality monitoring and surveillance is not conducted particularly among community managed rural water supplies due to high focus to increasing communities' access to improved water sources than ensuring quality, lack of capacity at Woreda level due to shortage of skilled professionals and high turnover of trained staff, shortage of water quality testing equipment and supplies, and lack of budget and transport to reach out to the remote communities.

Water quality monitoring of the utility managed urban water supplies is limited to testing of water samples collected from end points, which does not cover the whole system including point-of use. Existing practices, therefore, do not provide information whether or not safe water chain is maintained at the point of consumption. Furthermore, utilities have no capacity and resources to treat/remove toxic and heavy metals entering the drinking water sources through runoff.

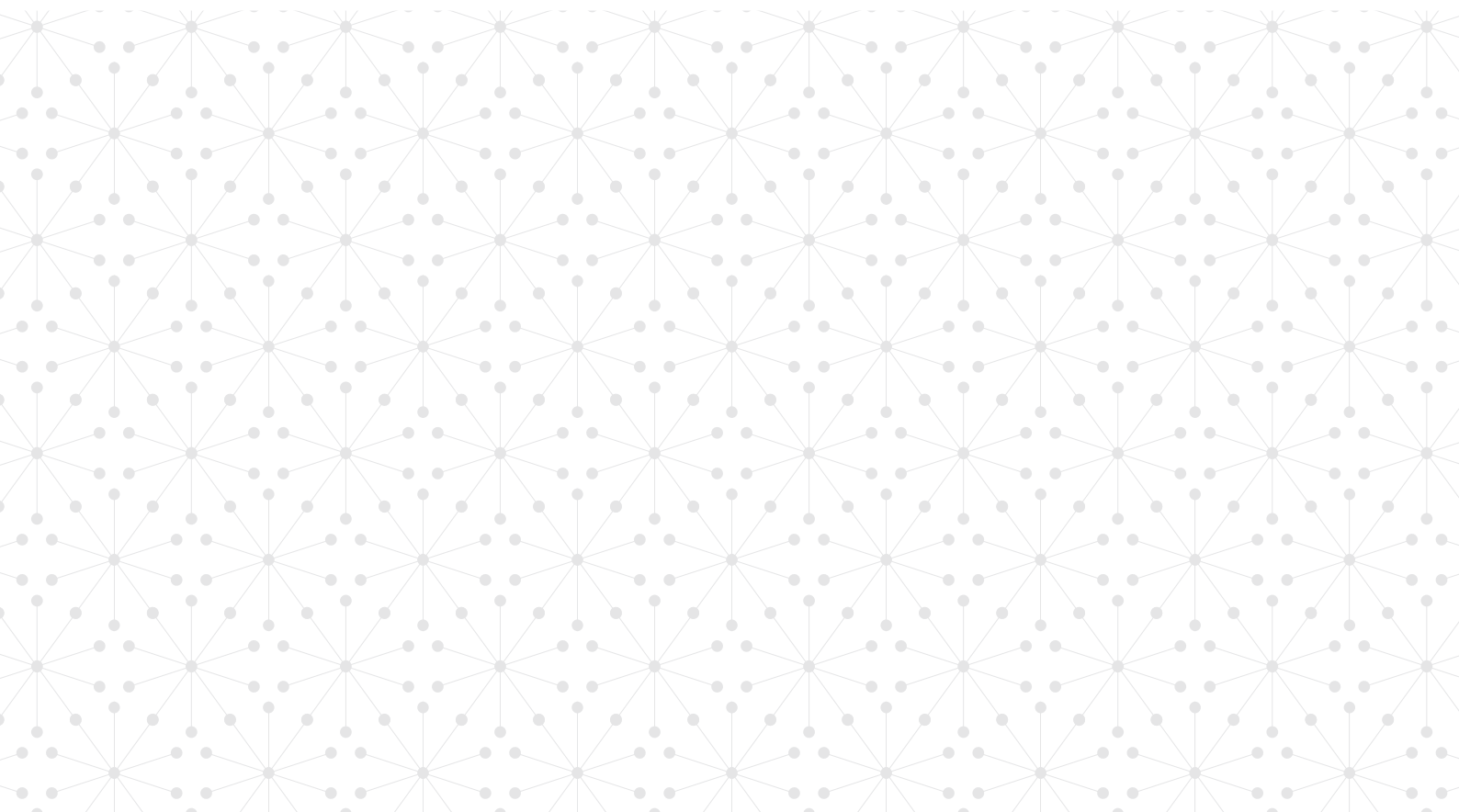
In addition, there are management related challenges including weak enforcement of the water quality standards, weak provider/supplier accountability and weak inter-sectoral coordination, poor operation and maintenance, lack of financial capacity and technical skills to independently manage and operate water supply schemes, and inadequate awareness amongst majority of the population about the importance of safe water and that the drinking water sources are finite natural resources.

# 2

**CHAPTER**

# 2

## **VISION, GOAL, SCOPE AND STRATEGIC OBJECTIVE**



## 2.1 Vision, Goal and Scope

**Vision:** To contribute to Government of Ethiopia's economic growth vision to become a middle income country by 2025 through facilitation of implementation of Climate Resilient Water Safety Plans in order to eliminate impacts of climate change on the safety of water which contribute to realization of a healthy, productive and prosperous society.

**Vision:** To contribute to Government of Ethiopia's economic growth vision to become a middle income country by 2025 through enhancement of the capacities of the drinking water supply systems for implementation of Water Safety Plans including risks due to climate change.

**Goal:** The goal of this strategy framework is to guide the development and implementation of Water Safety Plans aimed at improvements of each step of the water safety plans so as to enable provision of safe and adequate drinking water which has the trust of the consumers and meet health-based water quality target.

## 2.2 Strategic Objective of National Climate Resilient Water Safety Plans Strategy Framework

In order to achieve the above goal the following five strategic objectives are set in this strategic framework:

- I. Enhance a sustainability of safe drinking water supply systems through implementation of the risk based management and multiple barrier approach
- II. Enhance all drinking water supply systems in the country to meet the national compulsory standard drinking water specification and be a country with a water supply system implementing health-based target in line with the national compulsory drinking water standard specification (CESDWS 2013)
- III. Strengthen water quality monitoring and surveillance capacity of the supplier, regulatory and the independent surveillance agency
- IV. Guide the adoption of climate resilient WSP approach as major component of the drinking water supply plans, programs and investment of the WASH sector
- V. Strengthen capability of the urban utilities and rural WASH committees and boards to develop, implement, and monitor climate risks and variability to the drinking water sources and be able to manage water supplies during normal and emergency conditions.

## 2.3 Scope

The scope of the strategy framework covers water utility (city, small and medium town) and rural community managed drinking water supply from catchment to point of use including the water supply system and household (Table 1).

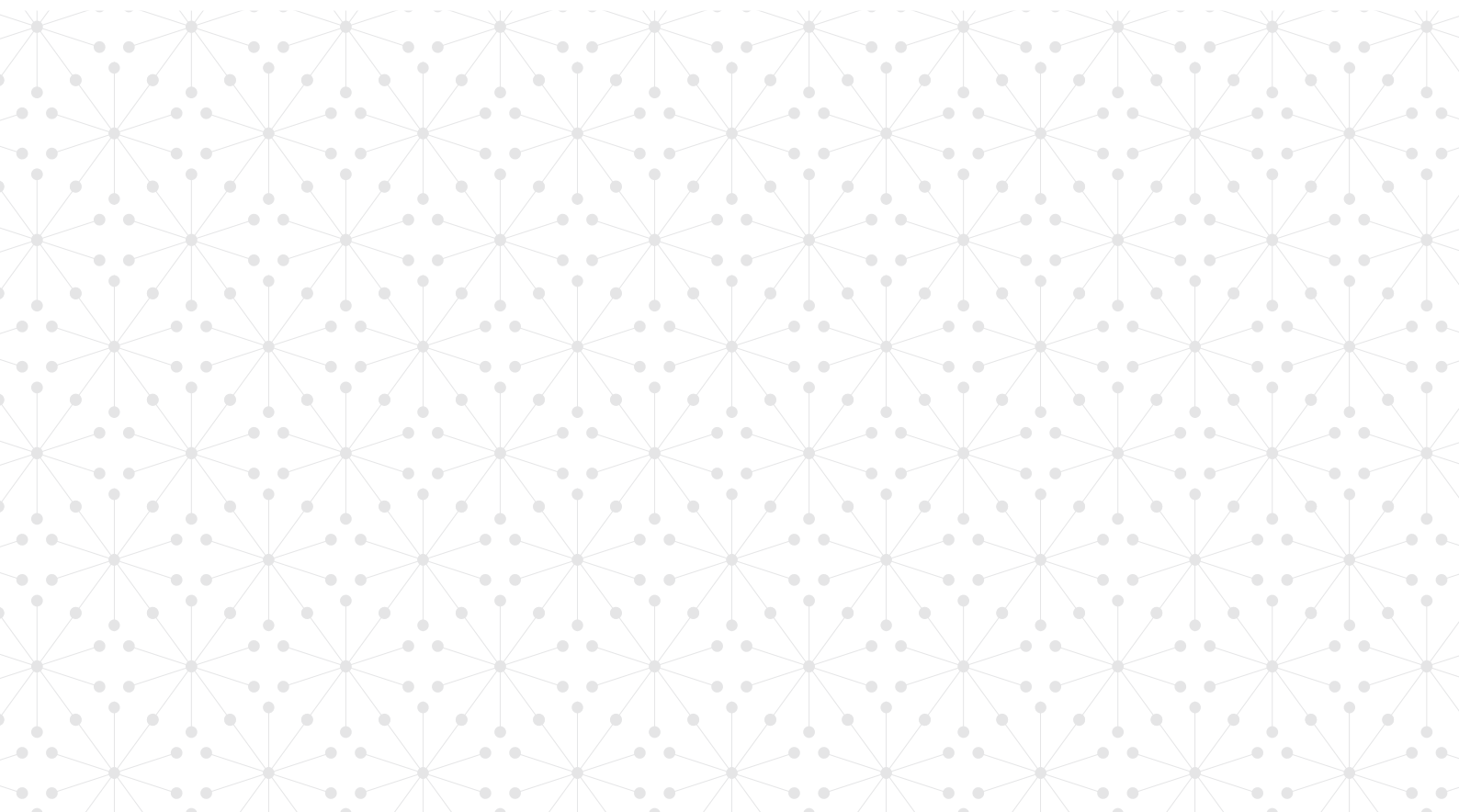
Table 1: Description of the scope the water supply schemes

Services	Type	Sources/catchment	Level	Institutions responsible for operation and management	Remarks
Urban utilities	Conventional water supply system with both public fountain and household connections	Deep well from single and multiple watershed	Small town	Legally mandated small towns water boards, and operation and maintenance management	90% of water supply coverage. Small towns with population greater than 2000
		Deep well from single and multiple watershed	Medium	Legally mandated medium town water Boards, and operation and maintenance management	Zonal and woreda capital towns
		Deep well, surface water from single and multiple watershed	Big	Manage water supply and sewerage systems	Addis Ababa, regional capital towns = 10% conventional water treatment system
Small community/ rural water supply	Point source: direct collection from the point,	Hand dug and shallow wells fitted with hand pumps, spot springs, and rain water harvesting	Small	Managed by WASH com and schools/health facilities	
	Public fountains and household connections	Gravity feed springs, motorized scheme (deep well)	Medium	Managed by WASH com and rural water boards	

# 2

**CHAPTER**

## **DIRECTIONS FOR CLIMATE RESILIENT WSP STRATEGIC FRAMEWORK**





A revised resolution adopted The Right to Water (2010) calling on states and international organizations to provide financial resources, build capacity and transfer technology, particularly to developing countries, in scaling up efforts to provide safe, clean, accessible and affordable drinking water and sanitation for all. Although better health protection is reason in its own right for the adoption of strategies to improve drinking-water quality, the objectives of water safety plans are to ensure safe drinking-water through risk assessment and management approach to ensure good water supply system practices which include: (I) manage catchment for reliable yield and good water quality, (II) address climate risks related to water quantity and quality, prevent contamination of source waters (III) treat the water to reduce or remove contamination that could be present to the extent necessary to meet the water quality targets, (IV) prevent re-contamination during storage, distribution and handling of drinking-water; and, (V) operate and maintain sustainably. Thus, the strategic directions addressed in this document are five WSPs stages/with 10 steps aimed at facilitating the realization of CR-WSPs implementation, so as to enable the water supply system in the provision of safety water supply which meet the national water quality target.

### **3.1 Steps of the Climate Resilient Water Safety Plans**

CR-WSPs is a way to ensure safe drinking-water by knowing the system thoroughly, identifying where and how problems could arise, putting barriers and management systems in place to stop the problems before they happen, making sure all parts of the system work properly. This can be achieved through a comprehensive risk assessment and risk management approach that encompasses all steps in water supply from catchment to consumer. It also fits within a framework for safe drinking-water which is health-driven target. The WSP steps will provide a framework to identify hazards and hazardous events including climate related vulnerabilities and risks to water supply systems; identify priority control measures, and development and implementation of improvement actions.

#### **3.1.1 Preparation**

For success of CR-WSPs, preparation is very important which includes establishment of the technical working /support group composed of senior/experienced professions from different sectors likely concerned with water supply system from catchment to point of use at national, regional/sub-regional and woreda levels followed by the formation of the WSP team with engagement of senior management and identifying required expertise lead by team leader with defined time frame, role and responsibilities. These will facilitate to own and lead WSP development and implementation efforts and to advocate the approach to those connected with the safety of the water supply and related climate issues.

#### **3.1.2 System Assessment**

Once responsible team is in place with senior management support, the next step the team will describe the water supply system, identify the hazards and assess the risks from catchment to point of use. The WHO and International Water Association (IWA) Water Safety Plan manual for CR-WSPs will be contextualized to the Ethiopian context and incorporates climate resilience in the implementation guidelines to be developed.

#### **3.1.3 Monitoring**

During planning, control measures will be determined and validated followed by reassessment and prioritization of risks. Once risk is prioritized, control measures will be developed, implemented, maintained, and improved through reassessment of the risks.

Defining monitoring of control measures and verifying the effectiveness of the WSP implementation are integral parts whereby control measures applied to prioritized risk factors are evaluated using WSP quality assurance tool. Monitoring defines the limits of acceptable performance and how these are monitored. Verification is the application of methods, procedures, tests and other evaluations to determine compliance with the WSP. Verification confirms that the water quality targets are being met and maintained and that the system as a whole is operating safely and the WSP is functioning effectively.



Surveillance and verification of WSP implementation will be performed by health sector and independent audit, respectively. Surveillance is aimed at protection of public health by promoting improvement of the quality, quantity, coverage, affordability, and continuity of water supplies and is complementary to the quality control function of the drinking water supply agency. In the context of this strategy framework surveillance will address all steps of CR-WSPs, in order to ensure that water supply is of acceptable quality and meets pre-determined health-based and other performance targets. Since surveillance will be implemented by the health sector, it will facilitate collaboration between water provider and feedback mechanism.

#### 3.1.4 Management and Communication

Effective CR-WSPs implementation at water supply schemes level heavily depend on supporting programs which include existing staff refresher training and continuing education at operational, medium and high levels, organizational culture, hygiene and sanitation, research, equipment upgrade and maintenance. Furthermore, standard operational management procedures define the actions to be taken during normal operational conditions and emergency operational conditions and communication procedures should detail the steps to follow in specific “incident” situations (corrective actions) when critical limits are exceeded.

#### 3.1.5 Feedback and Improvement

Review of CR-WSPs implementation is a major mechanism to be used for feedback which includes regular monitoring, near miss incident, new procedures and training followed by WSP revision including upgrade plan of the water supply system.

### 3.2 Advocacy, Capacity Building and Institutional Arrangement

#### 3.2.1 Advocacy for CR-WSP

The main purpose of the advocacy work is to create clear understanding about the benefits of CR-WSP approach among decision makers, development partners, universities, water supply service providers, and the users at national, regional, woreda, and utility and Kebele levels using level specific communication tools.

To get WSP approach buy-in by the policy makers, organizing advocacy workshops and conferences to adequately communicate multiple benefits of adopting CR-WSP approach from the view points of public health improvement through ensuring water supply improvements in operational efficiency and performances of the utilities/suppliers, and its benefit in strengthening coordination/integration between different sectors and water supply management information systems. Arranging an exposure visit for national and regional level decision makers to countries with best experience could increase acceptability of the approach.

Furthermore, creation of better understanding among professionals can be achieved through capacity building trainings, engaging them in all stages of CR-WSP development processes, review meetings and by arranging platform for knowledge and skill transfer from other experienced countries. Continuous community awareness creation and engagement activities through meetings, health extension programs and health development army (HDA), and mobilizing school and religious institutions inculcate the benefits of WSP among water users and increase communities involvement in the development of WSP approach.

Advocacy target will be multi-level including at National, Regional, Woreda and Kebele levels to mobilize decision-makers, service providers, informal community leaders, CSOs and the community to inform and create clear understanding on the role they will play in implementation of Water safety Plans for realization of the safety of water supplies. The main activities will include: conduct public awareness creation through multi-media approach, promote safe water chain management through health extension workers and health development armies.





**Table 2:** The advocacy level, target and engagement mechanism

<b>Level of the Advocacy</b>	Target groups	Engagement mechanisms (Communication mechanism)
<b>National</b>	MoWIE, MoH, Ministry of Agriculture, Ministry of Environment and Forestry, Ministry of Education, universities and development partners involved in WASH (Donors, NGOs and UN Agencies) and others. State Ministers, Directors, experts and others	Workshop, meeting, exposure visits and written document on WSPs
<b>Regional</b>	Water, Health, Agriculture, Education, Environment and Forest Bureaus, universities and development partners working in the respective region	Workshop, meeting, exposure visits, and written document on WSPs
<b>Woreda</b>	Woreda Council, Water, Health, Agriculture and Education office, religious institutions and NGOs working on WASH	Workshop, meeting and knowledge and skill transfer through international experts, trainings, and written document on WSPs
<b>Kebele</b>	Health extension workers, Kebele council, religious leaders, schools, and agriculture extension workers, and religious leaders	Workshop, meeting, trainings, interactive communication through HEWs, and written document on WSPs
<b>Community / water users</b>	WASH Committee, health development army and community(water users) for small/rural community water supply,  water utility board, water utility management, and technical staff, WASH committee members, religious leaders and water users	Workshop, meeting and written document on WSPs, community/village level campaign targeting risk factors such as watershed management and household safe water management through engagement of HDAs, schools and religious institutions

### 3.2.2 Capacity Building for CR-WSPs implementation

The success of this strategy framework depends on the appropriate capacity building, institutional arrangement and human resource. However, WSPs implementation is in its infant stages and end-pipe water quality monitoring and surveillance itself implemented only in ad hoc base in most cases. Thus, in order to strengthen the water supply system for implementation of WSPs, capacity building training for existing human resources and new professional to be involved in water and public health sectors are very important.

At the inception stage, WSP implementation guidelines for urban utility managed water supply systems and rural/small community managed water supplies will be developed. These guidelines are used for implementation of WSP at demonstration sites, evaluated and refined based on practical experiences in the field.

Though the primary target is the human resource at water supply system and public health facilities, experts at national, regional, zonal and woreda levels are also needed to go through capacity building training to enable existing water supply service providers, regulators/ auditors, professionals from sectors like education, environment and land management to understand the concepts of WSPs, tools and processes how to apply utility and community managed WSP steps/tasks, their roles, and how to plan, implement, monitor performances from the viewpoints of achieving health based targets through in-service training program.

Revision of existing water supply system specific operation/maintenance and management manuals and the water quality monitoring training materials to include/mainstream CR-WSP concepts and approaches and use of the manual for in-service training program of existing service providers and auditors/regulators are actions to be taken to initiate WSPs with existing human resources.

Further nationwide scale up of WSP approach application needs skilled human resource development, which can be achieved through revision of pre-service training curriculum of the water supply and environmental health professionals to incorporate CR-WSP approaches into Technical and Vocational Education Training (TVET) and university courses.

Mainstreaming of WSPs performance data into existing National WASH and Health Management Information Systems (WASH-MIS and HMIS) through One-WASH National Program (OWNP) and into existing coordination structures at all levels gives an opportunity for policy/decision makers to follow up, monitor and review inclusion of WSPs in the WASH programs/projects and its implementation.

For implementation of WSPs, existing water supply system institution will be employed i.e. urban water utility management and small community/rural water supply community based management are institution where WSPs integrated to the ongoing water quality interventions. WSPs will be included to all steps of the water supply provision from catchment to point of use. Though the direct provision of safe water supply is the sole responsibility of the water sector/ supplier for implementation of WSPs the involvement of public health sector, agriculture and education as a member of the WSPs team are very vital (Table 3).

**Table 3:** Capacity building needs and participants at different levels

<b>Capacity building need level</b>	<b>Target trainees</b>	<b>Who is leading?</b>	<b>Who is engaged?</b>
<b>National ToT</b>	National CR-WSP task force	MoWIE	MoH, MoA, MoEF, universities and WASH development partners
<b>Regional experts training</b>	National WASH Task force	Regional Water and Energy Bureau	RHB, RAB and WASH development partners
<b>Woreda</b>	Woreda social service standing committee	Woreda water office	Woreda health office, woreda natural resource office and NGOs working on WASH
<b>Urban Water Utility</b>	Utility management team	Water utility board	Public health facility, teachers and others
<b>Small/ rural Water Supply</b>	Kebele development committee	WASH committee	Health extension workers, teachers and health development army

### 3.2.3 Institutional Arrangement for WSP

The Ministry of Water, Irrigation, and Energy and its regional and woreda structure are legally responsible to plan, implement, monitor and evaluate provision of safe drinking water supply to the population. To make services more efficient and effective, the government has established an autonomous institution called urban water supply utility for operation and management of and supply safe water to urban communities. On the other hand, operation and management of rural community managed water supply schemes in the rural communities are the responsibilities of WASH committees elected by the users.

The FMoH and its regional and woreda structures are responsible for auditing qualities of water provided by the supply agencies according to the set national standard protocols through national, regional and sub-regional public health laboratories.

Therefore, planning and implementation of the WSPs mainly involve existing water and health structures at all levels, and additionally involves agriculture, environment and education sectors at woreda and kebele levels. Water sector (through its specific directorate/core process) plays a leading role and serves as a secretariat for planning, implementation, monitoring, and evaluation of the milestones with expertise support from technical working groups and WASH coordination offices at all levels.

The water sector plays a leading role and responsible for development and implementation of the climate resilient water safety plans both in the urban water utilities and rural community managed water supplies. However, management and administration of land around the water source catchments, and development activities in the catchment zones, and removal of the hazards/contamination risks from source to point of use are not under the management of the water sector.



Therefore, implementation of the WSPs needs ***multi-sectoral coordination*** at all administrative levels, and technical and management inputs of professionals from catchment authorities/agriculture, water resource, utility, health, education, regulatory bodies and of the development partner organizations. Thus, the existing WASH coordination mechanisms is expected to play a significant role in the scale up of the water safety plan implementation being an integral part of one WASH national program.

However, development and implementation of the country wide WSPs by the urban utilities and rural community managed water supplies are technically supported by the Technical Working Group (TWG) composed of senior professionals from water, health, environment/meteorology, and agriculture with expertise in the design of water supply systems, water treatment works operation and maintenance, water quality monitoring/analysis, natural resource/watershed management, environmental health, and regulation of the standards. In addition, the national TWG encompasses donors, UN agencies, and international NGOs working on WASH and promotion of environmental protection at national, regional/zonal and woreda levels.

At utility and water supply scheme levels, WSP team will be organized /formed to assess the needs, plan for improvement actions, monitor implementation and evaluate performances with expertise support from woreda water and health offices on water supply system mapping, micro watershed/catchment delineation, water quality assurance and quality auditing/surveillance.

**Table 4:** WSP implementation Roles and responsibilities of stakeholders at all levels

Level	Sector/Organization	Responsibility	Coordination in place/ used as plat form	Remark
National	MoWIE (Hydrology and Water Quality Directorate/ Drinking Water & Sanitation Directorate	Lead and secretariat planning, implementation and monitoring and evaluation of national WSPs	NWCO/OWNP/Check under the current Water Sector Working Group	
	MoH/FMHACA/EPHI/National Standard authority	Surveillance and regulatory/auditing	NWCO/OWNP/ NHSTF	
Regional	Regional Water, and Energy	Lead regional WSPs planning, implementation and ME	Regional WCO/WASH Task force	Health, Water, Education Agriculture and Environment Sector
	Regional Health Bureaus/ regional and sub-regional public health laboratories	Surveillance and regulatory/auditing	Regional WCO/ WASH Task force	
Woreda	Woreda Water Resource Office	Woreda specific CR-WSPs planning, implementation and ME	Woreda WASH Team (WWT), Woreda WCO	Mapping of micro water shed and water schemes according to climatic zone (quantity and quality of water )
	Woreda Health Office/ Health centers	Surveillance and regulatory/auditing	Woreda WASH Team(WWT), Woreda WCO	

<b>Urban water Utilities</b>	Water supply management team	Utility specific of WSP planning, implementation and quality assurance	Utility management board	Establish WSPs team with involvement of relevant experts from health, environment, natural and land resource management
<b>Community managed water schemes</b>	WASHCOMs	Rural/small community water supply specific CR-CR-WSPs planning, implementation and quality assurance.  With the support of WWT identification and management of micro Watershed	WASH Boards	Establish WSPs team with involvement of HEWs, DA, Teachers WASHCOMs
<b>Household level</b>	HDA, HEW	Safe water management (promotion)	Kebele development manger	Promotion of the activity as integral part of health promotion through demonstration

#### 3.2.4 Water Safety Plan coordination and partnership

For effective implementation of the WSPs, there will be concerted actions of relevant stakeholders involved in the provision of water supply are very important, which can be realized through coordination and partnership. The water resource management technical committee under the water sector working group will serve as steering committee for implementation of the WSPs. With leadership of the steering committee, a group of technical expertise will be formed from ministries of water resources, health and watershed management authorities including from donor and UN agencies and international NGOs are responsible for WSP implementation from policy to implementation levels.

This coordination mechanisms establishes platform for division of roles and responsibilities, and mobilization of resources (including material, financial, expertise, and information), and to harmonize the use of agreed / uniform working system (such as implementation guidelines/procedures) and ensure accountability through joint monitoring and evaluation of WSP performances.

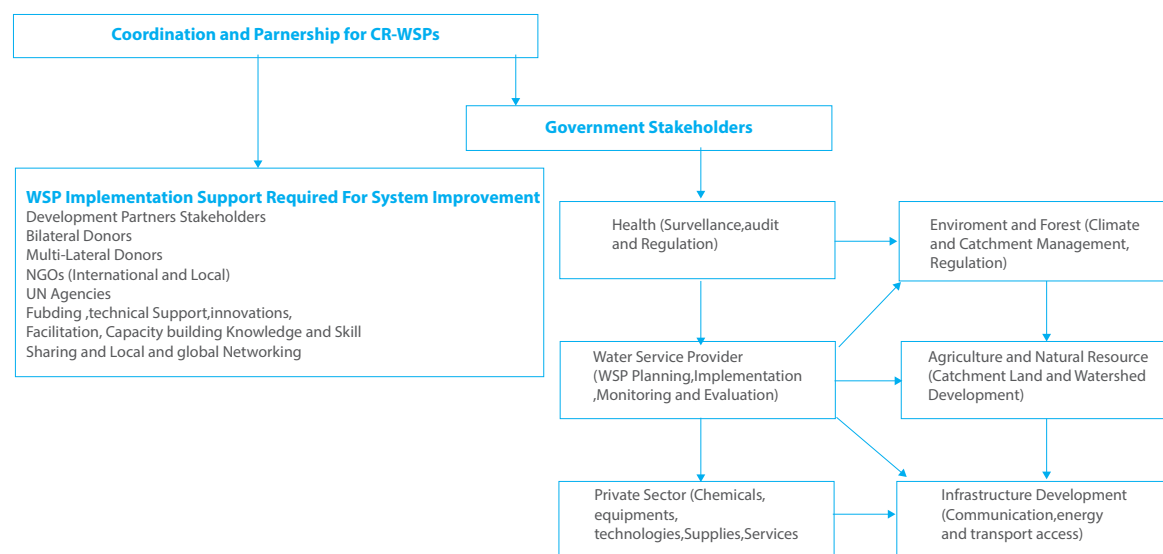


Fig.1: Coordination and Partnership for climate resilient Water Safety Plans

### 3.3 WSP milestones, implementation plan and timeline

Government of Ethiopia has committed to provide its population with safe and adequate water supplies. Development of the WSP strategic framework is among other steps taken forward by the government to realize its commitment to sustainably ensure quality of drinking water supplies. Effective Implementation of the WSPs requires concerted actions and involvement of all stakeholders and at-scale adoption of the approach including continuous support from decision makers, commitment of urban utilities and WASH committees to implement WSPs, enforcement from the surveillance agency/regulators, and active sectoral coordination and partnerships with international and local development organizations including CSOs, UN agencies and private sectors. As part of the WSP strategic framework, the following sets milestones and core activities to be implemented are identified (Table 5);

Table 5: Core activities, key milestones and implementation timeline

S. No	Core activities	Key Milestones	Implementation timeline by year*						
			2014	2015 Q			2016	2017	2018
			IV	I	II	III	IV		
1	National and regional WSP advocacy workshop organized and conducted Different WSP promotional materials such as brochures, wall charts, etc prepared and distributed	Adequate understanding is created about impacts of climate change on the water supply systems, the concepts and benefits of WSPs in reducing climate change impacts on water supply systems and ensures sustainability of safe water supply among national and regional senior decision makers in water supplies' and regulatory agencies, donors, and partner organizations engaged in WASH programs.							
2	Conduct Vulnerability assessment of the Water sector to climate change with focus on drinking water supplies at climatic zone level	Vulnerability of the water sector identified and used as base line for planning							
3	Development of WSP implementation guidelines for utility managed piped urban water supplies and for community managed rural water supplies, training packages developed; and the national and regional master ToT on WSP implementation Guidelines conducted	Guidelines and the WSP training package endorsed by the FMoWIE and WASH stakeholders, shared, and national and regional master ToT convened							
4	WSP steps are followed to plan, implement, and evaluate CR-WSP demonstrations Demonstration processes, challenges encountered and way-outs, and successes (practicality, range of financial resource required for full CR-WSPs implementation) are documented and shared among internal and external stakeholders Inputs for WSP scale up /strategy plan identified	Local practical experiences established based on WSP processes through demonstration on urban water supply utilities and rural community managed water supply schemes							

S. No	Core activities	Key Milestones	Implementation timeline by year*						
			2014	2015 Q			2016	2017	2018
			IV	I	II	III	IV		
5	<p>National/regional stakeholders consultation and planning workshop organized to share lessons gained from demonstrations and prepare scale-up strategies</p> <p>Existing working systems (policies, strategies, legislations, standards) and appropriateness/adequacy of existing institutional arrangements for implementation of WSP strategic implementation plan are jointly reviewed and improved</p> <p>WSP implementation guidelines revised based on lessons learned from field demonstrations</p> <p>Strategic actions, targets, and implementation timelines are identified/set</p> <p>Goals, objectives, targets of the Strategic WSP implementation scale up plan are well understood among all stakeholders and taken up to mainstream into their respective WASH programs/projects</p>	<p>Existing Working systems including policies, legislations, standards and WSP implementation arrangements revisions and amendments are endorsed by the policy makers</p> <p>Revised version of the WSP guidelines endorsed by the WASH sectors and understanding created</p> <p>National/regional climate resilient WSP strategic action plan developed to implement WSP at-scale</p>							
6	<p>Awareness about benefits of WSPs, roles of suppliers and the communities and the local government is created at national, regional, woreda and community levels using appropriate BCC/IEC materials/media</p> <p>Knowledge and skills of WSP implementers (WSP team, steering committee, regulatory body, etc) is improved through in-service training, exposure visits, etc.</p> <p>Availability of water quality testing equipment, supplies and materials are ensured at regional, sub-regional and woreda levels</p> <p>Water supply system assessment tools, operation and maintenance manuals, water quality testing procedures, etc., are revised/developed and made available at all levels</p> <p>Technical/ management support mechanisms between national-regional-zonal-woreda, utility and community managed water supply schemes established</p> <p>Knowledge and experience sharing forum /platform established between regions and with the regions, support networking between urban utilities established</p> <p>Private sectors/organizations that provide capacity building trainings on WSP processes, and water quality surveillance are established and supported</p> <p>WSP training is incorporated into the pre-service professional courses (at TVET and University)</p> <p>WSP implementation learning notes on lessons prepared and shared with stakeholders with in the country and between countries</p>	<p>Capacity of water suppliers and regulators strengthened at all levels to support WSP implementation at scale</p>							

S. No	Core activities	Key Milestones	Implementation timeline by year*						
			2014	2015 Q			2016	2017	2018
			IV	I	II	III	IV		
7	<p><b>Core activities</b></p> <p>Existing structures of the suppliers and regulators revised and strengthened with skilled professionals, laboratory facilities equipped with essential materials and supplies, and additional laboratories established where appropriate</p> <p>Existing standards, regulations, proclamations and working guidelines/manuals revised/amended, developed and made available for use at all levels</p> <p>WSP implementation is made a policy/legal requirement being a cardinal elements of the WASH program/projects including redefining staffing, roles and responsibilities of urban utilities, legislation/minimum standards specification on the import and installation of the climate resilient water supply technologies, strengthening capacity of regulatory and surveillance agencies, revision and incorporation WSP in to pre-service university training courses for professionals, and establishment of the private – public partnership and support for CR-WSP implementation</p> <p>Urban utilities and community managed rural water supply schemes that are expected to implement CR-WSP are identified/listed</p> <p>Climate resilient water safety plan management information system (WSMIS) strengthened</p>	<p>Institutional set up for CR-WSP implementation strengthened</p>							
8	<p>National, regional and woreda WSP technical advisory and review boards established/formed</p> <p>WSP documentation/recording and performance indicator reporting tools and feedback systems developed</p> <p>Mechanisms for WSP resource centers and experiences/lessons sharing between internal and external stakeholders, and between regions in the country and other countries established</p> <p>Objectively measurable mechanism established( rewarding best performing utilities, rural WASH boards and WASH committees)</p>	<p>Continuous water safety improvement reviews and support mechanisms established</p>							





### 3.4 Financing of the WSP strategy framework

A number of alternatives can be sought to finance implementation of the WSPs. Provision of safe and adequate water is one of the policy priorities of the government of Ethiopia.

The main financial sources for WSPs is the federal, regional and local governments' annual capital and operational budget for development and operation for the urban utilities and community managed water supplies. In addition, there are budget sources to be leveraged from donor and non-governmental organization (NGOs) development support for WASH programs and projects, and environmental protection such as OOWNP and WASH projects implemented by NGOs.

Furthermore, there are a national program directly linkable with WSPs such as National Program for Soil and Water Conservation and Productive Safety Net Program (PSNP) which directly contribute to the environmental sustainability of the drinking water through increasing ground water recharges, and to health extension package (HEP), which significantly contribute in the reduction of water contamination risks from source to point-of-use. Therefore, WSPs planning and implementation processes consider all available opportunities to eliminate implementation barriers.

Resources for implementation of WSPs for drinking water sources catchment (micro-shed) management can be foraged by integrating WSPs in to the national soil and water conservation program with adequate awareness creation of the community and leadership.

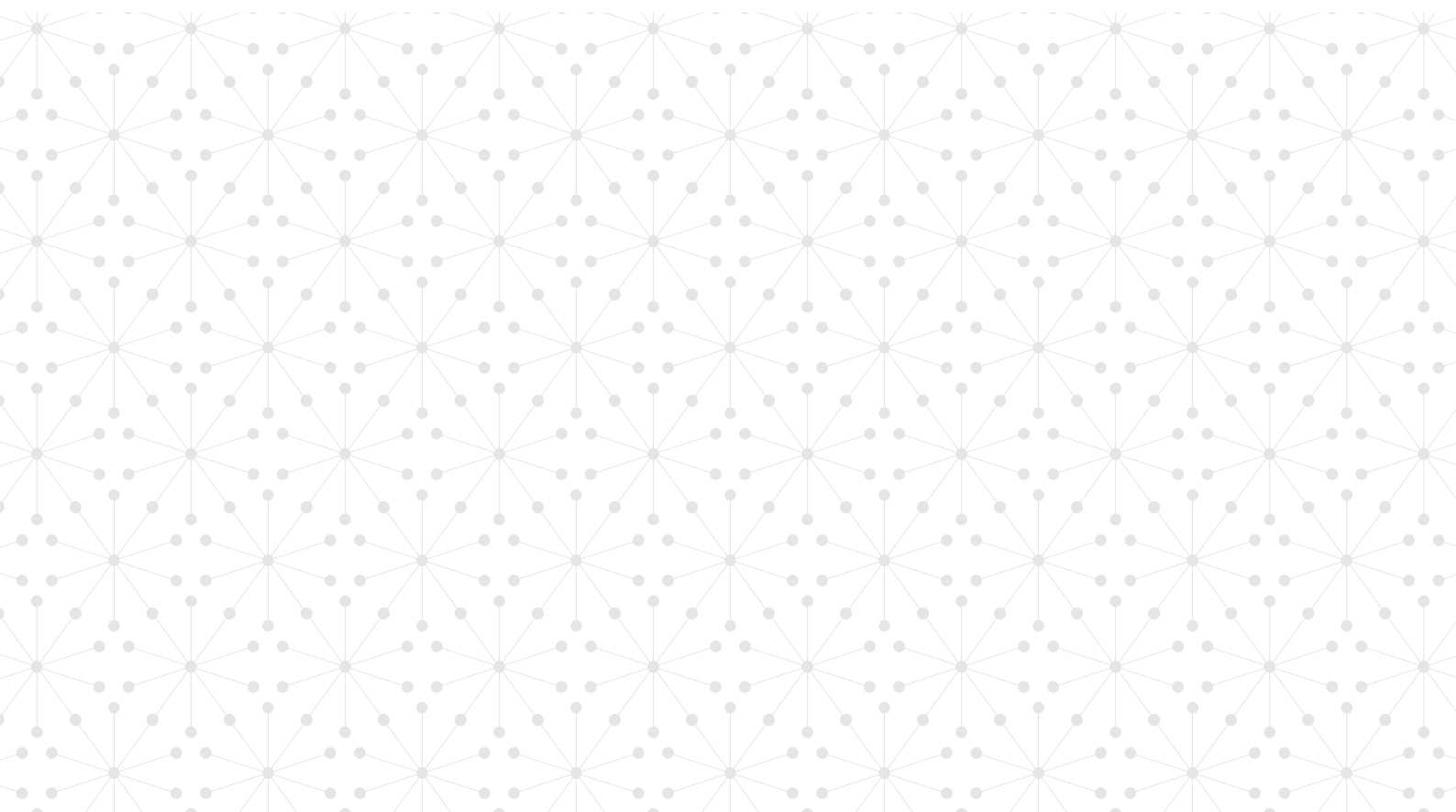
Safe disposal of human excreta, solid and liquid wastes, and household water treatment and safe water storage are integral elements of the health extension program packages. Therefore, water safety plans can be built-in to the routine activities of the health extension workers (HEWs) and health development armies (HDAs).

Management/Environmental safeguard, water quality monitoring, program management and capacity building are identified to be major components of the OOWNP with earmarked budget which is 3% of total OOWNP budget (11.8 million USD). Budget for implementation of CR-WSPs will be foraged from OOWNP budget for the same activities of urban utilities and community managed water supply systems.

Thus, this framework could serve as a policy guidance for integrating WSPs into WASH sector investment plan including plan for cost recovery business model.

# CHAPTER

## MONITORING AND EVALUATION



Monitoring the implementation of the strategy framework milestones is the key activity which will be implemented through supervision, regular reporting and annual review at national, Woreda and water supply system. Periodic evaluation will be conducted two times within the strategy time frame (midterm evaluation and end term evaluation end of 5 years) together with consideration of water and health sector. The purpose of both monitoring and evaluation is to track progress, identify challenges and draw timely corrective actions in the process. It also ensures all stakeholders and institution is achieving the intended output and outcome using inputs effectively and efficiently. These will guide the long term strategic direction how WSPs Water and Health Sector Program and Strategic Plan. The following input, output, outcome and impact indicators will be used for monitoring and evaluation.

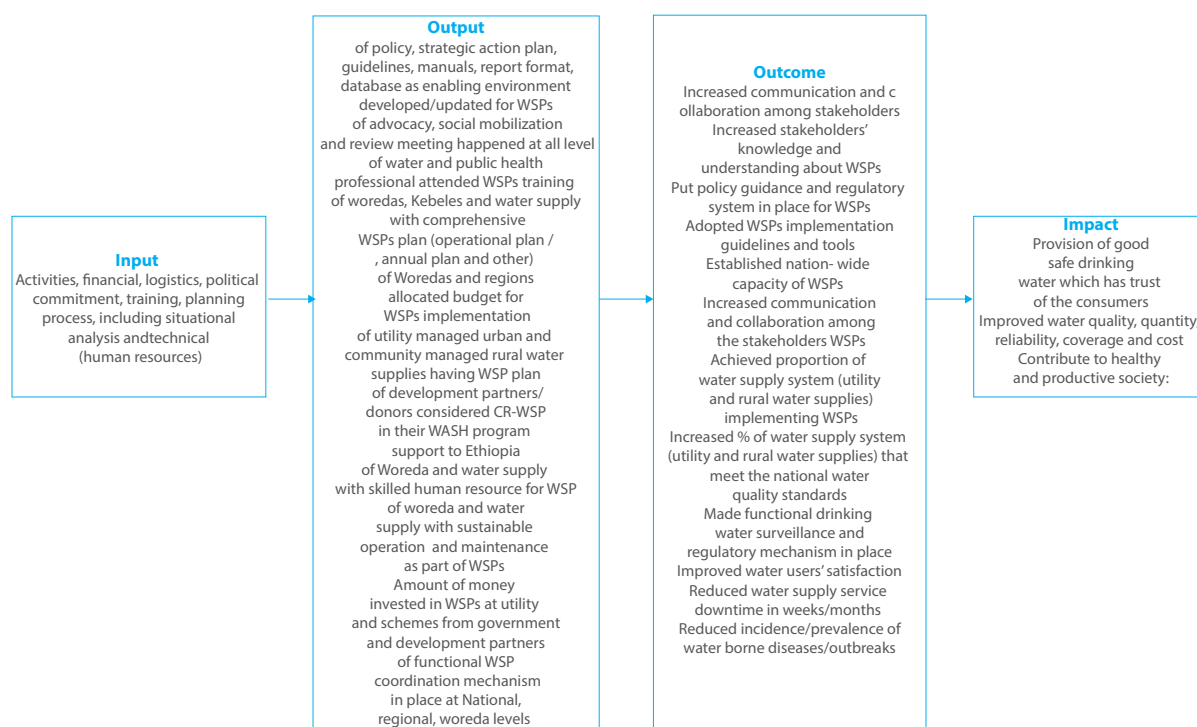


Fig 2: Monitoring and Evaluation Schematic with Input, Output, Outcome and Impact

As part of WSPs implementation monitoring and evaluation data management, documentation and reporting are an indispensable part of this WSPs strategy framework. It is only through this process that progress of the implementation which leads to outcome and impact will be tracked over a period of time through identification of best practice, challenges and correction of challenges. Thus, data generated and information produced at all level need to be properly documented with appropriate formats using very simple and practical data base such as EXCEL spread sheet of CR-WSPs of WHO and IWA and properly processed and resulted into analytical report which can be shared with decision makers, implementers , development partners and community for action.

The national WSP technical working group develops data recording and reporting forms, data compilation and brief data analysis sheets/guides and information management systems that accommodate important information needed for the routine operation of the different water supply systems and management decision about both urban utilities and the community managed rural water supplies.

In addition, checklists to be used by the technical working group during supportive supervision to WSP teams are also prepared by the national TWG and shared /made available at all levels. The key performance indicators

specific for urban utilities and community managed rural water supplies that are considered necessarily to be reported to the next higher level, reporting due dates/frequencies, mode of reporting and responsible body/person are also determined at the national level in consultation with/through the involvement of regional and national stakeholders.

There is a need to develop objectively verifiable outcome and impact indicators of WSP implementation. These indicators are helpful to establish baseline and evaluate outcomes and impacts and to compare results before with after WSP implementation. Therefore, the national TWG is also expected to set core indicators of WSP outcome and impacts and define how to measure possible sources of information. For the purpose of comparison between the regions and between woredas, output, outcome and impact indicators will be consistent across all regions and woredas and will be determined with thorough discussion/consultation with stakeholders. However, amendments (changes and additions) of these indicators can be addressed during implementation of the midterm reviews and end line reviews based on implementation experiences and documented lessons. While Indicators of input and output are monitored monthly and evaluated on quarterly basis by the WSP team and TWG, outcome indicators are monitored yearly and of impact are at the middle and end of the strategy at regional and national level by respective TWGs and sector stakeholders.

However, important sustainability indicators of the strategy such as participation of the communities (users) in the need (risk) assessments, in the planning and implementation of improvement measures, as well as their level of satisfaction about the safety of the water will be qualitatively and/or quantitatively evaluated. Improvements of the drinking water safety at all stages of the water supply systems (from source to point-of-use) will be periodically monitored every six months by the respective TWG and the feedback is given to the WSPs implementers and supporters.

Depending on the level of the water supply system, implementers of the WSPs are provided with uniform / consistent recording and reporting tools to track safety/quality improvements, document challenges and best practices (input, processes, outputs, outcome and impact indicators, recording and reporting formats, analysis procedures are provided in the implementation guidelines).

Lessons (best practices, challenges etc) gained from the WSPs implementation processes and outputs of the follow up, monitoring and evaluation of WSPs implementation are systematically documented, periodically analyzed and shared with all stakeholders periodically by the WSP team at level of the specific water supply system and by the technical working groups at Woreda, regional and national levels.

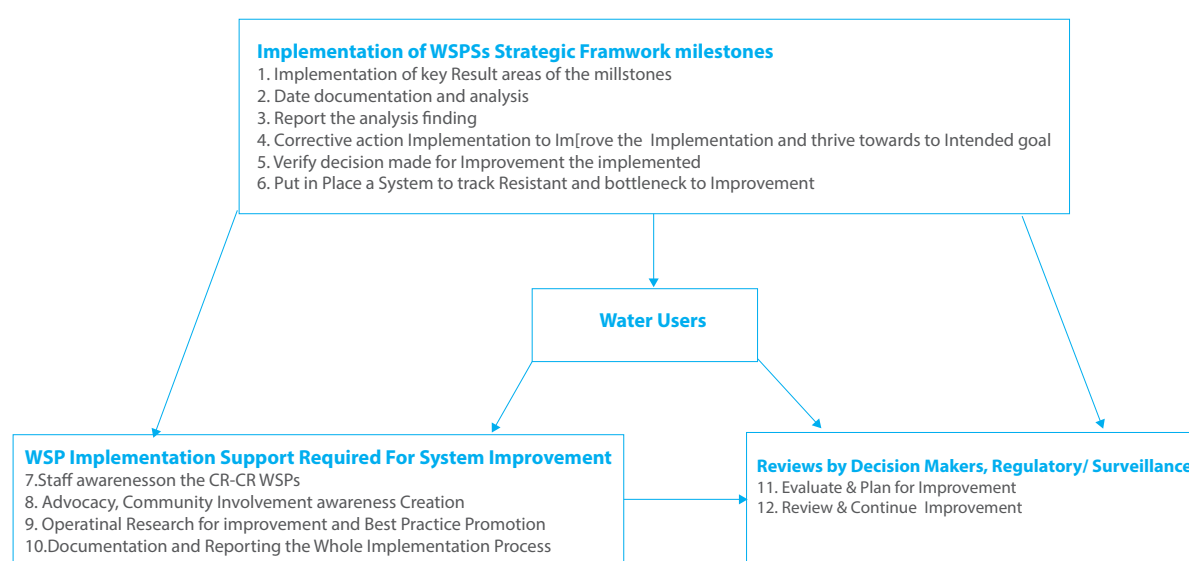


Fig. 3: Participatory WSPs Strategy Framework Implementation Monitoring and Evaluation and feedback mechanism

## REFERENCES

1. FMoWIE 2014. Ethiopia Water Resources Potential. <http://www.mowr.gov.et/index.php?pagenum=2&pagehgt=1785px>
2. WHO 2013. Child Health Epidemiology Reference Group 2000-2011; Global Health Estimates Technical Paper, WHO/HIS/HSI/GHE/2013.2 [http://www.who.int/healthinfo/statistics/ChildCOD\\_method.pdf](http://www.who.int/healthinfo/statistics/ChildCOD_method.pdf).
3. Guidelines for Drinking-Water Quality, 4th Edition, WHO 2011.
4. Water Safety Plans: Managing Drinking-water Quality for Public Health, WHO and IWA 2010 [www.who.int/water\\_sanitation\\_health/dwq/en/](http://www.who.int/water_sanitation_health/dwq/en/); [www.iwahq.org](http://www.iwahq.org); [www.wsportal.org](http://www.wsportal.org)
5. Rango T, et al; (2012): Ground water quality and its health impacts: An assessment of dental fluorosis in rural inhabitants of the main Ethiopian rift valley. *Environment International* 43 (2012): 37-47.
6. Meseret Desalegn and Feleke Zewge (2013), Daily Fluoride intake in rural villages of the Ethiopian Rift Valley, *Toxicological and Environmental Chemistry*, 96:6, 1056-1068, DOI: 10.1086/02772248.2013. 728675.
7. FMoWIE and NMA (2007). National Adaptation Program Action (NAPA) of Ethiopia, June 2007, Addis Ababa, Ethiopia.
8. FMoA (2010). The Federal Agricultural Sector Policy and Investment Framework (ASPIF 2010-2020), Addis Ababa, Ethiopia.
9. WHO/UNICEF (2010). Rapid assessment of the drinking water quality in Ethiopia, Country Report, Addis Ababa, Ethiopia.
10. Godfrey, S, and Howard, G, 2004. Water Safety Plans (WSP) for Urban Piped Water Supplies in Developing Countries. WEDC, Loughborough University, Loughborough.

# ANNEXES

## **Annex 1: Criteria for selection of water supply system for implementation of the CR-WSP**

Implementation of the CR-CR-WSPs takes into consideration the capacity of the water supply systems, existing and anticipated climate variability problems and systems' vulnerability to climate change, etc. For practical purposes, the following criteria will be employed:

- Inclusion of all types of the water supply systems
- Water quality and quantity issues
- Sustainability of the water sources (social, economic, technical and environmental)
- Operation and maintenance status
- Vulnerability to climate change variability
- Use of meteorological data/information to predict the level of vulnerability to climate change
- Current and future capacity of the water supply systems
- Status of the community sanitation and hygiene conditions
- Stakeholders' involvement
- Possibility of resource leveraging from other programs (soil and water conservation, OWNPN and PSNP) and mainstream into existing development programs such as HEP
- Disaster risk reduction and food security early warning system for drought and flood information will be used during the hazard identification of the water supply system





