Report

Building adaptive water resources management in Ethiopia

Beatrice Mosello, Roger Calow, Josephine Tucker, Helen Parker, Tena Alamirew, Seifu Kebede, Tesfay Alemseged, Assefa Gudina.

May 2015

Overseas Development Institute
203 Blackfriars Road
London SE1 8NJ

Tel. +44 (0) 20 7922 0300
Fax. +44 (0) 20 7922 0399
E-mail: info@odi.org.uk

www.odi.org
www.odi.org/facebook
www.odi.org/twitter

Financed by the SCIP Fund; the SCIP Fund is financed by DFID UK-Aid, the Royal Norwegian Embassy and the Royal Danish Embassy.

ISSN: 2052-7209

Cover photo: Beatrice Mosello

Contents

List of tables, figures and boxes

Tables

Figures

Boxes

Maps

Acknowledgements

Thanks are due to Asmamaw Kume (Ministry of Water, Irrigation and Energy, Ethiopia), Dr Catherine Tovey (World Bank, Ethiopia) and Daniel Yeo (Global Green Growth Institute) for their advice in-country. We also would like to thank Ben Irwin, Arsema Tesfaye and Hidaya Yusuf (KPMG) for their steer and support throughout the project. Peer review was provided by Dr Nigel Walmsley and Darren Lumbroso (HR Wallingford) and Dr Guy Jobbins (Overseas Development Institute, UK). We would like to thank Naomi Oates and Nathaniel Mason (Overseas Development Institute, UK) for their inputs into the methodology and preliminary drafts of this report, and Thomas Orrell (independent consultant) for his support with the literature review. All findings, conclusions and errors remain those of the authors.

Finally, we would like to thank all the people we interviewed in the course of the project - from ministry staff to those managing irrigation schemes, hydropower and urban water supply - who gave their time so generously, and engaged in an open and constructive manner throughout.

This report was Financed by the SCIP Fund; the SCIP Fund is financed by DFID UK-Aid, the Royal Norwegian Embassy and the Royal Danish Embassy.

Abbreviations

AAU	Addis Ababa University
AAWSA	Addis Ababa Water and Sewerage Authority
AfDB	African Development Bank
AMCOW-WSP	African Ministers' Council on Water – Water and Sanitation Programme
ARBA	Abay River Basin Authority
ATA	Agricultural Transformation Agency
AwBA	Awash Basin Authority
AWRM	Adaptive Water Resources Management
BCM	Billion Cubic Metres
BeSBO	Beles Sub-basin Organisation
BIS	Basin Information System
CAACs	Catchment Area Advisory Committees (Kenya)
CC-WRMA	Climate Change and Water Resources Management Assessment
CRGE	Climate Resilient Green Economy
CSOs	Country Status Overviews
DFID	Department for International Development (UK)
DP	Development Partner
DRM	Disaster Risk Management
EACC	Economics of Adaptation to Climate Change
EDB	European Development Bank
EEPCo	The Ethiopian Electric Power Corporation
EIA	Environmental Impact Assessment
EIC	Ethiopian Investment Commission
EIWR	Ethiopian Institute of Water Resources
EPA	Environmental Protection Authority
ETB	Ethiopian Birr (currency)
FDRE	Federal Democratic Republic of Ethiopia
GDP	Gross Domestic Product
GIZ	German International Development Cooperation
GoE	Government of Ethiopia
GTP	Growth and Transformation Plan
GTP-2	Growth and Transformation Plan 2
GWP	Global Water Partnership
ha	Hectares
IWRM	Integrated Water Resources Management
JICA	Japanese International Cooperation Agency
MEF	Ministry of Environment and Forestry
MoA	Ministry of Agriculture
MoFED	Ministry of Finance and Economic Development
MoTI	Ministry of Trade and Industry
MoWIE	Ministry of Water, Irrigation and Energy
NMA	National Meteorological Agency
ODI	Overseas Development Institute
OWEB	Oromia Water and Energy Bureau
OWNP	One WASH National Programme
PASDEP	Plan for Accelerated and Sustained Development to End Poverty
RBAs	River Basin Authorities

RBHCs	River Basin High Councils
REDD	Reducing Emissions from Deforestation and forest Degradation
RVLB	Rift Valley Lakes Basin
RVLBA	Rift Valley Lakes Basin Authority
RWB	Regional Water Bureau
SCIP	Strategic Climate Infrastructure Programme
SIDA	Swedish International Development Cooperation Agency
SLM	Sustainable land management
TaSBO	Tana Sub-basin Organisation
UNICEF	United Nations Children's Fund
WASH	Water, Sanitation and Hygiene
WASH-BAT	Bottleneck Analysis Tool for the WASH sector
WB	The World Bank
WEAP	Water Evaluation and Planning system
WGC	Water Governance Centre
WLRC	Water and Land Resource Centre
WRD	Water Resources Development
WRDF	Water Resources Development Fund
WRM	Water Resources Management
WRMA	Water Resources Management Authority (Kenya)
WRMP	Water Resources Management Policy
WRUAs	Water Resources Users' Associations
WSDP	Water Sector Development Programme
WSP	Water and Sanitation Programme
WSWG	Water Sector Working Group

Executive Summary

Introduction: making the case for water resources management in Ethiopia

Ethiopia has a generous endowment of water, but this water is distributed unevenly in space and time. Unmitigated hydrological variability, compounded by climate change, has been estimated to cost the country roughly one third of its growth potential (World Bank, 2006). Despite this, Ethiopia's investments to mitigate these impacts and harness its considerable water assets for power, food production, industry, livestock and improvements in health and livelihoods have been historically very limited (World Bank, 2006). Today, the development of water resources to support 'green growth' and poverty reduction forms a key plank of government policy as the country strives to achieve middle-income status by 2025. Ethiopia's Growth and Transformation Plan (GTP) sets out ambitious targets for a sixfold increase in irrigated land area, and a quadrupling of hydropower generation capacity between now and 2015 (Federal Democratic Republic of Ethiopia (FDRE), 2010).

The establishment of a minimum platform of hydraulic infrastructure to store and distribute water and to buffer rainfall variability can stimulate growth and reduce vulnerability to climate change. But is a development model that prioritises large dams and water-demanding irrigation projects sustainable in the long term? And under what conditions can it secure benefit streams for poor people and preserve the environmental assets on which they depend? The experience of fast-growing economies in South Asia and China indicates that investments in water infrastructure need to be inscribed in an institutional framework that ensures that water resources are developed in a coordinated and sustainable manner, maximising economic returns to water across sectors while protecting local livelihoods and ecosystems (Calow and Mason, 2014).

Against this background the Ministry of Water, Irrigation and Energy (MoWIE) and the UK's Overseas Development Institute (ODI) have co-directed a project entitled 'Building adaptive water resources management in Ethiopia' in partnership with the Ethiopian Institute of Water Resources (EIWR), Addis Ababa University (AAU), and the Water and Land Resource Centre (WLRC). This report builds on the diagnostic study of water risk management (WRM) in Ethiopia that ODI and the MoWIE have conducted during the project's inception phase. It is intended for the MoWIE and other stakeholders with decision-making competencies over water resources in Ethiopia, including development partners (DPs). Ideally, the proposed methodology could be replicated by researchers and analysts to understand bottlenecks and strengths of WRM systems in other countries and/or at different governance levels.

Pressures on Ethiopia's water resources: rapid growth and development, and climate change, as a 'risk multiplier'

Ethiopia is currently experiencing significant natural and socioeconomic changes, which are modifying the availability and demand of water resources. Because of its geography and climate, Ethiopia has always been characterised by high hydrological variability, compounded by the almost total absence of water storage and highly vulnerable watershed (World Bank, 2006). Climate change is expected to lead to more uncertainty and extremes in weather patterns as well as increased rainfall variability (Conway and Schipper, 2011).

In addition, the stunning economic growth and population increases of the last decade demand a lot of good quality water resources and give rise to prominent pollution problems. Nevertheless, Ethiopia's water sector continues to be characterised by little integrated planning, so that water resources are being allocated in ways that neither take into account competing demands nor are based on a systematic understanding of 'how much water' is available. This is already leading to instances of conflict, as demonstrated in the case of the Awash River Basin between upstream and downstream irrigators as well as between irrigators and hydropower operators.

A review of the policy and institutional framework for WRM suggested that Ethiopia may not be prepared to cope with these pressures. The existing legal and policy framework for WRM already enshrines the basic principles of Integrated Water Resources Management (IWRM). However, it requires updating and strengthening; and basin planning through embryonic River Basin Authorities (RBAs) remains weak. The establishment of 'good enough' WRM institutions in Ethiopia is hampered by a lack of knowledge of resource conditions, patterns of use, and drivers of change; and a lack of capacity and skills within institutions to plan water allocation, assess the impacts and

trade-offs of water resources development and allocation, and ensure that planning is 'climate smart'.

The kind of institution-building effort required to address these challenges will take decades rather than years; it is a complex process, requiring substantial investments in terms of financial, human and technical resources. It should start by identifying the 'bottlenecks' that have blocked concrete action to date and, consequently, need to be removed. In other words, the first step of this long journey should be to produce the evidence base required to make the case for investing in WRM institutions.

Understanding the problem: introducing the CC-WRMA methodology

The Climate Change and Water Resources Management Assessment (CC-WRMA), conducted between December 2013 and October 2014, was the primary methodology we used to identify the strengths and limitations of the current system for WRM in Ethiopia. It consisted of: (a) a review of pressures on WRM (based on a desk study of existing policies and strategies in the water sector); and (b) an indicator-based assessment of WRM systems, practices, capacities and outcomes, which took a 'pathways' or 'bottlenecks' approach to identify the underlying factors supporting or hindering progress towards achieving Adaptive Water Resources Management (AWRM). AWRM was defined as a process that promotes the coordinated development and management of water, land and related resources while being able to adapt to the impacts of changing physical and socioeconomic contexts on resource availability and quality.

The CC-WRMA was conducted at the national level; three case studies were also investigated in order to add some detail 'from the ground'. For this, we focused on those river basins where RBAs have been established, namely: the Awash and Abay (Blue Nile) River Basins and the Rift Valley Lakes (Lake Ziway). Taking inspiration from two internationally recognised methodologies for assessing 'bottlenecks' in management systems for water, sanitation and hygiene (WASH), we developed some specific WRM indicators and grouped them into 'enabling', 'developing' and 'sustaining' categories. Indicators in the enabling and developing categories described the very basic conditions that are required to establish and operationalise a WRM system, respectively. The sustaining category encompassed those actions that are needed to make the system adaptive to changes and uncertainties in the long term, for example by ensuring flexibility, encouraging learning loops, and fostering compliance with institutional rules.

Data for the assessment were collected through semi-structured interviews with key stakeholders in the water and water-related sectors at federal, regional and basin levels. With the aim of creating a common understanding and an agreed set of priorities for AWRM, extensive stakeholder engagement and joint reflection and visioning were included in the development and compilation of the CC-WRMA. For each indicator, scores were generated with reference to a range of specific questions (sub-indicators) and a simple visual key allowed easy identification of problem building blocks (barriers).

Achieving 'good enough' WRM: a long-term process that should start by identifying bottlenecks to action

Interestingly, the results of the CC-WRMA indicated that while the institutional system for WRM in Ethiopia performs moderately well in the 'enabling' category – indicating that the basic elements of WRM are there or are being established – the conditions for making the system function in the short to long term remain largely unsatisfactory. On the one hand, this can be interpreted as a normal consequence of the fact that WRM is a process; and, as such, it needs to be put in place step-by-step, depending on the resources that are available to the system, and in synergy with development trends in other sectors. On the other hand, however, the CC-WRMA revealed a number of critical bottlenecks that hamper the capacity of Ethiopian institutions to promote the coordinated development and management of water, land and related resources while adapting to the impacts of changing physical and socioeconomic contexts on resource availability and quality.

Enabling WRM: an 'IWRM-friendly' legislative and policy framework, but poorly implemented

Enabling factors refer to the key building blocks of WRM, including the legal and policy framework, the evidence base for decision-making, financial structures and human and technical capacities within the sector. Our analysis revealed that while Ethiopia has a policy and legislative framework that supports IWRM, its implementation is poor. Furthermore, institutional roles are not sufficiently well-articulated, nor are coordination mechanisms for WRM (especially at sub-national level). Three RBAs have been established in strategic river basins in Ethiopia. However, in most cases they lack adequate financial, human and technical resources to fulfil their mandate. Hydrological (for both surface water and groundwater) and meteorological data are collected in a scattered way by different organisations, and information sharing is minimal. Water permits are issued by competing state and federal authorities, often outside the scope of Basin Master Plans (when these exist), and with insufficient consideration given to the sustainable and equitable allocation of water resources.

Developing WRM: lacking the conditions to establish who needs what, when and how

The functioning of the WRM system in Ethiopia is hampered by several factors. First and foremost, coordination between planning units at different levels (and especially between basin and regional states) and across sectors (e.g. in terms of land and water management) is very limited. Secondly, expert personnel, technology and budget for monitoring the quality and availability of both surface and ground waters are insufficient. The lack of a system for releasing water-use and pollution permits makes it difficult to understand who is using how much water. Further challenges relate to the capacity-building needs of RBAs' staff – particularly in terms of conflict resolution and stakeholders' engagement and communication. Finally, the linkages between data/information and decision-making and planning processes were found to be poor or even non-existent in certain cases.

High staff turnover, capacity gaps and poor scenario planning: threats to sustainable WRM

Our analysis also identified several bottlenecks in the actions required to ensure that WRM structures continue to be effective in the long run. WRM institutions and activities are undermined by the absence of a long-term financing system and high staff turnover rates, coupled with numerous capacity-building gaps. Planning efforts fail to sufficiently take into account projections and scenarios on the impacts of climate and socioeconomic changes, which are done on an ad hoc basis by researchers but remain disconnected from the decision-making process. Because provisions for water allocation and pollution reduction are not enforced, the needs of poor and marginalised communities risk being eclipsed by the interests of the most powerful groups and actors.

WRM in Ethiopia: transforming good intentions into concrete actions

We do not want to suggest that an entirely new system for WRM should be created in Ethiopia. But clearly, the existing one should be improved. To this end, Ethiopia's rich natural water resource endowment, its rapidly growing economy and its ambitious government agenda offer significant opportunities. It is important to understand what these opportunities are, and capitalise on them. For example, the formulation of the second GTP (GTP-2) can provide an entry point to reinforce the links between WRM and land resource management and to set aside funding for the establishment of stakeholder coordination and data-sharing mechanisms at all levels. There is also an opportunity to ensure that the Climate Resilient Green Economy (CRGE) strategy is mainstreamed within the three main areas of economic growth (agriculture, industry and energy generation). This would allow promoting knowledge-sharing between the actors involved, and would reduce the likelihood of environmental conservation being 'traded-off' in favour of pure economic growth imperatives. The One WASH National Programme midterm review in 2015 also offers an opportunity for the MoWIE to integrate WASH, watershed management, environmental protection and climate resilience initiatives.

A fundamental consideration to retain is that there is no single formula for institutional building and development. The efficient planning of activities will need to be adjusted to fit the specifics of the local and national planning processes. Also, it is not possible to implement all the identified activities at once. Instead, one needs to understand what 'bottlenecks' to address, and when and how. We proposed the following criteria for action prioritisation: the relevance of the problem for the overall functioning of the water management system; the time frame for implementation; the institutional and coordination requirements; and the resource intensity of the planned action.

Efforts to improve WRM in Ethiopia should encompass a wide range of interventions. In the short term, we recommend that the MoWIE focuses on putting in place the key building blocks of WRM, in collaboration with other water stakeholders at federal, regional and basin level, and with the support of DPs, the research community, the private sector and civil society where appropriate. A concurrent regulatory effort must be made to define and assert the mandate of RBAs and clarify their relationships with actors that may have competing water management functions (in particular regional states) through the River Basin High Councils (RBHCs). We recommend that the setting of the WRM institutional framework is matched by the definition of financial requirements and mechanisms, to ensure the transparent allocation of budget at different levels and especially for RBAs – in a harmonisation effort similar to the one conducted for WASH.

Once the enabling environment for WRM is set up, the actual planning and management functions can be exercised. A priority for the MoWIE should be to ensure that RBAs have enough resources to fulfil their tasks, including competent personnel, budget and equipment. RBAs should also be capacitated to engage water users and managers in inclusive and participatory decision-making with regards to the allocation and use of water resources. The MoWIE should make the water permit system coherent and effective, introducing water and pollution charges on a clearly established legal basis, with the involvement of the Ministry of Finance and Economic Development, and in coordination with other ministries. At this stage, it is vital to start adopting a longer-term perspective and embed elements of climate change adaptation (e.g. in the form of flood and drought management) into the WRM system.

Finally, we recommend that actions are taken to ensure that WRM structures continue to function in the long

run. To this end, coordination between the MoWIE and government agencies in water-using sectors at different levels must be improved. The current capacity gap that affects the Ethiopian water sector also needs to be addressed by providing adequate trainings and support to staff (especially in RBAs), and incentives to reduce high turnover rates. To address the present and future impacts of climate-related and other pressures, through collaboration with the research sector and DPs, climate and socioeconomic scenarios need to be developed and used to inform investment and allocation decisions. All these activities are rather resource intensive, meaning that, realistically, they can only be conducted in the framework of robust and coordinated institutions, financial mechanisms, and adequate human and technical resources. To win investments, it will be essential to make a credible economic case for WRM at the highest political level and among DPs and investors.

Recommendations for 'Building AWRM' in Ethiopia

In order to strengthen the institutional framework for WRM, which is necessary to ensure that infrastructure development is 'climate smart' and delivers broad-based economic and social benefits to Ethiopia and its people, we recommend the following:

- **Baseline information is key for planning and managing investments in water infrastructure.** Our analysis revealed that WRM in Ethiopia is hampered by a lack of knowledge of resource conditions, patterns of use, and drivers of change, and a lack of capacity and skills within institutions to plan water allocation, assess impacts and trade-offs and ensure planning is 'climate smart'. As investment in water ramps up, there is a real danger that unconstrained development and weak management will undermine the resource base, and squander opportunities for the kind of broad-based economic growth envisaged by the GTP.
- **Water infrastructure needs water institutions.** Therefore, while a minimum platform of hydraulic infrastructure is required, one should not forget the equal importance of investing in an institutional framework that disciplines water resources management and hence development. If there is only a focus on water resource development and no management framework, substantial difficulties and conflicts are bound to arise.
- **A fixation with 'implementing IWRM' is not always useful**; it can create paralysis, and get in the way of more pragmatic, problem-focused solutions. As a first step, it is important to recognise that WRM is a long-term endeavour with no quick returns. Change is hard, and it can only be triggered by a clear understanding of why it is needed. Therefore, in order to improve the institutional system for WRM, one should start analysing emerging problems ('hot spots') and potential solutions ('problem-driven approach'), working within the existing frame of power and resources.
- **Ethiopia needs an operational plan with clear institutional mandates** that clarifies relations especially between the regions and RBAs, detailing who will do what, when it will be done, and how much it will cost. This needs to happen as soon as possible. The relevant ministries (with the support of DPs and the research community) should also develop a system for data collection and management. Water data must be available across all government and for different users including the private sector and those working in the agricultural or energy sectors.
- **Everything cannot be done at the same time.** Interventions to strengthen institutional mechanisms in the water sector need to be prioritised according to their relevance for the functioning of the water management system, the time frame for implementation, the institutional and coordination requirements for their implementation, and their (financial, human and technical) resource intensity. Short-, medium- and longer-term actions need to be identified for gains in WRM.
- **Political will is essential to achieve all of the objectives above.** As our study demonstrated, a strong steer from a high level (e.g. through RBHCs, Water Minister's or Prime Minister's Office) in support of WRM is needed, to send a political message and make the case for more investments into the system's capacity and resources. In turn, creating political will implies 'framing the question right' by quantifying and visualising the risks of mismanagement to growth and transformation. To date, in Ethiopia, donors have focused more on water, sanitation and hygiene. However, without a concurrent effort in WRM, which allows dealing with increasing competition for water resources, benefits of WASH also will be lost.
- **'Start small, stay focused and be opportunistic'** is the way to find specific solutions that actually work in the short term. Ultimately, WRM should be purported as an enabler of 'green' and 'climate resilient' economic growth and transformation. Shaping the WRM operational plan around the GTP-2 and CRGE offers a window of opportunity to strengthen the links between water and land resources management and to align the water sector strategy with climate-resilient agricultural, energy and industrial policy.
- **We recommend reaching out beyond the water community** to make the case for WRM – engaging with those actors that implement interventions on watershed management, irrigation, forest and sustainable land management, hydropower generation, etc. International benchmarking and experiences can serve as inspiration to solve specific problems, but with the caveat that what has worked in one country may not be appropriate for Ethiopia ('the context matters').

1. Introduction

1.1 Ethiopia and the water challenge: a matter of management?

Ethiopia has a generous endowment of water, but this water is distributed unevenly in space and time. Unmitigated hydrological variability, compounded by climate change, has been estimated to cost the country roughly one third of its growth potential. Best and worst case scenarios for climate change impacts over the coming decades foresee a reduction of gross domestic product (GDP) growth by 2% and 10% per year, respectively (World Bank, 2006). In the agricultural sector, a cornerstone of Ethiopia's economy, agricultural productivity will likely generate 30% less income (Gebreegziabher et al., 2011).

Historically, Ethiopia's investments to mitigate these impacts and harness its considerable water assets for power, food production, industry, livestock, and improvements in health and livelihoods have been very limited (World Bank, 2006). However, the development of water resources to support 'green growth' and poverty reduction now forms a key plank of government policy as the country strives to achieve middle-income status by 2025. Ethiopia's Growth and Transformation Plan (GTP) sets out targets for a sixfold increase in irrigated land area and a quadrupling of hydropower generation capacity between now and 2015 (FDRE, 2010). According to recent data from the Ethiopian Ministry of Water, Irrigation and Energy (MoWIE), there are currently 12 fully commissioned hydropower plants with a total installed capacity of 1,945 MW. In addition, there are plans to expand the existing 237,156 ha of active irrigation projects to 1.8 million ha by 2015 and to 5 million ha by 2020.[1]

This brings important opportunities to stimulate growth and reduce vulnerability to climate change by establishing a minimum platform of hydraulic infrastructure with which to store and distribute water and to buffer rainfall variability. But is a development model that prioritises large dams and water-demanding irrigation projects sustainable in the long term, especially considering the impacts of climate and socioeconomic changes on both water demand and supply? And does this development model also secure benefit streams for poor people and preserve the environmental assets on which they depend?

The experience of South Asian countries and China, for example, indicates that investments in water infrastructure need to be inscribed in a parallel institutional platform that ensures that water resources are developed in a coordinated and sustainable manner, maximising economic returns to water across sectors while protecting local livelihoods and ecosystems (Calow and Mason, 2014).

In Ethiopia, the existing legal and policy framework for water resources management (WRM) enshrines the basic principles of Integrated Water Resources Management (IWRM). However, it requires updating and strengthening, and basin planning through embryonic River Basin Authorities (RBAs) remains weak.

Box 1: Why is WRM important for poor people?

Harnessing water is central to the development ambitions of Ethiopia. But new projects and infrastructure are not intrinsically good for poor people if parallel investments in the institutional 'plumbing' of rights and allocation are missing.

Symptoms of unconstrained water resources development and weak management include:

- Over-exploitation and degradation of water resources, reductions in ecological function, and impacts on poorer groups – those with a stake but little voice in WRM.
- Water 'capture' by powerful groups and interests in the absence of clear rules on water withdrawal and allocation. One outcome can be de facto privatisation of a common resource and the consequent transfer of wealth from poorer to richer groups.
- Tensions or conflicts over water allocation – between regions, between upstream and downstream users, and between different sectors (e.g. commercial irrigation, domestic use, the environment).
- Failure to deliver the expected benefits of infrastructure development because of resource over-exploitation and a lack of local benefit sharing. For example, big irrigation projects may only succeed in developing islands of prosperity and may capture water that was already being used.

1 Data from personal communication with MoWIE representative (January 2015).

The establishment of at least 'good enough' – if not perfect – WRM institutions is hampered by a lack of knowledge of resource conditions, patterns of use, and drivers of change; and by the lack of capacity and skills within institutions to plan water allocation, assess the impacts and trade-offs of water resources development (WRD) and allocation, and to ensure planning is 'climate smart'.[2] The kind of institution-building effort required to address these challenges is long term – decades rather than years. At least, consensus is now emerging in the Government of Ethiopia (GoE) and its development partners (DPs) that this should be a priority.

1.2 Understanding the problems to find the solutions: assessing institutional bottlenecks to 'good enough' WRM

Against this background, the Ministry of Water, Irrigation and Energy (MoWIE) and the UK's Overseas Development Institute (ODI) have co-directed a project entitled 'Building adaptive water resources management in Ethiopia' in partnership with the Ethiopian Institute of Water Resources (EIWR), Addis Ababa University (AAU) and the Water and Land Resource Centre (WLRC). The project budget, provided by the UK Department for International Development (DFID) through the Strategic Climate Infrastructure Programme (SCIP), was £190,000.

The project was conceived to have two main phases:

- **a 12-month inception and diagnostic phase**, during which the project team conducted a climate change and water resources management assessment (CC-WRMA) at federal level (with basin-level case studies) and provided initial training and needs assessment around integrated and adaptive water resources management (AWRM).
- **a 24-month capacity building and technical assistance phase** dedicated to further diagnostic work in selected basins and capacity development of RBAs and MoWIE to address gaps and build on strengths identified in phase 1.

Running through the project was a focus on identifying and enabling pathways to AWRM, not conceived as an end in itself but as a process leading to better water management outcomes. The present report is the result of the first phase, which ran from September 2013 to January 2015.

Box 2: Integrated and adaptive water resources management: key definitions

Integrated Water Resources Management (IWRM) describes a process that promotes the coordinated development and management of water, land and related resources. The goal is to maximise economic and social welfare in an equitable manner without affecting the functions of vital ecosystems in the short or longer term (Global Water Partnership (GWP), 2000).

More recently and in the context of climate change, the notion **of Adaptive Water Resources Management (AWRM)** has grown in prominence, emphasising the need for governance structures that are flexible and robust in the face of uncertainties. During periods of abrupt change, social learning mechanisms – an essential component of AWRM – become essential for managing socioecological systems (Pahl-Wostl, 2007). More specifically, the literature (see, for example, Folke et al., 2005; Armitage, 2008; Ostrom, 2008) indicated the following basic requirements for adaptive governance:

1. Producing and using accurate and relevant information
2. Discovering, preventing and resolving conflict
3. Fostering compliance with institutional rules through monitoring systems
4. Providing infrastructures that are flexible over time
5. Responding to physical and socioeconomic changes
6. Encouraging adaptation to learn from good and bad practice (learning loops).

In this study, we understood **AWRM** as **a process that promotes the coordinated development and management of water, land and related resources while being able to adapt to the impacts of changing physical and socioeconomic contexts on resource availability and quality**. Because AWRM implies a constant learning process, water management will probably always remain imperfect, but it should be flexible and try to learn from experience.

In a way, the AWRM approach could be conceived as a way to counteract the rigidity implied by IWRM, which has sometimes been criticised for following preset formulae rather than answering to the real water-related issues that exist at basin level (Giordano and Shah, 2014). It has the potential to do so by suggesting the need to start small, try new solutions and approaches, discard what does not work and build on what works. Its final objective should be to maximise economic and social welfare through equitable distribution of derived benefits of resource development, without compromising the sustainability of vital ecosystems.

2 The World Bank understands climate-smart development as a way to achieve development and climate goals simultaneously. The term indicates policies that reduce GHG emissions and other short-lived climate pollutants while having clear economic, health and other social benefits. See: Akbar et al., 2014.

1.3 This report: audience and structure

This report builds on the diagnostic study of WRM in Ethiopia that ODI and the MoWIE conducted during the inception phase of the 'Building adaptive water resources management in Ethiopia' project. It is intended for the MoWIE and other stakeholders with decision-making competencies over water resources in Ethiopia, including DPs. We hope that the CC-WRMA methodology could be replicated by other researchers and analysts to understand bottlenecks and strengths of WRM systems in other countries and/or at different governance levels (e.g. the basin level). It should also be noted that the analysis only concerns WRM inside Ethiopia, and not in international river basins.

Section 2 presents an overview of the pressures and water resources in Ethiopia, focusing on both climatic and socioeconomic drivers of change and their impacts on water resources availability and demand. It then describes the regulatory and institutional framework for managing water resources in Ethiopia and identifies some of the problems emerging in the absence of clearly defined 'rules of the game'. This analysis is furthered by means of a climate change and water resources management assessment (CC-WRMA), conducted at federal level, with basin-level case studies. The methodology of the CC-WRMA is explained in detail in section 3.

Section 4 discusses the main gaps that remain in the institutional system for managing water resources in Ethiopia, based on the CC-WRMA results. The story it tells is one of inadequate investments in WRM (as opposed to WRD) in Ethiopia, despite the increasing pressures that a thriving economy, growing population and changing climate are placing on its water resources.

Building on the analysis presented in section 4, section 5 highlights some of the entry points that exist for the establishment of institutions that 'better' manage water resources. It also suggests some actions, prioritised according to the criteria of time, relevance and resource intensity, for the MoWIE and partners to revise the national WRM policy and institutional framework in order to remove (or at least 'soften') the identified bottlenecks.

The main message we want to convey, summarised in section 6, is that improving a country's WRM to make it efficient, equitable and sustainable is a long-term mission. Not everything can and should be done at the same time; rather, a 'problem-focused' approach should be adopted. This suggests the need to 'start small' by identifying very concrete problems and looking for opportunities to solve them, although with a clear vision in mind and ensuring coordination between all relevant actors in the water and water-related sectors.

2. Setting the context

Key messages

Managing water resources in a way that responds to multiple natural and socioeconomic changes and pressures is fundamental for the economic growth and development of Ethiopia. This requires investments in a minimum platform of water infrastructure to buffer variability, as well as investments in the institutional platform that is required to define who gets what, when and how.

Ethiopia is currently experiencing significant natural and socioeconomic changes, which are putting pressure on water resources by modifying their availability and demand. Because of its geography and climate, Ethiopia has always been characterised by high hydrological variability, compounded by the almost total absence of water storage and highly vulnerable watershed (World Bank, 2006: 3). Climate change is expected to worsen such variability (Conway and Schipper, 2011). The stunning economic growth and population increases that the country has been experiencing for the last two decades also demand a lot of good quality water resources. Home to several international rivers, of which the Nile is the most important, Ethiopia needs to plan the development of its water resources with careful consideration of how its neighbours might react.[3]

Managing water resources in a way that responds to these multiple changes and pressures becomes fundamental for the economic growth and development of Ethiopia. Ethiopian water politics need to look beyond 'what is traditionally considered water resources management, in order to curtail the negative effects of hydrological variability on the performance of the Ethiopian economy' (World Bank, 2006: 60). This will require large investments (from the public sector first, to provide adequate security for private investors to follow) to achieve a nationwide 'minimum platform' of water infrastructure (ibid).

This is happening; partly with international funding and partly with national budget, the Government of Ethiopia is realising ambitious water development projects to meet its growth and transformation objectives. The expansion of hydropower will allow for an increase of installed capacity from the current 2,178 MW to 24,092 MW by 2030. Medium- and large-scale irrigation schemes will cover 1.8 million ha of land by 2030, more than a sevenfold increase from the current 237,000 ha. According to the GTP, 98% and 100% of the rural and urban population (respectively) will have access to safe water supply by the end of 2015, and all Ethiopians will have access to basic sanitation (FDRE, 2010).

What is not happening is a concomitant investment in the management institutions and capacity that are needed to question the current development model and ensure it is sustainable in the long term. Institutions give rise to social practices, assign tasks to participants in those practices, and govern the interactions among the occupants of the various roles. In other words, they 'set the rules of the game', and can prevent the conflicts that occur when the political allocation of water resources leaves winners with abundance and losers with shortage. Without a proper institutional framework, there is a risk that large infrastructure projects will go ahead despite their costs for the poorest and most marginalised communities and the environment.

In Ethiopia, there are already a multiplicity of development plans, policies, strategies, programmes, initiatives and legal proclamations that govern, or at least influence, WRM at different levels. We examine them in the following paragraphs, where we also identify and describe the main drivers of change that impact, directly or indirectly, Ethiopia's water resources.

2.1 Global and local drivers of change: understanding the pressures on water resources in Ethiopia

2.1.1 Physical risks: climate change as a 'multiplier'

As Ethiopia pursues its ambitious development goals, it is critical that the effects of climate change on the country's water resources are properly understood and taken into account throughout all institutions of government and at different levels. Climate change has the potential to halve Ethiopia's GDP potential within 25 years unless steps to establish resilience are taken (FDRE, 2011b: 7). In short, climate change is expected to cause the following:

3 A discussion of the international policy of Ethiopia in the Nile Basin goes beyond the scope of this study. For more information, we recommend consulting the website of the Nile Basin Initiative at http://www.nilebasin.org/ (accessed March 2015).

Construction works of the Addis Ababa Light Rail. Started in 2011, after securing funds from the Export-Import Bank of China, the light rail system will have two lines running east-west and north-south Addis Ababa, covering 32 kilometres and with 39 stations. Photo credit: Beatrice Mosello.

- **Upward temperature trend across the country**. Between 1960 and 2006, Ethiopia's mean annual temperature increased by 1.3°C, an average of 0.28°C per decade (McSweeney, 2014: 2). Moving forward, climate models predict that the country will experience a further warming of all seasons in the range of 0.7°C and 2.3°C by the mid-2020s and between 1.4°C and 2.9°C by the 2050s (FDRE, 2011b: 2).
- **More uncertainty and extremes in weather patterns**. By and large, 'more regular heavy rainfall events are expected; this is likely to result in increased flooding' (FDRE, 2011b: 2). Increased intensity rainfall will also adversely impact soil quality (FDRE, 2011b: 8).
- **Increased rainfall variability**. According to historical data, *year-to-year* rainfall variability is already stark, particularly in the South and South-Eastern regime, with annual rainfall varying between +36% and -25% of the mean (McSweeney, 2014). Climate change is expected to increase such variability; however, the level of uncertainty concerning the long-term rainfall trend is very high (FEWS NET, 2012).

The 2010 Economics of Adaptation to Climate Change (EACC) study concluded that climatic vulnerability already affects (and will continue to affect) the Ethiopian economy through three main channels: (1) agriculture, which accounted for 47% of Ethiopian GDP in 2006 and is highly sensitive to seasonal variations in temperature and moisture; (2) roads, the backbone of the country's transportation system, which are often hit by large floods, causing serious infrastructure damage and disruptions to supply chains; and (3) dams, which provide hydropower and irrigation and are affected by large precipitation swings (World Bank, 2010: 38).

2.1.2 Ethiopia's rapid growth and development: increasing water demand

A booming population and the demands on water arising from the agricultural, industrial and energy sectors are set to increase pressure on Ethiopia's water resources. The cumulative impact of demand growth from both demographic and sectoral changes bears significant costs. Without appropriate institutional mechanisms such as markets or allocation permits to ration water use and pollutants, there is the risk of over-exploitation and decreased water quality as absorptive capacities are exceeded. In the medium term, this limits water availability and leads to a negative cycle of resource degradation, which could be entrenched and amplified by climate change.

Each of the pressures discussed in this section poses a risk and a potential cost to Ethiopia. The impacts of these risks materialising can be direct and indirect, through biophysical effects or socioeconomic costs, with varying severity at both the local and national level (see figure 1 overleaf). As discussed, many risks either result from climate change or have impacts that will be amplified by climate change. The time scale for the risk landscape is uncertain; however, poor water management already exerts a cost on local livelihoods, for example through loss of productive agricultural land or conflict between local water users. These issues are projected to become more urgent in the short to medium term (within five to ten years). It is only through strong institutional frameworks, together with adequate information and infrastructure, that Ethiopia can manage and mitigate such complex and interrelated water resource risks.

Population growth

Ethiopia's population is forecast to reach 120 million by 2030, increasing pressure on both land and water resources (Stein, 2014: 2). Urban centres are also set to grow, fuelled by both the rapidly growing population and increased migration to cities from rural areas. Within the Rift Valley Basin, for example, the urban population is set to increase from 1.12 million in 2009 to over 5 million by 2025 (Halcrow Group Ltd & GIRD, 2009: 26). At present, most Ethiopian urban centres, including Addis Ababa, are already facing a water emergency situation (Alamirew, 2014: 6).[4] Population growth will also increase energy demand, particularly for biofuels (Negash, 2011).

Within rural settings, water scarcity is set to become more pronounced as a result of the rapidly growing population, assuming people start using more water through better services and perhaps access to small-scale irrigation, and unless efforts are made to improve water management. This is likely to lead to increased incidences of conflict between local communities and pastoralists, as already observed in the Rift Valley Basin (Halcrow Group Ltd & GIRD, 2009: 59).

Agriculture development

Currently, Ethiopia's economy relies overwhelmingly on rain-fed agriculture (Demeke, 2010: 186). 'Agriculture, primarily rain-fed and highly sensitive to fluctuations in rainfall, forms the basis of the economy providing approximately 46% of GDP and jobs for 80% of the working population. Chronic food security affects 10% of the population and even in average rainfall years these households cannot meet their food needs and they rely partly on food assistance' (FDRE, 2011b: 7). This renders agricultural production particularly vulnerable to variation in rainfall patterns and adverse weather phenomena including drought and flooding (Demeke, 2010: 186).

Droughts can result in sharp reductions in agricultural output and related productive activity and employment, with multiplier effects on the monetary economy. Floods

4 Interviews with the Addis Ababa Water and Sewerage Authority (AAWSA) revealed that the city faces a 40% water deficit and that parts of the city receive water only one day a week. Information from interview with representative of AAWSA, held in Addis Ababa in September 2014.

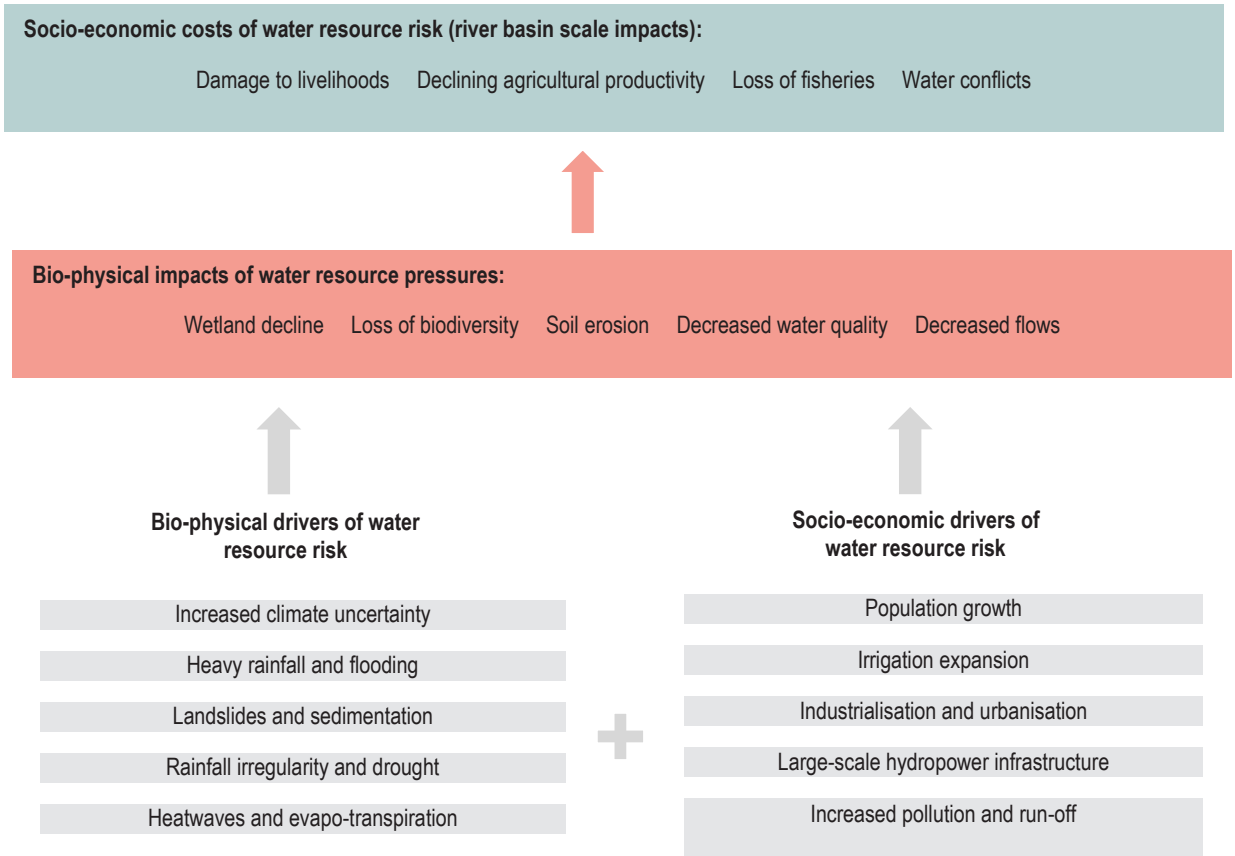
also regularly cause crop and infrastructure damage and widespread suffering and hardship. As the GoE has set ambitious targets for the development of the agricultural sector, there is a strong need to diversify the sources of water for agricultural use, including harnessing Ethiopia's groundwater potential and increasing irrigation coverage, as recognised in the GTP.

Energy and industrial development

Under Ethiopia's growth plans, hydroelectric production is set to increase exponentially from 2,178 MW installed capacity today to approximately 24,092 MW available capacity[5] by 2030. This will enable Ethiopia to meet future domestic peak demand (estimated at 14,213 MW by 2030) and export additional electricity (coincident maximum demand estimated at 3,655 MW by 2030) to provide a critical source of foreign exchange income and to support regional integration, as foreseen by the GTP. Likewise, the industrial sector is set to grow by 20% by 2016 (FDRE, 2011a: 9). According to the 2014 African Economic Outlook, industry accounted for 21.8% of the real GDP growth of Ethiopia (estimated at 9.7%) in 2012/13, growing by 18.5% as a consequence of the continued construction boom, together with expansion in mining and manufacturing (Zerihun et al., 2014).

The accelerated industrial growth that Ethiopia is experiencing has adverse effects on the quality of the country's water resources. There are a number of well-documented examples. For instance, the water quality of the Borkena River in north-east Ethiopia has deteriorated considerably as a result of untreated industrial and domestic waste being discharged directly into the river (Beyene, 2008: 474). Failure to manage pollutants and water abstraction has direct costs for livelihoods, particularly for poorer households who rely on surface water sources for domestic use and for agricultural and livestock activities (93% of rural households and 42% of small town households) (CSA, 2013). Pollution and salinity can lead to the loss of agricultural land or decreased productivity for crops.

Figure 1: Mapping of biophysical and socioeconomic drivers of risk for the Ethiopian water sector, and potential impacts and costs at the local and national level



Souce: authors.

The Adama water treatment plant, where water is being purified and made ready for human use before being delivered to the city of Adama. Built 11 years ago, the Adama water treatment plant was conceived with a life span of 20 years. However, the population served has now more than triplicated, which means that the water treated and released by the plant for drinking purposes (domestic consumption) is not sufficient. Photo: Beatrice Mosello.

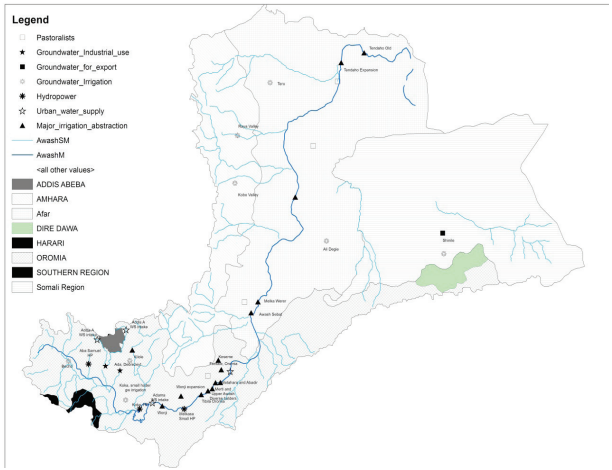
Box 3: Competing water demands in the Awash Basin

The Awash Basin is growing economically, and demand for water is quickly increasing. Irrigation is expanding rapidly – both planned (e.g. for sugar cane) and unplanned (farmer financed, opportunistic). According to the agricultural water survey conducted in 2012 in the Awash Basin (in Tiruneh, 2013), current agricultural water demand for a physical area of 152,828 ha and a cropped area of 181,113 ha is 2,452 Mm^3; current agricultural water withdrawals already amount to 2,285 Mm^3, which means that the proportion of water withdrawals to water demand is 94.7%. This leaves little space to the proposed irrigation expansion projects. Hydropower generation is also an important priority. One large-scale hydropower plant (Koka) and two smaller-scale ones (the newly renovated Aba Samuel power plant and the Awash Melkassa plant) generate electricity from the flows of the Awash. With a reservoir of about 180 km^2, these dams risk losing up to 5 m^3/s (or 197 Mm^3 per year) of water owing to evaporation. In addition, operation rules for hydropower generation have a great impact on irrigation water availability and scheduling downstream.

There are four expanding urban-industrial centres taking water from the Awash River, and groundwater withdrawals are accelerating. The city of Addis Ababa, with a population of 4 million, relies on two tributaries (Tilku Akaki and Tinish Akaki) of the Awash River for nearly 50% of its water supply. Other major towns that extract water from Awash for domestic water supply are Adama, with a population of over 300,000; Awash, population 20,000; and Metahara, population around 10,000. Large water-intensive industries (including floriculture, horticulture and manufacturing) are abstracting water directly from the Awash River and its tributaries, or from the groundwater that is ultimately connected to the flow of the Awash. This raises concerns about pollution, for example in the Akaki River. The expansion of commercial irrigation can impact directly on pastoral welfare and livestock productivity.

During our interviews, respondents complained about increasing instances of water shortage particularly in the dry season. These are a direct reflection of all the rapidly increasing – and often competing – demands for the water of the Awash river and its tributaries. Some of these developments are planned (e.g. for sugar cane expansion), others unplanned (farmer financed, opportunistic). But water users will have to expect more and more situations of water scarcity in the future.

Map 1: The Awash River Basin



Source: authors.

2.2 The rules of the game: policies and institutions for WRM

2.2.1 Water policy and water strategy

The **Ethiopian Water Resources Management Policy (1999)** (**'WRMP/the 1999 Policy'**) set out the basis for contemporary IWRM in Ethiopia. Recognising that Ethiopia's water resources are unevenly distributed in both space and time,[6] its objective was to 'enhance and promote all national efforts towards the efficient, equitable and optimum use of the available water resources of Ethiopia for significant socioeconomic development on a sustainable basis' (FDRE, 1999, 1.1).

In 2001, the Ethiopian Water Strategy was adopted with the stated aim of translating the 1999 Policy into action. At that time, the priority in terms of IWRM was water allocation for drinking and sanitation purposes, followed by water requirements for livestock. The strategy aimed to foster an enabling environment to strengthen the institutional framework and secure coordination of water resources development and management. Fundamentally anchored in this strategy, the **Water Sector Development Programme** (**WSDP**) was launched in 2002 by the GoE.

5 Installed hydropower capacity is the theoretical maximum that the system can produce; the actual generation capacity is lower due to the seasonality of rainfall. 2030 figures are therefore based on the 'very dry' hydrological conditions modelled by the Power Sector Expansion Masterplan Study, which uses the 3 driest years of the last 45 and therefore assumes a worst case generation scenario. Information from personal communication with MoWIE representative, held in January 2015.

Box 4: Growing demand for the waters of Lake Ziway

Among the Central Rift Valley Lakes, Lake Ziway is the only freshwater lake suitable for water supply and agricultural purposes (Ayenew, 1998). It falls within the administrative borders of three weredas (Adami Tullu and Jido Kombolcha, Dugda Bora, and Ziway Dugda) and borders the towns of Ziway and Meki.* The information collected during the field assessment from government and other non-government representatives indicates that Lake Ziway is used for a variety of social and developmental activities such as large-scale commercial farming, domestic water supply and cattle watering. It also supports commercial fisheries of *Oreochromis niloticus*, *Tilapia zillii*, *Cyprinus carpio* and *Clarias gariepnus* (Pascual-Ferrer et al., 2014).

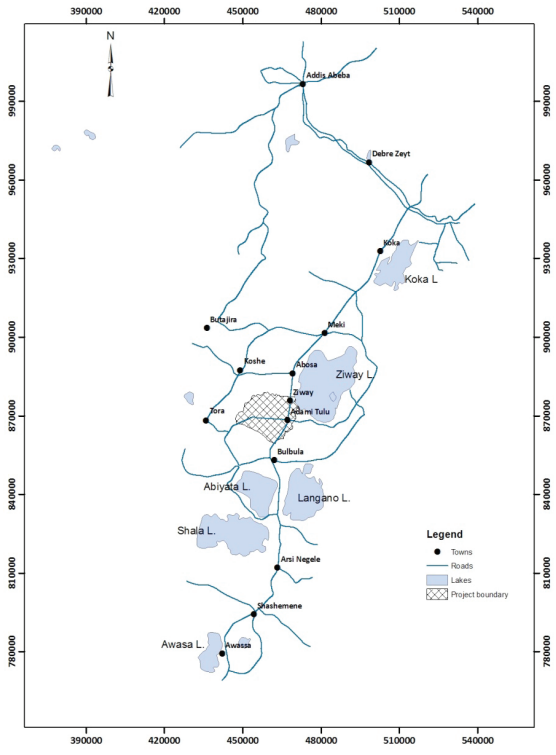
Currently around 12,000 ha of land are under irrigation, predominantly based on open canal and furrow irrigation practices (only 500 ha are closed irrigated production systems). The dominant irrigation water supply system in the area consists of direct pumping from Lake Ziway (31%). In addition, water diverted from the Ketar (27%), Meki (11%) and Bulbula (4%) Rivers, and pumped groundwater (25%) are used (Pascual-Ferrer et al., 2014). The Irrigation Office of Ziway Dugda wereda reported that there is a huge expansion in irrigated farming, mainly by the Sher Ethiopia floriculture complex and Castle winery and grape farming.** To date, no major water-related conflicts have been reported, also due to the fact that water abstractions go largely uncontrolled, so that nobody really knows how much water is being used by whom. However, our interviewees expressed concern about the pollution levels of Lake Ziway.***

**Information from: World Lake Database, International Lake Environment Foundation (ILEF)*

*** Interview with representative of Wereda Office, held in Ziway in January 2015.*

**** Information from interviews with several stakeholders in Lake Ziway and surrounding areas, held in January 2015.*

Map 2: Lake Ziway and surrounding areas



Source: authors.

The WSDP outlined the country's vision for the development and management of water resources over a 15-year period (2002 to 2016). Unlike the more recent GTP (see section 2.2.2 overleaf), according to which Ethiopia's Federal Regional boundaries constitute the primary planning units for economic development, the WSDP provided for basin-level WRM. It further recommended the establishment of RBAs in seven river basins. In the temporary absence of RBAs (which were only authorised five years later by Proclamation 534/2007), the WSDP envisioned that the Ministry of Water Resources and regional administrations would lead on the strategy implementation, and coordinate activities and stakeholders when and where appropriate.

The WSDP anticipated completion of Master Plans for all seven river basins by 2016; on paper, these would then converge in a 'national integrated river-basin master-plan' (FDRE, 2002a: 11). As of December 2014, eight Master Plan studies have been completed by foreign consultants on the Mereb, Tekeze, Abay, Baro-Akobo, Omo-Gibe, Wabi Shebele and Genale Dawa rivers, as well as Rift Valley Lakes. However, most of these studies were actually done in the 1990s, and urgently need to be revised to take into account recent changes (e.g. population growth). This update process has only been started in the three river basins that have established functional RBAs (Awash, Abay and Rift Valley) (see table 1 overleaf).

Two other important proclamations regulating WRM in Ethiopia were enacted in 2000 and 2007. The

6 At the time of the Policy's drafting, 80-90% of Ethiopia's water resources were located in just four river basins in the West and South-west of the country: Abay (Blue Nile), Tekeze, Baro-Akobo and Omo-Gibe; cumulatively covering around 30-40% of Ethiopia's population. Conversely, just 10-20% of Ethiopia's water resources were located in the Eastern and Central Basins of the country, where about 60% of the country's population resides.

Table 1: Ethiopian River Basins and RBAs presence

River basin	Characteristics (MWR, 2002)	Water management issues	Scale of issues	RBA status
Awash	112,912 km^2; 4.6 BCM	Water scarcity, salinisation, pollution, flooding	Community, regional	1
Abay Basin (mainly Tana and Beles)	199,912 km^2; 52.6 BCM;	Flooding, competition between multiple sectors (hydropower, tourism, navigation, irrigation), pollution	Community, regional, international	1
Rift Valley Lakes	52,740km^2; 5.6 BCM	Water scarcity, salinity, pollution, decline in water availability, water table decline	Community, regional	2
Omo-Gibe	78,200 km^2; 17.9 BCM	'Perceived' or 'real' impact on downstream of upstream dam and irrigation projects; flooding, salinity (2 hydropower projects under completion, two more planned, sugar cane irrigation underway)	Regional and international	3
Baro Akobo	74,100 km2; 23.6 BCM	Pollution and degradation of wetlands; water and land use planning; water use competition (natural systems vs planned large-scale irrigation); flooding	Regional and international	3
Tekeze	89,000 km^2; 7.63 BCM	Water scarcity	Community, regional	3
Wabi Shebele	200,214 km^2; 3.13 BCM	Flooding, water scarcity, salinity	Community	3
Genale - Dawa	171,050 km^2; 5.80 BCM	Flooding; water scarcity, salinity	Community	3

1 = Basin Authority is formally established by proclamation, and the RBA runs offices and operations and has started practicing water management in the Basin; 2 = Basin Authority is formally established by proclamation, exercising WRM mandate yet to start; 3 = No RBA established. Source: Alamirew and Kebede 2014.

'Ethiopian Water Recourses Management Proclamation' (Proclamation 197/2000) served to 'ensure that the water resources of the country are protected and used for the highest social and economic benefits of the people of Ethiopia […]'. Proclamation 197/2000 defined WRM as '[…] those activities that include water resources development, use, conservation, protection and control'. It further set out the powers and responsibilities of the 'supervising body', defined as the responsible Ministry (at the time of drafting the Ministry of Water Resources, now MoWIE) or 'any organ delegated by the Ministry'. These included responsibility for management of the water sector, the power to issue permits for water use, the power to determine allocation and use, and the establishment of quality standards.

In 2007, the Ethiopian Council of Ministers approved the **'River Basin Councils and Authorities Proclamation' (Proclamation 534/2007)** to authorise the establishment of River Basin High Councils (RBHCs) and RBAs for each of Ethiopia's major river basins. RBHCs and RBAs aim at 'promoting and monitoring the integrated resources management process in the river basins falling under their jurisdictions […]'.At the basin level, RBHCs 'provide policy guidance and planning oversight to ensure coordination among stakeholders for the implementation of integrated water resources management, and direct the preparation of the River Basin Master Plan to be submitted for approval by the Government' (article 6). Implementation of the Master Plan is entrusted to the Basin Authorities that should also 'ensure that projects, activities and interventions related to water in the basin are in line with the integrated water resources management process' (article 9).

2.2.2 More recent strategic developments with impacts on WRM (and development)

The Growth and Transformation Plan (GTP)

The GTP replaced the Plan for Accelerated and Sustained Development to End Poverty (PASDEP) in 2010 as Ethiopia's overarching five-year poverty reduction plan. In its introduction, the GTP affirms that 'achieving broad-based, accelerated and sustained economic growth so as to eradicate poverty has been, and is, a key objective of the Government of Ethiopia' (FDRE, 2010).

During the PASDEP implementation period (2005-2010), Ethiopia's economy grew at an impressive average rate of 11% per annum. Disaggregated by sectoral output, agriculture

grew by 8.4%, industry by 10% and services by 14.6% (FDRE, 2010: 4). The GTP's targets are premised on this rate of growth being maintained, if not augmented, throughout the implementation period. The GTP aims to increase real GDP growth from the agricultural sector from 7.6% in 2009/10 to 8.7% by 2015; and from the industrial sector, ambitiously, from 10.6% to 23.7% over the same period.[7]

The GoE's vision is to transform Ethiopia into a middle-income country by 2020-2023. To achieve this, the GTP places substantial emphasis on investments in infrastructure and to improve the quality of public services in Ethiopia. A 'modern and productive agricultural sector with enhanced technology' and an 'industrial sector that plays a leading role in the economy' are identified as the main drivers of economic growth within the GTP implementation period (2010-2015) (FDRE, 2010: 21).

The strategy also recognises that 'better adaptation to climate variability' (FDRE, 2010: 23) will be required in order to meet its ambitious targets. To this end, there is a need for improved water use and plans to develop ground and surface water resources for both hydropower generation and increased agricultural productivity and expansion. The GTP expressly states that an integrated approach to WRM will be adopted, but it does not detail how core elements of IWRM such as coordination, capacity and data sharing between stakeholders will be developed and implemented.

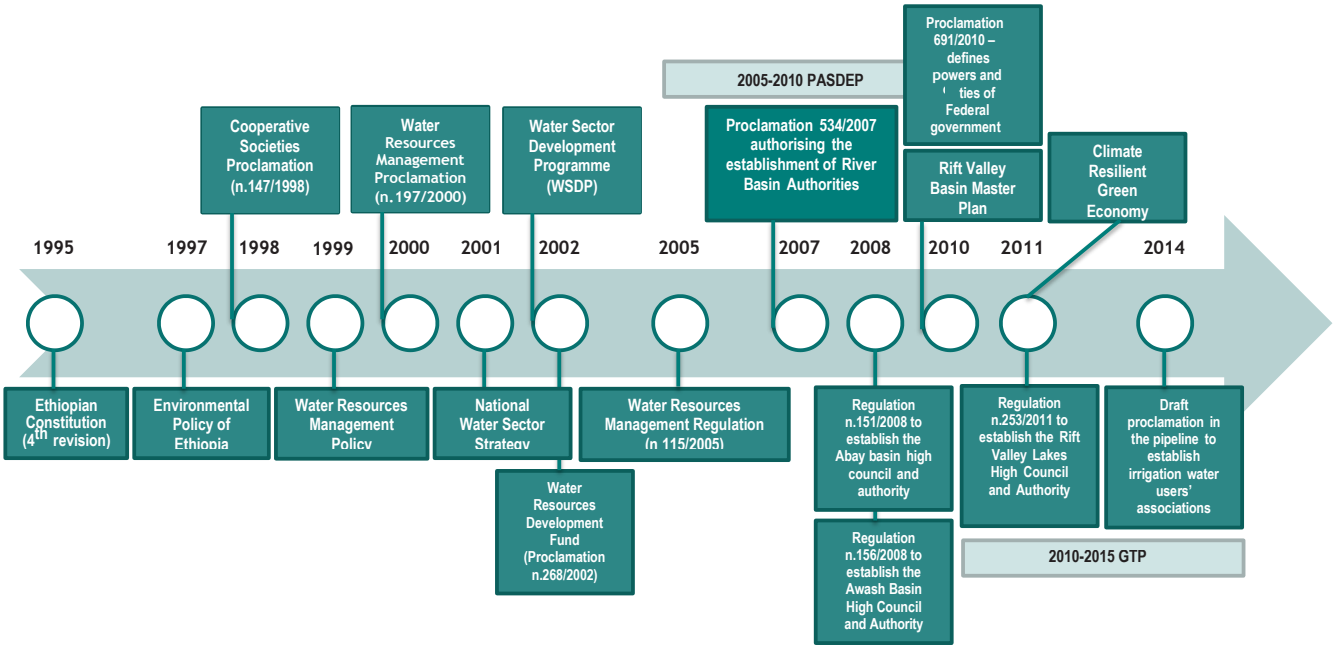
The Climate Resilient Green Economy (CRGE) strategy

The CRGE initiative was launched in February 2011 under the leadership of the Prime Minister's Office, the Environmental Protection Authority (now the Ministry of Environment and Forestry, MEF) and the Ethiopian Development Research Institute. Although international actors including bi/multilateral donors are set to play a role in financing the implementation of the CRGE (FDRE, 2011a: 55), the CRGE unequivocally affirmed that the ownership and management of its components would lie exclusively with the GoE (FDRE, 2011a: 48).

The CRGE's objective is to identify green opportunities to help Ethiopia become a middle-income country by 2020-23. Importantly, the CRGE is premised on the recognition that 'Ethiopia is experiencing the effects of climate change' (FDRE, 2011a: Foreword). Therefore, the country needs to implement actions to reduce greenhouse gas emissions while safeguarding economic growth ('green economy') as well as adaptation initiatives to reduce vulnerability to the effects of climate change ('climate resilience') (FDRE, 2011a: 8). The CRGE's Green Economy Plan is founded on four pillars: improving crop and livestock production practices; protecting and re-establishing forests; expanding electricity generation from renewable sources; and leapfrogging to modern and energy-efficient technologies (FDRE, 2011). On these bases, 150 initiatives have been identified and 60 prioritised based on their local relevance, feasibility, contribution to reaching GTP targets, and significant potential for emission reduction at a reasonable cost for the relevant sectors (FDRE, 2011a).

The CRGE understands water management as key to achieving a green economy because of the role of water for developing hydropower and agriculture. Therefore, the Ministry of Water, Irrigation and Energy (MoWIE) is listed as

Figure 2: Main policies for WRM in Ethiopia in chronological order



Source: authors.

Table 2: List of key institutions in the water sector in Ethiopia

Institution	Role
Ministry of Water, Irrigation and Energy (MoWIE)	Develops overarching policies and laws; is responsible for overall planning and coordination as well as monitoring the implementation of WRM and development programmes within the sector. Issues licenses for large and medium-scale irrigation schemes.
Ministry of Finance and Economic Development (MoFED)	Responsible for all spending with regard to WRM and WRD, including investments under the Water Master Plan/Strategy. MoFED also sets development priorities and strategies in cooperation with the other ministries, formulates strategies for managing foreign aid and loans, negotiates and signs aid and loan agreements and monitors their implementation.
Ministry of Environment and Forestry (MEF) – formerly the Environmental Protection Authority	The Environmental Protection Authority (EPA) was established in 1995 (Proclamation No. 9/1995). It developed an Environmental Impact Assessment (EIA) guideline, which was given a legal basis with the adoption of EIA Proclamation No.299/2002 (in the same Proclamation, the EPA was given legal mandate to conduct EIAs). An EIA directive under article 5 of the EIA proclamation was issued in 2008 (Directive no.1/2008), listing the type of projects that require EIA. In 2013, the EPA was upgraded into (and its tasks transferred to) the MEF. The MEF is in charge of EIAs at the federal level and decides on EIAs for projects that are likely to produce trans-regional impacts. Regionally, EIAs are a competence of the regional state environmental agencies. The monitoring and evaluation of EIAs is delegated to 6 sector institutions: Ministry of Mines and Energy; Ministry of Health; Ministry of Communications and Transport; Ministry of Water, Irrigation and Energy; Ministry of Trade and Industry; and Ministry of Agriculture. MEF (together with MoFED) is also a Coordinating Entity for the CRGE; in this role, it has focused on putting in place the overall technical approach and system for coordination for CRGE implementation and the monitoring of progress.
Ministry of Trade and Industry (MoTI)	Issues licenses and permits to industrial development projects.
Ministry of Agriculture (MoA)	Responsibility for watershed management, water harvesting and small-scale irrigation schemes.
The National Meteorological Agency	Establishes and operates a national network of meteorological stations.
Water Resources Development Fund (WRDF)	The WRDF was established by MoWIE in January 2002 through Proclamation 268/2002 as a semi-autonomous loan-granting body. The Fund provides small-scale financing to water supply, sanitation and irrigation development initiatives. Loans are granted for extended periods of up to 30 years, to be repaid through the collection of tariffs with fixed interest rates of 3%.
The Ethiopian Electric Power Corporation (EEPCo)	EEPCo is a government-owned utility responsible for the generation, transmission, distribution and sale of electric energy throughout Ethiopia 'in accordance with economic and social development policies' (EEPCo, 2014). The main energy source of the national grid ('Interconnected System') is hydropower plants, as well as some mini-hydro and diesel power generators allocated in various areas of the country.
Regional Authorities	According to the Ethiopian Constitution (art. 52 c), states have the power to administer land and natural resources in accordance with laws enacted by the Federal Government. Proclamation 197/2000 further provides for the possibility of the Federal Government delegating its powers to manage water and other resources to regional states.
RBHCs and RBAs	Management and regulatory functions as set out in Proclamation 534/2007: • RBHCs: prepare the basin plan in a participatory way and submit it to the government for approval; it has final responsibility for coordination of stakeholders at basin level. • RBAs: implement the basin plan, coordinate water-related interventions at basin level, and manage permit and information system.

Source: authors.

7 Although now a bit outdated, the Ministry of Finance and Economic Development (MoFED)'s annual GTP progress report (2013) noted that in the first two years of GTP implementation, Ethiopia was slightly behind schedule in the achievement of its development objectives. The average productivity of major food crops in the 2011/12 fiscal year was 17 quintal per hectare, which is higher by 0.50 quintal per hectare than the average productivity in 2010/11. However, marginal improvements need to be significantly improved in order to accelerate the economic growth, reduce poverty, contain inflationary pressure and increase foreign exchange earnings. Similarly, the performance of the industrial sector, and of the manufacturing industry in particular, was said to be insufficient to reach the targets set in the GTP (MoFED, 2013).

one of the actors with a role in encouraging the formulation and implementation of green economy (FDRE, 2011a: 48).

2.2.3 Key institutions in the water sector

In Ethiopia, a multiplicity of institutions in various sectors and at different levels are engaged with the management and development of water resources. At the federal level, the most important institution is the **Ministry of Water, Irrigation and Energy** (**MoWIE**). The MoWIE was established in 2010 through the Proclamation to provide for the definition of powers and duties of the Executive organs of the Federal Democratic Republic of Ethiopia (Proclamation 691/2010). Article 26 of the Proclamation set out the powers and functions vested in MoWIE, including: the promotion of the development of water and energy resources, the completion of basin studies determining both ground and surface water resources and plans for their development, and the expansion of medium and large-scale irrigation dams.

At the sub-national level, key institutions for water management and development include regional states, and basin-level authorities and high councils. Regional states are entitled by the Constitution (article 52) to administer their land and natural resources in accordance with laws enacted by the Federal Government (Proclamation 197/2000).[8] Within the regional states, **Regional Water Bureaus** (**RWBs**) are the focal institutions responsible for WRM. Each of the nine regional states as well as Dire Dawa City Administration has a RWB. Initially, the role of RWBs included project implementation and scheme operation (as established by the 2000 Proclamation), but this has translated, in practice, into one of programme planning, management, coordination and capacity building (WGC, 2013).[9]

In addition to government institutions, **development partners** (**DPs**) are playing an important role in the development and management of water resources within Ethiopia. This is especially true in the Water, Sanitation and Hygiene (WASH) sector, where there has been significant investment and support provided to the One WASH National Programme (OWNP). A midterm review of the OWNP is due to take place in 2015 and is expected to provide opportunities for improving coordination mechanisms between the WASH and WRM sectors.

Table 2 lists the key institutions engaged, to varying degrees, in WRM in Ethiopia. Figure 2 shows the main policies for WRM in Ethiopia, in chronological order.

2.3 In summary

Ethiopia's water resources have been typically characterised by high variability in terms of both their seasonal and geographical distribution. Climate change is expected to increase this variability, although the uncertainty surrounding climate projections for Ethiopia is significant. What we know is that more regular heavy rainfall events will probably occur, resulting in flooding and degraded soil quality. Higher rainfall variability and upward temperature trends across the country will also cause more intense and frequent drought events in certain regions.

However, this is not the whole story. Climate change has a negative multiplier effect on other risks that can affect Ethiopia's water resources. Population growth and the economic development path that Ethiopia has embarked upon in the last 5-10 years mean that demand for water resources is increasing (and will continue to do so). In certain 'hotspots', such as the Awash River Basin, instances of conflict between downstream and upstream irrigators, and/or between water uses for irrigation and hydropower generation, are already evident. Problems of pollution are also emerging, threatening the quality of water resources and the health and survival of several ecosystems on which people's livelihoods depend.

The review of the existing policy and institutional framework for water resource management suggests that Ethiopia may not be prepared to cope with these pressures. While the IWRM approach is inscribed in all the main water-related policies, as well as in the most recent strategies for economic growth and climate resilience, this does not appear to be matched by a corresponding institutional setup. RBHCs and RBAs, which should be the implementing pillars of IWRM, are only present in three river basins; their roles and responsibilities, while fully spelled out on paper, overlap with those of regional states.

A first step to establishing a functional WRM system in Ethiopia – one that responds to the competing pressures, growing demands and changing contexts that characterise the country today – is to understand what is wrong with the existing one. What is working well, and where do the problems lie instead? The CC-WRMA aims at attempting an answer to these questions. Its methodology and results are presented in the next two sections, respectively.

8 In addition, according to article 49 of the Constitution, 'The special interest of the state of Oromia with respect to supply of services or the utilisation of resources or administrative matters arising from the presence of the city of Addis Ababa within the state of Oromia shall be protected. Particulars shall be determined by law'.

9 In most regions, RWBs are responsible for approving programs as well as consolidating monitoring and evaluation reports of local structures (Zonal Water Offices, Wereda Water Desks, Kebeles) for submission to the MoWIE. It should also be noted that regional states have revenue sources of their own, such as income tax, agricultural tax, land use tax, and fees and charges from service-providing public bodies (WGC, 2013).

3. The CC-WRMA methodology

3.1 Introducing the Climate Change and Water Resources Management Assessment (CC-WRMA)

A fundamental component of the project is the CC-WRMA, which identifies and prioritises the gaps of the current WRM system, and the revisions to national WRM policy and strategy that are required to meet current and future water needs. It is hoped that the CC-WRMA could also produce the evidence base that is required to make the case for investments in the WRM institutional framework.

The CC-WRMA was conducted in Ethiopia between December 2013 and October 2014. It consists of an indicator-based assessment of WRM systems, practices, capacities and outcomes, taking a 'pathways' or 'bottlenecks' approach to identify the underlying factors supporting or hindering progress towards AWRM. It primarily focused on the national level, although three basin-level case studies were also used to illustrate the concrete manifestations or consequences of the bottlenecks that emerged from the analysis. For these, we considered those river basins where RBAs have been established, namely the Awash and Abay (Blue Nile) River Basins and the Rift Valley Lakes (Lake Ziway).

Its methodology built on the one adopted by the African Ministers' Council on Water – Water and Sanitation Programme (AMCOW-WSP) Country Status Overviews (CSOs) for the WASH sector, which has international recognition (AMCOW, 2011) and has been applied to assess water supply and sanitation coverage in Ethiopia in 2009/2010 (WSP, 2011). It also drew on UNICEF's Bottleneck Analysis Tool for the WASH sector (WASH-BAT) (Schweitzer et al., 2014) (see box 5).

Box 5: Methodological Tools

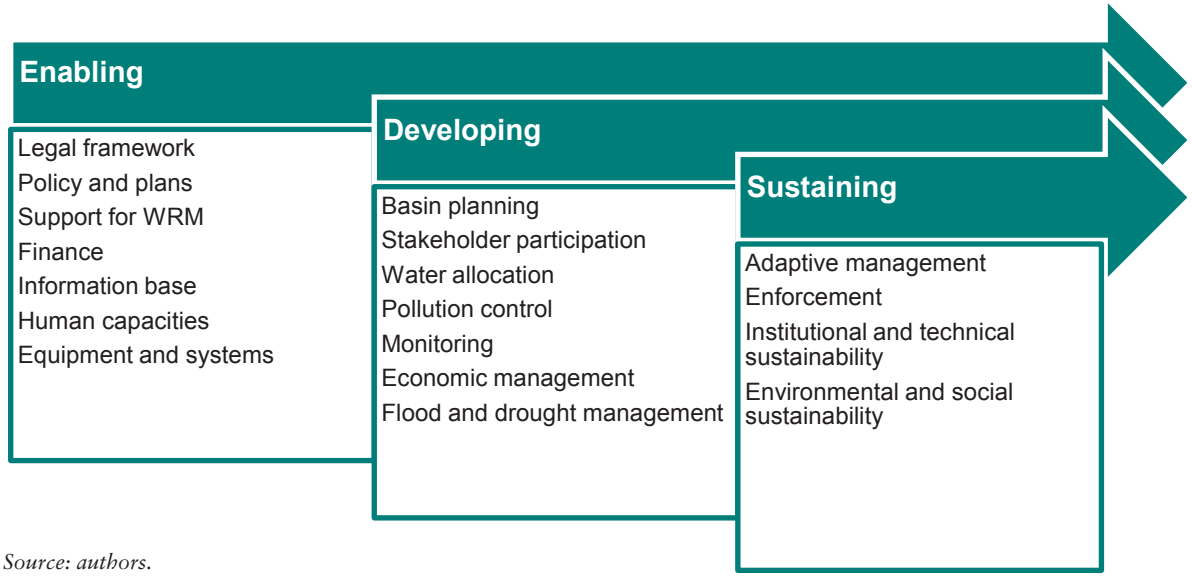
AMCOW's CSO2 methodology

In 2011, the African Ministers' Council on Water (AMCOW) commissioned the production of a second round of Country Status Overviews (CSOs) to better understand what underpins progress in water supply and sanitation and what its member governments can do to accelerate that progress across countries in sub-Saharan Africa. Data were collected through desk reviews and country visits – and analysed using a 'scorecard', i.e. an assessment framework allowing identification of drivers and barriers in the 'service delivery pathway' of each of the four subsectors: urban water supply, rural water supply, urban sanitation, and rural sanitation. Scores were generated with reference to a range of specific questions (each indicator was awarded a score of 0, 0.5 or 1; these sub-scores were then aggregated to obtain the overall building block score ranging from 0 to 3). A simple visual key was used to easily identify problem building blocks (barriers) (AMCOW 2011, 24).

UNICEF's Bottleneck Analysis Tool (WASH-BAT)

WASH-BAT is a sector analysis and monitoring tool developed in 2011 by the United Nations Children's Fund (UNICEF) and the World Bank (WB) as part of the Marginal Budgeting for Bottlenecks approach. It aims to assess the enabling environment of WASH delivery by tracking the removal of barriers to sustainable and efficient services at national, regional, service provider and community levels. The performance of enabling factors is scored, and activities for the removal of each bottleneck are identified, sequenced and prioritised. Funding is then sought and allocated to the activities ranked highest priority. The tool caters to the need of the user, and each enquiry can vary in scope (water/sanitation and hygiene, urban/rural), level of detail, and time period covered. The tool was pilot tested in 2012 and its roll-out version 1.0 was underway in 2014 in priority countries.

Figure 3: Indicators of IWRM and AWRM selected from the literature, grouped into 'enabling', 'developing' and 'sustaining'



Source: authors.

The innovative aspect of our study lay in moulding these indicator-based assessment tools in order to render them fit to analyse the institutional system for WRM. While maintaining the 'enabling', 'developing' and 'sustaining' categories of the CSO and WASH-BAT tools, we used different indicators to characterise AWRM. In turn, these indicators were selected from the relevant academic literature in the fields of WRM and institutional adaptive capacity (see annex 3). The full list of indicators that were used to describe the Ethiopian institutional system for WRM is presented in figure 3.

More indicators were selected for the enabling and developing categories, as these regroup the very basic conditions that are required to establish and operationalise the WRM system. As many of these conditions already serve to ensure its long-term sustainability, the sustaining category included fewer indicators; these referred to those actions that are needed to make the system adaptive to changes and uncertainties in the long term, for example by ensuring flexibility, encouraging learning loops, and fostering compliance with institutional rules.

- **Indicators in the enabling category** describe the key building blocks of WRM, including the legal and policy framework, the evidence base for decision-making, financial structures, and human and technical capacities within the sector (7 indicators).
- **Indicators in the developing category** refer to the key activities associated with functional WRM systems, including basin planning, water allocation and monitoring, participatory decision-making processes, and flood and drought management (7 indicators).
- **Indicators in the sustaining category** refer to the actions required to ensure that WRM structures continue to be effective in the long run, in order to support achievement of development goals. To realise this, institutions must be resilient to pressures and risks including population growth, industrialisation and climate change (4 indicators).

For each indicator, scores were generated with reference to a range of specific questions (sub-indicators) and a simple visual key allows problem building blocks (barriers) to be easily identified. Each sub-indicator was assigned scores between 1 and 5 (with increments of 1), on the basis of clearly defined response options. For example, a criteria describing a condition/function that was not in place at the federal and basin level was given a 1. An indicator was attributed a score corresponding to the average value of its sub-indicators (see annex 3). A low score equated to the presence of a bottleneck. We deliberately chose a 5-grade scale in order to allow for the option of a midpoint, which indicates a more neutral judgement and hence reduces the bias towards producing low scores and highlighting problems rather than achievements.

A traffic light system was then applied to help decision-makers identify the major impediments to AWRM, and prioritise investments and resources. Accordingly, if the condition was absent or major impediments existed to its effective functioning, the indicator was coloured in red (for scores of 1 for sub-indicators and between 1 and 2 for indicators); if it was present but poorly performing, it was coloured in orange (for scores of 2 and 3 for sub-indicators and between 2 and 4 for indicators); and if it was present and performing well, it was coloured in green (for scores

of 4 and 5 for sub-indicators and between 4 and 5 for indicators) (see table 3 below). Scores were registered on a simple Excel sheet; the recording system was deliberately kept simple in order to allow for its replication by decision-makers or other researchers wishing to conduct similar institutional assessment exercises.

Table 3: Scoring system used in WRM bottleneck analysis

Score	Description
1	Very weak or no performance against indicator
2	Weak performance against indicator
3	Adequate performance against indicator
4	Moderately good performance against indicator
5	Very good performance/no issues associated with this indicator

Source: authors.

3.2 Data collection and analysis

The data collection for both the status assessment and the review of pressures and opportunities was done through a combination of literature review, expert interviews, consultations and stakeholder dialogues. The purpose was not for the project team to produce an apolitical and technocratic study but for national stakeholders to reflect on their own priorities and develop a shared vision for the future of WRM in Ethiopia under climate change and other socioeconomic pressures, and to identify specific cases where action on water management can realistically start. Participatory reflection, consultation and consensus building ran through the assessment process, from its design to the implementation phase.

Data collection was done primarily with government officials, some private sector stakeholders and development partners. A few end users, including smallholders, were also involved. Interviews were based on questions linked to the CC-WRMA indicators (see full list of respondents in annex 1 and full list of questions in annex 2). The interviewers maintained a flexible (semi-structured) approach to the process, so that questions were selected and modified depending on the occasion. This aimed to ensure that the particular expertise and knowledge of the respondents could emerge during the interview process, while providing an opportunity for probing questions around why situations are the way they are.

3.3 Presenting the results of the CC-WRMA

The next section of this report presents the results of the CC-WRMA. It is divided into three main sections, one for each category of indicators (enabling, developing and sustaining). Each section opens with a summary of the main limitations of the institutional system for WRM with reference to the criteria assessed, as well as its strengths (where applicable). The section then includes a table showing and justifying the average score attributed to each indicator (in turn, based on the scores of sub-indicators). Finally, it outlines the results of the analysis in greater detail, synthesising the main bottlenecks (the red and orange ones according to the traffic light system) and factors promoting progress in terms of WRM (the green ones).

It should be noted that the discussion on the enabling, developing and sustaining categories in sections 4.1, 4.2 and 4.3 does not exactly mirror the indicators that have been used in the interviews but is organised around key messages. This reporting structure aims to encourage a more 'problem-focused' approach, which identifies specific issues and their underlying causes, i.e. not only 'what' but also 'why' bottlenecks to concrete action exist. Simply providing a set of high-level recommendations based on a pre-established analytical structure would have been more scientifically rigorous but less useful from a political, action-oriented perspective.

4. 'Bottlenecks' to AWRM in Ethiopia

Key messages

Ethiopia has a policy and legislative framework that supports IWRM, but its implementation is poor; institutional roles are not sufficiently well-articulated, nor are coordination mechanisms for WRM (especially at sub-national level). Three RBAs have been established in strategic river basins in Ethiopia; however, in most cases they lack adequate financial, human and technical resources to fulfil their mandate. Hydrological (for both surface water and groundwater) and meteorological data are collected in a scattered way by different organisations, and information sharing is minimal. Water permits are issued by competing state and federal authorities, often outside the scope of Basin Master Plans (when these exist), and with insufficient consideration of the sustainable and equitable allocation of water resources.

Before proceeding with the identification of 'bottlenecks' impeding action on WRM in Ethiopia, we want to clarify that the purpose of the CC-WRMA is not to negatively 'judge' an emerging approach. We recognise that Ethiopia has only recently embarked upon the (long-term) process of revisiting the way in which its water resources are managed to ensure the sustainable development of the country, facing multiple risks. Instead, our goal here is to identify progress and weaknesses constructively, in support of the national IWRM agenda being pursued by the MoWIE and other governmental and non-governmental stakeholders.

4.1 Enabling factors

Enabling factors refer to the key building blocks of WRM, including the legal and policy framework, the evidence base for decision-making, financial structures, and human and technical capacities within the sector. The scores of the indicators and relative sub-indicators that were used to understand the extent to which the building blocks of WRM were present in Ethiopia are listed in annex 4 (figure 5) and discussed more in detail in the paragraphs that follow.

Laws and policies supporting IWRM

Overall, legal frameworks are strong and scored 3.75/5, reflecting that while there is room for improvement, the existing laws and regulations are adequate. These include provisions for basin planning, stakeholder participation and the user pays principle, and make explicit reference to the need to balance social, economic and environmental objectives. For example, drawing on the principles of IWRM, the 2000 Proclamation stated that 'water resources development needs to be underpinned by rural-centred, decentralised management, participatory approach as well as integrated framework [and] should encourage the participation of all stakeholders, user communities, and particularly women's participation in the relevant aspects of water resources management' (Article 1.3 #6).

The 2000 Proclamation also established that water consumption for domestic use and livestock should take priority over other uses. At the river basin level, RBAs, established by the 2007 Proclamation, are supposed to embrace similar principles – for example, the mission statement of the Awash Basin Authority (AwBA) clarifies that WRM activities in the basin should 'promote the socioeconomic welfare of the people without compromising the sustainability of the aquatic ecosystems'.

However, IWRM policies and plans only scored 2/5 because of their predominant focus on technical elements only, and their failure to align with subsequent strategic developments in other sectors and to adequately spell out the roles of the different institutions for WRM at different levels.

IWRM in Ethiopia: good in principle, less so in practice

Although legal and policy provisions pay lip service to IWRM, our interviews revealed that policy-makers and water managers remain unclear on what IWRM means in practical terms. The 'support for WRM' indicator only received an average score of 2. Especially at basin level, water management institutions were said to receive little financial and technical support to perform their functions, and interviews revealed little political commitment to WRM. In other words, IWRM in Ethiopia seems to have become 'an end in itself', with the risk that pragmatic solutions to existing water problems are shut out.

In addition, we noted that the 1999 Policy is still the main guidance for WRM in Ethiopia, despite more

Box 6: Water rights in Ethiopia

According to the 1995 Constitution of the Federal Democratic Republic of Ethiopia, all natural resources (including water) are the common property of the Ethiopian people (article 44). The provisions for water rights are laid out in the 1999 Ethiopian Water Resources Management Policy and 2000 Proclamation. In theory, the information included in the Master Plans provides the basis for the allocation of water between different uses and users. In practice, however, most Master Plans are outdated and poorly reflect the actual water needs of expanding irrigation and hydropower capacity, industrial development and a growing population (Negash, 2011: 33).

While a modern system of formal water rights has yet to be implemented, traditional or customary water rights shape claims to access and use of water in many parts of Ethiopia. In pastoralist areas, for example, access to water is mediated through negotiation and reciprocity within a system of communal land tenure. Groups are often associated with specific territories that have critical natural resources, such as grazing land and water resources, while membership in these groups is often 'fuzzy' to accommodate mobility in times of scarcity. Traditional institutions allow different clans or groups to be represented in decision-making regarding access to land and water (Nassef and Belayhun, 2012).

Overall, however, water rights issues, including their definition and allocation within basin caps, and the interface between formal and customary systems, remain a largely unresolved and under-researched issue in Ethiopia (Negash, 2011: 33).

recent and salient strategies, namely the CRGE and GTP, having been enacted in other (water-related) sectors. The investment plan that was supposed to accompany and operationalise the WSDP (which is due to expire in 2016) was never completed, according to key respondents in the MoWIE. Interestingly, a strategic plan exists for groundwater development (prepared in 2011 at the initiative of the Ministry of Water Resources with the assistance of the World Bank), but it is not clear to what extent it has been endorsed and is currently being implemented. Moreover, there remains a fundamental disconnection between groundwater and surface water development and management, which is becoming problematic particularly in those basins (for example, the Awash) where groundwater abstraction is increasing.

A basin approach, but not for all basins

Respondents reported that the Government of Ethiopia initially focused on introducing a river basin management approach in the Abay, Awash and Rift Valley Lakes Basins, as these are the areas experiencing the biggest pressures from climate and socioeconomic drivers of change. It is expected that 'pilot' RBAs will guide the establishment of other, similar bodies in Ethiopia in the remaining nine river basins. However, there is no evidence that this is happening yet, and a significant institutional vacuum in being created in the Ethiopian WRM system. This reflects the previous observation that while the legal framework for WRM is appropriate (scoring 3.75), its translation into policies and plans and actual support for WRM are much less obvious (scoring 2).

Crucially, RBAs are expected to produce and implement River Basin Master Plans. The three existing basin authorities have all initiated a planning process, but this has heavy data requirements and demands the capacity of RBA staff to bring together RWBs and the main water users (sugar producers, EEPCo, flower producers, water utilities, mining companies, etc.). At present, these conditions appear to be absent in the Awash, Abay and Rift Valley Lakes Basins. Our analysis revealed that not enough human and financial resources were dedicated to the basin planning process.[10]

While being clear on RBAs' responsibilities in relation to irrigation, the 2007 Proclamation failed to define those on energy, industrial water use, livestock watering and urban water utilities. RWBs have used this legal ambiguity to maintain their authority on water allocation, thus limiting the influence of RBAs to agricultural/irrigation water use. For example, the Oromia Water and Energy Bureau (OWEB) started issuing water use permits to flower farms operating in the region (GWC, 2013). The permitting mandate of OWEB, according to respondents, encompasses both surface and groundwater and largely covers the area around the city of Addis Ababa, as this is where requests are concentrated. Interviewees in different departments

Key messages

RBAs have only been established in those basins with that are economically or politically important and are experiencing serious environmental threats. This creates an institutional vacuum in remaining areas. Even in those basins where RBAs have been established, water resources planning and management continues to occur in a fragmented way across governance levels and water-using sectors. In most cases (and especially beyond the agricultural sector) water users are not aware of the existence and functions of RBAs.

10 Information from interviews with key respondents in Awash and Abay Basins and in MoWIE, held in August-October 2014.

Box 7: Setting up new RBAs: the challenges of the Rift Valley Lakes Basin Authority

The Rift Valley Lakes Basin Authority (RVLBA) was established by Proclamation No. 534/2007. The RVLBA is an autonomous organisation entrusted with coordination and technical implementation of IWRM in the Rift Valley Lakes Basin (RVLB). Its mandate foresees close collaboration with regional, zonal and wereda administrations in the basin as well as all other public and private stakeholders.

Among the three authorities, RVLBA is the youngest. In 2009, a study project for the Rift Valley Lakes Basin Integrated Resources Development Master Plan was commissioned by the MoWIE and completed by a foreign consultancy firm (Halcrow Group Ltd & GIRD, 2009). The study was supposed to inform the activities of the newborn RVLBA; but the latter only became fully operational in 2014, with the establishment of its branch offices in the towns of Ziway (covering the northern areas of the basin) and Arba Minch (covering the southern part of the basin). Interviews with key informants revealed that the RVLBA has not yet been able to hold any type of coordination activity with stakeholders in the basin (apart from a meeting with water users in 2011 when a serious water shortage occurred), including regional and local authorities. The problem, it was said, is that the RVLBA does not have enough capacity and authority over the wereda governments. There is a gap in promoting the complementary role of the authority and its mission of planning and regulating WRD in partnership (as opposed to rivalry) with regional and local bureaux.*

** Information from interview held with representative of Rift Valley Lakes Basin Authority in Ziway in January 2015.*

Interviewees' comments

'It is good in principle, reflecting international approaches such as IWRM and laying the basis for responsible water resources management'.

'It is very old now, it definitely needs to be updated'.

of the MoWIE agreed that the breakdown of roles and responsibilities at the federal level is clear, but grey areas remain between regional and basin administrations as to their respective competencies.[11]

This adds to the ignorance that persists among water users regarding the mandate of RBAs. An irrigation manager in the AwBA stated that 'farmers, let alone other users, do not know about the existence of the AwBA; they do not pay water fees to it and hence they feel entitled to divert water for their own purposes'.[12]

Less attention to WRM than WASH

Our analysis revealed that, to date, WRM has received limited attention from government and its DPs ('WRM support' indicator scored 2/5). Most efforts (and resources) have tended to focus on WASH. Although extending and sustaining access to domestic water supply is clearly part of the WRM equation, WASH continues to be treated as a separate 'sector', with little if any discussions of the resource base it depends on.

WASH interventions are well resourced within an agreed institutional framework under the OWNP, in line with GTP provisions. In contrast, WRM remains institutionally fragmented and under-resourced. New investments in WASH, hydropower and irrigation therefore occur in silos, with little understanding of the trade-offs and risks involved. Table 4 contrasts the solid organisational and funding base for WASH with the weak overall provisions for WRM.

Key messages

Compared to the WASH sector, WRM has received less attention (and fewer investments) from both the GoE and DPs. In particular, it lacks:

- a coherent institutional and policy framework (one that is aligned with the strategic development priorities of the country, including in non-water sectors), outlining roles and responsibilities of different organisations at different levels and including a coordination body
- a clear definition of budgetary needs; and a consolidated financial mechanism to gather investments from both the government and DPs
- a well-defined structure for implementation of interventions, outlining roles and responsibilities of different organisations at different levels and including a coordination body.

11 Information from interviews with representatives of Oromia OWEB and the MoWIE, held in Addis Ababa in January and May 2014.

12 Information from interview with representative of the AwBA, held in August 2014.

Box 8: Why is it difficult to put IWRM in practice? The case of the Abay River Basin Authority

The adoption of the 2007 Proclamation marked the beginning of Ethiopia's process to reform its water sector towards a more decentralised and basin-level approach. Regulation no. 151/2008 established the Abay River Basin Authority (ARBA) and detailed its duties and responsibilities, firmly anchored in the IWRM principles, i.e. recognising that water is a finite and vulnerable resource, stressing the importance of participatory decision-making (including women), and highlighting the value of water as a social and economic good and the need for its equitable, efficient and sustainable use.

The establishment of RBAs brought about the necessity to harmonise hydrological and political boundaries. In the case of the Abay Basin, for example, in addition to the ARBA, several regional states also have WRM functions. On paper, the Abay River Basin High Council should be the body facilitating the operations of the ARBA and mediating its relations with regional states. In practice, its members were only appointed in 2011 and have not been able to meet regularly and make meaningful decisions to date. In fact, the Abay RBHC is composed of high-level leaders with diverse responsibilities at both federal and state level, who generally find it difficult to invest enough time to understand and address the challenges of WRM at basin level.

In order to listen to and better accommodate the interests of the regional states sharing the river basin, the ARBA opened offices in the towns where sub-basins are located (Tana Sub-basin Organization in Bahir Dar, Beles Sub-basin Organization in Asossa, and Dedessa Sub-basin Organization in Nekemte). However, our analysis did not provide any evidence of whether this decentralisation effort actually bore any fruit in terms of building relationships with the regions. In addition, these initiatives were supported by external funding (provided by the World Bank*), which raises concerns over their long-term sustainability.

One clear conclusion that we can draw from the case of the ARBA is that establishing RBAs – as a symbol of the adoption of IWRM principles - does not automatically translate into good WRM. Reforms take time, as well as credible investments in both financial and social capital, enforceable policies, legislations and regulations. Since its creation in 2008, the ARBA has been on a steep learning curve, defining its mandate, raising awareness about its existence and functions, building its institutional and human capacity. As an organisation, there are daily lessons it can learn – and these lessons are instrumental in shaping its activities, and eventually those of other RBAs. Documenting learning and change should be a priority.

** In the Tana and Beles Sub-basins, the World Bank is implementing the 'Tana & Beles Integrated Water Resources Development' project, which aims to develop enabling institutions and investments for integrated planning, management and development to accelerate sustainable growth. For more information about the project, see the World Bank's website at: http://www.worldbank.org/projects/P096323/tana-beles-integrated-water-resources-development?lang=en (accessed March 2015).*

Insufficient budget to fund WRM institutions

Of particular concern to the interviewees was 'the shortage of finance to cover the demand for development in the sector' [which is] 'crystal clear at both federal and basin level'.[13] The finance indicator received a very low score in our assessment (1.25/5). Besides WASH, irrigation and drainage and hydropower development are priorities for the GoE[14], but not WRM.

Our analysis revealed that funding is a problem especially for RBAs. According to the 2007 Proclamation, their budget should come from the Federal Government (through the MoFED) and from water charges collected from permit holders and service fees (such as maintenance and construction of roads to access irrigation sites). However, interviewees noted that the capital budget that RBAs receive from the MoFED is usually insufficient.[15] In addition, the process for obtaining the requested budget from the MoFED was described as lengthy and overly bureaucratic.[16]

As well as receiving insufficient core budget, RBAs are unable to collect revenue from licensed users because permit systems are not fully operational. Only large-scale irrigation schemes need to obtain a water-use permit (and hence pay a water fee) from RBAs; permits are delivered after the land has already been secured by the relevant ministry at regional or federal level. All the other users can extract water without a permit, or, as in the case of industries, water rights are embedded into their licenses for land and industrial development, which are issued by regional governments.[17]

13 Quote from interview with representative of MoWIE, held in May 2014 in Addis Ababa.

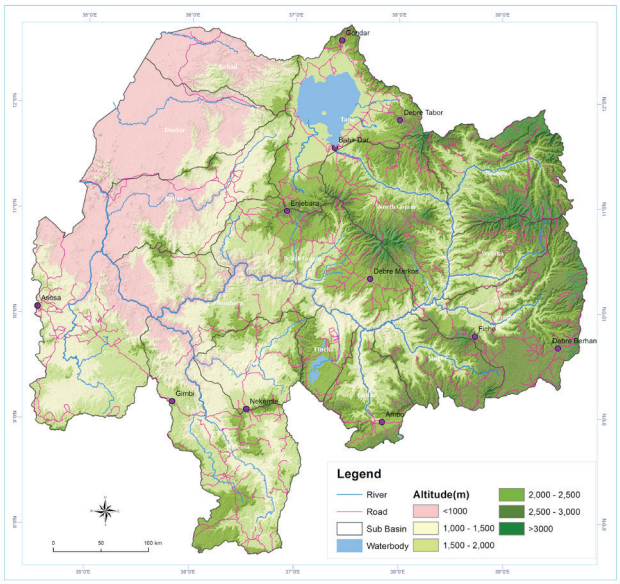
14 Irrigation development is predominantly funded through Foreign Direct Investments and, more recently, public-private partnerships; hydropower development is funded by the GoE itself, with little international funding. Source: information from interview with MoWIE representative in September 2014.

15 Information from interview with RBA representative in September 2014.

16 For example, the AwBA needs to submit its budget and activity proposals to MoFED every year in September; these go through a first review by the MoWIE in December; the AwBA then needs to rewrite its proposals in March, so that the MoFED can submit them to the Council of Ministers; approval is upon the House of Parliament; the AwBA receives a final answer from MoFED only in June, almost one year after the original proposals, which reflect the demands and needs of stakeholders in the basin, were formulated. Information obtained from discussions with various stakeholders in January-October 2014. Also cfr. WGC (2013).

17 Information from interview with representatives of AwBA and ARBAs, held in September and October 2014.

Map 3: Topography map of the Abay Basin



Source: authors.

Interviewees' comments

'The government budget is more or less sufficient to cover our immediate needs, but often we need project funding to install new equipment, update database, build the technical capacity of our staff.'

'The government will have to find adequate funding to allow RBAs to implement the Basin Plans.'

To date, the AwBA is the only RBA that has set up a permit system, covering only large irrigation schemes. The Government (through the MoWIE) has set a standard fee rate at 3 Ethiopian Birr (ETB) for each 1,000 m^3 of irrigation water. This very low tariff reflects a concern to ensure that all users can pay for the water they consume; it was intended to incentivise irrigation rather than to manage demand. However, this means that the AwBA cannot raise enough revenue to sustain its effective and independent functioning. Respondents from the AwBA reported that the authority collects up to 2-3 million ETB annually from users, compared with the 220 million ETB that they need.[18]

After covering their fixed costs (e.g. salaries), RBAs are not left with much; many of the activities inscribed in their mandates are essentially supported by DPs on a project basis. For example, in the Abay River Basin, the

Key messages

Efforts are underway to establish Basin Information Systems (BISs) in major Ethiopian river basins (at present: Awash and Abay). However, these need to be:

- Conveyed to a centralised system (at federal level) that collects water data from different sources (including RWBs); data should then be synthesised and translated into useful information for decision-making purposes at federal, basin and sub-basin level.
- Coupled with investments into capacity-building on data management and analysis as well as the necessary software and hardware.

World Bank is investing $70 million in the Tana-Beles Integrated Water Resources Development Project, which aims to develop enabling institutions and investments for integrated planning, management and development in the Tana and Beles sub-basins. Respondents expressed concern over the sustainability of donors' funding in the long term. In addition, DPs have traditionally shown little interest in WRM in Ethiopia; rather than supporting basin planning, they have preferred funding land, watershed and drought/flood management. A detailed list of DPs' interventions is provided in annex 6.

Not enough is known about water resources

Interviewees agreed that at federal level there is a relatively good availability of data on quality and quantity of surface waters. Hydrology data are annually complied by the MoWIE (Hydrology Department). However, at basin, sub-basin and local/farm level, our interviews revealed that reliable and sufficient information on water availability, use and quality are lacking. Overall, data and information seemed to be good for some, less good for others; and there

Key messages

Efforts are underway to establish Basin Information Systems (BISs) in major Ethiopian river basins (at present: Awash and Abay). However, these need to be conveyed to a centralised system (at federal level) that collects water data from different sources (including RWBs); data should then be synthesised and translated into useful information for decision-making purposes at federal, basin and sub-basin level coupled with investments into capacity-building on data management and analysis as well as the necessary software and hardware.

18 Information from interview with representative of AwBA, held in January 2014.

Table 4: WASH provisions in contrast with WRM

	WASH	WRM
Policy (guiding principles)	• Integration • Alignment • Harmonisation • Partnership	• Integration • Priority to water supply and sanitation • Basin level (and focus on drought-prone areas) • Rural-centred, decentralised and participatory management
Policy (targets)	• Targets of 98% and 100% access to safe water supply for rural and urban areas respectively. • Access to basic sanitation for all Ethiopians. • 7% of population with safe water handling and water treatment at home • 80% of communities with Open Defecation Free status • (in line with GTP, targets by 2015)	• WSDP sets broad objectives (no concrete targets) for hydropower & irrigation development, as well as water supply systems. • GTP: 98.5% potable water coverage, 100% urban water coverage, 98% rural water coverage, 15.6% developed irrigable land; increase hydropower generating capacity to 10,000 MW (by 2015) • CRGE: does not set targets for WRM specifically.
Components	• Rural WASH (agrarian and pastoralists) • Urban WASH (supply services, sanitation services) • Institutional WASH (schools and health facilities) • Programme management and capacity-building	• In WSDP & GTP: Hydropower, water supply systems, irrigation. • In CRGE: water cuts across exploiting the vast hydropower potential; large-scale promotion of advanced rural cooking technologies; efficiency improvements to the livestock value chain; and Reducing Emissions from Deforestation and forest Degradation (REDD).
Budget	• Total estimated: $485 million ($92.1 m from AfDB, $131.6 m from DFID, $46.3 m from GoE, $10 m from UNICEF, $205 m from WB). • Committed funds from WB, AfDB, UNICEF, DFID, EDB, Government of Finland, France, JICA = $500 million (estimate)	• Not a single estimate for WRM (different budgets in different strategies). CRGE: total $150 billion over 20 years (no specifics about water) • Actual investment from DPs on WRM currently (December 2014) amounts to $180 million – but mostly focused on sustainable land management and drought/flood management.
Financial mechanisms	• One Consolidated WASH Account (CWA) from which WASH activities and investments would be supported, where all DPs contributions are deposited. • Proclamation 268/2002: established the WRDF (managed by MoFED) to ensure the self-sufficiency of water and sanitation service providers.	• Mix bottom-up (water fees from permits at basin level – but not operational) and top-down (WRDF to ensure the sustainability of irrigation development by granting long-term loans on the basis of the principle of cost recovery).
Partnerships	• Ministries (MoWIE, MOFED, Ministry of Health, Ministry of Education), DPs (AfDB, DFID, WB, UNICEF). • Civil society organisations and private sector recognised as significant partners. • WASH Technical Committee under Water Sector Working Group (WSWG) established in April 2014 – terms of reference agreed and activities started.	• Establishment of WRM Technical Committee under WSWG (MoWIE and DPs), but still at early stages.

	WASH	WRM
Implementation modality	• Clear OWNP governance structure and specification of roles and responsibilities for each implementing partner. • Specific institutional arrangements for OWNP governance: National WASH Steering Committee, WASH Sector Working Group, Regional/Wereda/Town WASH Steering Committees. • Oversight and management provided by National and Regional Technical teams.	• MoWIE and RBAs at federal and basin level; RWBs at regional (down to wereda) level. Overlapping mandates especially of RBAs and RWBs. • River Basin High Councils (RBHCs): the highest policy and strategic decision-making body at river-basin level, should coordinate between RBAs, RWBs and other stakeholders. • WRM Sector Working Group: recently established.

Source: authors.

was no shared view on the extent of and criteria for data accessibility ('data exchange protocols are in the process of being established, but we are not sure when they will be ready and how they will function'[19]). Hydrological data are made available only upon official request to and approval by the competent authorities in the MoWIE.[20] Reflecting these mixed views regarding information availability and access, the indicator on information scored between low (for groundwater data availability and information exchange) and average (data on surface water availability and other environmental trends) in our assessment (average 1.5/5).

Interviewees' comments

'In our industrial farm, we obtain the permit for water use from the regional government (but we do not actually pay for water use), and we do not liaise at all with the AwBA'.

'The AwBA people come to our irrigation scheme and read the meter, then just multiply the readings by the number of days we need to be billed for. But this method does not take into account the fact that some days we cannot irrigate because we do not have electricity. Before they started using crop water requirements to estimate use, it was a much better system'.

The Hydrology Department of the MoWIE plays a leading role in terms of data collection and analysis, but it is expected to delegate these functions to RBAs soon. Large users (e.g. industries or irrigation schemes) and RWBs collect their own data for planning and managing purposes but do not share them with RBAs.[21] Reportedly, RBAs have limited capacity to collect and analyse data and hence rely on information provided by individual users and/or the MoWIE.[22] Overall, we noted that

Box 9: Lack of monitoring data, lack of water allocation system, emerging problems in Lake Ziway

In the case of Lake Ziway, there was a general agreement amongst interviewees that monitoring tools and capacity are limited. This obstructs the measurement of water abstraction and pollution in the lake and its tributaries. A database on major water uses and Lake users is also missing. * In turn, without knowing how much water is available and who is using it, it is difficult to determine how the existing resources ought to be allocated. On paper, this should be a competency of the RVLBA, but in practice it lacks the required staff and budget. Respondents said that 'there are not formal water user licensing provisions and tariff and economic instruments in place; there is no entity that controls, regulates and allocates water among users'.** Large users (e.g. flower farms) are required to go through a formal licensing system (including the completion of an environmental impact assessment), which, however, is handled by federal and regional authorities.**

It seems that the lack of regulatory provisions for water allocation in Lake Ziway has only recently started becoming a real problem in people's eyes. Water scarcity used to be associated with rainfall variability. It is only in the last few years that the over-abstraction of water caused by the expansion of floriculture greenhouses and grape farms has become a problem. For urban water users around Lake Ziway, poor water quality is also an emerging issue.

** The RVLBA is in the process of producing baseline information on Lake Ziway to fill this gap, but until now data have only been collected in a scattered and fragmented way. Information obtained during the interview with Rift Valley Lakes Basin Authority, held in Ziway in January 2015.*

*** Information obtained from interview with Rift Valley Lakes Basin Authority and other water users, held in Ziway in January 2015.*

19 Information from interview with representative of MoWIE, held in May 2014 in Addis Ababa.

20 Ibid.

21 Information from interviews with representatives of RBAs in the Awash and Abay basins, held in August and October 2014.

22 Information from interviews conducted in the Awash Basin in August 2014.

institutions with a stake in WRM were at times unwilling to share data and information with each other; and this occurred between organisations both at different levels and in different sectors. Mostly, this seemed to be a consequence of the high level of bureaucracy that still characterises governmental institutions in Ethiopia, which subjects all types of decision-making to complicated approval procedures. In specific instances, rivalry between institutions and the reluctance to give up responsibilities, and hence possible funding and/or power, may also be responsible for the little information sharing that occurs between ministries and departments.

Data reporting on groundwater availability was also poor. A National Groundwater Information System (NGIS) exists, but at present there is no systematic monitoring of groundwater quality or groundwater levels. Discussions held with water managers at both federal and basin levels revealed that there is an increasing awareness of the importance of groundwater resources for WRD in Ethiopia, which has translated into major investments in research in this area, for example led by the MoWIE Groundwater Directorate and the Agricultural Transformation Agency (ATA). It was also acknowledged that more investments need to be directed to the expansion of the groundwater monitoring network. A Strategic Framework for Managed Groundwater Development has been developed (Ministry of Water Resources, 2011) but not yet fully implemented.

Not enough equipment, especially for monitoring purposes

Interviewees agreed that the current monitoring system is inappropriate (the indicator on 'equipment and systems' received a score of 1.7), and that water allocation decisions are not backed by controls over actual utilisation. Measurements of water use and quality only occur at the intake of irrigation canals, and 'nobody knows what happens afterwards; farmers can illegally divert water from canals, or industries can release pollutants without being held accountable'.[23] The current hydrological network consists of 560 gauging stations, of which 498 are operational.[24] Aware of this problem, the MoWIE is currently planning to modernise the monitoring system; several projects are underway to upgrade data collection instruments and systems.[25] However, a stronger overall plan to build lasting and practical data sets and the systems to maintain them would be required to amplify the impact of existing projects and improve their long-term sustainability.

Key messages

While on paper, water resources should be managed following the principles of IWRM, in practice the 'integrated' dimension seems to have been forgotten. Basin-level planning only occurs in certain basins and with limited involvement of certain categories of stakeholders; Master Plans have not always been matched by implementing institutions (RBAs); and there is an unresolved discrepancy between basin boundaries used for planning and administrative boundaries used in budget allocation.

Key messages

While water resources should in theory be managed following the principles of IWRM, in practice the 'integrated' dimension seems to have been forgotten. Basin-level planning only occurs in certain basins and with limited involvement of certain categories of stakeholders; Master Plans have not always been matched by implementing institutions (RBAs); and there is an unresolved discrepancy between basin boundaries used for planning and administrative boundaries used in budget allocation.

4.2 Developing factors

In terms of the developing factors that are needed to move towards a more functional WRM system, our analysis highlighted that several bottlenecks hamper the smooth development of this process; these are summarised in annex 4 (figure 6).

The functioning of the WRM system in Ethiopia is hampered by several factors. First and foremost, there is very limited coordination between planning units at different levels (and especially between basin and regional states) and across sectors (e.g. in terms of land and water management). Expert personnel, technology and budget for monitoring the quality and availability of both surface water and groundwater are insufficient. The lack of a system for releasing water-use and pollution permits makes it difficult to understand who is using how much water. Further challenges relate to the capacity-building needs of RBAs' staff particularly in terms of conflict resolution and stakeholders' engagement and communication. The linkages between data/information and decision-making and planning processes were found to be poor or even non-existent in certain cases.

23 Ibid.

24 Information from interview with representative of Hydrology Department of MoWIE, held in Addis Ababa in May 2014.

25 For example, the NMA is developing a master plan for the upgrade of the Ethiopian meteorological observation network with support from the UNECA Africa Climate Policy Centre (ACPC). The ACPC is also working with the MoWIE to upgrade hydrological observation networks.

Table 5: Basin planning process in the Awash, Abay and Rift Valley Lakes Basins

River Basin	Responsible RBA	Update on process
Awash	Awash Basin Authority (AwBA), formally established by (Proclamation no. 156/2008)	Strategic Plan under preparation by the AwBA. It will cover the entire Awash River Basin (divided in 6 sub-basins), with a time horizon of 3-5 years. It will include guidelines in terms of water allocation, watershed management and water quality. Scenario planning for each of these dimensions was incorporated. AwBA has set up a policy planning department, entrusted with the organisation of yearly meetings with stakeholders in the upper and lower Awash to discuss the basin plan. First draft of the Plan presented for stakeholder consultation in June 2014.
Abay	Abay River Basin Authority (ARBA) formally established by (Proclamation no. 151/2008)	Abay River Basin Integrated Development Master Plan (Master Plan), prepared 1994-1998 and finalised in 1999; key strategic and planning document, comprising 44 hardcover reports (including 18 sectoral studies, a Water Utilisation and Allocation Plan, and the Integrated Development Master Plan with situation analysis, major strategies and proposals for programmes and projects). 2008 'Institutional set-up studies of the Ethiopian Nile (Abay) Basin Project' funded by French Government, reviewed and updated the Master Plan. Process included stakeholder consultations (including with regional states). In 2010, WB project started integrated sub-basin planning in Tana and Beles sub-basins. Innovative methodology including stakeholder consultation at local, wereda, zonal, regional and national levels and use of decision support models. Draft plans to be submitted to the Abay RBHC in May 2015.
Rift Valley Lakes	Rift Valley Lakes Basin Authority (RVLBA) formally established (Proclamation no. 253/2011), but exercise of its WRM mandate yet to start	1992 Reconnaissance Master Plan for the Rift Valley Lakes Basin (broad, multi-sectoral study). Master Plan study realised by consultants in 2009 (Halcrow Group Ltd and GIRD, 2009). Started in 2006, used 1992 study as starting point, and based on an extensive process of stakeholder consultations. It suggested: base year 2005, covering 25 years (short, medium, and long term). It was stated that by 2010, proposed Master Plan projects will be reviewed and incorporated into the regional programmes of Southern Nations, Nationalities and Peoples' Region and Oromia Region. No information on whether this has actually happened.

Source: authors.

No planning, no IWRM

Basin planning received a low score in the CC-WRMA (1.75/5); our analysis indicated that problems are related to basin plans that are often outdated and missing critical information, for example in terms of groundwater availability. There is also limited connection between sectoral and basin plans, and between basin plans and federal and regional planning.

Most of Ethiopia's Integrated Basin Development Master Plans are more than 15 years old and urgently need to be aligned with developments in water-related sectors such as irrigation and hydropower. Such an updating process has started in only three basins (Awash, Abay and Rift Valley Lakes, see table 5 above for more information on the planning process in these basins). A respondent

Interviewees' comments

'We have an agreement with the RBA for water allocation, but with the Sugar Corporation for land use. We decide how much sugarcane to plant with the Sugar Corporation, then we simply request the water to the RBA, but we do not conduct an assessment of how much water is actually available.'

Box 10: A list of 'the problems that we face', the Awash RBA speaks

- **Little coordination at basin level.** In the Awash basin there is very little synergy between the water development initiatives driven by the regional governments and those driven by the MoWIE (through AwBA). Besides providing for basin-level water management and planning, the existing policies and regulations do not sufficiently articulate the specific WRM roles of the regions and their interactions with basin authorities. Because regional governments operate separately from the AwBA, the latter is not aware of the regional agenda for water resource development. This makes basin planning very difficult. For example, the Fentale Irrigation Scheme (covering 18,000 ha of irrigated land) is developed by the Oromia Regional State without the supervision or knowledge of the AwBA. A similar challenge is raised by the Ethiopian Investment Commission, which has its own water-use plans (mostly for industrial development, e.g. leather, textile and horticulture), and does not coordinate with the AwBA.*
- **Upstream-downstream conflicts.** Poor coordination between upstream and downstream users is leading to more conflicts in the basin. For instance, the water release rules of the Koka reservoir for hydropower generation are based upon the power supply needs at national level, and thus do not necessarily align with the water needs of irrigators downstream. Water users in the Middle-Awash agro-industry and at Merti farm said that the high daily flow of the Awash in the dry season occurs mostly during the night when they are not irrigating.** Another example of poor coordination is the expansion of the Wonji sugar cane plantation (from 6,000 ha to 22,000 ha through outgrowers' schemes), which is being done without consulting the downstream users. According to key informants at Wonji, water shortages are already experienced during the dry season when river flow is low. Especially irrigators in the downstream horticultural farms around Merti are worried that the Wonji expansion will have a negating impact on their water availability.***

** The Ethiopian Investment Commission (EIC) is an autonomous government institution accountable to the country's Investment Board, which is chaired by the Ethiopian Prime Minister. It is entrusted with 'promoting the country's investment opportunities and conditions for foreign and domestic investors'. It has the power to issue investment permits, work permits, trade registration certificates and business licenses, and to assist investors in the acquisition of land, utilities, etc. Currently, the EIC is promoting investments in the strategic sectors of leather products, textiles and garments, horticulture, and industry zone development. See EIC's website at: http://www.investethiopia.gov.et/about-us/how-we-can-help (accessed March 2015).*

*** Information from interviews with stakeholders in the Awash Basin, held in August 2014.*

**** Information from interviews held in the Awash Basin in August 2014.*

from the MoWIE reported that most of the Ministry's current investments in terms of water management are dedicated to updating the basin plans, which is acknowledged as a priority.[26] However, we found little evidence to support this claim.

Implementation of the Master Plans has been handicapped by several factors. First of all, land and water management continue to take place under separate mandates, as land is a regional responsibility while RBAs are established as a federal structure, and their mandate only covers water management. Regional governments have their own agendas and may develop water resources without the knowledge of the RBA and without following the Master Plan. In some cases, RWBs did not appear to be even aware of the existence of Master Plans. Sectoral coordination also proved to be low, with little or no attempts to align sectoral and basin plans, especially in the case of industrial, irrigation and hydropower developments.

Participation: not always, not everybody

Participation also scored relatively low in the CC-WRMA (1.7/5). Although provisions for formal stakeholder engagement in WRM exist, there is no systematic way to ensure that all interested parties are involved in the decision-making process over water allocation. Especially at the basin level, participation of stakeholders in planning and management processes tended to occur on an ad hoc basis, as part of donor-funded projects (see box 11).

Overall, respondents remained quite critical of participatory processes. For example, they said that the AwBA has been 'ineffective especially in including women and other marginalised groups like pastoralists in consultations on WRM interventions'.[27] The involvement of communities and pastoralists into decision-making over land and water resources allocation and management is mostly done by the weredas rather than the RBAs. Mechanisms to ensure that downstream voices can influence upstream decisions and that the more powerful stakeholders are included (and held accountable) in the decision-making process are lacking.

Our analysis revealed two main problems in relation to participatory and conflict-resolution processes at basin level. First, water managers in the RBAs do not have the required 'soft skills' and resources to organise and run stakeholder consultations.[28] Second, some of the key stakeholders do not participate in the AwBA's meetings. Reportedly, the most challenging users to involve are those in the hydropower sector. Hydropower

26 Information from interview with representative of MoWIE, held in Addis Ababa in January 2014.

27 Information from interview with representative of MoWIE held in Addis Ababa in January 2014.

Box 11: Stakeholder participation in the Abay basin, and the unresolved problem of water theft in the Awash basin

One fundamental principle behind IWRM is the active participation of stakeholders, including at basin level. In the Abay River Basin, there are stakeholders at basin and sub-basin levels, and stakeholders in irrigation schemes (e.g. in the Koga, Ribb and Megech irrigation schemes). Efforts at participatory decision-making, to date, have mostly included stakeholders in regional state bureaux, rather than the ultimate beneficiaries. Often, these are unaware of the situation they are asked to take decisions on, or are unwilling to share their development plans. Therefore, they do not truly engage in the WRM decision-making process with the ARBA. If the ARBA is to conduct successful participatory decision-making processes in the future, a stakeholder mapping exercise must be done first at basin, sub-basin and scheme levels to identify who the real beneficiaries are. In addition, the ARBA must build its internal capacity to liaise and communicate with stakeholders, so that they can contribute to their goals and activities. Notable exceptions to this analysis are the Tana and Beles sub-basin organisations (TaSBO and BeSBO). In the framework of a 5-year project funded by the World Bank, TaSBO and BeSBO have been very successful in convening a 'Planning Team' that includes representatives of water sector organisations at local, wereda, zonal, regional and national levels, Bahir Dar University, and the ARBA. Consultations with the Planning Team have taken place to obtain guidance and feedback on investment options and other key elements of the sub-basin Master Plans; the latter are currently being finalised and should be submitted to the Abay RBHC for approval in May 2015.*

In the Awash River Basin, participatory decision-making is a novelty, and when it occurs, only a few known stakeholders are involved. Small-scale farmers have little representation in the decision-making processes in both RBA and RWBs; but major 'powerful' water users (e.g. some industrial and urban water utilities) do not participate in coordination meetings either. Only large-scale irrigators had a substantial and regular presence in the decision-making of the AwBA, mostly because they receive their water permit from (and pay water fees to) it. However, even they complained that they do not feel completely represented by the RBA. In particular, they lamented the lack of mechanisms to deal with the increasing problem of water theft in the Awash River. In fact, many irrigation water users abstract water from the Awash River through either motor pumps or gravity flow without any permit issuance from the authority. Some users get access to water from primary irrigation canals illegally, either by tampering or by abstracting through motor pumps, and are charged neither for services nor for the cost of water (Teklay and Ayana, 2014: 73). Mostly, these are smallholders from Afar communities cultivating fruit and other products for their subsistence or the local market. The AwBA admitted that it has no capacity to monitor and sanction illegal diversions; so far, however, it has taken no clear position either in favour of irrigators, or in recognising the livelihood imperative of small farmers.

**Information from interview with representative of TaSBO, held in Bahir Dar in October 2014, and follow-up personal communication in January 2015.*

producers have different priorities from the ones of the irrigators that are represented by RBAs, and hence little interest in negotiating. Water supply utilities have not been involved in the planning process initiated by RBAs either, and anyway recognise the authority of RWBs, and not of RBAs.[29] These limitations were attributed to the restricted authority of RBAs. In turn, this would seem to be a consequence of the lack of awareness regarding their powers and functions amongst key stakeholders. For example, in the Awash basin, the functions of the AwBA are understood solely in terms of flood control.[30]

Permit system and water allocations: work in progress?

From our interviews, it clearly emerged that the current system for water allocation is not fit for purpose (the 'water allocation' indicator only scored 1.5/5). According to Proclamation 197/2000 – which subjects water works,

Key messages

Permitting is viewed as a registration and fee collection exercise, not as a vehicle for defining, monitoring and allocating known shares of basin water resources. The permitting and monitoring system is at too early a stage to expect enforcement to occur in a regular and effective way. However, at present, evidence suggests that the system for the release of water and pollution licenses/permits is poorly implemented, partly because of poor monitoring (due to limited technical, financial and human resources), and partly because of the lack of awareness and clarity in relation to its existence and provisions. Penalties for breaches exist only in theory, but are rarely applied in practice. Most water withdrawals proceed unchecked. Pollution of water, especially from industries, is a growing concern, particularly in the Awash Basin due to the industrial development in Addis Ababa and in the Upper Awash.

28 Information from discussion with representatives of RBAs, held in Awash and Abay basins in August and October 2014.

29 Ibid.

30 Ibid.

Built in 1954, Wonji is a state farm destined to sugarcane production (although some other leguminous are produced e.g. soya beans, mostly for improving soil fertility). Traditionally expanding over an area of 6,000 ha, it has recently undergone an expansion of 11,000. The original area is irrigated with furrow irrigation; while the expansion is irrigated with overhead (sprinkler) irrigation. The additional 11,000 ha are occupied by out growers: these farmers are given the right to the land, cultivate sugarcane and sell it to the government for processing and export. Maintenance of infrastructure and canals is done by the government, as well as provision of inputs (and extension services). Photo credit: Beatrice Mosello.

water use and discharge of treated wastewater to a permit system – the Permitting Department of the MoWIE should be the competent authority to issue permits for water use and well drilling. Key respondents reported that most requests are for irrigation, water bottling, mining and, increasingly, fisheries and geothermal energy.[31] Permits are granted on the basis of a site visit, assessment of plans, land ownership, support of local government, studies on water availability, and distance to the nearest well (for groundwater).[32] However, in practice, most investors still do not request permits, in spite of the MoWIE's efforts over the last two years to promote this obligation.

According to the 2005 Regulation, priority for water allocation goes to domestic water use, and permits can be terminated in the case of drought or overuse. The MoWIE sends professionals to the field to inform users about the need to obtain a permit and to refer non-compliance to the relevant regional authorities. No cases of permit termination or suspension have occurred to date, according to key respondents.[33] Nevertheless, discrepancies between allocations and actual uses were reported, resulting from the limited monitoring capacity and equipment of management organisations (in turn, a consequence of lack of staff, funding and adequate equipment). Moreover, since water use is estimated on the basis of issued permits, it is difficult to account for all the water captured by unlicensed users. Given the growing number of small users and their cumulative impact, this is becoming problematic. Major water users are known and included in a federal registry (held by the MoWIE Permit Department). According to the 2007 Proclamation, RBAs are tasked with creating and updating a registry of users at the basin level, but this is not happening yet.

The MoWIE has also recently delegated some permitting functions to RBAs, but at present only the AwBA has taken up this role.[34] The AwBA is currently issuing water development permits (for groundwater exploration), water user permits (for irrigation in the Upper Awash only), and wastewater discharge permits (WGC, 2013: 18) (see box 12 for more information).

Box 12: The permitting system in the Awash Basin

The Awash Basin Authority (AwBA) has the mandate to control irrigation schemes in the Awash Basin up to the primary irrigation canals. Secondary, tertiary and on-farm irrigation canals are controlled by the respective individual irrigation users. The AwBA collects water fees on volumetric basis; individual users are charged according to their annual consumption of irrigation water with a charging rate of 3 Ethiopian Birr (ETB) per 1000 m^3. All legal irrigation water users in the basin are charged 78.18 ETB per hectare per year for the service rendered by the authority in addition to the water fee. Users abstracting water with gravity are additionally charged 5.9198 ETB per hectare per year to cover monthly salaries of gate operators.

Each year a contract is signed between the AwBA and its clients, and irrigation water use permits are issued. Users pay 87 ETB for a new permit and 55 ETB each year for renewal. * Permits have an expiration date and stipulate the amount of water required by each client, means of water abstraction, area to be irrigated and irrigation period. Individual irrigators submit their irrigation water demand request to the authority on a weekly basis; in turn, the amount of water diverted to individual users is measured at offtake structures of the primary irrigation canals with water-measuring staff gauges. At the end of each Ethiopian budget year, ARBA issues a letter to individual legal irrigation water users in the basin stating their annual irrigation area (ha), amount of water consumed (m^3), irrigation water charge (ETB), and service charges (ETB) and requesting payment of their annual water and service charges through the basin's bank account.

The current irrigation water pricing system in the Awash River basin does not limit the maximum extraction rate of irrigation water for upstream users. Therefore, there is no way to restrict the amount of water used during peak irrigation demand. As a result, downstream irrigation users suffer from water shortage during low flow and high irrigation water demands.

** Information from interview with representative of the MoWIE Permitting Department, held in Addis Ababa in May 2014.*

Source: Teklay and Ayana, 2014: 72-73.

31 A permit is required for irrigation at medium or large scale; for irrigation over 500 ha it is the federal ministry that issues the permit; for irrigation under 500 ha, this function is delegated to the regions. Industrial uses like brewing or textile production are all permitted by the Ministry. On paper, public water development should also be subject to a permit, but in practice this is not being done, because municipal water supply schemes are government owned, so it is assumed that they have already been planned on the basis of available resources.

32 Ibid.

33 Interviews with key respondents in the Awash Basin and at the MoWIE Permitting Department, held in May and August 2014.

34 Ibid.

Box 13: Threats from the increase in size of Lake Beseka: the unintended impacts of rapid (and uncontrolled) irrigation development

The surface area of Lake Beseka, situated in the Awash Basin, has swelled from 2.6 km^2 in the 1960s to 55 km^2 in 2013. In just over 40 years, the lake has also changed from a hypersaline closed lake into brackish water with a natural outflow. Before it reaches the natural spill point, the level of Lake Beseka is regulated initially by pumping, and later by discharging the water through a regulated channel and outlet. According to a study commissioned by the MoWIE, the cause of the lake's expansion is related to irrigation return entering the lake from expanding farms (Metahara, Abadir, and Fentale) following subsurface geological drainage (MoWIE, 2014).

The increase in volume has impacted the surrounding area in various forms, namely by (a) submerging agriculture land, (b) inundating urban settlements and utilities, and (c) engulfing the Ethiopia-Djibouti railway and highway. Currently, the unregulated outflow from Lake Beseka is threatening downstream water users as it could lead to major salinisation of the Awash River, thereby damaging the ambitious irrigation projects downstream and threatening water supply for urban settlements. A 2014 study, commissioned by the MoWIE, proposed a threefold strategy to address these issues in the short, medium and long term. While interventions in the short and medium term are of a technical nature, the study recognised that local engineering measures will not be enough to solve the problems of Lake Beseka. Instead, basin-scale management is required, which in turn calls for a strong organisation to take charge of coordinating water abstractions and allocations from the Awash River (MoWIE 2014).

Environmental concerns: the problem of water pollution

New investments in irrigation, hydropower and other uses carry environmental risks. However, pollution control is still largely absent in Ethiopia, as revealed by the CC-WRMA (the relative indicator only scored 1.5/5). The Water Resources Management Regulation (n. 115/2005) makes provisions for maintaining environmental flows, protecting or restoring ecosystem services and addressing the water needs of marginalised groups, but there is little evidence of their rigorous enforcement. According to a study conducted by the UN Food and Agriculture Organization (FAO) in 2013 (Tiruneh, 2013), there are no standard methods for estimating environmental water requirements in Ethiopia. Some irrigation studies allow 10-15% of a stream's dry season flow for downstream use and environmental effects. While this could be considered for a perennial stream (and only for some rivers), it cannot be generalised at sub-basin level as many of the streams in the sub-basin are ephemeral (Tiruneh, 2013: 18).

Environmental Impact Assessments (EIAs), which according to the law should accompany all permit requests, generally include environmental and social criteria as well as consideration of the project's impact on communities and provisions for compensation and resettlement (as provided by the 2002 Proclamation and the procedural guidelines developed by the Environmental Protection Authority in 2003).[35] As of 2013, only approximately 30 EIAs were produced at the federal level annually – a figure that is very low as most EIAs are conducted at the regional level (César and Ekbom, 2013).

According to key respondents, the EIA process is very time-consuming, which means that many projects are implemented before the assessment is actually completed. Also, some of the industrial developments were started before these regulations existed and hence did not go through the assessment process.[36] Reportedly, EIA capacity in the government (at both federal and regional levels) and among external EIA experts (mostly consultants) was also very limited.[37] An analysis of the EIA process conducted by the Swedish International Development Cooperation Agency (César and Ekbom, 2013) revealed that 'there is a lack of awareness and widespread misconceptions about EIAs in Ethiopia; some consider EIAs as obstacles to development activities' (p. 21). The same study noted that public participation is included in the EIA proclamation but in reality people seldom receive enough information regarding the process (César and Ekbom, 2013: 22).

Pollution was another issue that respondents identified as a bottleneck to effective water resources management and development in Ethiopia (see box 14). During the last

Interviewees' comments

'*At present, the MoWIE Permit Department is raising awareness about the need to obtain water permits, especially amongst larger water users. Once water users understand that they need to obtain a permit, we can work towards a system to release those permits.*'

'Only the 10-20% of the monitoring that is planned is effectively done. It is very difficult for us [RBAs] to prove compliance with water permits. We simply do not have enough equipment and people to go and monitor all water uses throughout the country.'

35 All EIA guidelines and related documents can be downloaded from the website of the former EPA at: http://goo.gl/VYFmQ0 (accessed March 2015).

36 Information from interviews with different stakeholders conducted in May 2014 in Addis Ababa.

37 Information from interviews with different stakeholders conducted in May, August and October 2014 in Addis Ababa.

Box 14: Pollution in the Abay and Awash basins

The siltation of water bodies is a growing problem in the Abay River Basin. To respond to this challenge, watershed management activities have been initiated in the Tana and Beles sub-basins (funded by the World Bank). The Ministry of Agriculture (MoA), through Regional Agricultural Bureaus, is also engaged in watershed management and development. However, the two streams of activities have a different objective. The Bureau of Agriculture invests in sustainable land management to improve agricultural productivity, whereas the focus of the TaSBO is to protect water bodies from pollution/siltation. The interventions present a lot of similarities; efforts to plan these activities together could minimise duplication of efforts and maximise impacts.

In the Awash River basin, pollution is a growing problem, according to most of our respondents. However, what kind of pollution is happening and what is the source of such pollution are issues that remain to be investigated. The obvious answer is that the major cities and industrial areas in Upper Awash are polluting the river. To date, pollution has caused the infestation of Lake Koka by water hyacinth, algal bloom in Lake Abay Samuel, nitrate pollution elsewhere in the river course, and industrial pollution of the Akaki river course, particularly visible at farm level. Soil salinisation has also led to the abandonment of several hectares of land in the middle Awash basin and is contributing to the decline in yield of crops in the valley. One clear example is the salinisation of the Amibara plantation and subsequent abandonment of irrigation activities as the result of faulty design in drains constructed to reclaim the affected land.

Key messages

Hydrological variability, rather than a narrow focus on drought, must be the central water resources challenge for development in Ethiopia. Flood and drought management need to be strengthened through further investments into weather and climate monitoring infrastructure and capacity. More coordination between the different agencies that are producing and using climate information is also required.

20 years, the late EPA (now the Ministry of Environment and Forestry, MEF) and MoWIE, among others, developed a number of water quality standards for surface waters and groundwater. However, it remains unclear whether the MoWIE and the MEF are collaborating at all in this domain, or rather developing different sets of standards; and, if so, how will they be reconciled, if at all? At the basin level, some respondents complained that 'the standards and procedures to control the quality of water resources are not good enough [...] there are very high levels of pollution especially downstream'.[38] Data on pollution are very scarce (especially for groundwater resources) and much of the available knowledge remains anecdotal. Moreover, because polluters tend to be powerful stakeholders (e.g. industries), it is very difficult to enforce actions against them and to develop an integrated strategy for pollution reduction and control, particularly for institutionally weak RBAs.

Interviewees' comments

'Flash floods are more and more a concern here in the Awash basin. There is no forecasting mechanism, nobody tells us that a flood will happen; and when it happens we can only evacuate people, we do what we can.'

Flood and drought management

The capacity of institutions in the water and related sectors to predict, prepare for and cope with extreme events such as droughts and floods is also a critical component of AWRM. As climate change is expected to lead to changes in the frequency, intensity, spatial extent and duration of weather and climate events, thus potentially resulting in unprecedented extremes (e.g. consecutive years of drought or heavy flooding), it is important that planners and policy-makers become increasingly able to manage these risks and their impact on water resources. Our analysis revealed that Ethiopia has successfully developed a hazard early warning institutional structure, coordinated through the Disaster Risk Management and Food Security Sector in the MoA. As the name suggests, however, the system is geared towards assessing and responding to food and nutrition needs; drought and flood early warning and response typically received much less attention. More generally, the Disaster Risk Management (DRM) approach in Ethiopia did not seem to have a strong water resources focus, which implies that the role of the MoWIE and RBAs in responding to episodes of drought and flood tends to remain undefined. Accordingly, the indicator on flood and drought

38 Information from interviews with representatives of RBAs in the Awash and Abay basins, held in August and October 2014.

The Lake Beseka swelled to 55 km^2 in 2013 from its original size of 2.6 km^2 in the 1960s due to the consequences of unregulated irrigation. It thus inundated urban settlements and engulfed the Ethiopia-Djibouti railway, as shown in the picture. Photo credit: Beatrice Mosello

In this picture, women and children are washing their clothes in the polluted water of the Akaki River, downstream of Addis Ababa. Photo credit: Beatrice Mosello.

management scored 2.25/5, revealing that the system exists but could be improved.

Ethiopia's National Meteorological Agency (NMA) has developed some techniques for forecasting purposes, but their remit overlaps with the MoWIE, which is responsible for flooding and low flow early warning. Generally, the MoWIE uses forecasts from the NMA to simulate river flows and flooding in key river basins, including the Awash and Lake Tana systems. Respondents reported a lack of weather and climate monitoring infrastructure, limited knowledge and capacity to effectively predict future climate events, inconsistent use of different information sources across and within country borders, and no systematic forecasting of climate hazards and risks.[39] It was unclear whether early warning information is communicated on time to the affected communities. Interviewees in the Hydrology Department of the MoWIE said they communicate directly to communities if the flood is imminent and certain; otherwise they pass the information on to regional and wereda disaster bureaux.[40]

4.3 Sustaining factors

Our analysis also identified several bottlenecks in terms of the actions that are required to ensure that WRM structures continue to be effective in the long run, in order to support achievement of development goals. These are summarised in annex 4 (figure 7), and further discussed around key messages in the paragraphs that follow. A first look at the results of the traffic light system applied to the indicators in this category reveals a worrisome predominance of the red colour. It should be noted that scores at this end of the assessment are expected to be low. The point of this analysis should not be to criticise a system that is, admittedly, emerging, but to highlight strengths and gaps, identify priorities, and provide a baseline against which future progress can be clearly identified.

WRM institutions and activities are undermined by the lack of a long-term financing system and high staff turnover rates, coupled with numerous capacity-building gaps. Planning efforts fail to sufficiently take into account projections and scenarios on the impacts of climate and socioeconomic changes, which are done on an ad hoc basis by researchers but remain disconnected from the decision-making process. Because provisions for water allocation

39 Information from discussions with different stakeholders in the Awash and Abay basins, held in August and October 2014.

40 Information from interview with key respondent in the MoWIE (Hydrology Department), held in Addis Ababa in August 2014.

Box 15: The case of Lake Haramaya

Haramaya is one of the districts in East Hararghe Zone, Ethiopia. It is the area with the highest agricultural potential in East Hararghe Zone thanks to its lakes, rivers and springs. The district used to host the four lakes of Tinike, Haramaya, Adele and Harajitu. However, Harajitu Lake disappeared many years ago, and today also the Haramaya and Adele lakes are disappearing or becoming seasonal (Abebe et al., 2014). Once more than 10 miles around and 30 feet deep in places, Lake Haramaya used to be the main water source of Harar, one of Islam's holy cities and designated a World Heritage site by the United Nations Educational, Scientific and Cultural Organization (Abebe et al., 2014). The Alemaya Water Treatment Plant, constructed in 1961, was designed to serve 70,000 people with a system capacity of 60 l/s. However, 40 years later it was catering for 160,000 people (Alamirew, 2011). Excessive abstraction is one of the possible causes of the disappearance of Lake Haramaya, together with decrease in storage capacity of the lake due to siltation, localised climate change and/or geological fault (ibid). Clearly, the story of Lake Haramaya is one of water resources mismanagement, bringing to light the negative consequences of faulty water permitting systems, ignorance of environmental concerns and lack of institutional coordination.

In the 1990s, the maximum and mean depths of the lake were 8 m and 3.13 m respectively and the lake area was in the order of 470 hectares. During the past 15-20 years, the GoE, with the support of international organisations, has drilled numerous wells on what used to be the bed of Lake Haramaya in order to supply water to the growing Harar city and its surroundings. The water of Lake Haramaya also served to irrigate chat fields and other crops. Today, Lake Haramaya has shrunk to one fourth of its original size. Harar is taking its water from the Jara well field, near Dire Dawa, through a 75 km-long pipe with four pumping stations. The high costs associated with this new system could have been avoided if the 18 million m^3 of water that were in Lake Haramaya had been efficiently, effectively and sustainably managed.

But can Lake Haramaya revive? Lake Haramaya is a closed system (unless the water level rises too high, in which case water may flow out to the Wabi Shebele river basin). The outlet is too high and the gorge is too narrow to be easily dammed. Rehabilitating the lake would require (1) reducing siltation through watershed management and (2) managing abstractions to a sustainable level, for example by managing wasteful irrigation water application. Sustainable land management initiatives have helped reduce the siltation problem. However, the main challenge remains one of managing water abstractions. The Haramaya University has recently started some initiatives to rehabilitate the lake. A task forces has been established with members at the state, zone and wereda levels, with Haramaya University serving as the secretariat. Watershed development activities have also been initiated. In addition, the abstractions to supply Harar and the nearby towns have reduced thanks to the new system. All these efforts have brought some improvements, and some water has now returned to Lake Haramaya.

Substantial challenges remain. Despite a good start, the task force is not able to regularly meet, its modus operandi has not been developed, it is not institutionalised in the two states of Oromia and Harari, and there are no forums for stakeholders' participation and for enforcement mechanisms. With the new water supply from Dire Jara, the current Harari leadership may be satisfied that the problem is solved in its political time horizon. But a longer-term perspective needs to be adopted. A stronger and more coordinated institutional system for managing Lake Haramaya is needed, one that involves all major stakeholders and considers the different water uses in the area as well as the other water sources in the vicinity of the lake. Adequate financial and technical support from the regional states must also be guaranteed.

and pollution reduction are not enforced, the needs of poor and marginalised communities risk being eclipsed by the interests of the most powerful ones.

The absence of coordination mechanisms

Since many of the enabling and developing conditions for achieving AWRM are not in place, the prerequisites for sustaining AWRM over the medium- to-longer term are also absent. Accordingly, the 'adaptive management' indicator scored low in the CC-WRMA (1.3/5). First, we identified a lack of provision for a regular multi-stakeholder review to monitor policy implementation, learn lessons and set actions at basin and national level in terms of WRM. According to the 2007 Proclamation, the RBHCs are designated as a venue for this type of review and for dialogue to occur.

Key messages

- There is a lack of provision for a regular multi-stakeholder review to monitor policy implementation, learn lessons and set actions at basin and national level in terms of WRM.
- There is a lack of coordination between ministries in their day-to-day work.

The members of the RBHCs should be designated by and accountable to the Federal Government (and chaired by the Vice Prime Minister). Therefore, the composition of the RBHCs is left to the discretion of the Council of Ministers. In practice, the high-level nature of these bodies has been the very impediment to their proper functioning. For example, in the Awash Basin, the RBHC has convened only once; in the Abay Basin, the members have just been appointed. Without the RBHCs, RBAs are de facto deprived of any decision-making power, and their authority and legitimacy especially vis-à-vis the regions is compromised.

In addition to the absence of WRM-related coordination mechanisms, there is a broader lack of coordination between ministries in their day-to-day work. For example, interviewees agreed that communication and information sharing between the MoWIE and the MoA and the Ministry of Trade and Industry (MoTI) does not happen on a regular basis.[41] It is hoped that coordination will be improved with the establishment of the WRM Working Group within the Water Sector Working Group (WSWG), composed of representatives of the MoWIE (including the RBAs), other ministries and DPs.

Interviewees' comments

'One solution that we tried to address capacity gaps was to bring in external experts from other countries, like North Korea and India. They are often cheaper than Ethiopian experts'.

'We often collaborate with universities. For example, we have a MoU with the University of Bahir Dar. Students come to the RBA for some months and perform short-term assignments. This is good for students because they learn practical tasks, but it is not sustainable for us as people change continuously'.

'The ARBA is quite new. At the beginning, we had to assembly a team of people with different disciplinary backgrounds. Many of our employees are new, and with limited experience on water resources management. Also, people tend to leave their jobs quite soon. Internal capacity-building is definitely one of our biggest challenges'.

Key bottlenecks

- Basin plans not designed to be robust under a range of future scenarios, including climate and socioeconomic ones
- Analysis of future trends tends to be project based, fails to be incorporated into decision-making
- Lack of historical series of hydrological and meteorological data, and sometimes also of socioeconomic ones
- No centralised information system at either federal or basin level.

Key data

Out of nearly 800 employees of the AwBA only 20% are skilled professional workers.

In the AwBA, out of 15 required positions for water resources professionals, only three are currently filled.

In the key water institutions (such as RWBs and RBAs) there are 25-60% vacancies for drillers, hydrogeologists, and water supply engineers.

Climate (and other) changes: absence of scenario-based planning

It was noted that basin plans are not designed to be robust under a range of climate and socioeconomic futures, as evidenced by the low scores that the related indicator (adaptive management) received in the CC-WRMA (1.3/5). According to key interviewees, climate and socioeconomic modelling and scenarios are run by universities and DPs, often in the framework of donor-funded projects. However, research and policy remain disconnected. For example, Addis Ababa University was involved in a water audit using the Water Evaluation and Planning system (WEAP) in the Awash River Basin, looking at capacity-based expansion under different management models and considering four climate and socioeconomic scenarios (see Tiruneh, 2013).[42] While researchers communicated the results of this study to the MoWIE, they failed to reach water managers in the RBAs and RWBs.

Projections of socioeconomic trends, such as demographic growth, were only used in certain cases. For

41 Interview with representatives of the MoWIE, MoTI and MoA, held in Addis Ababa in August 2014.

42 Developed by the Stockholm Environment Institute, the WEAP model is intended to be used to evaluate planning and management issues associated with water resource development. The WEAP model essentially performs a mass balance of flow sequentially down a river system, making allowance for abstractions and inflows. The elements that comprise the water demand-supply system and their spatial relationship are characterised within the model. The system is represented in terms of its various water sources (e.g., surface water, groundwater and water reuse elements); withdrawal, transmission, reservoirs, and wastewater treatment facilities, and water demands (i.e. user-defined sectors, but typically comprising industry, mines, irrigation and

List of capacity needs for MoWIE and RBAs' staff, as identified by respondents

- WRM planning process – different phases in river basin management, from planning (basin plan preparation) to implementation and monitoring and evaluation
- Basin information management system (data collection, analysis and management) for both groundwater and surface waters
- Development and utilisation of decision support systems for WRM at basin, federal and transboundary levels
- Pollution monitoring and environmental protection (for both groundwater and surface waters)
- Lake and wetlands management, ecosystems protection, integrated watershed management
- Modelling tools for river basins/watersheds (and use of GIS)
- Flood control and management (including development of early warning systems)
- Development of water allocation system, including provisions for monitoring water abstractions and enforcing penalties for breaches.

example, the Oromia Water, Mineral & Energy Bureau has included them in its plan for the upgrade and optimisation of the water treatment plant of Adama City, which was facing 9,000 m^3 supply deficit on a daily basis in 2014.[43] Also, the GTP considered two alternative growth rate scenarios: the 'base rate' scenario, assuming that the economic growth rate of the preceding five years will be maintained; and the 'high case' scenario, envisaging that the GDP and agricultural value added achieved in 2009/10 will double by the end of 2015 (GTP, 2010). The climate resilience strategy for the water and energy sectors (forthcoming) also uses projections of population growth by 2030 to illustrate the potential impacts of climate change on Ethiopia's strategy for economic growth and poverty reduction.[44]

The capacity gap: expertise, recruitment, turnover

The long-term prospects of WRM institutions at both federal and basin level in Ethiopia are seriously undermined by high staff turnover throughout water sector agencies at all levels, as identified under the indicator of 'institutional and technical sustainability' which scored very low (1.3/5) in the CC-WRMA. Key respondents reported that experts are difficult to find, and even more difficult to retain, because of the low salaries in the public sector: 'Good people leave after a few years, attracted by jobs in the private sector or with international

Box 16: Paying the price of water resource development: some examples of compensation schemes in the Abay basin

The Koga Dam was built on the Koga River in the Koga Basin, in turn part of the Blue Nile (Abay) Basin. It is located about 35 km south of the city of Bahir Dar and Lake Tana, just outside the village of Merawi, in the West Gojam zone of the Amhara state. The dam was constructed as part of a project to increase food security in the region; before Koga existed, the 600,000 people living in the basin depended upon rainfed agriculture. Upon completion, the reservoir had a volume of 83.1 Mm^3 and a surface area of 1,750 ha, and served a total command area of 7,000 ha (Reynolds 2013).*

While the Koga Dam was constructed, farmers had an average of 2 ha of land but could irrigate only 0.5 to 1 ha; the rest was redistributed as a form of compensation to those farmers that were displaced by the dam. Other farmers simply received money; 70 million ETB were paid as form of compensation to communities displaced by the dam. According to respondents from the Koga Water Structure Management and Water Administration Centre, all the communities have benefited from the construction of the dam.** Our interviews with representatives of the centre said that 'compensation was paid to those farmers who had land surrounding the wetland; this land was waterlogged, not productive, therefore not many people had to be displaced'.*** However, many transhumance pastoralists used this land in the dry season as grazing area, and they have not been included in the compensation scheme.****

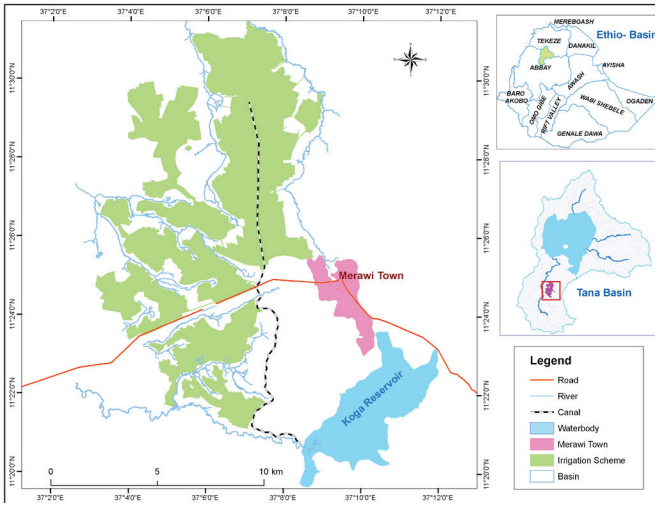
** The Koga project started in 2003-2004, but its construction only began in 2007 and took five years. The first budget amounted to 500 million ETB but ended up being more than 800 million ETB including construction costs and watershed management activities (Reynolds 2013).*
*** It should be noted, however, that we did not talk directly to communities in Koga. Therefore, this statement should be read as representing the government's point of view.*
**** Interviews held in October 2014.*
***** Information from interview held in the Koga Irrigation Scheme in October 2014.*

43 Information from discussion with representative of Adama's water treatment plant in September 2014

44 Information from personal communication with MoWIE representative, held in January 2015.

45 Information from interviews with representatives of RBAs, held in August and October 2014.

Map 4: Map of the Koga irrigation scheme. Source: Authors



agencies that pay better'.[45] This problem was felt as particularly acute in the Awash and Rift Valley Lakes Basins, as accepting a position as a water manager in an RBA entails moving to a remote area.[46] The MoWIE should seriously consider its siting policy and locate its local (wereda) and basin (RBA) offices in more accessible and serviced towns where officers could move with their families.

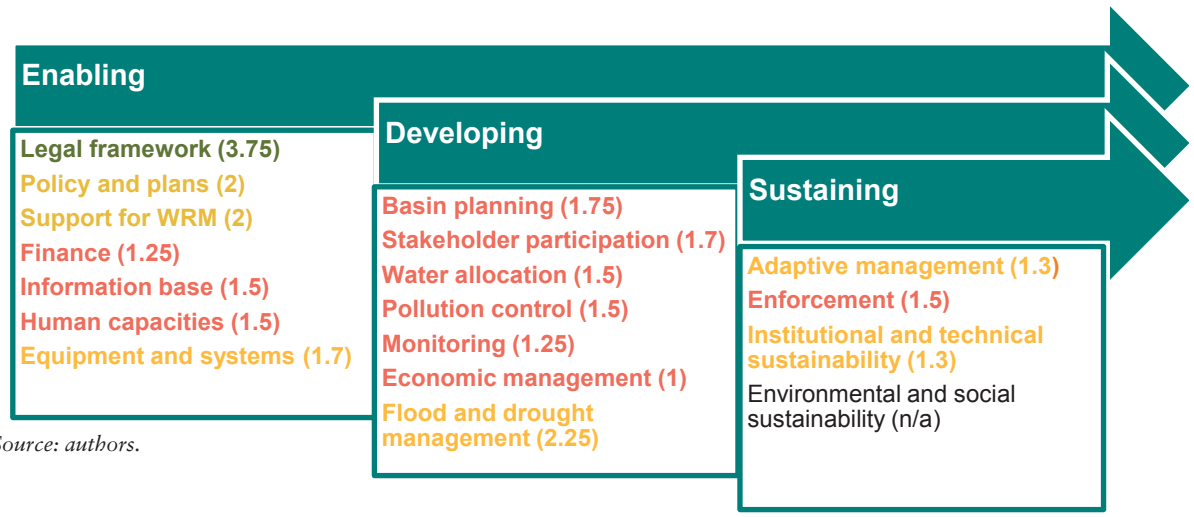
Especially in their initial phases, RBAs were seriously understaffed; they had to recruit interns, experts from local universities (hired on short-term contracts), or even consultants to perform their functions. At present, the situation seems to have improved, with all the RBAs almost reaching their full-staff capacity, according to key respondents. The lack of staff with adequate hydrology and water management/engineering skills was noted particularly for groundwater management. Respondents further highlighted a lack of personnel with adequate technical competences (hydrologists, irrigation engineers, etc.), project management/administration background, and skills in terms of stakeholder engagement and communication. Several capacity-building needs were identified, and educational/training opportunities were said to be insufficient (although increasing), especially for personnel in weredas and RBAs (see list one page 54).

Addressing equity concerns

Our analysis did not provide enough evidence to give a definite score to the indicator of 'environmental and social sustainability'. The only dimension that was superficially discussed in our interviews was the degree to which the current WRM system protects the water needs of the poorest and most marginalised communities. Policy documents such as the 1999 WRM Policy, 2000 Proclamation and 2002 WSDP reference the needs of the poor and marginalised communities/groups (including provisions for gender equity), and there is a general understanding amongst water managers of the need to protect and strengthen poor people's entitlements. However, respondents reported major problems with implementing pro-poor policies and plans ('the interests of the most powerful prevail').[47] For example, in the interviews we conducted, little mention was made of including vulnerability analysis in EIAs or other types of project feasibility studies.

Women seemed to be largely excluded from the WRM decision-making process, probably as a consequence of the very limited presence of women in managerial positions at most of the institutions surveyed. Representatives of the AwBA admitted that women tend to be under-represented, if not completely absent, in their meetings with stakeholders

Figure 4: Summary of the results of the CC-WRMA for the 'enabling', 'developing' and 'sustaining' categories



Source: authors.

46 Information from interviews with representatives of RBAs, held in August and October 2014.
47 Information from interview with small-farmers in the Awash River Basin, held in August 2014.

Table 6: Summary of bottlenecks identified by the CC-WRMA in Ethiopia, listed with reference to the 'ideal' conditions for AWRM according to the literature (as per box 2 in section 1)

AWRM in theory (as the literature says it should be)…	… And AWRM as it is in Ethiopia (i.e. summary of bottlenecks identified in the CC-WRMA)
Producing and using use of accurate and relevant information	Data on water resource conditions, trends and patterns of use is poor, particularly for groundwater (because of lack of equipment/systems and capacity for data collection and management). Existing data holdings are fragmented.
Discovering, preventing and resolving conflict	Unresolved discrepancy between basin boundaries used for planning, and administrative boundaries used in budget allocation, creating conflicts between RBAs and RWBs in particular. Establishment and staffing of RBAs has been slow, leaving an institutional vacuum as far as conflict prevention and resolution is concerned. No systematic mechanism to ensure participation of stakeholders (and especially of the poorest and most marginalised, less powerful ones) in WRM decision-making.
Fostering compliance with institutional rules through monitoring systems	Monitoring systems need strengthening; existing policy and regulatory framework needs updating, and RBAs lack resources & capacity to fulfil their mandate.
Providing infrastructures that are flexible over time	Climate and socioeconomic scenarios are incorporated in infrastructure development and water allocations ad hoc; not enough hydro/meteo data and monitoring done to understand water trends.
Responding to physical and socioeconomic changes	River Basin Master Plans are outdated and do not incorporate scenario-based planning. Lack of an integrated (across sectors and governance levels, including basin) approach to WRM (occurring though disconnected projects and with limited support from government and donors) limits capacity to understand and systematically address (fast) physical and socioeconomic changes.
Encouraging adaptation to learn from good and bad practice	Early warning and response systems have focused on drought and food security, with little recognition of the role water plays in protecting livelihoods. Flood hazards will increase, but flood early warning and response is weak and institutionally fragmented. High staff turnover within WRM institutions at all levels limits institutional memory and hence the learning capacity of the WRM system.

Source: authors.

and users. However, because many rural households are headed by women, it was acknowledged that women 'should be taken more into consideration by RBAs'.[48] The water resources needs and demands of pastoralists were seldom mentioned by our interviewees, despite the fact that these groups clearly have a widespread presence in some of the basins we studied. Nevertheless, more evidence needs to be collected to support these statements.

4.4 Summary: bottlenecks to 'good' WRM in Ethiopia

Our study revealed that while WRM is increasingly being given the importance it deserves in strategic documents, including as an essential pillar of the GTP (for irrigation, hydropower and new industrial poles), the major challenge is now to transform good intentions into concrete actions. Interestingly, the results of the CC-WRMA (summarised above) indicated that while the institutional system for WRM in Ethiopia performs moderately well in the 'enabling' category, indicating that the basic elements of WRM are there or are in the process of being established, the conditions for making the system function in the short to long term remain largely unsatisfactory. On the one

48 Information from interview with representative of AwBA, held in August 2014.

hand, this can be interpreted as a normal consequence of the fact that WRM is a process; as such, it needs to be put in place step-by-step, depending on the resources that are available to the system, and in synergy with development trends in other sectors. On the other hand, however, a number of critical bottlenecks hamper the capacity of Ethiopian institutions to promote the coordinated development and management of water, land and related resources while adapting to the impacts of changing physical and socioeconomic contexts on resource availability and quality.

Before identifying the actions that can be taken to address these bottlenecks, it is useful to recall the basic conditions for AWRM according to the literature (see box 2 in section 1) and compare them to the characteristics of the institutional system for WRM in Ethiopia. Table 6 highlights what is still missing ('AWRM as it is') for Ethiopia to be able to control and allocate its water resources to satisfy its competing development needs while protecting the most vulnerable and adapting to rapidly changing climatic and socioeconomic contexts ('AWRM in theory').

In turn, we have seen that the 'bottlenecks' identified by the CC-WRMA have arisen as a consequence of different factors, including the following:

- **IWRM has been introduced and promoted in Ethiopia following a top-down approach, largely under the 'push' of international discourses and priorities.** However, this has not been matched by the creation of an adequate institutional and capacity framework for its implementation. RBAs are only established in three strategic river basins, but their mandate on WRM remains unclear, especially in relation to that of regional states. There is a fundamental and unresolved discrepancy between basin boundaries for planning and administrative boundaries for budgeting. The power dynamics between national institutions and regions are a real issue. These need to be resolved with leadership and drive from a high level, insisting on cooperation around IWRM.
- **In addition to a lack of institutional structures, financial mechanisms for WRM were found to be inadequate**. When paid, water fees are too low to cover the operational costs of RBAs; government funding was also limited due to the complex and bureaucratic procedures to which its disbursement is subjected. In turn, the limited institutional and financial investments from the government's side in terms of WRM discouraged the engagement of DPs (in contrast to their strong role in the water, sanitation and hygiene sectors).
- **Because of limited human and technical capacity, RBAs do not systematically collect data on water availability, uses/abstractions and quality, especially for groundwater.** Even when collected, hydrological data are not stored in a centralised and easily accessible information system. This is partly because water managers have limited competences in terms of data collection, analysis and management. In addition, the rigidity and 'sectoralisation' of the Ethiopian institutional system do not facilitate easy communication and exchange between stakeholders in different areas and at different levels.
- **Regulations providing for stakeholder engagement are not systematically implemented.** Our analysis revealed that this was due to the lack of capacity in terms of stakeholder engagement and communication of water managers especially in RBAs. In addition, as long as the mandate of RBAs remains unclear and gets confused with that of regional states, stakeholders – especially the most powerful ones that can plan and operate with relative autonomy – fail to understand the importance of engaging in participatory decision-making.
- **The system of issuing permits that should regulate 'who gets what, when and how' remains very limited in scope, especially at basin level, and tends to cover irrigation users only.** Traditional water rights systems also exist and dominate allocation choices in some areas. However, these are not included in and merged with the formal allocation system.
- **Pollution is a growing problem**, with limited data and no integrated control methods.
- **Hazard early warning systems are in place for droughts/food security, but flooding receives less attention**. Forecasting is conducted by the National Meteorological Agency and the MoWIE, but climate monitoring systems are limited.
- **Overall, the frameworks to sustain water management processes in the longer term are absent.** The IWRM approach lacks the cross-sectoral political clout that characterises sectors like energy and irrigation development. In particular, there is a lack of cross-sector coordination across government ministries and within DP agencies. Climate and socioeconomic risks and pressures are poorly considered in decision-making. Climate models and scenario-building exercises are run in the framework of individual, donor-funded projects, but there is little dissemination of research results to decision-makers. Institutional capacity gaps are also significant and are exacerbated by high staff turnover, insufficient educational or training opportunities, and poor institutional memory.

5. Roadmap towards AWRM in Ethiopia

5.1 Improving WRM in Ethiopia: starting from what is already there

Water resources can provide significant economic benefits when managed well. In Ethiopia, the incomplete institutional framework for WRM has direct and indirect social, economic and environmental costs at the micro and macro levels. These costs are amplified by the country's highly variable hydrological environment and by the nonalignment of water supply and economic demand. On the ground, the fragmented regulation and governance systems for water resources result in pollution, salinity, competition and scarcity. These affect the livelihoods of households in the river basin. Low levels of adaptive capacity as well as limited infrastructure and access to markets also mean that the poorest households are the most impacted by degradation of water resources.

We do not want to suggest that an entirely new system for WRM should be created in Ethiopia. But clearly, the existing one should be improved. To this end, Ethiopia's rich natural water resource endowment, its rapidly growing economy and its ambitious government agenda offer significant opportunities. It is important to understand what these opportunities are and capitalise on them. For example, the formulation of the second GTP can provide an entry point to reinforce the links between water and land resource management and to set aside funding for the establishment of stakeholder coordination and data-sharing mechanisms at all levels.

There is also an opportunity to ensure that the CRGE strategy is mainstreamed within the three main areas of economic growth (agriculture, industry and energy generation). This would allow the promotion of knowledge sharing between the actors involved, and reduce the likelihood of environmental conservation being 'traded-off' in favour of pure economic growth imperatives. By aligning agricultural, energy and industrial policy with the CRGE strategy, pollution can be controlled and accountability promoted. The One WASH National Programme midterm review in 2015 also offers an opportunity for the MoWIE to integrate WASH, watershed management, environmental protection and climate resilience initiatives.[49]

5.2 Action planning: starting small, staying focused, and being opportunistic

The CC-WRMA provided a detailed understanding of the institutional landscape for WRM in Ethiopia, and highlighted its strengths and weaknesses. This is a fundamental first step to build the institutional platform that is required for the coordinated and sustainable management and development of Ethiopian water resources. A subsequent plan of action to address the system's 'bottlenecks' must follow.

A fundamental consideration to retain is that there is no single formula for institutional building and development. The efficient planning of activities needs to be adjusted to fit the specifics of the local and national planning processes. Also, it is not possible to implement all the identified activities at once; one has to understand what 'bottlenecks' to address, and when and how – based on the opportunities for action that already exist, and on the resources that are available in the short to medium term. We suggest the following criteria for action prioritisation:

- **Relevance for the functioning of the water management system**: Is the action one that will establish the basic components of WRM (enabling); perform the key activities of WRM (developing); or ensure the sustainability of WRM structures (sustaining)?
- **Time frame for implementation**: Can the action be implemented (and is it useful) in the short to medium term (5-10 years), or does it address longer-term concerns?
- **Institutional and coordination requirements for its implementation**: What actors should be responsible for the implementation of the action, and with what other actors should they collaborate/coordinate to ensure integrated decision-making across sectors and governance levels?
- **Resource intensity of the planned actions**: How much will the action cost in terms of financial, human/capacity, and technical resources?

Efforts to improve WRM in Ethiopia should encompass a wide range of interventions. The detailed list of suggested

49 This is recognised within the One WASH National Programme, which states that following the 2015 midterm review, the programme may be expanded to include the above-mentioned elements (FDRE, 2014: 7).

Box 17: Priority actions for WRM in Ethiopia according to water managers and users

In December 2014, we convened a stakeholder workshop to discuss a range of potential interventions to improve the functionality of existing water management systems. On this occasion, stakeholders came up with the following list of priority actions:

- The GoE, through the MoWIE and other ministries in sectors reliant on water (e.g. agriculture, industry) need to ensure that sustainable and effective WRM becomes one of the drivers of the economic growth and development strategy of Ethiopia. Sectoral policies and plans should converge into the GTP-2.
- The MoWIE should provide adequate support RBAs, by legally defining and asserting their roles and responsibilities as well as their relationships with other actors that would otherwise have competing water management functions. RBAs need to be given a univocal mandate and sufficient resources, including competent personnel, budget and equipment. The MoWIE should further support RBAs in the process of establishing a water permit system.
- The MoWIE (at federal level) and RBAs (at basin level) should establish dialogue platforms for water users and managers ('stakeholders') to come together and take participatory decisions about the allocation and utilisation of water resources. With the support of DPs, the capacity of RBAs' staff in this sense needs to be reinforced. Dialogue should be especially encouraged between RBAs and regional states in order to help them coordinate their water and land management functions. The MoWIE and RBAs should adopt a more pragmatic bottom-up approach, focusing not only on establishing structures but on resolving some very practical problems in specific places through dialogue and analysis. RBHCs need to be established and operationalised.
- The MoWIE and RBAs need to invest in data collection and analysis on surface and groundwater availability, withdrawals, and quality parameters. This information should be used to update basin plans. It is vital that provisions are made to fund and sustain information services. In addition, software and hardware equipment has to be purchased, and water managers at both federal and basin levels should receive training on how to use it (as well as training on data analysis and management). It is recommended that the MoWIE compiles a list of core equipment required to start and operate a functional data collection and management system.
- Finally, the impacts of climate change need to be studied and included in planning and development interventions. More investments should be devoted to developing credible modelling scenarios, and to communicating their implications for investments and allocation decisions.

actions for improving the WRM system in Ethiopia – encompassing all of the institutional, regulatory, capacity-building, technical/financial and information types – is presented in annex 5.

In the short term, it is recommended that the MoWIE focuses on putting in place the key building blocks of WRM, in collaboration with other water stakeholders at federal, regional and basin levels, and with the support of DPs, the research community, the private sector and civil society where appropriate. Starting from those activities that have a lower resource intensity (and consequently can be more easily implemented in the absence of substantial economic, technical and human resources), it is crucial that the new sectoral policies and plans for WRM respond to the directions set by the GTP-2 and align with the institutional and strategic framework provided by the CRGE. A concurrent regulatory effort must be made to define and assert the mandate of RBAs and clarify their relationships with actors that may have competing water management functions (in particular regional states) through the RBHCs. We recommend that the setting of the WRM institutional framework is matched by the definition of financial requirements and mechanisms to ensure the transparent allocation of budget at different levels, and especially for RBAs. Satisfying the demands for capacity-building on the different aspects of WRM and data collection and management for both surface waters and groundwater is resource intensive, but important in light of the process to update Basin Master Plans that should also be started by the MoWIE and RBAs as a priority.

Once the enabling environment for WRM is set up, the actual planning and management functions can be exercised. These will all demand a medium to high level of resource intensity, which is why the above pre-conditions should be met first. A priority for the MoWIE should be to ensure that RBAs have enough resources to fulfil their tasks, including competent personnel, budget and equipment. RBAs should also be capacitated to engage water users and managers in inclusive and participatory decision-making about the allocation and use of water resources. The MoWIE should make the water permit system coherent and effective, introducing water and pollution charges on a clearly established legal basis, with the involvement of MoFED, and in coordination with the MEF and MoTI for pollution control. This implies, among other things, major investments in monitoring systems and capacity (within RBAs) to assess the impacts of a given permit on other users and on the health of

the basin. At this stage, it is also vital to start adopting a longer-term perspective and embed elements of climate change adaptation (e.g. in the form of flood and drought management) into the WRM system. To this end, we suggest that the MoWIE, NMA and other federal and basin organisations with water management competencies collaborate to collect and analyse weather, climate and water data. In this sense, the support of DPs is essential, provided that interventions are adequately harmonised; also, research will play a key role.

Finally, we recommend that actions are taken to ensure that WRM structures continue to function in the long run. To this end, the WRM Working Group should be strengthened and should play a role in developing and sustaining an integrated institutional model, similar to the one that is in place in the WASH sector. The current capacity gap that affects the Ethiopian water sector needs to be addressed by providing adequate trainings and support to staff (especially in RBAs), and incentives to reduce high turnover rates. To address the present and future impacts of climate-related and other pressures, the MoWIE and decision-makers in water-relevant and climate-vulnerable sectors should shift to a vulnerability reduction approach, by adopting planning and management responses that have appropriate contingency and risk assessment in their design and implementation. In parallel, and through collaboration with the research sector and DPs, climate and socioeconomic scenarios need to be developed and used to inform investment and allocation decisions. All these activities are rather resource intensive – meaning that, realistically, they can only be conducted in the framework of robust and coordinated institutions and financial mechanisms and with adequate human and technical resources. To win investments, it will be essential to make a credible economic case for WRM at the highest political level and among DPs and investors.

Box 18: An example of 'good enough' WRM: Kenya

Kenya provides a good example of how regulatory and structural reforms can generate comprehensive and decentralised institutions for WRM. The 2002 Water Act created separate agencies for WRM and water services, embedded many of the principles of IWRM within national and local systems including the understanding of water as both a social and economic good, and recognised that effective management of water resources is a prerequisite for sustainable water services provision. These reforms attracted substantial investments by government, donors and private investors, and an influx of financial and human resources to the sector (Rampa, 2011).

The new institutional structure of the water sector operates under the Ministry of Environment, Water and Natural Resources, which is responsible for policy formulation. The Water Resources Management Authority (WRMA) regulates water resources, and the Water Services Regulatory Board is responsible for water supply and sanitation. The WRMA is also the coordinating body for six Catchment Area Advisory Committees (CAACs), one for each of Kenya's six river basins. It has a similar mandate to that of River Basin Authorities in Ethiopia, including the collection and management of data and information that serve to allocate the resources among users (WRMA, 2011).

The CAACs have key decision-making power at the basin level, including over the allocation of permits for abstraction and discharge, and the collection of water charges. Capacity in these areas is improving, with permit processing moving up from 2% in 2005 to 36% by 2010, and a steady increase in revenue for water use (WRMA, 2011). Stakeholder participation is operationalised through close collaboration between CAACs and local Water Resources Users Associations (WRUAs), which are formed around sub-catchments. WRUAs are responsible for local conflict resolution, and they play a monitoring and informing role. Of course, the functionality of CAACs and WRUAs varies across catchment; in some areas they may be less developed than in others (Meijerink et al., 2007). Their operation may also be undermined by traditional land tenure and water rights, which often overlap with formal systems (Rampa, 2011; Duvail et al., 2012).

Despite progress, Kenya faces some bottlenecks in terms of IWRM implementation. Serious governance challenges, including 'tribalism, corruption and nepotism', reportedly hamper water sector reforms (Rampa, 2011). There are also concerns about the confusion regarding roles and responsibilities that ensued from the rapid growth of the sector and intersecting mandates (Rampa, 2011 and Meijerink et al., 2007). Capacity building and the rolling out of reforms are ongoing to support strengthening of IWRM processes.

Still, the effective operation of catchment level institutions in Kenya can offer a learning opportunity to Ethiopia. The consideration of water availability and allocation for different users is particularly important, given Kenya and Ethiopia's shared profile of high hydrological variability. In particular, Ethiopia could draw on Kenya's experience in terms of mobilising communities for sustainable water management practices.

6. Conclusion

As Ethiopia embarks upon an ambitious development path, the capacity of its government and people to use water resources in a sustainable and equitable way becomes essential. While still a neglected subject, especially compared to WASH, WRM is gaining greater prominence amongst policy-makers and water managers. For example, as this analysis demonstrated, partly driven by international narratives, IWRM is mentioned in all the major policy documents on water resources. It is also an essential pillar of the GTP and GTP-2, establishing progressive and modern targets to drive the country's economic development towards achieving middle-income status by 2025. However, visions of irrigation and hydropower development, water supply for all, and the growth of industrial poles need to be backed up by a realistic assessment of how much water will be needed, how much water is available, and what the risks and trade-offs will be as competition for water intensifies.

Moreover, there is a tendency to assume that all new investments in water will simultaneously deliver both economic growth and poverty reduction. The experiences of other countries indicate that this may not be the case, and a much clearer understanding of 'how' and 'for whom' water resources should be developed is needed (Calow and Mason, 2014). With the benefit of hindsight, we can see that many previous water developments have missed opportunities and incurred unforeseen costs, and that that insufficient attention has been given to poverty reduction and environmental protection, even where overall (net) gains have been positive. This not only implies a need for better design and implementation of infrastructure; it also means investing in WRM to ensure that the claims and entitlements of poorer people are protected and strengthened.

In order to strengthen the institutional framework for WRM, which is necessary to ensure that infrastructure development is 'climate smart' and delivers broad-based economic and social benefits to Ethiopia and its people, we recommend the following:

Baseline information is key for planning and managing investments in water infrastructure. Our analysis revealed that WRM in Ethiopia is hampered by a lack of knowledge of resource conditions, patterns of use, and drivers of change, and a lack of capacity and skills within institutions to plan water allocation, assess impacts and trade-offs and ensure planning is 'climate smart'. As investment in water ramps up, there is a real danger that unconstrained development and weak management will undermine the resource base, and squander opportunities for the kind of broad-based economic growth envisaged by the GTP.

Water infrastructure needs water institutions. Therefore, while a minimum platform of hydraulic infrastructure is required, one should not forget the equal importance of investing in an institutional framework that disciplines water resources management and hence development. A minimum institutional platform should ensure the coordinated and sustainable management of water resources in order to:

- maximise economic returns across sectors and the national economy
- protect local livelihoods and ecosystems
- mitigate risks of climate variability and climate change
- improve resilience to the pressures posed by population growth and industrialisation.

If there is only a focus on water resource development and no management framework, substantial difficulties and conflicts are bound to arise.

A fixation with 'implementing IWRM' is not always useful; it can create paralysis and can get in the way of more pragmatic, problem-focused solutions. As a first step, it is important to recognise that WRM is a long-term endeavour with no quick returns. Change is hard, and it can only be triggered by a clear understanding of why it is needed. Therefore, in order to improve the institutional system for WRM, one should start analysing emerging problems ('hot spots') and potential solutions ('problem-driven approach'), working within the existing frame of power and resources. The hotspots should reflect situations of resource over-exploitation, resource appropriation or capture by powerful interests, and cases where allocation tensions/conflicts have occurred or are emerging. More importantly, hot spots should correspond to specific areas or problems that gather the interests of decision-makers, investors and people. This study has already highlighted a few potential candidates for this type of analysis, such as the Awash Basin, and Lake Ziway.

Ethiopia needs an operational plan with clear institutional mandates that clarifies relations especially between the regions and RBAs, detailing who will do what, when they will do it, and how much it will cost. This can be easily done, but needs to happen as soon as possible. Actually, water conservation has an economic and political mandate for internal and regional security. The relevant

ministries (with the support of DPs and the research community) should develop a system for data collection and management, also using the latest technology (e.g. satellite data). Water data must be available across all government and for different users, including the private sector and those working in the agricultural or energy sectors. It is fundamental that we know how much water is available before starting (or continuing) to plan the development of water infrastructure and services.

Everything cannot be done at the same time. Interventions to strengthen institutional mechanisms in the water sector need to be prioritised according to their relevance for the functioning of the water management system, the time frame for implementation, the institutional and coordination requirements for their implementation, and their (financial, human and technical) resource intensity. Short, medium and longer term actions need to be identified for gains in WRM.

Political will is essential to achieve all of the objectives above. As our study demonstrated, a strong steer is needed from a high level (e.g. through RBHCs, Water Minister's or Prime Minister's Office) in support of RBAs, to send a political message and make the case for more investments into their capacity and resources. In turn, creating political will implies 'framing the question right' by quantifying and visualising the risks of mismanagement to growth and transformation. To date, donors have focused more on water, sanitation and hygiene in Ethiopia. However, without a concurrent effort in terms of WRM, which allows dealing with increasing competition for water resources, benefits of WASH also will be lost.

'Start small, stay focused and be opportunistic' is the way to find specific solutions that actually work in the short term. However, ultimately WRM should be purported as an enabler of 'green' and 'climate-resilient' economic growth and transformation. Shaping the WRM operational plan around the GTP-2 and CRGE also offers a window of opportunity to strengthen the links between water and land resources management, and improve the alignment of the water sector strategy with climate-resilient agricultural, energy and industrial policy.

We recommend reaching out beyond the water community to make the case for WRM – engaging with those actors that implement interventions on watershed management, irrigation, forest and sustainable land management, hydropower generation, etc. International benchmarking and experiences can serve as inspiration to solve specific problems; but with the caveat that what has worked in one country may not be appropriate for Ethiopia ('the context matters').

References

Abebe, S., Haji, J. and Ketema, M. (2014) 'Impact of Disappearance of Lake Haramaya on the Livelihood of the Surrounding Community: The Case of Haramaya District in Oromia National Regional State, Ethiopia', *Journal of Economics and Sustainable Development* 5(18): 141-147. http://www.iiste.org/Journals/index.php/JEDS/article/download/16041/16423.

Akbar, S., Kleiman, G., Menon, S. and Segafredo, L. (2014) *Climate-smart development: adding up the benefits of actions that help build prosperity, end poverty and combat climate change*. Working Paper, International Bank for Reconstruction and Development, The World Bank and ClimateWorks Foundation, Washington, DC. https://openknowledge.worldbank.org/bitstream/handle/10986/18815/889080WP0v10RE0Smart0Development0Ma.pdf?sequence=1 (accessed March 2015).

AMCOW (African Ministers' Council on Water) (2006) *Getting Africa on Track to Meet the MDGs on Water and Sanitation: A Status Overview of Sixteen African Countries*. Washington, DC: The World Bank/Water and Sanitation Program. http://www.wsp.org/sites/wsp.org/files/publications/319200725615_312007101903_MDGs_All_final3_high.pdf (accessed March 2015)

AMCOW (African Ministers' Council on Water) (2011) *AMCOW Country Status Overviews – Regional Synthesis Report. Pathways to Progress: Transitioning to Country-Led Service Delivery Pathways to Meet Africa's Water Supply and Sanitation Targets*. Washington, DC: The World Bank/Water and Sanitation Program.http://www.wsp.org/sites/wsp.org/files/publications/CSO-Synthesis-Report.pdf (accessed March 2015).

Alamirew, T. (2011) *Groundwater Recharge Estimates of Lake Haramaya Watershed*. Final Report. Submitted to the Ministry of Water and Energy, Addis Ababa, Ethiopia.

Alamirew, T. and Kebede, S. (2014) *Building Adaptive Water Resources Management (Ethiopia)*, Scoping study realised in the framework of the ODI-MoWIE project (internal use only), Addis Ababa, Ethiopia.

Alem, G. (2011) *Strengthening Water Sector Monitoring and Information System in Ethiopia with GIRWI Project: Second Phase*. Ethiopia: UN-DESA and MoWE.

Amenu, K. et al. (2013) 'Water for human and livestock consumption in rural settings of Ethiopia: assessments of quality and health aspects', *Environ Monit Assess* (2013) 185(11):9571-9586.

Armitage, D. (2008) 'Governance and the Commons in a Multi-Level World', *International Journal of the Commons*, 2(1): 7-32.

Ayenew, T. (1998) 'The hydrogeological system of the Lake District Basin, Central Main Ethiopian Rift', PhD thesis. Amsterdam: Free University of Amsterdam.

Belay, G. (2006) 'Numerical groundwater modelling of the Lake Adele Haromaya Dry Lakes Catchment', MSc Thesis. Addis Ababa: Addis Ababa University.

Beyene, A. et al. (2008) 'Urban impact on ecological integrity of nearby rivers in developing countries: the Borkena River in highland Ethiopia', *Environ Monit Assess* 153:461-476.

Beyene, A. et al. (2011) 'The impact of traditional coffee processing on river water quality in Ethiopia and the urgency of adopting sound environmental practices', *Environ Monit Assess* 184:7053-7063.

Calow, R. and Mason, N. (2014) *The real water crisis: inequality in a fast changing world*. London: Overseas Development Institute. http://www.odi.org/sites/odi.org.uk/files/odi-assets/publications-opinion-files/8953.pdf (accessed March 2015).

CAP-NET (2008) *Indicators: Implementing Integrated Water Resources Management at River Basin Level*, New York: CAP-NET, UNDP. http://www.cap-net.org/documents/2008/09/indicators-implementing-integrated-water-resources-management-at-river-basin-level.pdf (accessed March 2015).

César, E. and Ekbom, A. (2013) *Ethiopia Environmental and Climate Change Policy Brief*. SIDA Helpdesk for Environment and Climate Change, Addis Ababa: Swedish International Development Cooperation Agency (SIDA). http://sidaenvironmenthelpdesk.se/wordpress3/wp-content/uploads/2013/05/Ethiopia-Environmental-and-Climate-Change-policy-20130527.pdf (accessed March 2015).

Central Statistics Agency (CSA) and World Bank (2013) *Ethiopia Rural Socioeconomic Survey (ERSS), Survey Report*. Ethiopia, Federal Democratic Republic of Ethiopia

Conway, D. and Schipper, E.L.F. (2011) 'Adaptation to climate change in Africa: Challenges and opportunities identified from Ethiopia', *Global Environmental Change*. 21: 227-237.

Demeke, A.B., Keil, A. and Zeller, M. (2010) 'Using panel data to estimate the effect of rainfall shock on smallholders food security and vulnerability in rural Ethiopia', *Climatic Change*, 108:185-206. New York: Springer.

Dixon, A. (2008) 'The resilience and sustainability of local wetland management institutions in Illuabor and Western Wellega, Ethiopia', *Singapore Journal of Tropical Geography* 29:341-356.

Duvail, S., Médard, C., Hamerlynck, O. and Nyingi, D. (2012), 'Land and water grabbing in an East African coastal wetland: the case of the Tana Delta', *Water Alternatives 5(2):* 322-343.

Engle, N. L., Johns, O.R., Lemos, M.C. and Nelson, D.R. (2011), 'Integrated and adaptive management of water resources: Tensions, legacies, and the next best thing', *Ecology and Society*, 16(1):19, http://www.ecologyandsociety.org/vol16/iss1/art19/ (accessed March 2015).

FDRE (Federal Democratic Republic of Ethiopia) (1999) *Ethiopian Water Policy.* Ethiopia, Federal Democratic Republic of Ethiopia.

FDRE (Federal Democratic Republic of Ethiopia) (2001) *Ethiopian Water Strategy.* Addis Ababa, Ethiopia: Federal Democratic Republic of Ethiopia.

FDRE (Federal Democratic Republic of Ethiopia) (2002a) *Water Sector Development Programme (Volume. 1)*. Addis Ababa, Ethiopia: Federal Democratic Republic of Ethiopia.

FDRE (Federal Democratic Republic of Ethiopia) (2002b) *Water Sector Development Programme (Volume. 2)*. Addis Ababa, Ethiopia: Federal Democratic Republic of Ethiopia.

FDRE (Federal Democratic Republic of Ethiopia) (2005) *Plan for Accelerated and Sustainable Development to End Poverty*. Addis Ababa, Ethiopia: Federal Democratic Republic of Ethiopia.

FDRE (Federal Democratic Republic of Ethiopia) (2010) *Growth and Transformation Plan.* Addis Ababa, Ethiopia: Federal Democratic Republic of Ethiopia.

FDRE (Federal Democratic Republic of Ethiopia) (2011a) *Climate-Resilient Green Economy.* Addis Ababa, Ethiopia: Federal Democratic Republic of Ethiopia.

FDRE (Federal Democratic Republic of Ethiopia) (2011b) *Climate-Resilient Green Economy Vision*. Addis Ababa, Ethiopia: Federal Democratic Republic of Ethiopia.

FDRE (Federal Democratic Republic of Ethiopia) (2014) *One WASH National Program*. Addis Ababa, Ethiopia: Federal Democratic Republic of Ethiopia.

FEWS NET (2012) 'A Climate Trend Analysis of Ethiopia', *Fact Sheet 2012-3053*, April. http://www.fews.net/sites/default/files/documents/reports/FS12-3053_ethiopia.pdf (accessed March 2015).

Folke, C., Hahn, T., Olsson, P. and Norberg, J. (2005) 'Adaptive governance of social-ecological systems', *Annual Review of Environmental Resources* 30:8.1-8.33.

Gebreegziabher, Z., Stage, J., Mekonnen, A. and Alemu, A. (2011), 'Climate change and the Ethiopian Economy – A Computable General Equilibrium Analysis', *Discussion Paper Series EfD DP 11-09*, Göteborg, Sweden: Environment for Development (EfD), University of Gothenburg.

Giordano M. and Shah T. (2014) 'From IWRM back to integrated water resources management', *International Journal of Water Resources Development*, 30:3, 364-376.

GWP (Global Water Partnership) (2000) 'Integrated Water Resources Management', *TAC Background Paper No.4*. Stockholm, Sweden: Global Water Partnership – Technical Advisory Committee (GWP-TAC).

GTP (Growth and Transformation Plan) (2010), *Growth and Transformation Plan 2010/11 – 2014/15*, Addis Ababa, Ethiopia: MoFED, Federal Democratic Republic of Ethiopia.

Halcrow Group Ltd and GIRD (2009) *Rift Valley Lakes Basin Integrated Resources Development Master Plan Study Project (Phase 2 Final Report)*. Addis Ababa, Ethiopia: Federal Democratic Republic of Ethiopia, Ministry of Water Resources.

Hill, M. and Engle, N. (2011) *Easing the tension: mobilising adaptive capacity across different scales and dynamics by looking through a lens of choice creation - lessons learnt from empirical research in Chile, USA and Switzerland*. Paper presented at the Resilience Conference, 2-17 March 2011, Tempe, USA.

Karlberg, L., Hoff, H., Amsalu, T., Andersson, K., Binnington, T., Flores-López, F., de Bruin, A., Gebrehiwot, S.G., Gedif, B., zur Heide, F., Johnson, O., Osbeck, M. and Young, C. (2015) 'Tackling complexity: Understanding the food-energy-environment nexus in Ethiopia's Lake Tana Sub-basin', *Water Alternatives* 8(1): 710-734.

McSweeney, C. et al. (2014) *UNDP Climate Change Country Profiles*, http://country-profiles.geog.ox.ac.uk (accessed March 2015).

Meijerink, G., Muchena, F., Njue, E., Noel, S., Onduru, D. and Porras, I. (2007) 'Political, institutional and financial framework for Green Water Credits in Kenya', *Green Water Credits Report 6*, ISRIC - World Soil Information, Wageningen.

MoFED (Ministry of Finance and Economic Development) (2013) *Growth and Transformation Plan: Annual Progress report for Financial Year 2011/12*. Addis Ababa, Ethiopia: Federal Democratic Republic of Ethiopia. http://www.undp.org/content/dam/ethiopia/docs/GTP%20APR%202004%20English%20Version_Sept%207.pdf (accessed March 2015).

MOWR (Ministry of Water Resources) (2011) *Ethiopia: Strategic Framework for Managed Groundwater Development*. Addis Ababa, Ethiopia: Government of Ethiopia.

MoWIE (Ministry of Water, Irrigation and Energy) (2014) *Assessment and Evaluation of Causes for Beseka Lake Level Rise and Design Mitigation Measures. Part II: Study for Medium and Long Term Solutions (Main Report – Final)*. Addis Ababa, Ethiopia: MoWIE.

Mysiak, J., Henrikson, H.J., Sullivan, C., Bromley, J. and Pahl-Wostl, C. (eds) (2010) *The Adaptive Water Resource Management Handbook*. London, Sterling, VA: Earthscan.

Nassef, M. and Belayhun, M. (2012) *Water Development in Ethiopia's Pastoral Areas: A synthesis of existing knowledge and experience*, Save the Children USA and Overseas Development Institute. http://www.usaid.gov/sites/default/files/documents/1860/Water%20Development%20in%20Pastoral%20Areas%20of%20Ethiopia_0.pdf (accessed March 2015).

Negash, F. (2011) 'Managing water for inclusive and sustainable growth in Ethiopia: key challenges and priorities', *Background Paper for the European Report on Development 2011/12: Confronting Scarcity: Managing Water, Energy and Land for Inclusive and Sustainable Growth*, http://ec.europa.eu/europeaid/node/43961 (accessed March 2015).

ODI (Overseas Development Institute) (2013) *Inception Workshop Report*. Internal document produced in the framework of the ODI-MOWIE project. London: Overseas Development Institute.

Ostrom, E. (2008) 'The Challenge of Common Pool Resources', *Environment*, Vol. 50, No. 4: 9-21.

Pahl-Wostl, C. (2007) 'Transitions towards adaptive management of water facing climate and global change', *Water Resources Management* (2007) 21: 49-62.

Pascual-Ferrer, J., Pérez-Foguet, A., Codony, J., Raventós, E. and Candela, L. (2014) 'Assessment of water resources management in the Ethiopian Central Rift Valley: environmental conservation and poverty reduction', *International Journal of Water Resources Development* 30(3): 572-587, DOI: 10.1080/07900627.2013.843410.

Rampa, F. (2011) 'Analysing governance in the water sector in Kenya', *ECDPM Discussion Paper No.124*. European Centre for Development Policy Management. http://www.ecdpm.org/dp124 (accessed March 2015).

Rowntree, K. (1990) 'Political and administrative constraints on integrated river basin development: an evaluation of the Tana and Athi Rivers Development Authority, Kenya', *Applied Geography* 10: 21-41.

Schweitzer, R.W., Grayson, C. and Lockwood, H. (2014) 'Mapping of Water, Sanitation and Hygiene Sustainability Tools', *Triple-S Working Paper 10*, May 2014. http://www.ircwash.org/sites/default/files/triple-s_wp10mappingofwashsustainabilitytools.pdf (accessed March 2015).

Setegn, S. et al. (2009) 'Spatial delineation of soil erosion vulnerability in the Lake Tana Basin, Ethiopia', *Hydrological Processes* 23: 3738-3750.

Stein, C. et al. (2014) *Advancing the Water-energy-food Nexus: Social Networks and Institutional Interplay in the Blue Nile*, Stockholm, Sweden: WLE Research for Development (R4D) Learning Services.

SEI (Stockholm Environment Institute) (2007) *WEAP: Water Evaluation and Planning system – user guide*. Boston, USA: Stockholm Environment Institute.

Teklay, G. and Ayana, M. (2014) 'Evaluation of Irrigation Water Pricing Systems on Water Productivity in Awash River Basin, Ethiopia', *Journal of Environment and Earth Science*, 4(7) http://www.iiste.org/Journals/index.php/JEES/article/viewFile/12314/12657 (accessed March 2015).

Tiruneh, Y.(2013) *Synthesis report: Awash River Basin water audit*. Addis Ababa, Ethiopia: FAO and Federal Democratic Republic of Ethiopia.

UNDP (United Nations Development Programme) (2006) 'Beyond Scarcity: Power, Poverty and the Global Water Crisis', *Human Development Report 2006*. United Nations Development Programme (UNDP). New York/Oxford: Oxford University Press.

UNEP (United Nations Environmental Programme) (2012) *The UN-Water Status Report on the Application of Integrated Approaches to Water Resources Management*. United Nations Development Programme (UNDP). New York/Oxford: Oxford University Press.

UNESCO (United Nations Educational, Scientific and Cultural Organization) et al. (2009a) *IWRM Guidelines at River Basin Level: Part 1 – Principles*. http://www.unesco.org/water/news/pdf/Part_1_Principles.pdf (accessed March 2015).

UNESCO (United Nations Educational, Scientific and Cultural Organization) et al. (2009b) *IWRM Guidelines at River Basin Level: Part 2-1 – Guidelines for IWRM Coordination*. http://www.unesco.org/water/news/pdf/Part_2-1_Guidelines_for_IWRM_Coordination.pdf (accessed March 2015).

UN-Water and GWP (n.d.) *Roadmapping for advancing Integrated Water Resources Management (IWRM) processes*. http://www.unwater.org/downloads/UNW_ROADMAPPING_IWRM.pdf (accessed March 2015).

WGC (Water Governance Centre) (2013) *Issues paper: Water governance capacity, Awash Basin, Central Ethiopia review on Content, Institutional, Relational layers*. The Netherlands: Water Governance Centre.

WRMA (Water Resources Management Authority) (2011) *Performance Report 2: A report to the public from the Water Resources Management Authority*. December 2011. Nairobi: WRMA. http://www.wrma.or.ke/images/WRMA_Performance_Report%202_Feb2012.pdf (accessed March 2015).

WSP (Water and Sanitation Programme) (2011) *Water Supply and Sanitation in Ethiopia: Turning Finance into Services for 2015 and Beyond. An AMCOW Country Status Overview*. Nairobi, Kenya: Water and Sanitation Program – Africa Region, The World Bank. http://www.wsp.org/sites/wsp.org/files/publications/CSO-Ethiopia.pdf (accessed March 2015).

Worku, G. (2014) 'Shrinkage and Carbon Stock in Wetlands of Fogera Plain, North West Ethiopia', *Journal of Environment and Earth Science* 4(13): 38-43.

WB (The World Bank) (2006) *World Bank's 2006 Country Water Resources Assistance Strategy, Ethiopia – Managing Water Resources to Maximise Sustainable Growth*. Washington, DC: The World Bank, Washington.
WB (The World Bank) (2010) *The Economics of Adaptation to Climate Change*. Washington, DC: The International Bank for Reconstruction and Development/The World Bank. https://openknowledge.worldbank.org/bitstream/handle/10986/12750/702670ESW0P10800EACCSynthesisReport.pdf?sequence=1 (accessed March 2015)
WWF (World Wildlife Fund) (2006) *Indicators of IWRM Success – a WWF Checklist*. www.panda.org/freshwater (accessed March 2015).
Zerihun, A.W., Kibret, H. and Wakiaga, J. (2014) *African Economic Outlook: Ethiopia*. AfDB, OECD, UNDP. http://www.africaneconomicoutlook.org/fileadmin/uploads/aeo/2014/PDF/CN_Long_EN/Ethiopie_EN.pdf (accessed March 2015).

Proclamations:

Proclamation 197/2000 (2000) Ethiopian Water Resources Management Proclamation, Addis Ababa, Ethiopia: Federal Democratic Republic of Ethiopia.
Proclamation 268/2002 (2002) Water Resources Development Fund Establishment and its Administration Proclamation, Addis Ababa, Ethiopia: Federal Democratic Republic of Ethiopia.
Proclamation 299/2002 (2002) Environmental Impact Assessment Proclamation, Addis Ababa, Ethiopia: Federal Democratic Republic of Ethiopia.
Proclamation 534/2007 (2007) River Basin Councils and Authorities Proclamation, Addis Ababa, Ethiopia: Federal Democratic Republic of Ethiopia.
Proclamation 691/2010 (2010) Proclamation to provide for the definition of powers and duties of the Executive organs of the Federal Democratic Republic of Ethiopia, Addis Ababa, Ethiopia: Federal Democratic Republic of Ethiopia.

Annexes

Annex 1: List of respondents

Instiution	Date of interview
Federal level	
Oromia Bureau of Water Resources	14/05/14
MoWIE Directorate of Hydrology and Water Quality (x2)	09/05/14 12/08/14
MoWIE Directorate of Hydropower Development and Dam Administration	09/05/14
MoWIE Directorate of Water, Utilisation and Permitting	14/05/14
MEF, Strategic Planning Directorate (CRGE Development Strategy)	11/08/14
Addis Ababa Water and Sewerage Authority (AAWSA)	11/08/14
MoWIE Water Supply Directorate	12/08/14
Water Works Design and Supervision Enterprise	12/08/14
Ministry of Agriculture, Natural Resources Directorate	13/08/14
Ethiopian Agricultural Transformation Agency (Household Irrigation Programme)	13/08/14
MoWIE, Irrigation Directorate	13/08/14
Ministry of Industry (Investment, Study, Monitoring & Support Directorate, Industrial Zone Development Directorate, Environmental Safeguard Directorate)	15/08/14
Oromia Water Works and Design Enterprise	15/08/14
World Bank	06/10/14
Basin level	
Abay Basin	
Abay Basin Authority (x2)	Jan 2014 02/10/14
Abay Basin Authority	Jan 2014
Tana Sub-basin Organisation (x2)	Jan 2014 29/09/14
Integrated Watershed Management Project (WB and GIZ)	29/09/14
Koga Dam and Irrigation Scheme – Koga Water Structure Management and Water Administration Centre	30/09/14
Ribb Dam and Irrigation Project	01/10/14
Awash Basin	
Awash Basin Authority (x2)	Jan 2014 5/08/14
Metahara Irrigation Scheme (x2)	Jan 2014 06/08/14
Wonji Plantation (x2)	Jan 2014 Oct 2014
Amibara Enterprise (private farm)	05/08/14
Smallholder farmers in Fentale Irrigation Scheme	06/08/14
Fentale project	06/08/14
Merti Farm	07/08/14
Koka Dam (x2)	08/08/14 22/09/14
Adama Water Utility	08/08/14
Smallholder farmers upstream of Koka Dam	08/08/14

Annex 1 (continued)

Instiution	Date of interview
Strawberry farm plantation Ilan Tot	09/08/14
Wereda Water Resources and Energy Office (Bishoftu)	09/08/14
Adama Water Treatment Plant	22/09/14
Lake Ziway	
Rift Valley Lakes Basin Authority (Directorate)	27/01/15
Rift Valley Lakes Basin Authority (Planning, Monitoring and Evaluation Expert)	27/01/15
Natural Resources Development and Protection Program	27/01/15
Wereda Health Bureau	27/01/15
Irrigation Authority Office (Extension team leader)	27/01/15
Nano Wonchi Irrigation Cooperative (x 3)	28/01/15
Fish Corporation	28/01/15
Fish Research Centre	28/01/15
Horn of Africa Research Centre	28/01/15
Office of Water Resources	28/01/15
Discussions with local communities (including small farmers)	28/01/15

Annex 2: Interviews questions

Legal framework:

Does water law include the following core elements of WRM?

- Stakeholder participation
- Basin-level management
- User pays principle
- Balancing social, economic and environmental objectives

Policy:

- Is there a WRM policy (or policies) reflecting these core elements?
- Is the policy (or policies) endorsed by cabinet?
- Is the policy (or policies) actively used by the responsible institution(s)?

Institutions:

- Are institutional roles and responsibilities for WRM across federal level, basins, regions and sectors clearly articulated?
- Does the lead institution have political support at the national level?
- Is there commitment to the WRM system in relevant sectors (water, agriculture, energy, industry, environment)?
- Is there an operational mechanism for regular integrated planning across regions and sectors, at basin level?

Finance:

- Does WRM have a dedicated and sufficient budget line?
- Is the lead institution able to utilise the allocated budget?

Staffing and capacity:

- Are WRM institutions and departments sufficiently staffed?
- Are key skills/capacities in place?
- Does the lead WRM institution provide capacity building for decentralised levels?

Plans and strategies:

- Is there a WRM investment/implementation plan at federal level?
- Does implementation follow this plan?

Information base: is there a basic understanding of the biophysical system and its uses, including:

- typical Max and min seasonal flows
- typical Max and min seasonal lake levels
- typical Max and min seasonal groundwater levels
- typical Max and min seasonal reservoir storage
- responses of the above to abnormal drought and flood events (critical thresholds)
- main groundwater recharge zones
- main flooding zones
- contribution of baseflow
- over-abstracted locations/periods

Basin planning:

- Are up to date basin plans in place?
- Are they publicly available?
- Do they include analysis of both biophysical parameters and socioeconomic priorities (equity, economic use of water)?

- Do sectoral plans and regional investment plans align with the basin plan?
- Is WRM linked with watershed management programmes and projects at basin or sub-basin level?
- Is there a requirement for social, environmental and economic impact assessment for infrastructure development?
- Are impact assessments of good quality, and do they have teeth?
- Are a range of infrastructure options considered in a transparent process, including 'natural infrastructure'?

Stakeholder participation:

- Are formal stakeholder structures established with a clear role in WRM decisions?
- Are the following groups represented in decision-making? (if represented indirectly, how is this managed?): small farmers, pastoralists (where applicable), medium and large farmers, small businesses/industry, large industry, energy providers, women, others.
- Is support provided to stakeholders to ensure that they are able to participate effectively in planning?
- Are stakeholder views and their influence on decisions documented and publicly available?
- Is there a transparent mechanism for resolution of conflicts of interest between basin stakeholders?

Water allocation:

- Are clear criteria and procedures in place for the allocation of water across different users?
- Do the criteria balance economic, social and environmental needs?
- Is there specific provision for poor or marginalised populations?
- Is there specific provision for environmental flows?
- Does actual water use reflect the agreed allocations?
- Are major water users and uses known?

Pollution control:

- Are water quality standards in place for watercourses and groundwater?
- Are major water pollutants and polluters known?
- Do water quality samples comply with standards, or is there an upward trend in water quality?
- Are pollution issues communicated to polluting actors and sectors?
- Do pollution reduction strategies exist for major pollutants (likely to be at sectoral level)?

Monitoring:

- Are surface water level/flow and quality monitored?
- Are groundwater levels and quality monitored?
- Is weather/rainfall monitored?
- Is an effective monitoring system in place allowing easy review, updating and analysis of the data?
- Does data inform action and planning?

Economic management:

- Are water users licensed and charged?
- Are polluters permitted and charged?
- Are charges appropriate to incentivise reductions in water use and pollution?
- What are the billing and collection ratios?

Flood and drought management:

- Is there a strategy for flood risk management?
- Is there a drought preparedness and response strategy (e.g. increasing storage/reducing use in advance of severe drought, reallocation of water)?
- Do monitoring systems provide early warning of floods and low flows?
- Are warnings and responses communicated effectively to stakeholders?

Sector learning and accountability:

- Is there a regular review process (e.g. annual review meeting with stakeholders) to assess progress and challenges in WRM and set action points? (at national or basin level)
- If yes, are action points followed up?
- What mechanisms exist for stakeholders to hold WRM institutions to account?
- Is there a mechanism for RBAs to share lessons and ideas?
- Are mechanisms in place to learn from flood and drought events?

Enforcement:

- Are the following legal provisions adequately enforced? (Mandate of RBAs to license water users, payment for water use, penalties for breach of permit conditions)
- Are users compliant with their permits?

Adaptive management:

- Is there provision for flexibility/discretion in the application of regulations at the local level, to allow for changing circumstances?
- Are basin plans flexible and robust to a range of future scenarios, rather than designed for a narrow set of current/future conditions?
- Is there a mechanism to update basin plans as conditions change?

Forward planning:

- Are trends/future water demands analysed/projected?
- Are trends/future pollution sources analysed/projected?
- Are trends in water availability/variability/shortage analysed and used to inform planning?

Information system:

- Is monitoring equipment and other equipment regularly checked and maintained?
- Is monitoring equipment and other equipment repaired promptly if broken?

Environmental sustainability:

- What percentage of the time are environmental flows above the standard?
- What percentage of water samples meet quality standards?
- Are environmental flows and water quality protected in times of drought / low flow?

Institutional sustainability:

- Is long-term financing in place for WRM institutions and activities?
- What are staff turnover rates? Are these on an improving trend?

Social sustainability:

- What is the trend in loss of life/livelihoods from (i) flood, (ii) drought?
- Do stakeholders have trust and confidence in WRM institutions?

Annex 3: CC-WRMA indicators

Indicators to assess the status of WRM (under conditions of climate and other changes) were selected from the academic and grey literature in the field. To this end, an extensive literature review process was conducted to identify what indicators can be used to describe the different phases of WRM processes (enabling, developing and sustaining). Indicators were then further distilled into a set that was as comprehensive as possible while maintaining the level of simplicity that is required for its replicability even with little resource availability. Table 7 overleaf presents the initial list of indicators as emerging from the literature review process. The final list of chosen indicators and sub-indicators is presented in table 8.

Table 7: Initial list of indicators emerging from literature review exercise

Principles	Factors	Indicators	Sources	Enabling/ Developing/ Sustaining
Participation/ stakeholder involvement/equity	Consultative, cross-sectoral processes	Water/river basin management bodies are multi-stakeholder in composition.	(adapted from CAP Net 2008)	Enabling
		Formal involvement of stakeholder groups.	UN-Water & GWP (n.d.); UNESCO et al. (2009a)	Enabling
		Stakeholder priorities reflected in the basin plan.	CAP Net (2008)	Developing
		Formal stakeholder structures established with clear roles and responsibilities in water resources management	CAP Net (2008)	Enabling
		Governance style: polycentric, horizontal, broad stakeholder participation focusing on managing uncertainties, instead of centralised, narrow stakeholder participation.	Mysiak et al. (2010); Pahl-Wostl (2007)	Enabling
	Representation	The level of representation and the established accountability and legitimacy of institutional arrangements.	Engle et al. (2011)	Enabling
	Equity	Basin stakeholders (male and female) represented in decision-making bodies at all levels.	CAP Net (2008)	Enabling
		Implementation of plans based on the principles of equity in participation and decision-making for all stakeholders.	WWF (2006)	Developing
	Gender mainstreaming	Female representatives involved in decision-making bodies at all levels.	UN-Water & GWP (n.d.); indicator adapted from CAP-Net (2008); UNESCO et al. (2009a)	Enabling
	Conflict mediation	Water conflicts across the sectors are mediated through participation of appropriate stakeholder groups.	UN-Water & GWP (n.d.)	Developing
	Private sector	Coordination/communication mechanisms between private sector and government authorities on water use; water use organisations and the private sector are increasingly coordinating water use in cooperation with government authorities.	UN-Water & GWP (n.d.)	Sustaining
	Human resources	Systems for capacity development and knowledge generation and sharing, with focus on marginalised groups (including, but not limited to, indigenous people, young people, women and people with disabilities).	UN-Water & GWP (n.d.)	Sustaining
	Regulating	Accountable and transparent mechanisms for regulating services with respect to principles of human rights, transparency, accountability, equity (including gender issues) inclusion, participation and supporting legal frameworks when appropriate.	UN-Water & GWP (n.d.)	Developing
Environmental sustainability	Pollution - monitoring	% of surface water quality samples complying with water quality objectives. % of groundwater quality samples complying with water quality objectives.	CAP Net (2008) CAP Net (2008)	Developing Developing
	Pollution - regulation	Number of polluters licensed according to the regulations. Proportion of water pollution permit holders complying with permit conditions. Pollution charges give incentive to reduce pollution (also relevant to finances).	CAP Net (2008) CAP Net (2008) CAP Net (2008)	Developing Developing Developing

Table 7: Initial list of indicators emerging from literature review exercise (continued)

Principles	Factors	Indicators	Sources	Enabling/ Developing/ Sustaining
	Pollution - control	Discharges of human waste are treated for bacterial contamination.	UN-Water & GWP (n.d.)	Implementation
		Toxic emissions from industrial enterprises are controlled within international health standards.	UN-Water & GWP (n.d.)	Developing
		Pesticides released into groundwater, wetlands and surface water is controlled.	UN-Water & GWP (n.d.)	Developing
	Water quantity	% of time environmental and social reserve is maintained in major water courses.	CAP Net (2008)	Developing
		% groundwater stations with declining levels.	CAP Net (2008)	Developing
		Infrastructure to store surface water, and further develop groundwater resources, is put in place.	UN-Water & GWP (n.d.)	Enabling
		Appropriate environmental flows are ensured to maintain wetlands goods and services (also relevant to water allocation).	UN-Water & GWP (n.d.)	Sustaining
		Safe water supply and sanitation expansion has reached or exceeded target.	UN-Water & GWP (n.d)	Sustaining
	Impact assessments	Appropriate impact assessment procedures (including EIA, Cost Benefit Analysis, and Options Assessments) and laws are in place and implemented effectively to support management of threats to sustainable water use (e.g. infrastructure construction, over-abstraction, point-source and diffuse pollution, habitat loss/ degradation).	WWF (2006)	Developing
(Sustainable/ equitable) water allocation	Demand/needs assessment	Surveys have identified actual and future water needs for all resource user-groups and environmental requirements and areas of significant competition/conflict between use types and/or user groups.	WWF (2006)	Enabling
	Water allocations and flow management planning	Water allocation/flow management plans that are environmentally and socioeconomically sustainable are in place for all user groups.	WWF (2006)	Enabling
		Water allocation/flow management plans that are flexible to accommodate changes, effective and efficient use of water resources.	UNESCO et al. (2009b)	Enabling
		Knowledge of water resource availability is a basis for management - ongoing monitoring of total water storage capacity and groundwater levels.	CAP Net (2008)	Developing
		Charges and fees for water allocation favour the poor and promote efficient water use (also relevant for equity).	CAP Net (2008)	Developing
		Water allocation criteria include use efficiency, economic benefit and social goals.	CAP Net (2008)	Enabling
	Demand management (implementation)	Water pricing and cost recovery are being used as demand management tools, particularly among commercial-scale users.	WWF (2006)	Developing
		Major water users are known and are managed through a licensing (or permit) system - no. of surface and groundwater users licensed according to the regulations.	CAP Net (2008)	Enabling
		Demand management of user behaviour and water use efficiency.	UN-Water & GWP (n.d.)	Developing
		Proportion of water allocation permit holders complying with permit conditions	CAP Net (2008)	Sustaining

Table 7: Initial list of indicators emerging from literature review exercise (continued)

Principles	Factors	Indicators	Sources	Enabling/ Developing/ Sustaining
	Pollution - control	Discharges of human waste are treated for bacterial contamination.	UN-Water & GWP (n.d.)	Implementation
		Toxic emissions from industrial enterprises are controlled within international health standards.	UN-Water & GWP (n.d.)	Developing
		Pesticides released into groundwater, wetlands and surface water is controlled.	UN-Water & GWP (n.d.)	Developing
	Water quantity	% of time environmental and social reserve is maintained in major water courses.	CAP Net (2008)	Developing
		% groundwater stations with declining levels.	CAP Net (2008)	Developing
		Infrastructure to store surface water, and further develop groundwater resources, is put in place.	UN-Water & GWP (n.d.)	Enabling
		Appropriate environmental flows are ensured to maintain wetlands goods and services (also relevant to water allocation).	UN-Water & GWP (n.d.)	Sustaining
		Safe water supply and sanitation expansion has reached or exceeded target.	UN-Water & GWP (n.d)	Sustaining
	Impact assessments	Appropriate impact assessment procedures (including EIA, Cost Benefit Analysis, and Options Assessments) and laws are in place and implemented effectively to support management of threats to sustainable water use (e.g. infrastructure construction, over-abstraction, point-source and diffuse pollution, habitat loss/ degradation).	WWF (2006)	Developing
(Sustainable/ equitable) water allocation	Demand/needs assessment	Surveys have identified actual and future water needs for all resource user-groups and environmental requirements and areas of significant competition/conflict between use types and/or user groups.	WWF (2006)	Enabling
	Water allocations and flow management planning	Water allocation/flow management plans that are environmentally and socioeconomically sustainable are in place for all user groups.	WWF (2006)	Enabling
		Water allocation/flow management plans that are flexible to accommodate changes, effective and efficient use of water resources.	UNESCO et al. (2009b)	Enabling
		Knowledge of water resource availability is a basis for management - ongoing monitoring of total water storage capacity and groundwater levels.	CAP Net (2008)	Developing
		Charges and fees for water allocation favour the poor and promote efficient water use (also relevant for equity).	CAP Net (2008)	Developing
		Water allocation criteria include use efficiency, economic benefit and social goals.	CAP Net (2008)	Enabling
	Demand management (implementation)	Water pricing and cost recovery are being used as demand management tools, particularly among commercial-scale users.	WWF (2006)	Developing
		Major water users are known and are managed through a licensing (or permit) system - no. of surface and groundwater users licensed according to the regulations.	CAP Net (2008)	Enabling
		Demand management of user behaviour and water use efficiency.	UN-Water & GWP (n.d.)	Developing

Table 7: Initial list of indicators emerging from literature review exercise (continued)

Principles	Factors	Indicators	Sources	Enabling/ Developing/ Sustaining
	Pollution - control	Discharges of human waste are treated for bacterial contamination.	UN-Water & GWP (n.d.)	Implementation
		Toxic emissions from industrial enterprises are controlled within international health standards.	UN-Water & GWP (n.d.)	Developing
		Pesticides released into groundwater, wetlands and surface water is controlled.	UN-Water & GWP (n.d.)	Developing
	Water quantity	% of time environmental and social reserve is maintained in major water courses.	CAP Net (2008)	Developing
		% groundwater stations with declining levels.	CAP Net (2008)	Developing
		Infrastructure to store surface water, and further develop groundwater resources, is put in place.	UN-Water & GWP (n.d.)	Enabling
		Appropriate environmental flows are ensured to maintain wetlands goods and services (also relevant to water allocation).	UN-Water & GWP (n.d.)	Sustaining
		Safe water supply and sanitation expansion has reached or exceeded target.	UN-Water & GWP (n.d)	Sustaining
	Impact assessments	Appropriate impact assessment procedures (including EIA, Cost Benefit Analysis, and Options Assessments) and laws are in place and implemented effectively to support management of threats to sustainable water use (e.g. infrastructure construction, over-abstraction, point-source and diffuse pollution, habitat loss/ degradation).	WWF (2006)	Developing
(Sustainable/ equitable) water allocation	Demand/needs assessment	Surveys have identified actual and future water needs for all resource user-groups and environmental requirements and areas of significant competition/conflict between use types and/or user groups.	WWF (2006)	Enabling
	Water allocations and flow management planning	Water allocation/flow management plans that are environmentally and socioeconomically sustainable are in place for all user groups.	WWF (2006)	Enabling
		Water allocation/flow management plans that are flexible to accommodate changes, effective and efficient use of water resources.	UNESCO et al. (2009b)	Enabling
		Knowledge of water resource availability is a basis for management - ongoing monitoring of total water storage capacity and groundwater levels.	CAP Net (2008)	Developing
		Charges and fees for water allocation favour the poor and promote efficient water use (also relevant for equity).	CAP Net (2008)	Developing
		Water allocation criteria include use efficiency, economic benefit and social goals.	CAP Net (2008)	Enabling
	Demand management (implementation)	Water pricing and cost recovery are being used as demand management tools, particularly among commercial-scale users.	WWF (2006)	Developing
		Major water users are known and are managed through a licensing (or permit) system - no. of surface and groundwater users licensed according to the regulations.	CAP Net (2008)	Enabling
	Pollution - control	Discharges of human waste are treated for bacterial contamination.	UN-Water & GWP (n.d.)	Implementation
		Toxic emissions from industrial enterprises are controlled within international health standards.	UN-Water & GWP (n.d.)	Developing
		Pesticides released into groundwater, wetlands and surface water is controlled.	UN-Water & GWP (n.d.)	Developing

Table 7: Initial list of indicators emerging from literature review exercise (continued)

Principles	Factors	Indicators	Sources	Enabling/ Developing/ Sustaining
	Water quantity	% of time environmental and social reserve is maintained in major water courses.	CAP Net (2008)	Developing
		% groundwater stations with declining levels.	CAP Net (2008)	Developing
		Infrastructure to store surface water, and further develop groundwater resources, is put in place.	UN-Water & GWP (n.d.)	Enabling
		Appropriate environmental flows are ensured to maintain wetlands goods and services (also relevant to water allocation).	UN-Water & GWP (n.d.)	Sustaining
		Safe water supply and sanitation expansion has reached or exceeded target.	UN-Water & GWP (n.d)	Sustaining
	Impact assessments	Appropriate impact assessment procedures (including EIA, Cost Benefit Analysis, and Options Assessments) and laws are in place and implemented effectively to support management of threats to sustainable water use (e.g. infrastructure construction, over-abstraction, point-source and diffuse pollution, habitat loss/ degradation).	WWF (2006)	Developing
(Sustainable/ equitable) water allocation	Demand/needs assessment	Surveys have identified actual and future water needs for all resource user-groups and environmental requirements and areas of significant competition/conflict between use types and/or user groups.	WWF (2006)	Enabling
	Water allocations and flow management planning	Water allocation/flow management plans that are environmentally and socioeconomically sustainable are in place for all user groups.	WWF (2006)	Enabling
		Water allocation/flow management plans that are flexible to accommodate changes, effective and efficient use of water resources.	UNESCO et al. (2009b)	Enabling
		Knowledge of water resource availability is a basis for management - ongoing monitoring of total water storage capacity and groundwater levels.	CAP Net (2008)	Developing
		Charges and fees for water allocation favour the poor and promote efficient water use (also relevant for equity).	CAP Net (2008)	Developing
		Water allocation criteria include use efficiency, economic benefit and social goals.	CAP Net (2008)	Enabling
	Demand management (implementation)	Water pricing and cost recovery are being used as demand management tools, particularly among commercial-scale users.	WWF (2006)	Developing
		Major water users are known and are managed through a licensing (or permit) system - no. of surface and groundwater users licensed according to the regulations.	CAP Net (2008)	Enabling
		Demand management of user behaviour and water use efficiency.	UN-Water & GWP (n.d.)	Developing
		Proportion of water allocation permit holders complying with permit conditions	CAP Net (2008)	Sustaining
Governance/ institutional frameworks for IWRM	Policy, laws and regulations	Policies, laws and regulations that can be used for enforcement-related actions – if required – are in place (e.g. for pollution control, land- and water-use planning controls).	WWF (2006)	Enabling
		Change of ministerial and departmental mandates.	UN-Water & GWP (n.d.)	Enabling
		Regulatory instruments and associated enforcement frameworks.	UN-Water & GWP (n.d.)	Enabling
		New legislation and standards, institutional capacity-building is taking effect.	UN-Water & GWP (n.d.)	Enabling

Table 7: Initial list of indicators emerging from literature review exercise (continued)

Principles	Factors	Indicators	Sources	Enabling/ Developing/ Sustaining
		The legal status of water and water entitlements/water rights is clear.	WWF (2006)	Enabling
		Existing customary (and other informal) rights of access to water resources are recognised.	WWF (2006)	Enabling
	Political will	Sector ministries are actively promoting and implementing IWRM approach.	UN-Water & GWP (n.d.)	Enabling
		Water resources agencies are starting to administrate according to new IWRM principles.	UN-Water & GWP (n.d.)	Developing
	Mainstreaming IWRM	IWRM principles included in Poverty Reduction Strategy Paper and other strategic socioeconomic texts relating to the water management sector and other key sectors (e.g. agriculture, tourism, energy, infrastructure) and listed among priority actions in implementation plans and costing schedules.	WWF (2006); see also UN-Water & GWP (2008)	Enabling
	Strategy & plan	IWRM strategy and plan development.	UN-Water & GWP (n.d.)	Enabling
		Transparent, coherent and consensus-based planning and strategy making is taking effect in all sectors.	UN-Water & GWP (n.d.)	Enabling
		Countries produce coherent water resources development and management plans that support the achievement of the MDGs.	UN-Water & GWP (n.d.)	Enabling
	Cross-sectoral linkages	Establishment of cross-sectoral coordination frameworks.	UN-Water & GWP (n.d.)	Enabling
		Cross-sectoral analysis. Identifies emergent problems and integrates policy implementation instead of analysing sectors separately.	Mysiak et al. (2010); Pahl-Wostl (2007)	Enabling
	Multi-scalar management framework	A 'nested' management framework operating simultaneously at different spatial scales (but with full coordination) is in place and working effectively.	WWF (2006); Pahl-Wostl et al. (2007)	Enabling
	Decentralisation	Decentralisation and delegation of decision-making at the river basin, provincial/local and community levels.	UN-Water & GWP (n.d.)	Enabling
	Transboundary basins	A bi- or multi-country/state/province river-basin management body is in place to promote cooperative management.	WWF (2006); Mysiak et al. (2010)	Enabling
	Basin-level planning & management	A multi-stakeholder river basin/water management body is in place and taking a leadership role.	WWF (2006)	Enabling
		Water management activities driven by Basin plan.	CAP Net (2008)	Enabling
		Institutional frameworks for coordination and cooperation across hydrological, administrative and sectoral boundaries, including transboundary waters	UN-Water & GWP (n.d.)	Enabling
Financing & resource allocation	Government and other investments	Sufficient financing to allow for effective IWRM implementation; or allocation of appropriate and sustainable funding in national budgets.	WWF (2006); UN-Water & GWP (2008)	Enabling

Table 7: Initial list of indicators emerging from literature review exercise (continued)

Principles	Factors	Indicators	Sources	Enabling/ Developing/ Sustaining
	Cost-sharing	Cost-sharing mechanisms being implemented successfully (e.g. application of the concepts of users and polluters pay; payment for environmental services).	WWF (2006)	Developing
	Financial sustainability	Bill collection ratio.	CAP Net (2008)	Sustaining
		Adequate investment and financial sustainability, including cost recovery elements, balancing management versus development of the resource.	UNESCO et al. (2009b)	Sustaining
Effective M&E	Monitoring networks	Number of water resource monitoring stations producing reliable data.	CAP Net (2008)	Developing
	Water resources assessments	Water resources issue assessment.	UN-Water & GWP (n.d.)	Developing
Knowledge & information	Knowledge base	Foundation knowledge base established; and shared between all stakeholders.	WWF (2006)	Enabling
		Monitoring and research programs are documenting the impacts and causes of major water issues.	UN-Water & GWP (n.d.)	Developing
	Data management	Database is established in formats compatible with other river basin organisations.	CAP Net (2008)	Developing
		Improvements in information management.	UN-Water & GWP (n.d.)	Developing
	Information sharing & flow	Information and knowledge as it is gathered is being passed freely and transparently between government and civil society stakeholders.	WWF (2006)	Developing
		Water management information is available to managers and other stakeholders as required.	CAP Net (2008)	Developing
Capacity & awareness	Training and capacity building	Training and capacity-building programmes ongoing to help process of building skills base of management agencies and key stakeholders.	WWF (2006)	Sustaining
		Capacity development of government staff and stakeholder groups.	UN-Water & GWP (n.d.); UNESCO et al. (2009b)	Sustaining
Adaptation/flexibility	Flexibility/ predictability	The need to be adaptable to change while requiring institutions and governance to be predictable in their implementation.	Engle et al. (2011)	Sustaining
		The balance of structure, guidance and policy certainty at higher administrative scales with the ability to implement adaptation at local levels.	Hill and Engle (2011)	Sustaining
	Robustness/ transformation	The ability to be well adapted to a particular type of extreme event while also able to change course, reorganise and mobilise quickly to reverse an unsustainable trajectory.	Hill and Engle (2011)	Sustaining
	Information/ knowledge	Support of training and response systems with climate and hydrological information systems.	Hill and Engle (2011)	Sustaining
		Effective deployment of objective scientific information across different networks or levels of decision-making from the management of resource issues in the context of change.	Hill and Engle (2011)	Sustaining
		Integration of different kinds of knowledge into decision-making.	Hill and Engle (2011)	Sustaining
		Effective and sufficient implementation and use of monitoring and assessment frameworks.	Hill and Engle (2011)	Sustaining
	Networks	The level and type of interactions between different stakeholders within the basin/sector, as well as across the different political layers.	Hill and Engle (2011); Engle et al. (2011)	Sustaining

Table 7: Initial list of indicators emerging from literature review exercise (continued)

Principles	Factors	Indicators	Sources	Enabling/ Developing/ Sustaining
Flood and drought management	Risk assessment	Risk assessment e.g. in terms of proportion of population at risk of floods/loss of life from water-related disasters conducted.	CAP Net (2008b)	Developing
	Early warning	Number of forecasts or warnings issued for floods.	CAP Net (2008b)	Developing
		Number of forecasts or warnings issued for low flows.	CAP Net (2008b)	Developing
		Proportion of population with access to effective early warning systems.	UN-Water & GWP (n.d.)	Developing
	Flood protection	Urban slum dwellers are protected against flooding.	UN-Water & GWP (n.d.)	Developing
		Rural poor populations are protected against flood risks.	UN-Water & GWP (n.d.)	Developing
		Plans and strategies to manage flood and drought risk developed and implemented at national and basin levels.	UN-Water & GWP (n.d.)	Developing
		Appropriate, decentralised, diverse sources of design, power delivery instead of massive, centralised infrastructure, single sources of design, power, delivery.	Mysiak et al. (2010); Pahl-Wostl (2007)	Enabling

Source: authors.

Table 8: Final list of indicators and sub-indicators used to conduct the CC-WRMA

Factor	Indicators	Guidance notes
Legal framework	Does water law include the following core elements of IWRM (clear, well developed):	
	Stakeholder participation? (with explicit reference to main categories of water users, women, poor communities and marginalised groups)	0 = no reference in law 5 = statement of principle, plus articulation of the procedure for incorporating stakeholder views in WRM and accountability mechanisms
	Basin-level management? (with explicit reference to the basin-level integration of different sectors and users and the identification of the lead institution/s)	0 = no reference in law 5 = statement of principle, plus requirements for water resource allocation plans and the preparation and implementation of basin plans
	User pays principle? (with explicit reference to both water use and pollution, principles for payment level)	0 = no reference in law 5 = statement of principle, plus a legal framework for granting and managing permits for abstraction and pollution, with rights and responsibilities from user to grantee clearly articulated, plus associated registration, monitoring, enforcement and charging systems.
	Allocation of water rights which balances social, economic and environmental objectives?	0 = no reference in law 5 = statement of principle, plus a clear distinction between ownership and use rights, recognition of customary and collective rights, and hierarchy of needs/priority (human, environment, agriculture, industrial)
Policy and plans	Is there an endorsed WRM policy/ies reflecting the above elements?	0 = no policy or no/very limited relevant policy statements 5 = clearly articulated, high quality and up to date WRM policy statements reflecting the above principles, with ministerial endorsement
	Are responsible institution/s aware of and acting in accordance with the policy?	0 = no awareness of WRM policy and its provisions, no evidence that activities follow policy 5 = detailed awareness of policies, clear understanding of how all aspects are being implemented, evidence that that plans and actions follow policies closely (a strong plan for implementation, with evidence of awareness and progress, would score fairly highly at 3 or 4)
	Are institutional roles, responsibilities and coordination mechanisms for WRM clearly articulated? (including the role of federal, basin, regional and local institutions)	0 = roles and responsibilities of other organisations, and their coordination, not mentioned, except the lead institution 5 = clear breakdown of the roles and responsibilities of all water-using line ministries/bureaux/offices (at federal, regional and local level), of basin authorities, of environment ministry/ bureaux/offices, of other agencies with a mandate relating to water-using sectors (e.g. ATA, EIA), with no significant duplication or gaps, and clarity on the coordination mechanisms
	Is there a national WRM strategy/investment plan? (which is up to date, endorsed, comprehensive, good quality)	0 = no such plan, or completely outdated/not in line with policy and law 5 = a detailed plan and strategy which clearly follows from the law and policy, realistic (with discussion of necessary resources), endorsed by all relevant institutions, and up to date
Support for WRM	Does the lead institution/s have political support at the national level, expressed in practical ways? (e.g. capacity-building)	0 = lead institution is unsupported in practical and political terms, no statements of support or evidence of capacity building efforts 5 = lead institution is strongly supported by both national ministries (at senior/ministerial level) and high level authorities (e.g. Prime Minister's Office, Cabinet), and this is effectively supporting the lead institution to implement WRM, e.g. by enhancing its capacity or power/status/authority

Table 8: Final list of indicators and sub-indicators used to conduct the CC-WRMA (continued)

Factor	Indicators	Guidance notes
Support for WRM	Do water-using sectors endorse IWRM in their policies/strategies, and engage in joint planning and information sharing in relation to water use/allocation?	0 = no reference to WRM obligations, no joint planning or sharing of water use information. 5 = all plans are reviewed in the light of basin plans, agreed allocations, and WRM principles; WRM obligations are recognised in documents and endorsed by officials; data on past, present and future water needs/use/pollution is provided to water managers and other water-using sectors as an input to planning
	Is the legal division of responsibility for WRM functions respected and properly followed by relevant institutions at all levels (RBAs, regional bureaux, federal ministries, local institutions)?	0 = no attention among relevant institutions 5 = all or virtually all institutions are aware of, and following, their roles and responsibilities, and using the specified coordination mechanisms and decision-making procedures
	Are public statements of support or communications of WRM issues made for awareness-raising purposes?	0 = no or very few examples 5 = frequent statements of the importance of WRM (e.g. in discussion of new water infrastructure, development goals, etc.), and bulletins on issues and trends (or similar), issued at national and basin level, by high-profile offices/individuals
Finance	Do WRM functions have clear and dedicated budget lines in the lead institution/s?	0 = no dedicated budget line for different functions, or very unclear 5 = clear budget line for each function/ planned activity, with no gaps/duplications
	Is allocated financing (government) and user fees for WRM sufficient and stable enough to implement the plan/strategy, including contingency for extreme events?	0 = budget allocation highly inadequate or unpredictable, creating significant problems in implementation 5 = budget fully adequate to implement all regular functions, on an ongoing basis, with enough contingency allocated for emergency use
	Is the basis for raising revenue from users clearly defined and explained (e.g. water resource/permit fees)?	0 = no clarity on how fees are to be determined and how much revenue is to be raised from users 5 = strategy for raising revenue from users fully defined and justified, with clarity on the basis on which fees are defined
	Do financial rules, regulations and procedures (e.g. procurement, disbursement) support effective use of budgets?	0 = extremely cumbersome financial procedures and/or lack of disbursements lead to substantial underspend (<40%) 5 = >90% of budget spent and financial procedures are clear, easy to apply and not excessively burdensome
Human capacities	Is sufficient staff in place with hydrology and water management/ engineering skills (scientific and technical expertise)?	0 = serious deficiency in staffing with significant impact on activities 5 = full complement of highly qualified staff, able to discharge duties to a high level
	Is sufficient staff in place with stakeholder engagement skills?	0 = serious deficiency in staffing with significant impact on activities 5 = full complement of highly qualified staff, able to discharge duties to a high level
	Is sufficient staff in place with social and economic analytical/ modelling skills for planning?	0 = serious deficiency in staffing with significant impact on activities 5 = full complement of highly qualified staff, able to discharge duties to a high level

Table 8: Final list of indicators and sub-indicators used to conduct the CC-WRMA (continued)

Factor	Indicators	Guidance notes
Information base	Is data available and accessible to managers on the water resource potential and quality of surface and groundwater, including temporal variations, which is reliable and up to date?	0 = very limited / very poor-quality data is available, insufficient to support any decision-making 5 = comprehensive, up to date data encompassing > x years of variability is available in a form which managers are able to use
Information base	Is data available and accessible to managers on the water resource potential and quality of surface and groundwater, including temporal variations, which is reliable and up to date?	0 = very limited / very poor-quality data is available, insufficient to support any decision-making 5 = comprehensive, up to date data encompassing > x years of variability is available in a form which managers are able to use
	Is information on water resources availability used to determine basin/ sub-basin allocation licensing/plans on a long-term and annual basis? (shares of the available resources – a preset and transparent formula)	0 = no clear link between resource data, allocation criteria (or these are absent) and allocation decisions 5 = data used to inform allocation decisions at all levels, based on a clear and transparent formula
	Are environmental needs and the nature of water-dependent ecosystem services understood, including the impact of different flow regimes on environmental services?	0 = no or very weak understanding of environmental needs, the nature and importance of water-based ecosystem services and the impacts of changing flows on these 5 = very good understanding among managers of a range of environmental needs, the nature and importance of water-based ecosystem services and the impact of changing flow levels on these, based on sound data.
	Are arrangements in place for publishing and sharing data/ information with stakeholders in useful forms?	0 = no information sharing or publishing arrangements Systems and equipment
Systems and equipment	Is sufficient good-quality equipment available to fulfil management functions? (e.g. monitoring equipment, computers, GPS, modelling software, vehicles)	0 = equipment is grossly insufficient and/or non-functional, with severe impacts on efficacy 5 = a full complement of functioning equipment is in place to enable effective delivery of functions
	Is a functioning management information system in place to enable use of data in planning and decision-making? (first step: registration of main users and sources of pollution)	0 = no management information system in place to enable use of data in decision-making; data is absent, inaccessible, or scattered/disorganised beyond the point where it can be practically used 5 = well organised management system integrates all available data and permits easy analysis for decision-making purposes
	Are there clear operational procedures and responsibilities for use and maintenance of equipment?	0 = no such procedures in place 5 = clear and suitable procedures in place for all equipment
	Are adequate procedures and systems in place for human, project and financial management within the lead institution/s for WRM?	0 = no or very weak procedures in place, hindering the work of the organisation significantly 5 = very strong procedures in place in all areas, supporting organisation effectiveness
Basin planning (enabling?)	Are up to date basin plans (long- and short-term) in place and publicly available, which include both biophysical and socioeconomic analysis (equity, economic use of water)? (based on an agreed and transparent process for determining long-term and annual water shares)	0 = no basin plan in place 5 = up to date long- and short-term plans in place, based on good-quality data with a clear basis for allocation decisions and strong analysis of economic, environmental and social issues
	Are sectoral and regional plans in line with the basin plan, and are plans communicated and shared?	0 = no connection between sectoral plans and basin plan 5 = fully integrated planning process
	Is there integration of WRM and watershed/land management and conservation?	0 = no connection between the planning of watershed management activities and WRM agenda (no cross-references in plans or evidence of connected decision-making) 5 = fully integrated planning process
	Is there a rigorous process for social and environmental impact assessment of new infrastructure, with 'natural' infrastructure given due consideration?	0 = no EIA process for new infrastructure, or outcomes ignored; very little consideration of the role of natural infrastructure 5 = strong and rigorous assessment process with significant influence on infrastructure design; high level of consideration of the value of natural systems

Table 8: Final list of indicators and sub-indicators used to conduct the CC-WRMA (continued)

Factor	Indicators	Guidance notes
Stakeholder participation	Are formal stakeholder identification and engagement processes in place with a clear role in WRM decision-making (including all categories of water user and communities depending on water resources?) (different levels)	0 = no formal stakeholder engagement in WRM decision-making 5 = strong process of stakeholder engagement with all relevant stakeholders represented and a clear function in decision-making
	Are all stakeholders able to participate on an equal footing, with support provided for marginalised groups and regulation of powerful actors?	0 = serious gaps/skew in participation and voice, with no measures to support the marginalised or regulate the most powerful 5 = strong measures to support the marginalised and regulate the most powerful, allowing all stakeholders an equal voice
	Are stakeholder views documented and their influence on decisions evident?	0 = no documentation of stakeholder views / consultation outcomes 5 = consistent documentation of consultations and clear evidence/examples of how formal stakeholder engagement processes inform decisions
	Is there a transparent, fair and effective mechanism for conflict resolution between stakeholders?	0 = no mechanism for conflict resolution, or one which is severely flawed or biased 5 = strong, transparent and equitable mechanism for conflict resolution with evidence of successful application
Water allocation	Are clear and transparent criteria applied for water allocation decisions and prioritisation of uses, which balance social, economic and environmental needs?	0 = no criteria articulated for water allocation and prioritisation 5 = clear, transparent criteria articulated which are designed to balance social, environmental and economic needs and used consistently
	Does actual water use reflect agreed allocations?	0 = substantial discrepancies between allocations and actual use, no attempt to follow allocations by users or managers 5 = pattern of use matches allocations, with strong attention to ensuring that allocations are followed by both users and managers
	Is there specific provision to protect the environment (e.g. environmental flows) and less powerful water users? [guidance to mention gender]	0 = no provision for environmental flows or the water needs of the marginalised 5 = provision for environmental flows and the water needs of the marginalised, clearly defined and protected in allocation decisions
	Are users of water in the basin and their water use patterns known and regularly updated?	0 = no or very limited knowledge of water users and their use patterns 5 = regularly updated, comprehensive data on water users and their use patterns
Pollution control	Are water quality standards in use for watercourses and groundwater, to protect both users and the environment?	0 = no water quality standards in place for watercourses or groundwater 5 = appropriate water quality standards in place for watercourses and groundwater, offering protection to users and the environment [WHO or other benchmarks?]
	Are the sources, types and impacts of water pollution known and regularly updated?	0 = no or very limited knowledge of water pollution types and sources 5 = good and comprehensive understanding of current water pollution types, sources and impacts
	Does (integrated) pollution reduction strategy/ies exist at basin level and in polluting sectors?	0 = no pollution reduction strategy in place 5 = strong and integrated strategies to reduce pollution both by water managers and across polluting sectors

Table 8: Final list of indicators and sub-indicators used to conduct the CC-WRMA (continued)

Factor	Indicators	Guidance notes
Pollution control	Are strategies implemented and discussed between WRM institutions and polluters?	0 = strategies, if they exist, are not implemented or discussed 5 = strategies are being implemented appropriately, in a coordinated fashion
Monitoring	Are flows/levels of surface water and groundwater monitored regularly with a sufficient network of stations?	0 = no or virtually no monitoring of flows and groundwater levels 5 = full network of monitoring stations and regular data collection on flows and groundwater levels
	Is the quality of surface water and groundwater monitored regularly at critical locations?	0 = no or virtually no monitoring of water quality 5 = regular data collection at critical locations for surface water and groundwater
	Are the records/database kept up to date?	0 = records highly out of date, disorganised, incomplete or non-existent 5 = well organised, up to date set of records
	Does data inform WRM planning and action in a timely way?	0 = no procedures for use of data in decision-making, and no evidence that this occurs 5 = appropriate and consistent use of data in decision-making
Economic management	Are water users licensed and billed?	0 = no licensing or billing in place 5 = all water users requiring a permit are licensed and billed appropriately
	Are polluters licensed and billed?	0 = no licensing or billing in place 5 = all polluters requiring a permit are licensed and billed appropriately
	Are charges for water use and pollution, and penalties for non-compliance, appropriate to promote sustainability, equity (including affordability of permits) and economic benefits?	0 = charges grossly inadequate or excessive 5 = charges carefully designed to promote multiple objectives, and reviewed regularly to assess effectiveness
	Are all users paying fees according to their licenses?	0 = collection rate less than 10% 5 = collection rate over 90%
Flood and drought management	Is there an effective strategy for flood risk management and response? (e.g. forecasting, insurance, levee construction)	0 = no flood risk management strategy in WRM sector 5 = high quality flood risk management strategy
	Is there an effective strategy for drought risk management and response? (e.g. increasing storage, reallocating water, adjusting permits)?	0 = no drought risk management strategy in WRM sector 5 = high quality drought risk management strategy
	Do monitoring systems provide early warning of floods and droughts/ low flows which are communicated to stakeholders?	0 = no effective warning system for floods and low flows 5 = warning systems for floods and low flows provide consistently timely warning of forthcoming emergencies, and warnings are communicated to stakeholders in good time
	Are lessons from past events used to improve prediction and mitigation of extreme events and their impacts?	0 = no evidence of learning from past extreme events to improve mitigation 5 = systematic processes to review responses to past extreme events and learn lessons, which are used to improve strategies for the future
Adaptive management	Is there a regular multi-stakeholder review of WRM to monitor policy implementation, learn lessons and set actions, at basin and national level?	0 = no multi-stakeholder review process for WRM 5 = regular (at least every 2 years) multi-stakeholder review process including all main stakeholders, with an effective function in monitoring policy implementation, learning lessons and setting actions

Table 8: Final list of indicators and sub-indicators used to conduct the CC-WRMA (continued)

Factor	Indicators	Guidance notes
Adaptive management	Are basin plans designed to be robust under a range of future scenarios, and is there discretion/flexibility in their implementation to allow for future uncertainties (e.g. climate, new uses and infrastructure)?	0 = no provision for climate change or other future change scenarios in basin plans 5 = basin plans designed to be robust under a range of future scenarios, and flexibility permitted in implementation to allow managers to adapt
	Are trends analysed and future scenarios developed in water demand and pollution, to inform plans and allocations?	0 = no analysis of trends and scenarios in water demand and pollution 5 = strong analysis of past trends and future scenarios for water demand and pollution, generating a plausible range of scenarios which inform plans
	Are trends analysed and future projections developed of spatial and temporal water availability (including climate change projections), to inform planning and allocation?	0 = no analysis of trends and scenarios in water availability 5 = strong analysis of past trends and future scenarios for water availability, generating a plausible range of scenarios which inform plans
Enforcement and effectiveness of instruments	Are permit conditions for abstraction and pollution monitored and enforced, with penalties for breaches or non-payment?	0 = no effective monitoring of compliance and/or no action in the case of non-compliance 5 = up to date monitoring of compliance, with effective responses in the case of non-compliance, for all users
	Is there a mechanism to enforce integration and coordination procedures among institutions with a role in WRM (e.g. adherence to allocation decisions and basin plans, EIA of infrastructure)?	0 = no mechanism and weak coordination of institutions with a role in WRM/water use 5 = strong, effective mechanisms to ensure coordination procedures for WRM are followed across relevant institutions
	Are the outcomes of WRM instruments assessed?	0 = no outcome assessment 5 = regular outcome assessment to strengthen the design and implementation of WRM instruments
	Has the introduction of WRM processes been associated with improvements in water use efficiency and at basin level?	0 = water use efficiency deteriorating 5 = clear evidence that WRM processes are having a positive effect on water use efficiency among users
Institutional and technical sustainability	Are qualified staff successfully recruited and retained?	0 = serious shortfall in hiring and retaining qualified staff 5 = qualified staff is successfully hired and retained
	Is long term financing secured for WRM institutions and activities?	0 = serious shortfall in long term financing, or no predictability of future financing 5 = funding secure for the forthcoming 5-10 years, adequate to meet needs, and confidence in disbursement is high
	Is regular capacity building provided to maintain staff capacity?	0 = No capacity development provided 5= Capacity development regularly provided to respond to staff needs
	Do stakeholders trust WRM processes and institutions, and engage with them willingly?	0 = very low level of engagement and high level of mistrust among stakeholders 5 = very high level of engagement and trust among stakeholders
Environmental and social sustainability	Are environmental flows maintained year-round?	0 = environmental flows maintained at less than half of measured sites on a regular basis 5 = environmental flows maintained at all sites on a regular basis, including in low flow years
	Do water samples meet quality standards year-round?	0 = water quality standards met at less than half of measured sites on a regular basis 5 = water quality standards maintained at all sites on a regular basis, including in low flow and flood years

Table 8: Final list of indicators and sub-indicators used to conduct the CC-WRMA (continued)

Factor	Indicators	Guidance notes
Environmental and social sustainability	Are the water needs of poor and marginalised communities/groups in the basin protected?	0 = significant failures to protect the needs of the poorest and marginalised groups 5 = needs are effectively protected, including during low flow and flood events
	Is there evidence that WRM is driving an increase in water productivity?	

Annex 4: Detailed results of the CC-WRMA

Figure 5: List of indicators and sub-indicators with traffic light system applied to identify bottlenecks in the 'enabling' category

LEGAL FRAMEWORK — Average score: 3.75

- Water law includes adequate provisions for stakeholder participation (4)
- Water law provides for basin-level management; IWRM introduced by 1999 Policy, 2002 WSDP and 2007 Proclamation (4)
- Water law includes user pays principle (2000 Proclamation, 2002 Environmental Control Proclamation and 2005 Regulation) (4)
- Water law balances social, economic and environmental objectives at federal level (social objective takes priority), less explicit at basin level (3)

POLICY AND PLANS — Total score: 2

- WRM law is reflected in policies and strategies that focus on IWRM approach - but outdated (1999 Policy still main reference). IWRM also reflected in CRGE and GTP (3)
- Responsible institutions are aware of the policy, but not always acting according to it especially at basin level (2)
- Institutional roles, responsibilites and coordination mechanisms for WRM are articulated at federal level (2010 Proclamation), less so at basin level (2)
- National WRM strategy exists but outdated (2002). Now integration of WRM in CRGE and GTP (process underway) (1)

SUPPORT FOR WRM — Total score: 2

- MoWIE receives adequate support from GoE to perform its functions (especially for WASH); less adequate support (especially financial) at basin level (RBAs) (3)
- Little commitment to WRM in water-using sectors due to lack of horizontal coordination and communication between ministries and within MoWIE (1)
- The legal division of responsibility for WRM functions is not clear - especially between regional states and RBAs (1)
- Public statements focus on WRD more than WRM (3)

FINANCE — Total score: 1.25

- WRM has dedicated budget line at federal level (WRDF established); but RBAs receive insufficient budget from government and have little capacity to raise water fees (2)
- Budget allocated for WRM deemed to be inadequate and unpredictable at both federal and basin levels (1)
- 2005 Proclamation provides for permit fees and charges for the use of water; but gaps in terms of specifying what authority should be in charge, crtieria and amount of water fees (1)
- Procurement rules and practices deemed to be inadequate to support effective use of budgets (but more information is needed) (1)

INFORMATION BASE — Total score: 1.5

- Average availability of data on surface water (2)
- Limited availability of data on groundwater (1)
- Average understanding of environmental needs in theory (2)
- Ineffective and insufficient data/information sharing between sectors and governance levels (1)

HUMAN CAPACITIES — Total score: 1.5

- Moderate complement of qualified staff with hydrological assessment and monitoring skills at federal level, less at basin level (3)
- Deficiency in staff with administrative/project and stakeholder management skills (1)
- Deficiency in staff with planning and modelling skills (1)
- Some expertise on climate change and vulnerability and risk assessments, but still not enough (1)

EQUIPMENT AND SYSTEMS — Total score: 1.7

- Monitoring equipment present (in some basins more than in others) but needs to be upgraded/modernised (2)
- No functioning management information system/database in place to enable use of data in planning and decision-making (1)
- Procedures are in place for human, project and financial management for WRM (more at federal, less at basin level) (2)

Figure 6: List of indicators and sub-indicators with traffic light system applied to identify bottlenecks in the 'developing' category

BASIN PLANNING

Average score: 1.75

- Basin plans are outdated (but in the process of being updated) and not publicly available; they include basic biophysical and socioeconomic analysis but miss some key aspects e.g. groundwater (2)
- Limited connection between sectoral plans and basin plans, and between basin plans and federal-/regional-level planning (1)
- Land and water management remains separate (different mandates, different organisations) (1)
- 2002 Proclamation and other regulations provide for social and environmental impact assessment of new infrastructure, little mention of natural infrastructure (3)

STAKEHOLDER PARTICIPATION

Average score: 1.7

- Provisions for formal stakeholder engagement in WRM, but no systematic way to ensure all stakeholders are represented (ad hoc participation) (2)
- Stakeholders' views collected, but unclear the extent to which they were documented and shared - lack of capacity especially in RBAs (2)
- Conflict resolution occurs ad hoc (no transparent and effective mechanism, role should be of RBAs at basin level) (1)

WATER ALLOCATION

Average score: 1.5

- Unclear criteria for water allocation - RBAs have not fully taken on regulatory role (1)
- Reported discrepancies between allocation and actual use, limited monitoring to ensure allocations are respected (1)
- Some provisions to protect the environment, less for poor water users although compensations paid (2)
- Major water users in the basin and their water use patterns are known; not the case for small users (and 'illegal' ones e.g. in Awash) (2)

POLLUTION CONTROL

Average score: 1.5

- Water quality standards in place, others being developed for surface water and groundwater but 'not enough' (2)
- Understanding of current water pollution types, sources and impacts not good enough and anecdotal at times (2)
- No integrated pollution reduction strategies at basin level (1)
- Only ad hoc measures to control pollution, no evidence of direct discussions between WRM institutions and polluters (1)

MONITORING

Average score: 1.25

- Monitoring of water quantity and allocation, rainfall and river flows, less of groundwater (2)
- Limited monitoring of water quality (1)
- Regular monitoring in theory, but shortage of data (no centralised database) and poor data analysis (1)
- No specification of procedure for data to inform WRM planning and action (1)

ECONOMIC MANAGEMENT

Average score: 1

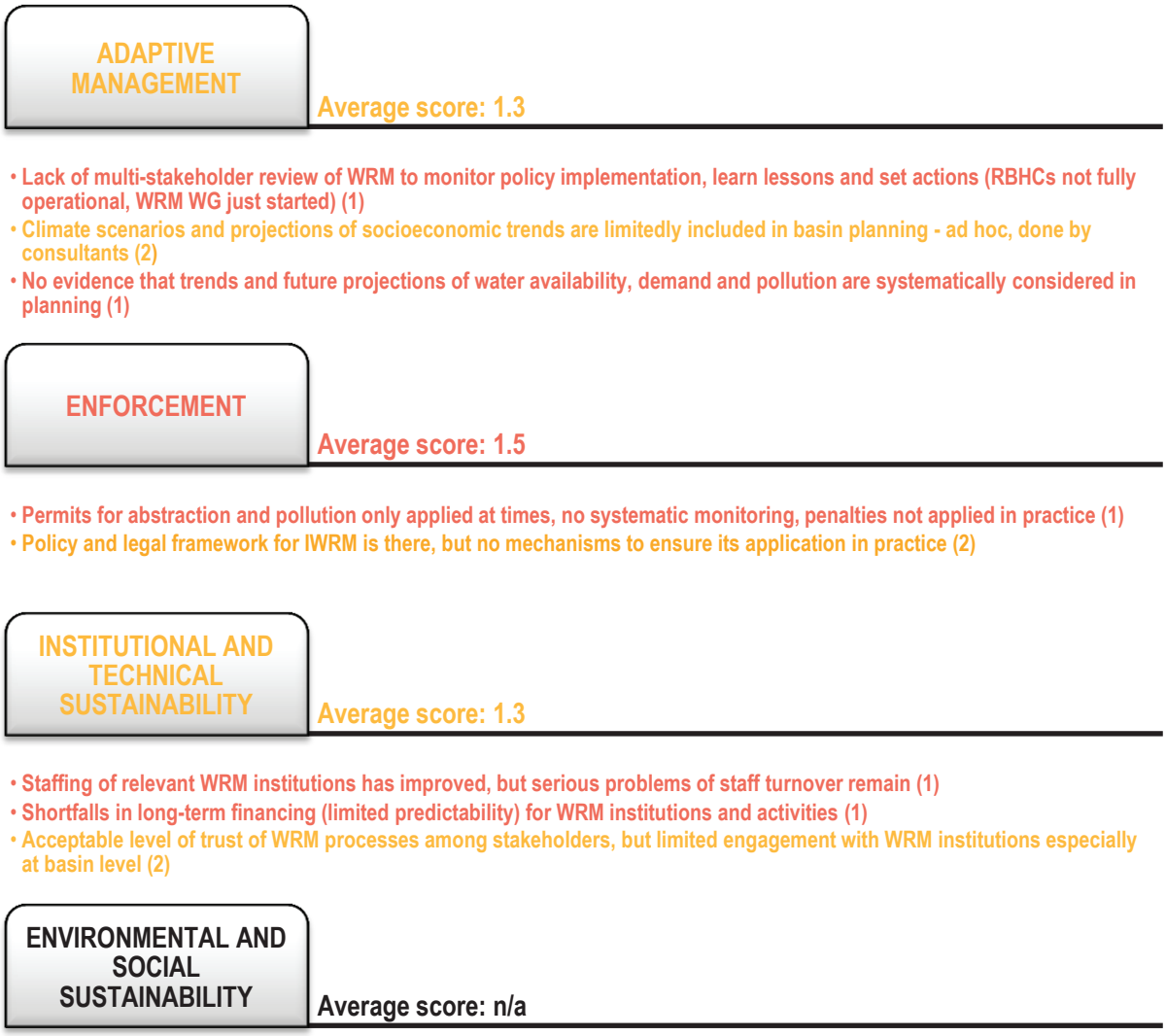
- 2005 Regulation provides for water users being licensed and charged, but not entirely enforced in practice especially at basin level (1)
- Polluters are not licensed and charged (1)
- Charges for water use and pollution are inadequate, penalties for non-compliance only exist on paper (1)

FLOOD AND DROUGHT MANAGEMENT

Average score: 2.25

- Flood risk management and response ad hoc (increasing support from donors), no clear linkages with WRM (3)
- Strategy for drought management and response in place (NMA in charge), no clear linkages with WRM (3)
- Early warning systems in place, but unclear extent to which regular and timely communication with communities occurs (2)
- No evidence learning from past events to improve adaptive capacity, limited institutional memory (1)

Figure 7: List of indicators and sub-indicators with traffic light system applied to identify bottlenecks in the 'sustaining' category



Annex 5: Summary of action planning – and resources needed, as listed by stakeholders

Bottlenecks	Action	Type	Institutional/coordination requirements	Priority: Relevance to WRM system	Priority: Time frame for action*	Priority: Resource intensity
WRM strategy (2002 WSDP and Basin Master Plans) is outdated and does not reflect new (planned and completed) water developments	New sectoral policies and plans to converge into the GTP-2 and incorporate CRGE strategies. GTP-2 to set the directions for WRD.	INST	GoE through the MoWIE and other ministries in water-related sectors (MoA, MEF, MoTI) and MoFED. Key role of RBHC and WRM Technical Committee. Include also Ministry of Households, Urban Development, Works (…).	Enabling	Current – 5 years	Low
RBAs are only established in three strategic basins and their mandate remains unclear; limited basin planning due to lack of capacity and resources	Define and assert RBAs' roles and responsibilities legally, as well as the relationships with other actors that would otherwise have competing water management functions. Establish and operationalise RBHCs.	REG/ INST	GoE – through MoWIE (to support RBAs), regional governments. Coordination in RBHCs. WRM TC should facilitate dialogue between different actors to clarify and raise awareness on RBAs' roles.	Enabling	Current – 5 years	Low
	Basin Master Plans should be updated (on the basis of previous studies and plans) as follows: a) incorporate groundwater resources, b) update hydrological and water resources modelling and allocation, c) factor unforeseen water development plans, d) integrate catchment soil and water conservation practices, e) recognise and regulate all small- to large-scale water users.	INFO	RBAs with support of MoWIE (e.g. for hydrological data and capacity-building); universities/researchers (for modelling); DPs. Stakeholder participation (including private sector, large and small farmers, other investors) to ensure comprehensiveness and equity of master plan and related water allocations. Involve Ministry of Households, Urban Development, Works. RBHCs to ensure Master Plans are comprehensive and result from participatory process that takes into account stakeholders' views and interests.	Enabling	Current – 5 years (but with medium- to long-term vision)	Medium
Lack of institutional structures and financial mechanisms in WRM discourages DP engagement in contrast to WASH	Define budget needs for WRM (institutions as well as infrastructure) and match them with commitments from government (including at regional level) and DPs.	FIN	MoFED, MoWIE and DPs (through RBHCs) to define budget needs, based on planned interventions at different levels (and hence inputs from RBAs, private investors needed too).	Enabling	Current – 5 years	Low
	Establish financial mechanisms to ensure transparent allocation of funds.	FIN	Same as above – key role of MoFED.	Enabling	Current – 5 years	Low
Funding shortage to cover increasing and conflicting development demands in the sector	Establish clear regulations on water fees (and raise awareness about water permits among users) and sustainable funding mechanisms for RBAs.	INST	MoFED, MoWIE, RBAs (in agreement with water users so that they perceive the water fee to be 'fair').	Enabling	Current – 5 years	Low

Annex 5: (continued)

Bottlenecks	Action	Type	Institutional/coordination requirements	Priority		
				Relevance to WRM system	Time frame for action*	Resource intensity
Lack of systematic data collection (and data series) on water availability, uses/abstractions and quality (especially on groundwater)	Conduct an assessment of available data and forecasts relevant to WRM which are held by different ministries, departments, universities and donors – and detail exactly who has what. If possible, gather all the data in one place.	INFO	MoWIE, RBAs – collaboration with regional governments and water users (e.g. large irrigation schemes).	Enabling	Current – 5 years	Low
Planned Basin Information System (BIS) is not yet operative: data management and exchange is limited	Invest in modernisation of water information system – development of BIS covering all water-related data and based on upgraded information systems (upscale of Tana-Beles Integrated Water Resources Development Project?).	INFO	MoWIE, RBAs – with support from DPs (e.g. WB), as well as universities/researchers.	Enabling/ Developing	Current – 5 years (with implication for medium- long-term)	High
	Purchase software and hardware equipment, invest in data collection and analysis on water (both surface water and groundwater) availability, abstraction; to feed into basin plans.	TECH	MoWIE, RBAs – with support from DPs when required; collaboration with universities (preferably institutionalised).	Enabling/ Developing	Current – 5 years	Medium
	Capacity-building of water managers at both federal and basin level (data analysis and management).	CB	MoWIE, RBAs – with support from universities/ researchers (also international) and DPs. Potential role for WRM TC to develop capacity-building programme.	Enabling/ Developing	Current – 5 years (medium-term)	Medium
Unresolved discrepancy between basin boundaries used for planning and administrative boundaries used in budget allocation: conflicts between RBAs' and regions' development agendas	RBAs need to be provided with a univocal mandate and sufficient resources to fulfil their tasks, including competent personnel, budget and equipment. Dialogue should be especially encouraged between RBAs and RWBs in order to help them coordinate their water and land management functions.	INST	RBHCs & MoWIE have key role to clarify RBAs' mandate and relations with RWBs, and provide them with adequate resources.	Developing	Current – up to 10 years (medium- to long-term process)	High
Regulations providing for stakeholder engagement are not systematically implemented / Capacity gap (of RBAs especially) to conduct participatory processes	Establish dialogue platforms for water users and managers ('stakeholders') to come together and take participatory decisions with regards to the allocation and utilisation of water resources.	INST basin/ local level, RWBs and RBAs to initiate and	RBAs (with support from MoWIE and DPs e.g. in the framework of the WRM TC especially for capacity-building), water users, including industries, irrigation schemes, small farmers, urban water supply utilities, and others.	Developing	Current – up to 5-10 years depending on planning requirements	Medium

Annex 5: (continued)

Bottlenecks	Action	Type	Institutional/coordination requirements	Priority: Relevance to WRM system	Priority: Time frame for action*	Priority: Resource intensity
Regulations providing for stakeholder engagement are not systematically implemented / Capacity gap (of RBAs especially) to conduct participatory processes	Awareness-raising and capacity-building on stakeholder participation (for RBAs especially).	CB	Same as above + NGOs.	Developing	Current – up to 5-10 years depending on planning requirements	Low
Permitting system very limited in scope (Awash basin) and does not account for all users (only large-scheme irrigation)	Establishment of water permit system, introducing water and pollution charges on a clearly established legal basis (recognising principle of equity).	REG	GoE, MoWIE supporting RBAs, involvement of MoFED. Coordination with MEF and MoTI for pollution control.	Developing	Current – up to 5 years (but with implications in medium- to long-term)	High
		REG	GoE, MoWIE supporting RBAs, involvement of MoFED.	Developing	Current – up to 5 years (but with implications in medium- to long-term) implications in medium- to long-term)	High
	Coordination with MEF and MoTI for pollution control. Involvement of Natural resources development and environmental protection committee (Parliament)		Current – up to 5 years (but with implications in medium- to long-term)	High	Current – 1-2 years	Low
Pollution is a growing problem, with limited data and no integrated control methods	Collect systematic data on water pollution (including for groundwater)/reinforce monitoring system.	INFO	MoWIE/RBAs, MEF, Ministry of Industry, regional governments, water utilities, water users (especially large ones with monitoring capacities, e.g. industries).	Developing	Current – up to 5 years (but with medium- and long-term implication)	Medium
	Enact strong and integrated (across sectors) regulations for pollution control, including 'polluter pays' principle.	REG	MEF in coordination with MoWIE. Natural resources development and environmental protection committee (Parliament) NGOs to lobby for pollution control.	Developing	Current – up to 5 years (but with medium- to long-term implication)	Low
	Reinforce capacity (and budget) of environmental authorities to enforce legislation.	CB	MoWIE, MEF, RBAs, RWBs, MoTI (and MoA), MoFED.	Developing	Current – up to 10 years	Medium
Hazard early warning system in place for food security, but flooding receives less attention	Flood and drought management need to be strengthened through further investment in weather- and climate-monitoring infrastructure and capacity.	INFO	MoWIE, Disaster Risk Management and Food Security Sector (DRMFSS) in the Ministry of Agriculture, NMA, RBAs & regional governments. Support of DPs: integrated approach bringing together CC interventions and interventions aiming to address climate variability. Key role of research.	Developing	Current – up to 5 years	High

Annex 5: (continued)

Bottlenecks	Action	Type	Institutional/coordination requirements	Priority		
				Relevance to WRM system	Time frame for action*	Resource intensity
	More coordination between the different agencies that are producing and using climate information.	INST	Same as above.	Developing	Current – up to 10 years	Low
Forecasting conducted by NMA and MoWIE but climate monitoring systems are limited	Equipment and capacity for climate monitoring and forecasting (train modellers, GIS/ Remote Sensing specialists).	TECH/ CB	Same as above + involvement of universities/ researchers.	Developing	Current – up to 10 years	High
Limited provisions for multi-stakeholder review of implementation and lack of cross sector coordination across government ministries and within DP agencies	Strengthen WRM TC Develop an integrated institutional model – similar to OneWASH, with clear criteria for monitoring and evaluation of outputs and outcomes, and mechanisms to incorporate learning (allowing flexibility).	INST	WRM TC (government and DPs) – in the framework of a coordinated plan of action/ strategy.	Sustaining	Current	Medium
Climate and socioeconomic risks and pressures are poorly considered in decision-making/ planning	Develop climate and socioeconomic scenarios to inform investment and allocation decisions.	INFO	Institutionalised (not ad hoc) collaboration with (national and international) universities and researchers through MoUs, exchange visits, mentoring.	Sustaining	Current – up to 5 years	High
	Vulnerability reduction approach: planning and management responses that are appropriate to a range of rainfall conditions, or that have at least contingency or risk assessment components in their design phase.	INST	MoWIE, MoA and other water-relevant and climate-vulnerable sectors; with support from DPs and inputs from research.	Sustaining	Current – up to 5 years	Medium
Institutional capacity gaps are significant, exacerbated by high staff turnover and insufficient educational/training opportunities	Capacity-building programme for RBAs to prepare and implement a river basin plan, establish a water permitting system, collect water fees, gather stakeholders to identify conflicts and find solutions.	CB	Universities/research community in coordination with MoWIE (and through WRM TC) to generate WRM capacity in RBAs and other water-related institutions at different levels	Sustaining	Current – up to 10 years (with implication in the long-term)	Medium

Annex 5: (Continued)

Bottlenecks	Action	Type	Institutional/coordination requirements	Priority		
				Relevance to WRM system	Time frame for action*	Resource intensity
Institutional capacity gaps are significant, exacerbated by high staff turnover and insufficient educational/training opportunities	Provide incentives (e.g. salary, benefits) for competent and able professionals to remain within government positions (especially in remote locations). Consider relocation of the Awash RBA Office to a less remote location where it will be able to attract more staff, engage with regional governments and look like less of a marginal outpost – also, review policy on siting RBA offices for other basins.	INST	GoE, MoWIE, RBAs and RWBs primarily.	Sustaining	Current – up to 5 years (with long-term implication)	Low

Colour code for priority (reflecting prioritisation done by stakeholders): red = high priority (enabling condition, required in the short term and low to medium resource intensity, i.e. what can be/must be done now); orange = medium priority (enabling or developing condition, required in the medium-term, and with medium to high resource intensity, i.e. what should be done as soon as possible/as soon as resources are available); green = low priority (sustaining condition, required in the long term, with varying resource intensity, i.e. what should be done eventually/ideally).
Colour code for actions: these are classified according to the type of response they require: REG regulatory response (i.e. new legislation/ regulations being enacted); INST institutional response (i.e. enhance coordination between institutions, create new institutions, etc.); CB capacity response (i.e. invest in capacity-building); FIN financial and TECH technical response (i.e. release funding, buy new equipment); INFO information response (i.e. new data, research).
Source: authors.

Annex 6: Donor-driven interventions/projects in water resource management funded by development partners

Name of Donor	Intervention focused on:	Counterpart/Government Institution	Area	Timeline	Major activities	Budget
German Federal Ministry for Economic Cooperation and Development / GIZ	Sustainable land management (SLM)	Ethiopian Ministry of Agriculture, Natural Resource Management Directorate	Amhara, Oromia, Tigray	01/2012 - 12/2014	1: Improvement of framework conditions for sustainable land management 2: Strengthening of the implementation structures for watershed development 3: Support to the agriculture advisory service for sustainable land management	16,39 Mio. €
Canadian Department of Foreign Affairs, Trade and Development/ GIZ				01/2012 - 06/2016		4,6 Mio. €
European Union/ GIZ			Amhara, Benishangul-Gumuz, Gambella, Oromia, Tigray	01/2012 - 06/2016	4: Introduction of additional climate relevant measures within the national SLM programme	8,5 Mio. €
German Federal Ministry for Economic Cooperation and Development / KfW	Sustainable Land management (SLM)	Ethiopian Ministry of Agriculture, Natural Resource Management Directorate	Amhara, Oromia, Tigray	07/2011 - 06/2016	1: Financing of investments in sustainable land management measures to scale up national Ethiopian SLM programme 2: Management support to national Ethiopian programme coordination to secure investments in SLM 3: Training on community level to complement capacity development of technical corporation	23,3 Mio. €
Canadian Department of Foreign Affairs, Trade and Development/ KfW						9,2 Mio. €
German Federal Ministry for Economic Cooperation and Development / GIZ	Participatory Forest Management in or adjacent to areas of the SLM programme in Ethiopia	Ethiopian Ministry of Agriculture, Natural Resource Management Directorate	Amhara, Oromia, Tigray	01/2013 - 12/2018	1: Participatory development of sustainable forest management plans 2: Strengthen local communities to use forest resources sustainably in a watershed approach 3: Policy dialogue to strengthen participatory forest management practices in the natural resource management sector	3 Mio. €

Annex 6: (continued)

Name of Donor	Intervention focused on:	Counterpart/Government Institution	Area	Timeline	Major activities	Budget
German Federal Ministry for Economic Cooperation and Development / GIZ	Strengthening Drought Resilience of the Pastoral and Agro-Pastoral Population in the Lowlands of Ethiopia (SDR-ASAL)	Ethiopian Ministry of Agriculture, Natural Resource Management Directorate	Afar	07/2013 - 08/2018	1: Pilot measures of lowland adapted natural resources management practices in selected areas 2: Participatory Land Use Planning (PLUP) 3: Capacity development on multiple levels for sustainable management of natural resources in lowland areas 4: Policy dialogue to improve framework conditions for sustainable management of natural resources in lowland areas	4 Mio. €
			Somali	TBD		4.5 Mio. €
			Afar, Somali	TBD		5.5 Mio. €
German Federal Ministry for Economic Cooperation and Development / KfW	Strengthening Drought Resilience of the Pastoral and Agro-Pastoral Population in the Lowlands of Ethiopia (SDR-ASAL)	Ethiopian Ministry of Agriculture, Natural Resource Management Directorate	Afar	07/2013 - 08/2018	1: Financing of investments in lowland adapted sustainable land management measures on a pilot basis 2: Financing of investments for income generation and diversification	6 Mio. €
German Federal Ministry for Economic Cooperation and Development / GIZ	Sustainable Land management (SLM)	Ethiopian Ministry of Agriculture, Natural Resource Management Directorate	Amhara, Benishangul-Gumuz, Gambella, Oromia, SNNPR, Tigray	01/2015 - 12/2018	1: Improvement of framework conditions for sustainable land management 2: Strengthening of the implementation structures for watershed development 3: Support to the agriculture advisory service for sustainable land management	17 Mio. €

Annex 6: (continued)

Name of Donor	Intervention focused on:	Counterpart/Government Institution	Area	Timeline	Major activities	Budget
German Federal Ministry for Economic Cooperation and Development / GIZ	Sustainable land management (SLM)	Ethiopian Ministry of Agriculture, Natural Resource Management Directorate	Amhara, Oromia, Tigray	01/2012 - 12/2014	1: Improvement of framework conditions for sustainable land management 2: Strengthening of the implementation structures for watershed development 3: Support to the agriculture advisory service for sustainable land management	16,39 Mio. €
Canadian Department of Foreign Affairs, Trade and Development/ GIZ				01/2012 - 06/2016		4,6 Mio. €
European Union/ GIZ			Amhara, Benishangul-Gumuz, Gambella, Oromia, Tigray	01/2012 - 06/2016	4: Introduction of additional climate relevant measures within the national SLM programme	8,5 Mio. €
German Federal Ministry for Economic Cooperation and Development / KfW	Sustainable Land management (SLM)	Ethiopian Ministry of Agriculture, Natural Resource Management Directorate	Amhara, Oromia, Tigray	07/2011 - 06/2016	1: Financing of investments in sustainable land management measures to scale up national Ethiopian SLM programme 2: Management support to national Ethiopian programme coordination to secure investments in SLM 3: Training on community level to complement capacity development of technical corporation	23,3 Mio. €
Canadian Department of Foreign Affairs, Trade and Development/ KfW						9,2 Mio. €
German Federal Ministry for Economic Cooperation and Development / GIZ	Participatory Forest Management in or adjacent to areas of the SLM programme in Ethiopia	Ethiopian Ministry of Agriculture, Natural Resource Management Directorate	Amhara, Oromia, Tigray	01/2013 - 12/2018	1: Participatory development of sustainable forest management plans 2: Strengthen local communities to use forest resources sustainably in a watershed approach 3: Policy dialogue to strengthen participatory forest management practices in the natural resource management sector	3 Mio. €

Annex 6: (continued)

Name of Donor	**Intervention focused on:**	**Counterpart/Government Institution**	**Area**	**Timeline**	**Major activities**	**Budget**
German Federal Ministry for Economic Cooperation and Development / GIZ	Strengthening Drought Resilience of the Pastoral and Agro-Pastoral Population in the Lowlands of Ethiopia (SDR-ASAL)	Ethiopian Ministry of Agriculture, Natural Resource Management Directorate	Afar	07/2013 - 08/2018	1: Pilot measures of lowland adapted natural resources management practices in selected areas 2: Participatory Land Use Planning (PLUP) 3: Capacity development on multiple levels for sustainable management of natural resources in lowland areas 4: Policy dialogue to improve framework conditions for sustainable management of natural resources in lowland areas	4 Mio. €
			Somali	TBD		4.5 Mio. €
			Afar, Somali	TBD		5.5 Mio. €
German Federal Ministry for Economic Cooperation and Development / KfW	Strengthening Drought Resilience of the Pastoral and Agro-Pastoral Population in the Lowlands of Ethiopia (SDR-ASAL)	Ethiopian Ministry of Agriculture, Natural Resource Management Directorate	Afar	07/2013 - 08/2018	1: Financing of investments in lowland adapted sustainable land management measures on a pilot basis 2: Financing of investments for income generation and diversification	6 Mio. €
German Federal Ministry for Economic Cooperation and Development / GIZ	Sustainable Land management (SLM)	Ethiopian Ministry of Agriculture, Natural Resource Management Directorate	Amhara, Benishangul-Gumuz, Gambella, Oromia, SNNPR, Tigray	01/2015 - 12/2018	1: Improvement of framework conditions for sustainable land management 2: Strengthening of the implementation structures for watershed development 3: Support to the agriculture advisory service for sustainable land management	17 Mio. €

Annex 6: (continued)

Name of Donor	**Intervention focused on:**	**Counterpart/Government Institution**	**Area**	**Timeline**	**Major activities**	**Budget**
German Federal Ministry for Economic Cooperation and Development / KfW	Sustainable Land management (SLM)	Ethiopian Ministry of Agriculture, Natural Resource Management Directorate	Amhara, Oromia, Tigray	01/2015 - 12/2018	1: Financing of investments in sustainable land management measures to scale up national Ethiopian SLM programme 2: Management Support to national Ethiopian programme coordination to secure investments in SLM 3: Training on community level to complement capacity development of technical corporation	18 Mio. €
World Bank	Tana Beles Integrated Water Resources Management Project	MoWIE, Amhara Agricultural and Water Bureaux, Tana and Beles sub-basin organisations	Tana and Beles sub-basins (part of Abay River Basin)	8 years. 75% disbursed. Closing in 10 months (July 2015)	Hydrological and basin information systems (including first weather radar and groundwater modelling); institutional strengthening, watershed restoration; flood management (early warning, new dredger)	$45 m (=38.8 Mio. €)
Japan International Cooperation Agency (JICA)	Development Study on Groundwater Assessment in Middle Awash Basin	Groundwater Directorate, MOWIE	Middle Awash Basin	Nov 2013 - Dec 2015	1) Drilling observation well 2) Technical seminar to MOWIE 3) Development of computer-based system on geographic information systems and Groundwater Modelling	n.a.

ODI is the UK's leading independent think tank on international development and humanitarian issues.

ISSN: 2052-7209

All ODI Reports are available from www.odi.org

Cover photo: Beatrice Mosello

Overseas Development Institute
203 Blackfriars Road
London SE1 8NJ
Tel +44 (0)20 7922 0300
Fax +44 (0)20 7922 0399

Water & Land Resource Centre