



Groundwater Governance

A Global Framework for Action

Groundwater Governance: - A Global Framework for Action (2011-2014)

Regional Diagnosis for the Sub-Saharan Africa Region

Report to the
Water Research Commission

by

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Executive Summary

The information for this diagnostic has come largely from the Regional Consultation for the Sub-Saharan Africa Region (29-31 May 2012, Nairobi, Kenya) of the “Groundwater Governance: A Framework for Action” project, supplemented from other sources to strengthen the interpretation and conclusions.

Groundwater is strategically important for socio-economic development **throughout the sub-Saharan Africa** region. Drivers that have a major bearing on its unfolding role and governance include the widespread poverty and food insecurity in the region, the continuing need for a basic domestic water supply in both rural and informal urban areas, rapid urbanization, and the need for drought security as part of all water provision. Drought is endemic in the region and is expected to be exacerbated by climate change.

Groundwater’s unseen and little understood functioning within the hydrological environment, and its common property resource nature contribute to its poor management. While **groundwater management is to be institutionalised as part IWRM**, which has been adopted as the water governance framework throughout the region, **its management performance continues to be hamstrung** by many impediments towards a more sustainable utilization – including a serious lack of capacity at national, river basin and local level, inadequate resource monitoring and assessment, lack of institutional development at the important local level, and a general lack of awareness and appreciation of its role, which together have a major region-wide impact on social and economic development.

Only a **systematic, but flexible, long-term process**, driven **within a multi-stakeholder-agreed framework**, can turn groundwater’s present poorly utilized and governed situation around. It is understood that this transformation must lead to, in its broadest sense, a **top down facilitation of multiple local actions**, thus requiring attention on many development fronts and implementation levels, in particular local, aquifer, basin, national and regional levels.

This process should be addressed strategically, starting with a **model institutional framework**, developed in a multi-stakeholder dialogue and based on a joint understanding on roles and management requirements of groundwater in different typical environments. The process needs to be knowledge driven and be capable of building widespread community support for courses of action across sectors and administrative jurisdictions. **River Basin Organisations should play a major role** in making groundwater a fully integrated part of IWRM.

Improved user-focused groundwater information lies at the heart of capacity for every part of the water sector. The vital issue of groundwater data and information management should be addressed strategically, as foundation for improved management by a variety of stakeholders and through cooperation between member states. **Systematic groundwater monitoring** needs to be implemented in every country. It should include the status of the resource in terms of quantity and quality as well as its use by the various economic sectors. Critical information

status and future conditions reporting should become a core part of state of water resources monitoring. Appropriate **information needs to cross divides and support awareness creation** at multiple levels, from multilateral donors and policy makers to stakeholders at grassroots level.

Immediate emphasis is required on a **systematic social and economic valuation of groundwater** as a commodity for local, national and regional development, undertaken jointly with the key stakeholders and as basis for much improved communication of the groundwater role within the water sector. This is seen as key to increase the level of investment on groundwater.

Good governance needs good communication and a place where all stakeholders can share. **Forums are required for all levels of stakeholders**, including ministerial and grassroots levels. This represents an important cost factor in the participation process.

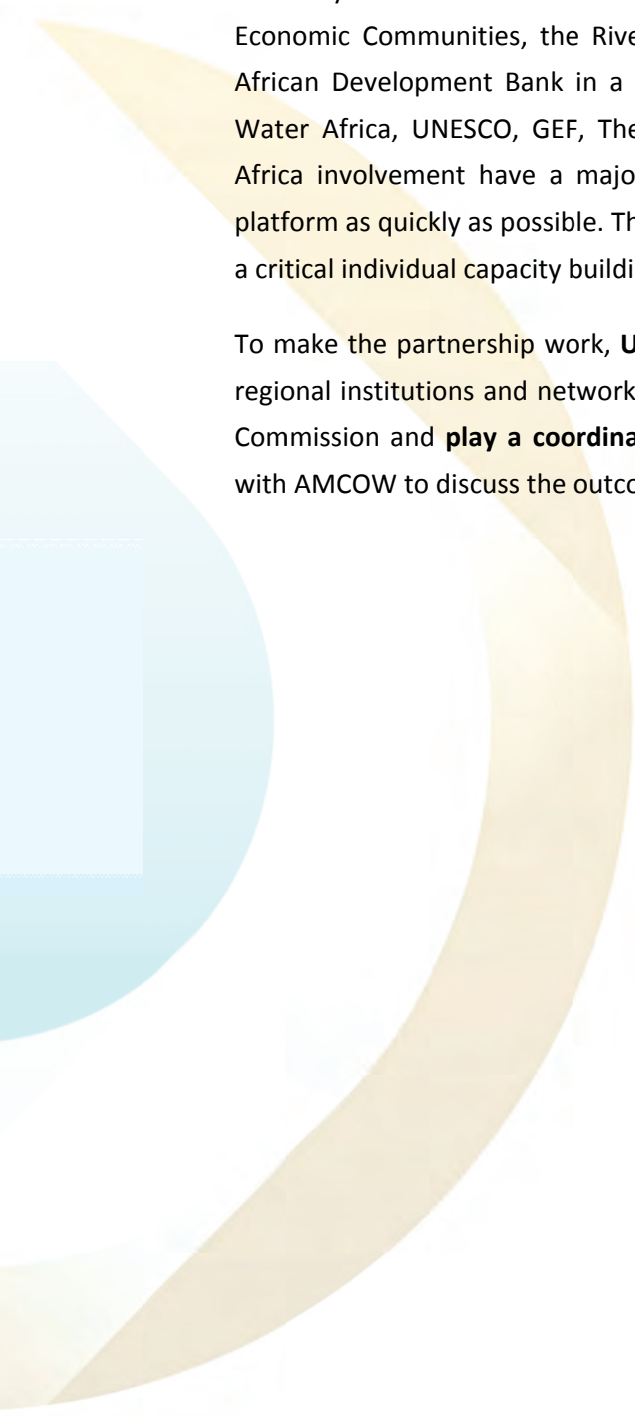
Knowledge management should be introduced as **on-going contribution from the groundwater science sector** to the water sector. This would include sharing, archiving and effective communication of knowledge products.

Capacity building is a long-term, continuing process and needs to cover the individual level (human resources development), the institutional level (organizational development) and the creation of an enabling environment in both the public and private sector. Roll-out of the information thrust should be strategically anchored in existing initiatives, e.g. institutional capacity building, local government support and disaster management.

With the recognition of the crucial role of science for African development and the establishment of the **NEPAD Water Centres of Excellence** to be covering the whole continent, there is opportunity for a much more strategic, **comprehensive approach to capacity development**. This should include systematic support for and growth of regional facilities such as the SADC Groundwater and Drought Management Institute and use of existing networks, such as Africa Groundwater Net, as a key part of the science structures.

There is still a very poor funding commitment to groundwater resources assessment and management relative to the strategic importance of the resources for a number key development sectors in the region. Particular investment is required in groundwater institutional development. To rectify the situation, a strategic effort at regional (AMCOW), the RECs, countries and their international development partners will be necessary. This should lead to **long-term commitments and new ways of financing**. As a first step, transboundary and regional communication and experience sharing needs to be raised to a high level.

The importance of groundwater in this region, the cooperative regional IWRM structures and institutions that already exist, the understanding there is already for groundwater at the highest decision-making levels, plus the desire of key international cooperation partners to help turn the situation around and join forces to make an impact, offers a **major opportunity to initiate a systematic, region-wide groundwater initiative**.



A range of partnerships should be employed to make systematic and sustained progress. AMCOW already has a Roadmap for the way forward and has created the Africa Groundwater Commission (AGWC) to take the process forward. Its critical role will be communication, advocacy and coordination. Partners within Africa will be the individual countries, the Regional Economic Communities, the River Basin Organisations, as well as the African Union and the African Development Bank in a critical support role. International partners will include UN-Water Africa, UNESCO, GEF, The World Bank and FAO. International partners with previous Africa involvement have a major role to play in helping build and populate the knowledge platform as quickly as possible. The International Association of Hydrogeologists will have to play a critical individual capacity building role.

To make the partnership work, **UNESCO** with its groundwater science and education focus and regional institutions and networks, could become a representative on the African Groundwater Commission and **play a coordinating role on behalf of the international partners**. A meeting with AMCOW to discuss the outcome of the Regional Consultation could act as the trigger.

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Section 1: Background

Groundwater resources are playing an ever-increasing role world-wide in human development and well-being, in particular in developing countries. The state of these resources and the health of the aquifers that supply human uses of groundwater are closely linked to the state of groundwater governance – the local arrangement that directly impact groundwater use and aquifer pollution.

Out of a global concern that the state of groundwater and groundwater governance is not ‘good’ and needs improvement, an international partnership initiative was launched. The Groundwater Governance – A Global Framework for Action (2011-2014) is a joint project supported by the Global Environment Facility (GEF) and implemented by the Food and Agriculture Organisation of the United Nations (FAO), jointly with UNESCO's International Hydrological Programme (UNESCO-IHP), the International Association of Hydrologists (IAH) and the World Bank. The project is designed to raise awareness of the importance of groundwater resources for many regions of the world, and identify and promote best practices in groundwater governance as a way to achieve the sustainable management of groundwater resources.

As a final result, the project will develop a global "Framework of Action", consisting of a set of effective governance tools: guidelines for policies, legislation, regulations and customary practices. The first phase of the project consists of a review of the global situation of groundwater governance and aims to develop of a Global Groundwater Diagnostic that integrates regional and country experiences with prospects for the future. This first phase builds on a series of case studies, thematic papers and five regional consultations – in Latin America, Sub-Saharan Africa, Arab Countries, Asia and a fifth one for USA, Canada, Europe including SEE, Central Asia and a day devoted to the private sector. Information and reports on the regional consultations can be found here: <http://www.groundwatergovernance.org/regional-consultations/consultations/en/>.

The purpose of the regional consultations is to solicit regional perspectives on the practical application of groundwater governance. The objectives of these regional consultations are: 1) the compilation of first-hand knowledge provided by direct local sources – groundwater experts, resource managers and actors in different areas – about the main features of the region; 2) the discussion about the different subjects that derive from the specific characteristics, challenges and priorities of the region based on case studies elaborated by national experts; 3) to build partnerships amongst cross-sectorial collaborating project agencies, stakeholders, decision-makers and specialists. This will feed into a Regional Groundwater Diagnostic which will in turn, together with the results of the four other regions, feed into Global Groundwater Diagnostic and a Global “Framework of Action”.

As context, the report starts with a brief Africa water resources and socio-economic setting, followed by an assessment of the current state of groundwater governance in the region, including the gaps in this regard. A section on lessons learnt and opportunities to address the gaps forms the basis for a set of conclusions and recommendations. The information for the diagnostic has come largely from the Regional Consultation, supplemented from other sources to strengthen the interpretation and conclusions.

Section 2: Africa Water and Development Setting

2.1 Africa water resources setting

Unless separately referenced, the content of this section has been largely taken from an assessment of the groundwater management situation in SADC and a paper in Ground Water on 'The role of groundwater in Africa' in which the main author was involved. (Braune *et al.*, 2008; Braune and Xu, 2009).

In this summary it has not always been possible separate Sub-Saharan Africa information from information for the continent as a whole. The Saharan and Sub-Saharan regions of Africa have been separated by the extremely harsh climate of the sparsely populated Sahara, forming an effective barrier interrupted by only the Nile River. The Sahel is the transitional zone between the Sahara and the savanna regions to the south. Politically, Sub-Saharan Africa consists of all African countries that are fully or partially located south of the Sahara (excluding Sudan). Sub-Saharan Africa makes up 74% of the continent's area and 85% of the population. Sub-Saharan countries are organized in to the Economic Communities of West Africa (ECOWAS), East Africa (EAC), Central Africa (ECCAS), and Southern Africa (SADC).

Africa is the second largest of the continents, comprising 54 countries (47 in Sub-Saharan Africa), with a wide range of hydrological conditions. The south-east of the continent is largely high plateau country, the north-west mainly plains and shallow river basins. The Sahara occupies about half of the continent north of the equator. The extreme north and south have Mediterranean types of climate, with winter rain and summer drought; between the tropics, the rains are concentrated in the summer months or, near the equator, occur in two seasons of the year. As a result of high temperatures everywhere in Africa except at high altitudes and during winter in the extreme north and south, rates of evaporation from the soil and from water surfaces are high, varying from about 750 mm in the more humid and cooler regions to over 2000 mm in the arid parts. This has a major impact on the hydrological cycle in terms of infiltration, groundwater recharge and runoff production as well as most human use of water, in particular for irrigation.

Large areas of the African continent are regularly subjected to series of prolonged and extreme droughts that are often broken by equally extreme flood events. Temporal and spatial variability are at the heart of resource insecurity, resulting in vulnerability of communities, especially poorer communities, and a strong impact on economic growth. It has been estimated, for example in Ethiopia, that projections of average annual GDP growth rates drop by as much as 38% as a consequence of this variability. According to the International Panel on Climate Change, the African continent is the most vulnerable to climate change. Runoff and water availability are expected to decline in the northern and southern regions of the continent, while the frequency of floods and droughts is expected to increase.

The annual renewable surface water resources are estimated at 4590 billion m³ per year and the per capita water resources at about 5000 m³/inhabitant/year. Groundwater resources amount to 15% of Africa's renewable water resources. Overall water availability is highly variable across the continent. Likewise groundwater resources have substantial variation across the continent, with availability primarily a function of geology, i.e. crystalline basement rock (making up 40% of the region); consolidated sedimentary rock (32%); unconsolidated sediments (22%) and volcanic rock (6%). These zones vary greatly in terms of their groundwater-bearing properties.

The hydrologic function and distribution of groundwater is highly correlated with rainfall patterns. In more arid areas (Sudano-Sahelian regions and southern Africa) groundwater systems tend to be not connected to surface systems. In humid regions (Gulf of Guinea and Central Africa) aquifers tend to be connected to river systems and groundwater becomes a major factor determining baseflow. Under semi-arid and arid conditions, groundwater storages are recharged for the most part by heavy rain that infiltrates through the soil into the underlying layers. Occasionally the shallow groundwater storages are augmented by the streams and rivers that lose water to the underground strata. In the driest parts, groundwater recharge may be limited and probably largely localized to line and point sources such as stream beds and dam basins respectively. Surface water resources are largely ephemeral, and most perennial rivers in these areas receive their recharge from humid areas. As a result, the groundwater resource has assumed great importance as the principal source of fresh water in these arid to semi-arid countries.

While most non-renewable groundwater occurs in the large sedimentary basins of North Africa, sub-Saharan Africa also has large arid areas in the south western part of the continent (Botswana, Namibia, parts of Angola) in which recharge only occurs very infrequently, with clear danger of over-exploitation if not wisely managed..

2.2 Africa socio-economic setting

Africa has one of the fastest growing populations of all the continents. Its population in 2005 was estimated at 905 million (and the 2007 estimate 993 million) or about 13% of the world's population, but has only 9% of its fresh water (World Water Council, 2006).

Clusters of large towns and cities are concentrated in regions of economic importance, particularly the Nile Delta, the Maghreb, southern Nigeria and the economic heartland of South Africa, which together contain roughly half of Africa's population on about 2 per cent of its land area. The rural population is densely populated over relatively small areas of the continent with wide areas still sparsely populated, with fewer than 4 persons per km². Rural settlements in many small villages characterized by an agricultural economy thus still dominate Tropical Africa. This settlement pattern is illustrated in Figure 1.

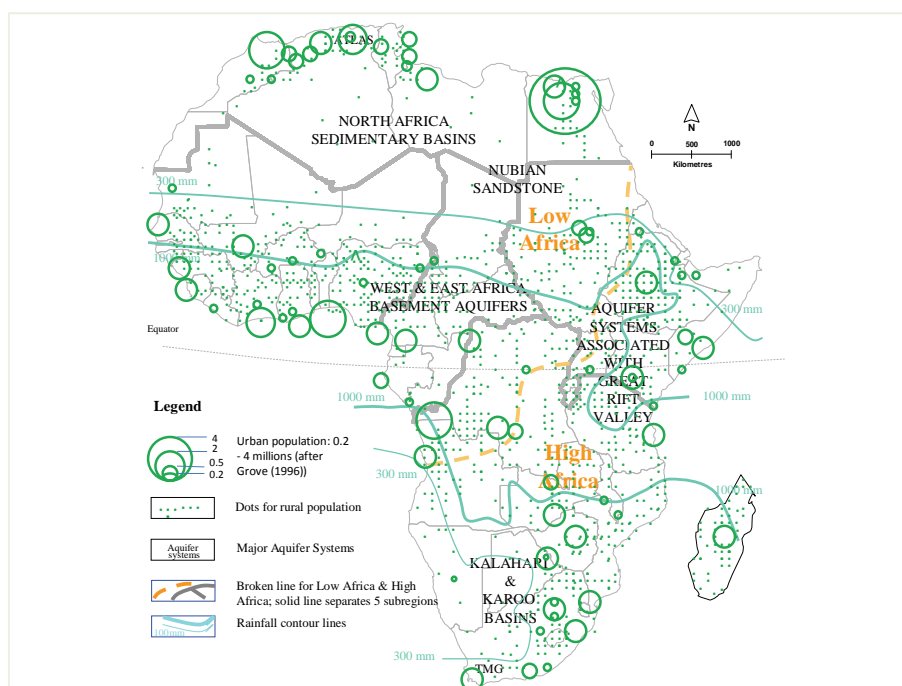


Figure 1: Human geographic conditions in Africa (Braune and Xu, 2009)

Currently 40% of the population is urban, but by 2025 more than half of the African population will be urban (World Water Council, 2006). The region has one of the fastest growing populations in the world, with growth rates between 1.6 and 3.1% per annum, while the urban population is growing at a rate of 6.5% per annum. Crucial in the development situation is that planned implementation cannot keep up. The proportion of the urban population in Africa living in slums was about 72% in 2001, considerably higher than the global estimate of 61%. The major factors that have fuelled rural-urban migration include recent wars and conflicts as well as economic factors, landlessness and the effects of drought. Rapid urbanization leads to considerable problems – squatter settlements, unsanitary conditions, inadequate water services and urban waste.

Alleviation of poverty is the key development challenge, with over 300 million people or about 40% of the total population still living in extreme poverty in 2001 (less than US\$1 a day) (African Regional Document, 2006). Africa also bears the brunt of the world's HIV/AIDS pandemic. To date, 13 million people have died of HIV/AIDS and 26 million are living with the virus, more than 60% of those infected world-wide. This is seriously hindering socio-economic growth and development (World Water Council, 2006)

The African continent is at this stage only using a small portion (5%) of the annually renewable water resources. The African water crisis is therefore a lot more complex than continental water availability and has been classified as economic scarcity rather than just physical water scarcity. Besides the large spatial and temporal variability of resource availability, going with the more arid climate prevalent in about 60 percent of the African continent, is the wide-spread lack of coping capability to manage the irregular availability of water, e.g. through building balancing

storage, transferring water between water-rich and water-poor areas and implementing water conservation and demand management.

The most basic aspect of water security is the provision of domestic water supply and sanitation services. At this stage, Africa has the lowest water supply and sanitation coverage of any region in the world. About 300 million people in Africa are without access to a safe water supply and about 313 million to adequate sanitation (World Water Council, 2006).

Agriculture has remained the most important sector in the African economy. Only 7% of total arable land is currently irrigated. Because the bulk of the African population depend on agriculture for their livelihoods, water is critical in reducing poverty and enhancing food security. Water is particularly important in African agriculture due to the prevalence of small-scale subsistence farmers who often have low levels of technological inputs that could help them increase the efficiency of other non-water factors of production (Africa Development Bank, 2013).

Overall, water has a vital role to play in socio-economic development in Africa, but on the other hand, success in economic development efforts is needed to ensure a sustainable flow of funds for the development of these water resources.

2.3 Present and potential role of groundwater in the region

2.3.1 Community water supply

Approximately 80% of the 300 million people who have no access to safe water supplies live in rural areas. Therefore, significantly increasing the coverage of rural water supply in Africa is fundamental to achieving MDGs. Groundwater is of strategic importance for rural water supply. Most African countries rely to a large extent on groundwater for their drinking water supply, ranging from shallow hand-dug wells to deeper public supply boreholes.

Box 1: Water supply to rural communities in West Africa

In West Africa, traditionally, rural communities have relied for their water supply needs on sources that range from dug-wells, ponds, dug-outs, streams, river-bed waterholes, and springs to rainwater harvesting from roofs. Most of these sources, particularly those based on surface water resources, are polluted and are the main sources of water borne diseases so common in the rural areas. It therefore appears that the solution to the problems of traditional rural water supply systems lies basically in the efficient utilization of groundwater and efficient management of aquifers, hand-dug wells, and boreholes. Already during the 1990s, for example, Ghana introduced improved water wells to part of the country as part a campaign to eradicate guinea worm, and 52% of rural communities achieved access to potable water mainly from groundwater sources during this period.

Gyau-Boakye and Dapaah-Siakwan (1999).

Overall, it is estimated that 75% of the African population is using groundwater as its main source of drinking water. In South Africa, with democratization in 1994, for example, there was a strong policy shift toward providing basic services, including water and sanitation services, to the whole population as soon as possible. By 2006, the backlog of 15 million unserved people, or

about 40% of the population, had been reduced to 4 million, and groundwater has played a major role in this regard, serving between 60% and 90% of rural communities in the different provinces.

A serious concern throughout the region is the unsustainable implementation of rural water supplies. In most countries more there are more than 30% broken water wells at any one time – in some more than 60%. Many of the problems indicated below have to do with the lack of involvement of the local population:

- Poorly designed boreholes
- Poorly sited boreholes
- Inadequate maintenance
- Single use design, but actual multiple use
- Lack of water

2.3.2 Water for livelihoods

Livelihood needs of rural populations mean more than what is presently supplied to meet basic domestic needs in the continent-wide rural water supply and sanitation drive. Water for greater food security and for productive uses in a local economy will become as important once rural development becomes a political priority. In general, local groundwater supplies are adequate for village subsistence level cropping, critical to the improvement of food security at local scale, for stock watering, and other local productive needs like pottery and brick-making. Most important, the different types of aquifers that occur throughout the continent can provide the much-needed balancing storage during times of recurring droughts and as mitigators of the expected impacts of climate change. Water for livelihoods is strongly promoted by the NGO sector, but has not yet become a strategy that is systematically implemented anywhere in the region.

2.3.3 Urban water supply

The urban explosion referred to under 2.2 is creating unprecedented challenges, among which provision of water and sanitation has been the most pressing. It is in the large unserved areas that groundwater is already playing a major, but mostly unrecorded role.

These trends are not just affecting megacities, but are even more pronounced in many hundreds of medium-sized towns. Where suitable aquifers are present, expansion of groundwater development is usually the preferred response (Tuinhof *et al.*, 2011). It should be noted that only in a few cases, the use of groundwater has evolved as part of planned urban water-supply development, but more often it has occurred in response to water shortage or service deficiency, and often through private initiative (e.g. Lusaka, Nairobi, Dar-es-Salaam, Addis Ababa, Kampala, Cape Town, Windhoek, Gaborone, Nouakchott, Dakar, Abidjan, and probably elsewhere) (Foster *et al.*, 2006).

Severe, widespread groundwater quality problems are the most important physical manifestation of the rapid unplanned urban development. Pollution of groundwater sources beneath African cities as well as in many rural communities has reached critical levels. Abandonment of vital water supply sources and even whole aquifers has occurred because of pollution, and polluted water has been served to communities through piped water supply systems, leading to typhoid outbreaks and national repercussions (Xu & Usher, 2006).

Issues that will need urgent attention in the urban water environment include:

- Piped supply vs. self-supply;
- Control of groundwater use (in Lusaka, for example, some 70% more than the planned supply is used);
- Integrated water supply, sanitation and waste disposal;
- Control of sea water intrusion in coastal cities.

Unplanned development and resource degradation is not going to change in the short to medium term. Groundwater's critical role for urban water supply should thus be formalized in country policy, and a legal framework created for its sustainable development and use. The fact that urban use is widespread shows that it is not so much a question of availability, accessibility, and economic feasibility as it is of economic means, political decision making, and the will to develop it.

2.3.4 Agricultural water supply

Only 3.3% of arable land in sub-Saharan Africa is irrigated (irrespective of source) compared to 37% in Asia (Siebert *et al.*, 2010). It has always been recognised that official statistics on groundwater irrigation, and particularly smallholder irrigation (poorer farmers, generally with landholdings that are smaller than 2 ha) from groundwater, in sub-Saharan Africa are imperfect and often not representative of the realities on the ground. When supplementing existing FAO-based compiled data (Siebert *et al.*, 2010) with case study information from across the continent, it was found that groundwater irrigation had been generally underestimated and represented 20% of total irrigated area compared to previous estimates of 6%. Significantly, it had increased from about 250 000 to 1 200 000 ha over a seven year period, corresponding to growth rates in India in the 1960s (Villholth, 2013).

It is important to note that the increase in smallholder groundwater irrigation is almost exclusively utilized in high-value horticulture production for markets and rarely for staple and non-food crops. It does not appear to be converting rainfed staple crops (i.e. grain) to being irrigated. This trend reflects increasing market demands for horticulture crops and greater willingness of farmers to risk pursuing higher-value crops (Villholth, 2013).

There are still high economic barriers (capital costs, energy costs, agricultural inputs, infrastructure for transport and markets and extension services) faced by smallholder farmers and these differ considerably between the shallow, informal, farmer-driven systems and the

deep, more formal systems. Governments will have to realize their dual role as facilitator as well as regulator to realize the potential of groundwater irrigation for poverty alleviation and socio-economic development (Villholth, 2013).

Large areas of savannah, semi-desert, and desert areas in sub-Saharan Africa are typified by livestock rather than crop production. In these areas, groundwater plays a critical role in the maintenance of the livestock economy, which itself is the basis of human survival of the poorest segments. In Namibia, for example, 17% of country water use is for stock watering and 80% of this is from groundwater sources (Christelis, 2012)

2.3.5 Groundwater for mining and industry

While industrial water is often provided as part of urban water supply, mining often occurs in remote areas and normally requires its own water supply solution. Often, because of the remoteness, there is a total reliance on groundwater. In Botswana, for example, mines use 25% of the country's total groundwater abstraction. Because of the large volumes required, systematic resource exploration and development of the surrounding area is required.

Mines, because of their underground exploration expertise, are usually better equipped than the state to undertake this. The further advantage of such an approach is that the development of new sources can be undertaken in conjunction with water demand management at the mine itself. In Botswana this led to a strategic partnership between government and the main mining stakeholder (Braune and Xu, 2010).

2.3.6 Groundwater and climate change / drought security

Drought is endemic in Africa and presents a major challenge to the achievement of sustainable development. Climate change is expected to exacerbate these extreme events, and their frequency and intensity are expected to increase in the future. There are indications that climate change is already starting to impact groundwater in some vulnerable areas through increased pressure on the resource due to the drying up of surface water resources. In Burkina Faso, reduced rainfall has intensified groundwater abstraction, from hundreds of wells to thousands of wells and also led to the drilling of deeper and deeper wells (Savadogo, 2012).

There is increasing evidence of a direct correlation between drought proneness and persistent poverty in Sub-Saharan Africa – and in reality a lack of investment at all scales in water storage for drought preparedness. It is necessary to achieve greater drought-proofing of rural livelihoods, as opposed to mitigating the failure of local crop production and drinking water sources. Thus, as regards drought preparedness, it is important to invest in the appraisal of drought susceptibility of aquifers in advance, with the drilling of new water wells and the deepening of existing wells (Tuinhof *et al.*, 2011). Policy responses to recurring drought in sub-Saharan Africa have so far, however, been largely based on short-term crisis reactions, which have generally proved to be inefficient or ineffective. Thus groundwater has not yet been able to play its strategic role in this regard.

2.3.7 Groundwater and the environment

Groundwater is essential both in sustaining ecosystems and landscapes in humid regions and in supporting unique aquatic ecosystems in more arid regions and along coastal belts. Groundwater discharge in these regions often takes the form of springs, diffuse slow seepage at the ground surface or evapotranspiration along riverine stretches. It is these springs and seepage flows that keep rivers flowing during dry periods. In many places in Africa, a system of natural springs provides sufficient water to create ponds, lakes, or rivers.

This aspect of 'groundwater service provision' (and its potential constraint on other uses) is just beginning to be appreciated. In many areas much uncertainty remains over the level of groundwater dependence of such ecosystems and little monitoring of this aspect has occurred so far. But there are clear signs in some areas of irreversible impacts on the environment through the drying up of whole landscapes, e.g. destruction of wetland and terrestrial ecosystems as well as migration of poor quality water (Brendonck, 2007). Systematic consideration of this role of groundwater thus needs to be introduced into groundwater governance to arrive at a balanced approach to its multiple use and conservation.

Section 3: Current Status of Groundwater Governance in the region

3.1 Understanding groundwater governance

The water community has increasingly emphasized that the global water crisis is centrally a crisis of governance. The first key message from the final report of the 2012 Marseille World Water Forum expresses this clearly – The ‘water crisis’ the world community faces today is largely a governance crisis. Securing water for all, especially for vulnerable populations, is often not only a question of hydrology (water quantity, quality, supply, demand) and financing, but equally a matter of good governance. Managing water scarcity and water-related risks (floods, natural disasters, etc.) requires resilience, institutions, collaborative efforts and sound capacity at all levels (WWF 2012:5 in Harris *et al.*, 2013). This is also the situation in Africa where recent studies by the African Development Bank have demonstrated that there is a direct correlation between the countries most lacking water services and those with the weakest governance (AfDB 2009).

In the governance box below the concept is highlighted from different perspectives to be able to identify the critical elements that would have a bearing on the diagnostic to be undertaken.

Box 2: Groundwater governance: concept and application

Governance refers to the process whereby elements in society wield power and authority, and influence and enact policies and decisions concerning public life, and economic and social development. Governance is a broader notion than government, whose principal elements include the constitution, legislature, executive and judiciary. Governance involves interaction between these formal institutions and those of civil society. Governance has no automatic normative connotation. However, typical criteria for assessing governance in a particular context might include the degree of legitimacy, representativeness, popular accountability and efficiency with which public affairs are conducted.

Governance Working Group of the International Institute of Administrative Sciences (1996).

Good governance mainly depends on the quality of leadership, the strength of the institutions and how efficiently, effectively, sustainably, and transparently the resources are managed by sector institutions and main stakeholders. Some criteria for good governance, largely based on the Human Rights-Based Approach to development (European Commission, 2009), were adopted as a common approach by the UN in 2003, are (UNESCO, 2006):

PARTICIPATION: All citizens a voice in processes of policy and decision-making; needs an inclusive approach from national and local government.

TRANSPARENCY: Information should flow freely within a society; processes and decisions transparent and open to scrutiny.

EQUITY: All groups in society should have opportunities to improve their wellbeing; both men and women.

ACCOUNTABILITY: Governments, the private sector, and civil society organizations should be accountable to the public or the interests they are representing.

COHERENCY: The increasing complexity of water resource issues, appropriate policies and actions must be taken into account so that they become coherent, consistent and easily understood.

RESPONSIVENESS: Institutions and processes should serve all stakeholders and respond efficiently to

changes in demand and preferences, or other new circumstances.

INTEGRATIVE: Water governance should enhance and promote integrated and holistic approaches.

Governance has recently been defined by the UNDP as “the exercise of political, economic and administrative authority in the management of a nation’s affairs at all levels — and thus comprises the mechanisms, processes and institutions through which the citizens of the nation articulate their interests, mediate their differences and fulfil their legal rights and obligations”

This was also the definition taken on board by the Africa Development Bank in their assessment of water governance in Africa.

The concept of governance in the water sector arose in order to guarantee more rational water resource management, ensure that the poorest people have access to water and generally contribute to changing attitudes within the sector. Water governance has been described as “...the range of political, social, economic and administrative systems that are in place to develop and manage water resources and the delivery of water services, at different levels of society” (Rogers and Hall, 2002)

The working definition for groundwater governance adopted in the review papers (TP 5) is: “Groundwater governance is the process by which groundwater is managed through the application of responsibility, participation, information availability, transparency, custom, and rule of law. It is the art of coordinating administrative actions and decision making between and among different jurisdictional levels– one of which may be global.”

Varady *et al.* (2012).

Common pool resources like groundwater may require specific governance arrangements if the objectives of sustainability, efficiency and equity are to be attained. Groundwater is an extreme case of a common pool resource, because it is easy to appropriate by simply tapping the resource lying under one’s own land. Governance is further complicated by its unseen and little understood nature. It is important that there is a definition that gives the layman, who is a crucial partner in governing the local groundwater resource, a working grasp of what is meant. For this reason the definition combined with a groundwater-specific analytical framework provided in Thematic Paper 11 was chosen for this diagnostic report (Wijnen *et al.*, 2012).

Box 3: Strategic Framework for Groundwater Governance

“Governance is the operation of rules, instruments and organizations that can align stakeholder behaviour and actual outcomes with policy objectives.”

The framework operates at three governance levels, namely the policy level, the strategic level and the local level):

SETTING POLICIES refers to the processes by which a nation establishes its objectives for groundwater, integrates those policies with water, land and environmental policies, and aligns and harmonizes them with other related policies affecting groundwater, (notably agricultural policy, trade policy, regional and urban development policies and policies on the division of public and private responsibilities, decentralization and the role of stakeholder participation).

STRATEGIC LEVEL GOVERNANCE denotes the institutions and instruments designed by a nation to align stakeholder behaviour and actual outcomes with policy objectives. For the purposes of the simplified analytical framework, five components are distinguished:

An IWRM planning function capable of allocating water in line with society’s policy goals;

A framework of laws, rights, and regulatory instruments adapted to the context;

An incentive framework (prices, subsidies, trade controls, etc.) that supports good groundwater management;

A framework for subsidiarity (management practised at the lowest feasible level) and support to local water management on a partnership basis; and

Acquisition and management of knowledge and information about the resource and its uses, and communications with stakeholders.

LOCAL LEVEL GOVERNANCE involves the organizations and institutions that control actual outcomes on the ground and respond (in varying degrees) to the rules and incentives from strategic level governance. This level includes, in descending order of responsiveness:

Public agencies (ministry branches, local authorities, basin agencies) which could be expected to reflect policies and strategic level governance at local level. These agencies may directly control part of the resource, (e.g. municipal well fields) or they may influence outcomes by the application of a regulatory regime, or by working in partnership with local collective management institutions or with individuals.

Local collective management institutions, including collective organizations and rules, sanctions and dispute resolution mechanisms developed by communities and interest groups;

Individual well owners, whose well development and abstraction behaviour (in the absence of respect of any other governance system) are determined by individual, household or family goals.

Wijnen *et al.* (2012).

3.2 Understanding / application of the water governance concept in Africa

The African Ministers Council on Water (AMCOW) and most African countries have adopted IWRM as their vision and approach for water resource management. On the other hand, the water governance concept is only starting to be considered as a framework for water and development in Africa. In the most recent Regional Strategic Action Plan (RSAP III) of SADC (SADC, 2011), for example, water governance has been introduced as one of three pillars (water governance, infrastructure development and water management) of a more structured IWRM approach, reflecting the human, physical, and engineering dimensions of integrated water resources management.

The goal of SADC's RSAP III is to strengthen the enabling environment for regional water resource governance, management and development through the application of integrated water resources management at the regional, river basin, Member State and local level. No further mention is made what governance means and is intended to achieve.

The IWRM definition adopted in SADC, is:

'Coordinated development and management of water, land and related resources, in order to maximize the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems'.

Of 40 countries surveyed by AMCOW, 60% are now implementing integrated water resources management at the river basin level (AMCOW, 2012). However, individual countries have varying capacity for the implementation of IWRM. Only five out of fifteen countries in SADC, so far, have IWRM and Water Efficiency Plans, a key mechanism to help achieve IWRM. This is strongly related to the development of appropriate institutional capacity. The Global Water Partnership (GWP) is playing an important role in helping to overcome some of these bottlenecks at country level.

The IWRM approach has come under increasing criticism in Africa, raising issues such as (Anderson, 2008; Merrey, 2008):

- It is a valid theoretical model, but not a practical guide to action and as a package or concept is not implementable;
- It assumes established water infrastructure, whereas infrastructure development itself is still the highest water priority in Africa;
- Emphasis has been on establishing an enabling environment (including policy reform and institutional restructures), whereas widespread implementation and improved water management is less visible;
- The focus on basin planning fails to incorporate adequately the elements of decentralised, local, community-led planning and management, and of traditional knowledge and wisdom.

It can be concluded from the above, that the concept of water governance has not yet been embraced at the implementation level in most of the Sub-Saharan Region. It is thus important to stress the full requirements of groundwater governance and address them in a practical and understandable framework, similar to the one discussed in 3.1 above.

3.3 Drivers of groundwater development, exploitation and management in the region

The particular water management challenges that IWRM must address in the region can best be illustrated by the Africa Water Vision.

'An Africa where there is an equitable and sustainable use and management of water resources for poverty alleviation, socio-economic development, regional cooperation, and the environment.'

Drivers that have a bearing on groundwater development, exploitation and management and thus on groundwater governance are summarized below, based on the more detailed discussion above of the Africa water resources and socio-economic setting and the resulting role of groundwater in the region.

Table 1. Groundwater drivers

Drivers (Socio-economic and physical)	Impacts on groundwater governance
Widespread poverty (rural and informal urban)	<p>Millennium Development Goal 7: Ensuring environmental sustainability, including provision of a basic domestic water supply and sanitation service;</p> <p>Groundwater is the preferred source, because this very diffuse demand is impossible to reach with bulk water supply solutions;</p> <p>Serious problems with maintenance and with pollution of the thousands of new water sources.</p>
Widespread food insecurity going with poverty and variable climate	<p>Millennium Development Goal 1: Eradicating extreme poverty and hunger; a major opportunity for groundwater, because agricultural production is still 70% from small farming; This includes home and community gardens and peri-urban agriculture. Ubiquitous groundwater resources will be crucial in this strategy to achieve spatial equity;</p> <p>Focus has to be on multiple uses of water for poverty alleviation and improved livelihoods, including a variety of local sources;</p> <p>There are groundwater technical bottlenecks, but also major institutional bottlenecks, e.g. micro-financing, markets and agricultural extension.</p>
Rapid urbanisation	<p>Opportunities for groundwater include:</p> <p>Coping with the small town water supply crisis;</p> <p>Water sources for self-supply in the vast informal urban areas;</p> <p>Improving urban water security through groundwater sources for conjunctive use;</p> <p>Threats include:</p> <p>Unplanned development, with missed opportunities for groundwater, poor maintenance of existing infrastructure and serious pollution impacts and resource degradation.</p>
Mining (and Industry) development	<p>Water demands are often in remote areas;</p> <p>Opportunity to find major new sources of groundwater through the underground expertise of the mining sector.</p> <p>Threat of long-term pollution impacts on major aquifers if state does not maintain control.</p>
Climate variability and change	<p>Three broad sets of green growth and climate change adaptation strategies for the water sector are foreseen in Africa (AfDB, 2013):</p> <ul style="list-style-type: none"> (i) Water harvesting – storage and distribution infrastructure (ii) Water conservation and demand management (iii) Water governance and institution building <p>The natural storage and widespread occurrence of groundwater can be a crucial element in any adaptation strategy;</p> <p>The present response to drought is still largely a short-term crisis reaction and groundwater has not had a chance to play its strategic role.</p>
Common property resource nature of groundwater	<p>Particularly challenging because of groundwater's hidden and little understood nature;</p> <p>Is already leading to competition and over-exploitation / degradation of high yield aquifers, e.g. coastal aquifers and</p>

	dolomitic aquifers; Key instruments of local control and popular participation as well as orderly conflict resolution are challenging to implement.
Linkage of groundwater to land use	Groundwater has a unique position in the landscape; Land degradation can lead to recharge reduction; Over-use can lead to impacts on groundwater-dependent ecosystems on the land surface.
Transboundary nature of groundwater	The transboundary nature of groundwater is only now getting recognition; The issues are not only about groundwater flow across national boundaries and equitable sharing of a common resource, but the conflict potential of different levels of development / regulation / incentives on both sides of the border; The general lack of information / understanding about groundwater increases the conflict potential. Transboundary aquifer cooperation presents a major opportunity of a higher status for groundwater with spinoffs for national governance.

3.4 Governance Institutions and how they reflect role of groundwater in the region

As background to a diagnostic of the functioning of the water sector in terms of its groundwater responsibility, an overview table, adapted from the SADC Water Sector is provided, showing the different stakeholder categories in relation to the regional / national development goals and water resource management approaches required to reach these goals.

Table 2. IWRM Framework for national / regional development (adapted from SADC)

Overall development goals Millennium Development Goals SADC: Regional integration and poverty eradication					
Industrial development	Food security	Health (Water & Sanitation)	Energy security	Safety from disasters	Water for peace (Transboundary Water Management)
Development without compromising the Environment					
Approach to reach goals IWRM					
Strategy, Planning and Policy-making; Water resources information	Capacity building; Research	Stakeholder participation; Public awareness; Conflict resolution	Water resources development & management; Transboundary management	Environmental management	Water user services (all water use sectors)

management Institutional development						
Multi-Stakeholders						
Government		Society		Science (S & T)		International
Good Governance Criteria (added for diagnostic purposes)						
Participation	Transparency	Equity	Accounta- bility	Coheren- cy	Respon- siveness	Integrative

The geographic scale of management action is often a key issue for groundwater – Groundwater is a widely-distributed but essentially local resource. Thus to understand whether effective governance arrangements are in place one has to get down to sub-national (provincial and district) level. This is the level at which most ‘groundwater bodies’ exist – ‘groundwater bodies’ being defined as resource management units with clearly-defined and scientifically-sound boundaries (usually parts of aquifer systems), which can be related as necessary to the overall basin in which they occur. To evaluate the situation solely at national level is not adequate since at this level there is often a 'semblance of sufficiency' that does not stand more detailed scrutiny.

Within this general framework, the legal / institutional situation within the government sector underpinning the role of groundwater is discussed, followed by a discussion of the other stakeholders and their institutions in relation to groundwater and the key drivers of groundwater governance in the region.

Table 3. Groundwater governance (legal / institutional) situation in the government sector

Regional level	
African Ministers' Council on Water	A forum for ministers of water for a whole continent is unique in the world and presents a major opportunity for a peaceful unfolding of continent-wide water security in the sub-regions, river basins and countries. The Council was only established a few years ago, but has already declared itself strongly on groundwater (see Box 5 below) and established the Africa Groundwater Commission under its umbrella.
Regional Economic Communities	SADC has the most advanced water sector in sub-Saharan Africa. It has the SADC Protocol on Shared Watercourse which is implemented through Regional Strategic action Plans for IWRM. An active Groundwater Programme is part of this plan and a SADC Groundwater Institute will soon be operational to lead the implementation of the programme; It is expected that the recent approval of a UNESCO Category II Centre for Groundwater in Kenya will have a regional impact.
International / Transboundary level	
Transboundary water management	AMCOW and the RECs, together with their International Cooperation Partners, are strongly pushing the establishment of River Basin Organisations as part of their IWRM strategy. Of the 15 large international river basins in SADC, 11 now have established management structures; Groundwater Management has only recently been introduced into this

	<p>process and is still in the identification of Transboundary Aquifers stage; The biggest advances have been made in the Illumedden Aquifer system through sustained GEF support. A common data base, a hydrogeological model and a consultation mechanism for joint management is in place for the three member states, Niger, Mali and Nigeria.</p>
National level	
General water resource management function	<p>Groundwater resource management structures virtually only exist at national level – in the National Department of Water Affairs and a variety of other ministries: Public Works, Minerals, Natural Resources and Irrigation. Usually the function is only groundwater-specific in the hydrological function (resource monitoring and assessment); this is sometimes still undertaken as a service by the National Geological Survey; Groundwater is generally still poorly established in the other water resource management functions (e.g. planning, allocation, conservation). Most countries have included groundwater in their legislation; however often this has only technical focus (drilling control) and few countries have detailed groundwater-specific regulations for critical aspects such as pollution control; While groundwater is treated as public water in most legislations, its use is still poorly regulated, because of its close association with the land which is often private.</p>
Domestic water supply and sanitation (in terms of the MDG Target 10)	<p>This has introduced a strong shift all over Africa from a water resource management and sustainability focus to service delivery. This shift brought about a decentralisation of service delivery, and often completely new institutions at national level, separate from the traditional water resource management institutions, to regulate and support this process (National Water Board, Water Utility). These changes have been highly significant for groundwater, because its role in Africa is strongly tied to community water supply; The focus of these institutions is water supply only and to date there has been very little coordination with the national WRM institutions. Water supply and sanitation are separately implemented, because of the different approaches required (water supply network versus a household sanitation service). Shallow groundwater sources are particularly sensitive to poor sanitation practices. As a result many new supplies have already been polluted, and in some cases whole well fields taken out of production.</p>
Agricultural water supply (in terms of the food security MDG)	<p>Small scale development of groundwater is often dealt with by departments of Agriculture and out of sight and control of national groundwater function – institutions are not at all prepared for a water for livelihoods responsibility</p>
Disaster risk management	<p>A lot of ad hoc groundwater development is taking place during drought emergencies – water points fall into disuse soon after they were established, because they have never been part of a planned development.</p>
River Basin / Catchment Management Organisation level	
General water resource management function	<p>Policy of IWRM is to roll out WRM to lower levels, in particular to river basin organisations – only a few countries have fully functioning RBOs. Groundwater has not yet been properly devolved to this level – even though it is policy (AMCOW and SADC)</p>
Provincial level	

Provincial government	Water management functions are sometimes devolved to provincial government; This offers opportunities for better coordination between different government functions.
District / Local Government level	
Water supply	Many countries have devolved the water services function to this level – very often this level has not been properly capacitated for its groundwater responsibility.
Urban water supply (rapid urbanisation the major population dynamic in Africa)	Groundwater is very poorly considered in urban planning (conjunctive use, waste disposal, water source protection) leading to poor national facilitation of local actions; Groundwater sources of many African cities have seriously degraded through pollution; Local groundwater sources could play an important bridging supply role but this is not systematically undertaken.
Aquifer level	
Specific Resource management	Very few water user associations established; Irrigation boards still focus largely on commercial irrigation.
Ward / Local level	
Specific Source management	Village level water committees – need empowerment and stronger role for women; Poorly integrated into higher levels – district / catchment

Box 4: Regional level policy expression

The African Ministers' Council on Water (AMCOW) provided the following important direction regarding groundwater in 2007.

"AMCOW to become the custodian through whom a strategic Africa groundwater initiative can be fast-tracked and a continent- wide impact can be ensured;

Promote the institutionalisation of groundwater management by river basin organisations to ensure regional ownership of the initiative;

Create synergy with the Rural Water supply and Sanitation Initiative (RWSSI) to ensure groundwater's inclusion in resource assessment and the sustainable management of groundwater resources;

Consider endorsing and supporting the efforts to secure core financial support from the African Water Facility that could be leveraged to raise additional resources from development cooperation partners, such as the European Union. "

AMCOW (2008).

The experience in Kenya (Box 6 below) is fairly typical for the region – adequate policy and legal provision for groundwater at national level, but little implementation and roll out to a local level, because of a lack of capacity of the hydrogeological function in government that has to drive the whole process forward.

Box 5: Institutional arrangements for groundwater – Example: Kenya

Water sector reform – National Water Act (2002)

National Water Resources Management Strategy (2005-2009)

Water Resources Management Authority (WRMA) operational in 2005

Groundwater governance to be rolled out within framework of WRMA

Significant provision for groundwater in National Water Act (2002):

Classification; Reserve determination; Maps of groundwater importance and vulnerability; Monitoring system; Regulation of the construction of wells and boreholes; Effluent discharge permits; Gazetting of groundwater recharge and discharge areas

Management of water resources is by basin-wide approach under the umbrella of the WRMA (6 Catchment Areas cover the country)

Little of the intentions of the Act have materialized due to the very limited capacity and funding of the hydrogeological function (discussed further in Section 4: Gaps)

Ochillo (2012).

3.5 Role and functioning of non-government stakeholders in the region

The stakeholders of the water sector are in general the governmental actors responsible for management and policy making, the consumers, e.g. agriculture, and their associations, the civil society, the public or the private sector managers (utilities), the donors and the universities and research centres (knowledge sector). These are shown in summary together with the international partners in the table below.

Table 4. Stakeholders and International partners

Multi-Stakeholders			
Government	Society	Science (S & T)	International
<i>Regional</i> Regional water management (AMCOW, REC; RBOs) <i>National</i> National water management; Water utilities; Catchment management associations; National environmental management; Government representatives of different water use sectors (Agriculture, etc.) <i>Local</i>	<i>Regional</i> NGOs (water, water users, environment) <i>National</i> Water use sectors NGOs Water industry – private sector <i>Local</i> Water users Water user associations NGOs	<i>Regional</i> Centres of Excellence Networks <i>National</i> Research centres Academic institutions Consultants <i>Local</i> Schools Consultants NGOs	International Cooperation Partners (ICPs); <i>Donors</i> ; UN Agencies; Science associations.

Same as above, including local government Private sector			
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Some further comments are made below regarding the non-government sector stakeholders at different levels and their role and functioning in the (ground) water sector to date.

3.5.1 Society

REGIONAL

Some international / regional NGOs are playing a major advocacy role, both regionally and nationally, e.g. Water Aid, Gender and Water Alliance – so much so that their targets, e.g. rainfall harvesting, have a stronger support from national politicians than sustainable groundwater utilisation;

The Global Water Partnership (GWP) plays a major role in Africa through regional and country partnerships to help roll out IWRM with multi-stakeholders. It is interested in groundwater, but would need groundwater expertise support to play a role in this regard

NATIONAL

Urban water supply infrastructure development and services provision is typically carried out by a mixture of public and private institutions. For example, Senegal has a parastatal utility at national level undertaking resource planning and development, while operation at the level of local urban supply networks is undertaken by a private company in accordance with the regulations and guidelines set forth in formal concessions and performance contracts. The national Ministry of Water monitors and enforces adherence to national water supply policies and regulations (AfDB, 2008). In Namibia, the national utility also undertakes the local operation in individual towns, to a large extent from groundwater. Water service delivery is of a high standard.

A strong indigenous groundwater private sector (drillers, pump manufacturers, consultants) is very beneficial to sustainable groundwater utilization in terms good practice and also strong advocacy. The Borehole Water Association of Southern Africa (Box 6 below) can serve as an example. Many countries still do not have a well-established groundwater private sector and rely mainly on international companies for implementation.

Box 6: Borehole Water Association of Southern Africa's Mission Statement

To protect Southern Africa's ground water resources, so as to maximize the long and short term utilization thereof, thereby guaranteeing its dependability as a water resource for the community at large while protecting the industry's economic future

Borehole Water Journal (2013).

LOCAL

Widespread decentralization reforms across Africa over the last decade have greatly increased opportunities for civil society participation. In line with the principle of subsidiarity, many local governments on the continent have now assumed responsibility for implementing rural water supply projects. Likewise, many municipalities are outsourcing water services to public or private utilities.

Most often overlooked are the small and often informal enterprises that fill the demand for water and sanitation services from households beyond the reach of public WSS infrastructure delivery. Alternative service providers (ASPs) provide them with access to water through private supplies such as wells, public stand posts, water kiosks, informal distribution networks, tankers and small scale vendors and can account for up to 60 or 70% of market share in some countries (AfDB, 2008).

There is still little understanding about and engagement of stakeholders in rural communities. None of the input documentation to the Regional Consultation reported on this, whereas the Thematic Paper on Legal and Institutional Frameworks indicated that in sub-Saharan Africa traditional tribal authorities command land, water and other natural resources, using customary law or informal arrangements, often side by side with the elected local government (Mechlem, 2012).

Few institutions for stakeholder participation at aquifer level (water user associations) have so far been established. They are much more common for surface water, usually in the form of an irrigation board. An example of an institution approaching the concept of user self-management of a common groundwater resource is taken from Namibia – see Box below.

Box 7: Example of a Groundwater User Association – the Karst Water Management Body in Namibia

The Karst area in central Namibia is a water control area, covering 16 000 km². The karst aquifer allows high abstractions for urban, domestic, irrigation and industrial use. The KWMB was constituted in 2003 as a voluntary & advisory body, with objectives:

Optimize management and achieve the most beneficial, sustainable use of water resources of the KWCA.

Enhance communication between the Government, those institutions engaged in public water services in the Karst Water Control Area

Develop better understanding about water issues between all stakeholders engaged in the water sector in the Karst Water Control Area

Promote water awareness and stakeholder participation through regular meetings between the stakeholders.

Christelis (2012).

Many African countries have an established process for rural water supply with institutional structure and associated roles well laid down from National to Village levels respectively, as shown in the example below from Malawi.

Box 8: Rural water supply implementation – Malawi

National level: The Ministry of Irrigation and Water Development established a Groundwater Division specifically to deal with groundwater resources.

At Regional (Provincial) level there is a regional water office, where the Hydrogeologist Officer from the Ministry looks after the groundwater issues.

At District level, there is a District Water Officer looking after groundwater issues.

Below the District level there is a Traditional Authority where an Area Development Committee (ADC) and Area Executive Committee (AEC) jointly look after groundwater affairs.

Below the Traditional Authority is the Village Development Committee (VDC) which is made up of representative bodies from a village or group of villages and in some cases a Water Point Committee (WPC) per village that manage groundwater resources (boreholes).

Braune *et al.* (2010).

In Tanzania, such decentralized structures already follow an IWRM structural hierarchy (sub-basin committees, water user associations, water user groups). While this appears ideal for the management of local groundwater resources, they also require considerable financial and information resources, which are seldom available and have held back overall implementation (Braune *et al.*, 2011).

3.5.2 Science / Knowledge sector

INTERNATIONAL COOPERATION PARTNERS

International Cooperation Partners (ICPs) play a major role both at regional and national level. Regional institutions like AMCOW and ANBO and sub-regional ones like the SADC Water Sector are completely reliant on ICP support.

Throughout the years, national partners like the Geological Surveys of a number of European countries have played a major and on-going role in developing the hydrogeological services in many African countries. Organisations like DANIDA and NORAD have helped many countries to introduce a sustainable groundwater component into water services delivery and into river basin management. The electronic database of scientific reports that came out of the activities of the British Geological Survey in Africa still represents some of the most accessible groundwater literature on the continent.

UN AGENCIES

UNESCO's International Hydrological Programme (IHP) has a strong and on-going groundwater component. African countries are, however, not yet organized in the same way as, for example, Latin America, to receive the full benefit of participating in the IHP programmes. The most visible and continent wide programme is the UNESCO-IHP ISARM initiative (Internationally Shared Aquifer Resources Management) initiative. It is presently in a stage of identifying transboundary aquifer systems (TBAs) in Africa which will be followed by a monitoring of these systems in a globally supported GEF programme as well as by selected case studies of joint TBA management. The overall initiative is to be led and supported by UNESCO's IGRAC, the International

Groundwater Resources Assessment Centre in Delft, The Netherlands. UNESCO's groundwater work is facilitating through the establishment of chairs and centres, in particular the UNESCO Chair in Groundwater at the University of the Western Cape and the recently established UNESCO Category II Groundwater Centre in Kenya. The excellent IHP groundwater publications cover virtually every aspect of groundwater and development and are available free of charge.

Many other UN Agencies have a groundwater involvement and, without good coordination, this can become distracting to African countries who still have very limited capacity to participate in external programmes. Experience has shown that a powerful regional impact can be achieved, where different agencies combine their groundwater efforts. This was seen during a period of fruitful cooperation, achieved for Africa in Nairobi, of UNESCO, UNEP and UN-Habitat. It was a similar global cooperation of a number of key international players that has led to the present Groundwater Governance initiative.

The World Bank has played a significant groundwater advocacy and support role, to a large extent enabled by its GW-MATE programme (Groundwater Management Advisory Team) of producing practical summary publications by international experts of every aspect of groundwater resources management and of case studies around the world.

The Global Environmental Facility (GEF) was created to support the sustainable development and management of large common property environmental systems. Their approach to key stakeholder involvement, to co-funding and of a systematic diagnostic analysis of the threatened environmental system followed by a strategic action plan to address the issues, often has a high sub-regional impact. To date groundwater, despite its persistent management challenges has only received 3% of the annually available GEF International Waters funding. According to GEF, this can only change when national and regional political leaders are starting to make a strong case for GEF support in this field. To date the region has had support for the SADC Groundwater and Drought Programme and for the Illumedden Transboundary Aquifer Programme.

PROFESSIONAL ASSOCIATIONS

The International Association of Hydrogeologists (IAH) is a world-wide professional association and has individual membership throughout Africa and many African countries have a formal national committee of the IAH. Membership of one's professional association is probably one of the most important aspects of individual capacity building and should be facilitated in every possible way. The IAH is a formal partner in the UNESCO IHP groundwater programme.

NETWORKS

Networks, supported by international funding, play a crucial role in capacity building in the region. WaterNet arranges many short courses, produces region-relevant publications and runs an annual water conference. WaterNet has recently become integrated into the institutional structure of the SADC Water Sector.

The recently established Africa Groundwater Network (AGW-Net), in collaboration with CAP-Net and others, has produced excellent groundwater training material and runs regular courses. It was established to increase awareness of the potential and value of groundwater across the continent and to contribute to capacity building in the groundwater sector in Africa.

ACADEMIC INSTITUTIONS

Most national universities have a Department of Geology with a groundwater component. The challenge is that these institutions and their groundwater part usually have very limited staff and capacity. A number of these institutions play a sub-region / region-wide role, e.g. the UNESCO Chair in Groundwater at the University of the Western Cape, the SADC Groundwater Institute, hosted at the University of the Free State in South Africa and the Sahara and Sahel Observatory in NW Africa. It can be expected that the recently approved UNESCO Category II Centre for Groundwater in Kenya will have a regional impact.

A promising development is the establishment of NEPAD Centres of Excellence to allow universities in a region to cooperate across national and discipline boundaries and focus their science on the development of the region. The first of these in the water field, the NEPAD Water Centres of Excellence has by now six countries as members and is already undertaking a major project for the African Union. A Western Africa Centres of Excellence is presently becoming operational. This presents a major opportunity for groundwater cooperation across country and institutional boundaries.

An excellent way of strengthening the capacity of local institutions is that of twinning with well-established international groundwater players. Groundwater management in Uganda, for example, has benefitted tremendously from a long-standing cooperation with the University College of London.

3.6 Conclusions: Status of groundwater governance in the region

In conclusion of this section on the current status of groundwater governance in Africa, one can say that IWRM structures are rolled out in all countries, but most action has remained at the national level, with the present focus on the establishment of river basin / catchment organisations as a key institution of IWRM. Groundwater is still poorly integrated into the IWRM processes of resource allocation, protection and conservation and its focus has remained resource infrastructure development on a largely ad hoc basis. Its functioning has remained at national level and in government regional offices, with virtually no direct stakeholder participation. On the other hand, decentralization of the important water supply and sanitation drive has brought a major groundwater supply activity to the local government / district level, undertaken by new players with very limited capacity for sustainable utilization of groundwater resources and poor links to the government resource management function.

There is however a growing recognition at the highest water-political level in some countries and in the region of the strategic importance of groundwater towards the regional development objectives. This presents a major opportunity for international cooperation partners, who are

playing a critical role at the moment, to address the groundwater governance function strategically with their African counterparts.

Section 4: Gaps in relation to the state of groundwater governance

4.1 Analysis Framework

Because IWRM is the agreed framework for water resource management in the region, the gap analysis will be undertaken, using the IWRM framework of the Global Water Partnership (GWP, 2000). The focus areas required in the gap analysis are shown in the table below under the main headings of the IWRM framework, namely Enabling Environment, Institutional Development and Management Instruments. This will also help ensure that there are no potentially neglected areas in the analysis.

Table 5. Focus areas for Gap Analysis

IWRM Framework	Areas of Gap Analysis
A. Enabling Environment	
A1. Policy	1. Policy gaps
A2. Legislative Framework	1. Policy gaps
A3. Financing and Incentive Structures	6. Funding gaps
B. Institutional Development	
B1. Creating an Organizational Framework	4. Institutional barriers
B2. Building Institutional Capacity	3. Capacity gaps
C. Management Instruments	
C1. Water Resources Assessment	5. Information gaps 7. Technical knowledge
C2. Plans for IWRM	3. Capacity gaps
C3. Efficiency in Water Use	
C4. Social Change Instruments	2. Accountability gaps
C5. Conflict Resolution	4. Institutional barriers
C6. Regulatory Instruments	1. Policy gaps
C7. Economic Instruments	
C8. Information Exchange	5. Information gaps

4.2 Policy

The vitally important social, economic and environmental roles of groundwater towards achievement of the regional development goals are still largely unrecognized and undervalued throughout the region. Even where groundwater has made 60-70% up of the sources towards the politically important domestic water supply thrust, this is still seldom captured in country statistics which persist in reporting in bulk water supply terms (e.g. groundwater making up 15% of country water supply). This results in neglecting the potential use of groundwater as a valuable alternative to surface water and also the protection of existing groundwater sources.

Despite the increasing scarcity of surface water as bulk water supply, there is no policy to give preference to the use of local water sources. The choice of the water supply system remains biased towards surface water, irrespective of the characteristics of a given area and nature of groundwater occurrence. Even in SADC, which has very good water resources policies and strategies and a groundwater programme, senior officials are acknowledging that much more attention should be given to groundwater development and protection.

Groundwater's vital role towards the next stage of poverty alleviation, namely water for agriculture and sustainable food security, is not understood at all and virtually no statistics exist on groundwater and agriculture. This can be contrasted with the demonstrated value of local water resources as in the case of the sand dams in Kenya (Table 6 below).

Table 6. Impacts of sand dams in Kitui, Kenya

Vulnerability categories	Vulnerability Indicators	Before dam construction	After dam construction
Agriculture	# of cash crops	1.5	2.8
Special aspects	% irrigated crops	37	68
Gender	Water collection – domestic (minutes)	140	90
	- livestock (minutes)	110	50
Economic	Income (US\$/year)	230	350
Health	% households suffering from malnutrition	31.6	0

Villholth (2012).

The main reason for this situation is that the groundwater resource management links to other groundwater-dependent sectors like agriculture, health and environment, are very poorly established in policy or in practice.

The main gaps thus relate to poor valuation of the resource, top down decision-making with no stakeholder participation and coordination with other sectors, who are the real beneficiaries.

4.3 Legislative Framework

All countries possess some form of water law, although many of these statutes make no specific reference to groundwater. Groundwater fits in under broader policies and legislations dealing with management of water, and sometimes natural resources. The modern National Water Act, 1998 of South Africa only uses the term groundwater once in the Act, in the definition of a 'significant water resource.' While it is important in terms of IWRM, that all significant water resources are treated the same in law, it has become clear that legal provisions specific to the peculiarities of groundwater management need to be formulated and promulgated.

Policy, legislation and regulations pertaining to the management of groundwater resources is extremely old in many countries, scattered through various legislative articles, out of line with national/international environmental views, and is sometimes almost non-existent.

It appears that in all countries, groundwater rights are now vested in the state and there is no private ownership of groundwater anymore. Most countries require users to obtain permits for groundwater abstraction, but these procedures are generally not strongly enforced. It remains particularly difficult to control groundwater abstraction due to the historic coupling of groundwater use rights to the location of the abstraction points (boreholes, springs) on land owned privately or tribally.

Customary rights to land and water in rural Africa appear not to have been considered in the drafting and implementation of water legislation in the region so far. This could turn out to be a serious omission, because new laws could be rejected in large parts of the country and even across national borders in the case of pastoralists. It could also lead to disenfranchisement of the weakest in society, particularly serious as agri-business expands in rural Africa. Alternative as well as supplementary approaches might have to be considered (Mechlem, 2012).

4.4 Financing and Incentive Structures

The status and level of funding for the governance of a country's groundwater resources is usually a reflection of the perceived importance of groundwater at the national level. As indicated under policy gaps, valuing the resource is still generally poor.

This is reflected in a poor funding commitment relative to surface water, in particular for vital groundwater monitoring, exploration and data gathering. In arid countries with a strong dependence on groundwater, the funding commitments are usually higher and groundwater development is a priority. A number of gaps with regard to financing of groundwater governance are listed below.

Despite the obvious need and high profile given to improved water supply, funding for groundwater evaluation and development is not necessarily increasing. For example, Uganda has seen a significant decrease in such funding since 2002, when some international donors started 'central budget support' block funding, rather than providing finance for specific water resource and water-supply projects.

Major funds are spend on groundwater infrastructure development for community water supply, the highest water priority on the continent. However, there is no special strategy to link this to improved groundwater resources management, which has a direct bearing on the sustainability of these supplies and thus on the attainment of the MDGs (see example in Box 9).

Box 9: Unsustainable provision from local groundwater sources – urbanization in Kenya

In the context of rapid urban growth in Kenya, water supply in fast growing peri-urban areas is not keeping pace with demand/need. One such urbanizing area (12 km long by 1.5 km wide) was incorporated into Nakuru Municipality in 2008 having expanded from a handful to some 5,000 households in two decades. Water supply was centrally available and pumped (5 cum/hr from 125 m depth) from an old existing borehole, to a tank and limited pipes and member households paid just over 1 US cent for 20 litres, being nominally allowed 100 litre per day for some \$2 per month. Subsequently "Constituency Development Fund"

funded the drilling of a new high capacity borehole, new pump for some 25cum/hr and larger tank; however, there was no improvement to the piped distribution nor software development. Within a short time the local user committee had insufficient funds to pay power cost which was cut off. Now users must pay up to some 4 US cents for 20 litres from private vendors.

Armstrong (2012).

Major investment in groundwater during drought emergencies is often wasted because it takes place unplanned, without stakeholder participation and very poorly recorded and is therefore falling into disuse within a very short time.

For it to attract major international funding, the role of groundwater in different development sectors like health, agriculture and disaster management is not well enough understood and there is insufficient evidence of the effects of good management.

Not enough ingenuity is shown in securing financing, for example creating one basket fund and sharing the finances equitably, undertaking partnerships with the private sector for mutual benefit and achieving an income through abstraction and pollution control.

Most importantly, the country capacity in the groundwater field is often too limited to prepare a complex and time-consuming application for a significant groundwater project.

The dependence of the majority of sub-Saharan African countries on external funding sources has an important bearing on groundwater development in these countries, particularly with respect to investment in a stable local resource development and management capacity.

4.5 Creating an Organizational Framework

In general, institutional development for groundwater resources development and management has not progressed much beyond the hydrogeological service function at national level, with a presence in the regional offices of the national department. The following key gaps have been identified and can be illustrated with the South African Case Study – Box 10 below).

- Centralisation of power with no opportunity for stakeholder interaction;
- Collaboration with other related authorities, e.g. those competent for public health, agriculture, land-use planning, soils management and waste management is virtually non-existent.
- The imperative for the local resource – groundwater, that local water users and stakeholder organizations need to be empowered in order to help ensure equitable access, joint decision-making and self-management or shared management, wherever possible, has basically not taken off yet;
- A gap exists between NGOs and government, preventing them from playing a significant role in governance of groundwater resources;

- River basin organisations / Catchment committees, the first level of decentralization, have been slow to become fully functional and do not yet have the capacity to take on groundwater resources management;
- New institutions have generally been created for the provision of water supply and sanitation services at both national and local level. Very often the new local level institutions have not been properly capacitated, leading to supply failure and resource degradation. This is giving groundwater resources a bad name.
- Groundwater user associations, so important internationally for self-management of a common aquifer source, have so far only been implemented in a few cases;
- Appropriate planning does not exist at national level through which the decentralized management of groundwater resources could systematically expand.

Box 10: Case Study: South Africa

The water sector reform in South Africa culminated in the Water Services Act, 1995 and the National Water Act (NWA), 1998. The NWA is built on IWRM principles and is to be implemented through decentralization. Groundwater is an integral part of the Act. However, groundwater governance has not progressed and groundwater has remained an undervalued resource. Capacity to deal with groundwater is lacking across all management levels. The recent World Bank study found that provisions to control groundwater abstraction and pollution are weak or even non-existent at more local levels. While national level technical, legal and institutional provisions are reasonable, cross-sector policy coordination is weak. Provisions for public participation, e.g. through the establishment of groundwater user associations, have not been enabled by the central government level.

Pietersen *et al.* (2011).

4.6 Building Institutional Capacity

Throughout the region the focus has remained on groundwater development, while the experience and the capacity to manage the resource base are still largely lacking:

- Shortage of indigenous groundwater personnel at all levels is apparent in many countries. This has led to a lack of knowledge and information about the resource and thus to a neglect of its sustainable development and management.
- Hydrogeologists continue to lack a broader national development and IWRM education and training and thus are not able to lead the expansion of their responsibility;
- Local institutions responsible for water and sanitation provision largely lack the capacity for the sustainable management of their sources of groundwater supply;
- Of particular concern is the lack of groundwater knowledge and skills in the water resources planning function. A lack of macro planning for groundwater prevails, as most of the programmes are undertaken on an ad-hoc or crisis response basis. Without proper planning, it will never be possible to upscale the important local solutions for groundwater (affordable, small-scale and indigenous solutions which have some chance of self-replication) and to direct and coordinate groundwater development for a range of

different purposes, i.e. meeting of basic human needs, food production and for socio-economic development.

- While there are a number education and training institutions in the groundwater field in the region, overseas institutions are often still preferred, because of technical assistance support.
- There is inadequate attention to research and development (R&D) and systematic use of local groundwater knowledge.

The widespread lack of capacity in the national hydrogeological function is illustrated with the example of Kenya.

Box 11: Challenges of Groundwater Governance in Kenya

Lack of comprehensive hydro geological map for Kenya.

Low funding for groundwater management, research, development and monitoring.

Low level of GW monitoring, only three dedicated boreholes are operational for groundwater level monitoring in the country.

Little technical capacity in groundwater modelling using modern techniques.

Lack of clear strategy for GW management and development

Lack of aquifer(s) management plans. Aquifers are managed in the broader sense of water resources management which is catchments based as opposed to aquifer based.

Lack of independent forum for aquifer users within WRMA.

Little data on groundwater in the WRMA data base.

No gazetted GCA since commencement of WRMA apart from NAS.

Little knowledge about the transboundary aquifers of Kenya.

Low awareness on GW resources by decision makers, users and stakeholders.

This situation prevails, despite a fairly recent water sector review leading to the Water Resource Management Act, 2002, a Water Resource Management Agency in place since 2005, the country covered by six Catchment Area Advisory Committees and good intentions made for groundwater written into the National Water Resources Strategy.

Ochillo (2012).

4.7 Water Resources Assessment

While poor and deteriorating hydrological networks and institutions were already seen as a major concern by AMCOW at its Pan-African Conference in 2003, it should be recognized that groundwater information services are the least established and in many African countries virtually non-existent. Major gaps include:

- Adequate hydrogeological monitoring of groundwater resources is still a critical deficiency in the region.
- Groundwater abstraction information is still generally not known.
- Information that is vital for developing groundwater resources is not readily accessible.

- The lack of reliable and timely information on the status of rural water supplies, fundamental to any form of groundwater drought planning and mitigation. has been a serious constraint on sector planning and management. However, some countries have started to invest community water supply funds for the systematic collection of data for all water supply schemes (see GRIP project in Box 12 below).
- The understanding of data quality and consistency is rarely recognised and quality assurance protocols for monitoring data are not implemented in any of the SADC member states.
- Manual data collection and sampling in countries having limited financial resources with large land areas and poor road networks are expensive.
- Lack of coordination has been identified as the major cause of poor data collection and management in most member states.
- Donor (and country) funded groundwater projects are usually of short duration, with little if any hydrogeological monitoring input in their design.

Box 12: User-focused and accessible groundwater information

With so many different partners that need to become involved in 'groundwater and development', user-focused and accessible information on the resource will be imperative. The production of the first SADC Hydrogeological Map and Atlas had major benefits, among them, learning to share data and knowledge about a common resource. However, it was also a wakeup call regarding the availability and quality of data that was submitted by different countries. About 50% of countries do not yet have their own hydrogeological map, in all countries a systematic monitoring is still in its infancy and a number do not yet have functioning data bases. To have the resource valued by decision-makers under these circumstances becomes very difficult. The Groundwater Resources Information Project (GRIP) in South Africa, using water supply funding to augment the very limited hydrogeological service budget for this purpose, may be a pointer in the right direction (for more information go to <http://www.griplimpopo.co.za/>).

Braune *et al.* (2010).

4.8 Social Change Instruments

Broad-based participation of stakeholders in the case of groundwater resources management is essential, because abstraction is geographically widely dispersed and diverse sectors and activities anywhere on the land surface can have unseen impacts on the resource beneath. It is at this level where groundwater governance is still largely failing. And it will take development of the challenging social change instruments, including awareness raising, consultation, participation, accountability to society and capacity development of stakeholders and society as a whole to make significant progress.

While stakeholder participation and particularly the involvement of women in decision-making and implementation are key principles (the Dublin Principles) of IWRM, this has barely started to happen.

A high degree of social consensus regarding problems and potential solutions will often be required to make policy instruments politically possible. Information and education of the general public and of policy makers should be used for this purpose. However, awareness-raising about groundwater is not yet undertaken systematically, despite the vulnerable nature of the resource and widespread ignorance about it. There is record of very good ad hoc awareness raising initiatives and in several cases, Ministers of Water Affairs have become champions of groundwater for development. This shows that it is possible.

Clearly water governance is influenced by the overall governance circumstances of the particular country or local area. Very often it is difficult to devise, implement and support reforms in one sector, e.g. in the water sector, if States themselves still lack a broader capacity for governance. The table below from an assessment of water governance in Africa by the African Development Bank (AfDB, 2008) shows some essential aspects of required state capacity.

Table 7. Essential aspects of required state capacity

Broader aspects of governance	Reflection in water governance
Public stability	Essential for investments
Economic and social policy	Role of water in poverty reduction
Government effectiveness in service delivery	Capacity of government institutions
Political participation	Enhance accountability for service delivery
Transparency	Improving access to information (rights, access)
Rule of law	Ensuring water rights, arbitration
Civil society	Sectoral social accountability
Respecting human rights	Process to fulfil water rights
Pro-poor policy	Response to priority needs of poor
Gender equity	Women's participation – decision-making, etc.

AfDB (2008)

Yet water managers need not wait helplessly until the governance environment improves. On the contrary, local, small-scale initiatives have led to valuable improvements, even when the broader environment is not conducive to such changes. Addressing water governance at any scale can help address the aspirations and frustrations of the developing world and allow water resources and related services to meet the challenges of the next century (The World Bank Group, 2006).

4.9 Conflict resolution

The transboundary nature of aquifer systems and the environmental and societal systems that depend on them still receive very little attention in the region. It can be foreseen that growing water scarcity will cause increasing water resources as well as related land resources

degradation and accompanying human conflicts, increasingly across international boundaries. Again, these problems are exacerbated through the unseen and poorly understood nature of groundwater.

Only in a few areas across the continent is there a visible focus on transboundary aquifer management (e.g. Lake Victoria, Niger and Orange River Basin). This is insignificant when compared to the major focus on river basin management in Africa. The important UNESCO-ISARM programme in Africa is now in the first stage of identifying transboundary aquifer systems, whereas other regions of the world are already in a joint management stage. To maintain progress and country commitment, requires significant funding, which has so far only been available for the Illumedden Aquifer System (see Box 13 below) crossed by the Niger River. While GEF has made the initial support investment, there are now some 14 continental and international partners plus GEF's continued involvement.

Box 13: Transboundary aquifers – Illumedden Management Framework

An exemplary model of a regionally shared aquifer system that is not yet heavily degraded, but under environmental threats – 2 major aquifers crossed by Niger river – 500.000 km² – Mali, Niger, Nigeria;

First meeting of Ministers in 2009: Roadmap – Structure for the Consultation Mechanism;

Since 2010: 7 countries – 2 500 000 km²

Common and integrated TDA/SAP; Common management tools; Common data base (17 000 boreholes), GIS, mathematical model; Prestige series of technical publications.

Lessons Learnt

1. Common Vision essential – efforts of single country cannot be enough to identify and to mitigate transboundary risks.
2. Need for countries' capacity building to "speak" the same technical language and have common management tools & monitoring network of the transboundary water resources issues.
3. Transboundary aquifers need separate investment strategies compared with transboundary surface water for better knowledge of groundwater resources.
4. Appropriate legal and institutional consultative mechanism is required to establish Groundwater Governance -

Groundwater Governance: solution to avoid conflict & to improve livelihoods of the riparian populations

Dodo (2012).

4.10 Regulatory Instruments

Effective regulation is required for drilling of boreholes (see Box 14 on high drilling costs below), abstraction control and waste discharge, focusing on the most vulnerable situations first, in order to prevent an unnecessary load on the regulator. This requires an intelligent application, jointly with hydrogeologists, and good monitoring of the situation.

- All countries indicate that there is legislation in place to prevent pollution but they all also indicate that there is insufficient capacity to monitor groundwater problems and to enforce the legislation.
- The widespread pollution of aquifers in and around cities is a clear indication that regulation is not yet existing or poorly coordinated with the local level.
- Widespread seawater intrusion along the African West Coast is a further indication that regulation (abstraction control) is not yet functioning.
- Not enough information could be gleaned from the published material on groundwater regulations that are in place.
- Opportunities like general authorizations (De minimis abstractions) or some form of control by local users are not used enough as forerunner to a much more complex system of formal water rights.
- Very often the human, administrative and financial resources required for implementation have not been adequately considered and in the end implementation has remained well below the targets set.
- Due to insufficient implementation, many recent water laws fail wholly or partly to work in practice thus making no or an insufficient contribution to aquifer governance.
- Enforcement is improving in many countries, but is incomplete, inconsistent and patchy.
- There is still a disregard of groundwater ecosystems and associated goods and services in regulation.

Box 14: Problem of high borehole costs

Borehole drilling costs in Sub-Saharan Africa are currently expensive compared to those in Latin America and very much higher than in south Asia (300-600% more for shallow tubewells/boreholes). The reasons for this are complex, but usually include:

- Lack of economy of scale and contractor competition, due to much more limited market;
- High mobilization / demobilization costs in remote areas with poor road networks;
- Excessive drilling depth for some hydrogeological conditions;
- High duties on imported equipment, often with no local manufacture of spares;
- Corruption in the letting and execution of contracts.

There are, however, some indications of a downward trend in costs in some countries, if misuse of market principles, corruption in regulating authorities and poor performance of knowledge dissemination mechanisms can be addressed.

(Tuinhof *et al.*, 2011; Xenarios and Pavelic, 2013).

4.11 Information Exchange

Groundwater data access is probably the single most important factor determining the ability of social auditors (e.g. NGOs and other civil society actors) to press governments and society as a whole to address emerging problems and their social or environmental impacts. Dissemination

of national groundwater data to a variety of stakeholders is therefore of strategic importance (FAO, 2003);

Groundwater monitoring should represent an integral part of the resource management process, in which decision-makers should be provided regularly with interpreted management-relevant information and programmes are evaluated regularly to ensure that they continue to meet this objective (UN-ECA Taskforce on Groundwater Monitoring & Assessment, 2000).

Serious deficiencies exist in reporting of groundwater development activities. The reports, by and large, lack the analytical aspects and only provide 'data' that is not interpreted or analysed and thereby converted into 'knowledge'. As yet there is little focused communication with groundwater stakeholders at any level; An exception was a annual SADC Multi-Stakeholder Water Dialogue having the theme of 'Groundwater'. A SADC groundwater website with a quarterly newsletter, as foreseen in the Groundwater Management Programme, has not yet materialized. Communication with stakeholders is hampered because there are as yet no formal structures for participative management in the case of groundwater. User-focused groundwater monitoring and assessment can, however, already be found in some country (see Box 15 below).

Box 15: Example of an Institutional Framework for groundwater – Uganda

Groundwater is key to meeting various water demands (of dispersed rural communities, rapidly growing towns, industrial and agricultural development);

An enabling policy, legal and institutional framework for groundwater resources management and development exists;

Water legislation in Uganda is currently undergoing review to make it responsive to emerging issues and challenges and ensure that water (groundwater) is effectively managed and developed;

The country is undertaking strategic water resources planning (linking management and investment) following a basin or catchment to ensure that water and related resources are managed in an integrated and coordinated manner to support sustainable socio-economic development;

Groundwater and surface water resources management being considered together within IWRM approach.

Groundwater monitoring and assessment appears exemplary:

- A purposely established monitoring network;
- Production of tools in form of maps and reports to guide planning and implementation of groundwater development activities at both the national and district levels (6 different types of maps, including a groundwater technology options map).

Tindimugaya (2012).

Section 5: Lessons learnt and opportunities to address the gaps

Drawing on the groundwater governance experience in Africa in the previous sections, a number of key lessons have been identified, which will be discussed under the main headings of Policy, Institutional reform / strengthening, Accountability, Capacity, Information and Funding support interventions. Where possible, the lessons will be highlighted with actual experiences from Africa.

POLICY

Lesson 1

Strategic role for groundwater in Africa

Poverty is the dominant development issue in the region, and water and its proper management will have to play a major role in its mitigation. Drought is endemic in this region and risk management requires wide-spread balancing storage for both basic domestic water services, conjunctive use storage for the rapidly expanding African cities as well as for productive uses, in particular small-scale agriculture. This will be completely infeasible, both technically and financially, from surface water resources alone. Groundwater, given its ubiquitous occurrence and unique characteristics of a protected underground storage and distribution system, can fulfill such a role in the region, despite the hard rock and generally low yield nature of aquifer systems in most parts.

Key groundwater focus areas for Africa governments will thus have to be (Tuinhof *et al.*, 2011):

- Improving rural water supply (the continuing need)
- Expanding irrigated agriculture production (the investment perspective)
- Making best use of groundwater for urban water supply
- Developing and protecting new urban water sources at a range of scales from small towns to large cities to improve water supply availability and security at lowest possible cost
- Formulating a policy on urban domestic in-situ self-supply from groundwater, and the related issue of exercising controls on urban sanitation and waste disposal.

At the same time a policy and legal foundation will have to be laid that will allow control of high impact uses of the subsurface – see Box 16 below.

Box 16: Future high impact use of the subsurface

The use of the subsurface is growing world-wide, aided by new technologies and often with major implications for aquifers. Examples are tapping deep seated aquifers that until present have been used only sparsely for abstracting freshwater, but also extracting minerals, oil and gas; developing geothermal energy; hazardous waste disposal; storage and recovery of substances and heat; and accommodating technical infrastructure. These activities are likely to result in new requirements for legal regulation, domestic as well as international as far as transboundary aquifers are implicated.

van der Gun, Merla, Jones and Burke (2012).

Lesson 2

Proper valuation of the resource at the highest political level

There is absolutely no doubt that institutional arrangement for groundwater will have to be given higher priority and greater investment made in this regard to have any chance of achieving the UN-Millennium Development Goals in Sub-Saharan Africa. However, this development role for groundwater in Africa is still poorly understood, and there has been no strong 'voice for groundwater' in the definition of national poverty reduction strategies, resulting in underutilization and poor management of the important resource.

Box 17: An economic case for groundwater

On average, 97% of national budget allocated to freshwater management goes to surface water management and only 3% goes to groundwater management. So we need to address the problem. The resource is invisible... we need to address it differently. The problem is within our community: we failed to build convincing cases. Groundwater specialists are very talented people, but we are very poor communicators: good science can make a difference only if it is properly communicated. Maybe we should change our vocabulary, the way we communicate. The huge challenge ahead of us is a learning exercise. We should make strong economic arguments. Internationally, GEF is starting to put greater emphasis on funding groundwater projects.

Dr. Rafik Hirji, World Bank (Hirji, 2012).

What has been very encouraging is an increasing acknowledgement at the highest decision-making level, both internationally and in the region, of the role of groundwater towards national and regional development objectives, as illustrated in the Box 18 below.

Box 18: Increasing high level acknowledgement of groundwater

Establishment of an Africa Groundwater Commission under AMCOW

Large River Basin Organisations (e.g. ORASECOM) starting to see groundwater as part of IWRM

UN International Law Commission Draft Articles on the Law of Transboundary Aquifers as a framework

FAO statistics starting to reflect irrigation from groundwater

Big emphasis on groundwater capacity building (IAH, AGW-Net, WaterNet integrated into SADC structures)

Emphasis on groundwater data, maps and knowledge (WHYMAP, UNESCO-ISARM – regional maps of Transboundary Aquifers, SADC Hydrogeological Map and Atlas, start of GEF-funded Transboundary Aquifer monitoring)

A major opportunity has arisen to take continent-wide action through a resolution by the African Ministers Council on Water (AMCOW) to become the custodian of a continent-wide strategic groundwater initiative. This is elaborated under Funding-support interventions. Such regional direction should help avoid a major duplication of effort and lead to a harmonisation of policies and strategies.

INSTITUTIONAL REFORM / STRENGTHENING

Lesson 3

A strategic framework for groundwater within IWRM

Responding to a new developmental agenda with a much increased role for groundwater, will require significant strengthening, evolution and, in some cases, reform of the institutional framework for groundwater governance. In such a reform, groundwater governance will still have to be seen in the broader view of water governance and within IWRM. National IWRM frameworks are important, but the experience has shown that local institutional arrangements determine the success of groundwater governance – see Box 19 below.

Box 19: Required approach for groundwater institutionalization

Experience has shown that local institutional arrangements determine the success of groundwater governance. This is because of a unique groundwater management challenge, which has been summarized well by describing it as “A widely distributed resource affected by plethora of local users and polluters. But the behaviour of these users and polluters is also greatly influenced by national policy decisions affecting land and water use. The approach to resource governance and information provision should be functioning at both the micro and macro level and has been called a ‘top-down facilitation of local actions’”.

Foster (2006).

This approach has been developed further into the groundwater governance analytical framework outlined in Thematic Paper 11 and in a number of World Bank publications (Wijnen *et al.*, 2012; Foster *et al.*, 2010; Tuinhof *et al.*, 2011). The framework is described in greater detail under section 3.1 ‘Understanding groundwater governance’. It was used to analyse the groundwater governance situation in a number of case studies with widely varying context, i.e. India, Morocco, Kenya, Tanzania and South Africa. The overall results are highly relevant for the Africa Regional Diagnostic (Wijnen *et al.*, 2012) and the framework definitely has the potential to help the region and individual countries to analyse their own situation and come up with a strategic way forward, based on the following questions:

- Why has groundwater governance failed to stop the emergence of very serious threats to the resource?

- What are the impediments to improving groundwater governance?
- What are the options to overcome those impediments?

Burke and Moench (2000) in their milestone book 'Groundwater and Society' also emphasize a strategic framework as an essential precursor and progressive instrument for effective groundwater management. If this is undertaken systematically with key stakeholder involvement, it is bound to become part of the country/river basin IWRM plan, the accepted way to integrated implementation.

Lesson 4

Short-term wins and long-term adaptive management roll-out

The design of a suite of institutional and technical strategies and their implementation at the scale required to make an impact (to conserve or reallocate groundwater resources) is unlikely to be achieved in the short term and periods of decades are now seen as reasonable. And, moving from scientific knowledge to legislation and finally to implementation requires a paradigm shift in people's mind sets, and often this is not related to financial shortages or a lack of human capacity (Knûppe, 2011).

While it is crucial to encourage whatever management actions are currently feasible, the long-term process of developing flexible, integrated management systems should not be delayed. Here a number of researchers have suggested an adaptive management approach, in which strategies that build off existing trends within society or help populations to adapt may be as effective as strategies that attempt to manage the groundwater resource base directly (FAO, 2003; Knûppe, 2011).

Appropriate planning at national / river basin level will be critical to the functioning of 'top-down facilitation of local actions'. At a macro-planning level, the development approaches and appropriate technologies, the resource conservation needs, the appropriate participative management approaches and the capacity and financing requirements will have to be planned for the roll-out at local level of hundreds and even thousands of small, locally dispersed groundwater schemes. It is essential to recognise the importance of 'external drivers' on groundwater resource use and pollution pressure — and procedures to influence associated macro-level policy decisions are likely to be required as part of strengthening groundwater governance.

Disregard of regulations and continued over-use of groundwater resources (abstraction and pollution) by individuals cannot be tolerated, because it defeats the whole purpose of wise management and can lead to a wide-spread loss of faith in the governance system as a whole. Examples of prosecuting and of naming and shaming offenders will have to be set. The medium term goal should be self-control by groundwater user associations within a national regulatory framework.

Essential to the adaptive management process will be a capacitated national government resource development and management function as leader and coordinator of the whole process. It needs to have a widely agreed policy and strategy framework and be particularly effective in its groundwater information and planning responsibilities. The growth of countries' own professional groundwater private sector is also seen as essential to the long-term process of establishing good groundwater governance.

A positive example of a planned approach is the development of a substantial groundwater source to augment existing sources for the city of Dar-es-Salaam – see Box below.

Box 20: Groundwater to augment Dar-es-Salaam's water supply

The Dar-es-Salaam municipal water service utility (DAWASA) is responsible for the provision of water supply to a conurbation with a rapidly increasing population of more than 3 million. The utility struggles to meet the burgeoning demand totalling around 400 MI/d, especially during drought periods. Systematic exploration of groundwater resources within a 50 km radius led to the discovery of an extensive coastal terrace aquifer, with a definite potential for development of at least 250 MI/d.

However, sustainable development of the resource will require the concerted efforts of DAWASA and the Ministry of Water Resources (through its local river basin agency) to promote a coordinated action plan involving:

Systematically-staged wellfield development involving closely monitored long-term trial pumping to supply which should facilitate refinement of overall wellfield design together with calibration of an aquifer numerical model to guide development and sustainable use, including an assessment of the risk of coastal saline intrusion;

General land protection to avoid urban invasion and degradation of the aquifer recharge area, and also specific wellhead protection measures.

(Tuinhof *et al.*, 2011).

Lesson 5

Opportunities for a partnership approach to institutional reform

There are a number of opportunities for synergy in a groundwater institutional reform.

- The IWRM and political priority for the establishment river basin / catchment management organizations and the general acceptance that groundwater resource management must be institutionalized in these structures, presents a major opportunity for systematic implementation of groundwater governance. The interest of ICPs to promote transboundary water cooperation in Africa provides an opportunity for joint learning by countries sharing a river basin and implementing groundwater governance reforms within the basin. The UN International Law Commission Draft Articles on The Law of Transboundary Aquifers can act as framework and unifying mechanism in this cooperation, which can be a region-wide initiative.
- The general trend for decentralization and the establishment of new institutions to achieve sustainable water and sanitation services at local level needs to be supported with

systematic capacity development. Local government should be brought on board as a major local player in sustainable groundwater resource utilization and protection, both as immediate focus and as part of a multi-stakeholder mobilization. Approaches in this regard could include awareness raising, guidelines and training and targeted support, with special focus on potentially underutilized local government capacity.

ACCOUNTABILITY

Lesson 6

Increasing the influence of local stakeholders, particularly women, in resource governance

It is generally agreed that sustainable groundwater management requires maximum involvement of the local population. It is significant that this has been a major observation from the groundwater industry that have had the most involvement on the ground so far with the big groundwater infrastructure drive for community water supply, e.g. the Kenya Water Industries Association and the Borehole Water Association of Southern Africa (see Box 21 below).

Box 21: Lessons learned: Implementation of groundwater for community water supply

The rapid growth of community water supply from groundwater sources since 1994 presents a major learning opportunity for a new groundwater for livelihoods thrust.

- Attempts to centrally plan and implement schemes without the complete buy in of communities have met with limited or no success. A clear and mutually understandable definition of the role the community plays in the conception, installation; operation and maintenance of the water system must be spelt out and recorded. The importance of this aspect of any plan cannot be overemphasized.
- Once buy in has been obtained from the community, the process of empowering the relevant role players can begin. Empowerment (capacity building) plays a vital role in ensuring long term viability of any water system.
- Any technology applied in rural areas must be appropriate and sustainable. Communities must be part of the technology selection.
- Rising expectations ensure that the objective of providing for "basic" needs is something of a moving target.
- Any plan which aims to improve access to clean water will have to take into account the possibility that the increased consumption that will inevitably happen can be met by the available supply. The objective therefore is to implement a system which will reward responsible use of water while making indiscriminate consumption difficult and demanding.
- Role players such as drillers, pump installers and suppliers must be consulted. There is a wealth of information available which has been accumulated during previous projects of this nature and it would be bode well for any new project to collect this information and apply it in the most cost effective manner.

John Tonkin, President: Borehole Water Association of Southern Africa (Tonkin, 2009).

Good Governance occurs when the interfaces between the three clusters of actors – government, science and society are effective and is more likely to occur where there is a prevailing political culture of democracy. The opportunity here is the interest from both African

governments and their international cooperation partners for democratization in general and particularly in the improvement of water sector governance. The four main focus areas of a good governance approach are:

- Improving the understanding of different stakeholders, in particular of traditional institutions and their customary rights and approaches;
- Increasing the influence of stakeholders (particularly the poorest and most marginalised) on the planning and decision-making process for the use and management of water resources;
- Creating platforms for information sharing, mutual understanding and consensus-building;
- Building participatory institutions that enhance good governance and build upon communities' strengths, while overcoming their weaknesses;
- Enhancing vertical and horizontal linkages and information flows between water stakeholders;
- Demonstrating the effectiveness of the approach through pilot projects and documenting the learning process.

Despite the role of women having been strongly stressed in the Dublin Principles for IWRM, their role has not yet been clearly defined. A suggestion in this regard was made by the Niger Basin Authority in their assessment of gaps in the IWRM strategy – see Box 22 below.

Box 22: Gender aspects of water management in a basin

The role of women in user organizations is not as clearly defined in the Water Charter as it should emphasize the gender aspects of water management in the basin.

A gender assessment of the household economy should be carried out, with sex and age disaggregated data on the roles and responsibilities of household members for different activities and sources of in-kind and cash income, including how males and females access and control resources. The scope of the assessment should also include time use studies for males and females in the household. The information generated by the gender assessment will establish a clear baseline from which to evaluate how investments yield benefits to strengthen the agricultural activities of men and women and, together, contribute to reducing household poverty levels.

Enoumba (2012).

Such a process needs to be nationally enabled, starting with planning, multi-stakeholder dialogues and financial provision, introducing local government and NGOs as major linkages, and involving the science sector systematically to support the learning process.

CAPACITY

Lesson 7

New approaches to comprehensive capacity development

A key recognition has been that without adequate, appropriate capacity at different levels of government and at local level, services will not be sustainable and maintained. Capacity building

is a long-term, continuing process and needs to cover the individual level (human resources development), the institutional level (organizational development) and the creation of an enabling environment in both the public and private sector.

Focus must go beyond water users of all categories, including ordinary people, NGOs and the community, to water engineers, water planners, policy-makers, administrators, managers of systems, bureaucrats, technocrats, politicians, economists, agricultural scientists, and so on, – including people in the World Bank, United Nations agencies, donor organisations, GWP, World Water Council, in recognition of the knowledge and wisdom that lie outside their own domains.

With the recognition of the crucial role of science for African development and the establishment of the NEPAD Water Centres of Excellence as a result, at the moment in West and Southern Africa, but soon covering the whole continent, there is opportunity for a much more strategic, comprehensive approach to capacity development – see Box 23 below.

Box 23: New approaches for comprehensive capacity development

The move to sector-wide approaches to water resource governance also requires new approaches to capacity development for the water sector. This should be a movement from present ad hoc processes (technical assistance, training, workshops, etc.) to:

- Developing sensible, broader plans for effective capacity development and implementing the plans; and
- Unleashing existing capacity through modification of mandates, changed incentives and improved platforms for collaboration.
- Incentives for donor staff and country authorities to prioritise joint learning in a planned way so that it can feed back into repeated cycles of policy processes, planning, implementation and monitoring.
- Formal participation in the water sector by the specialised actors who can effectively promote learning – national research centres, universities and think-tanks.

Braune and Goldin (2012).

Other measures should include:

- Groundwater capacity development needs to achieve the highest level political direction and attention, possibly in the form of a ‘silver drop’ award for good groundwater governance – the blue drop and green drop awards in South Africa for water supply and for effluent disposal respectively have been very effective in keeping the issues in the public eye and improving service delivery – an appropriate scoring system for groundwater management at the municipal level has already been developed and tested (Riemann *et al.*, 2013);
- As part of a more strategic approach, existing networks, such as Africa Groundwater Net should be recognized and systematically used as a key part of the science structures. This has already happened when SADC made WaterNet a formal part of its Water Sector structure;

- Promote systematic support for and growth of regional facilities such as the SADC Groundwater and Drought Management Institute, the UNESCO Category II Groundwater Centre, just getting off the ground in Kenya, and the UNESCO Chair in Groundwater at the University of the Western Cape;
- Perceptions and awareness of public and private decision-makers and an adequate cross-sector policy dialogue are critically important. This will allow the integration of groundwater resources into national policy, so that they can make an appropriate and effective contribution in different economic sectors. Resources of different partners, national, regional and international, should be pooled to achieve a sustained impact;
- Hydrogeologists and related technocrats have been selling groundwater governance messages to themselves; there is need to address soft issues and inclusivity should be encouraged, i.e. include resource-scientists, social-scientists, politicians, transformative specialists, community/grass-roots leaders, municipality managers, governors specialists, etc.;
- Stimulate a culture of science-led development and the appropriate valuation of research and development outputs and national capacity in this regard. Find innovative ways of funding, sharing and disseminating R&D. If this was financed as a small portion of water sales income, as is the case for the South African Water Research Fund, every country could become part of a regional groundwater R&D initiative;
- Organized local science presents a major opportunity for a higher impact by International Cooperation Partners. GEFs new strategy of involving the local knowledge sector more systematically in their major transboundary projects opens the door for such cooperation;
- High profile issues, such as hazardous waste disposal and fracking for shale gas should be used to achieve widespread education on groundwater.

INFORMATION

Lesson 8

User-focused information as key part of capacity development

Producing and disseminating user-focused information is a key part of capacity development. Many countries are still lacking the financial and technical capacity to support the water sector adequately with information. Key focus areas for an improved information thrust are:

- Address the vital issue of groundwater data and information management strategically, as foundation for improved management by a variety of stakeholders and through cooperation between member states. Focal points include:
 - An assessment of information needs, sources of existing data and information and major gaps.
 - The setting of standards for groundwater data collection and management, with emphasis on appropriateness and value for money.
 - Achievement of a major increase in data accessibility.

- Establishment of groundwater monitoring networks, establishment of groundwater databases and modelling capabilities, conducting groundwater resources assessment and mapping. An adequate level of aquifer characterisation and quantification is crucial in order to provide a scientific foundation for efficient and sustainable groundwater development and management.
- Take forward the best practice approach to showcase feasible solutions and as one of the most appropriate ways of building capacity. Take practical steps for visible progress at local/community level, through the piloting of successful approaches.

Case studies addressing issues of groundwater governance in the region that were reported on at the Regional Consultation are shown in Box 24 below and are referenced to allow access.

- Introduce knowledge management as on-going contribution from the groundwater science sector to the water sector. This would include sharing, archiving and effective communication of knowledge products.

Box 24: Case studies relating to groundwater governance

Kenya Groundwater Governance Case Study – prepared for the World Bank (Mumma *et al.*, 2011)

South Africa Groundwater Governance Case Study – prepared for the World Bank (Pietersen *et al.*, 2011)

Tanzania Groundwater Governance Case Study – prepared for the World Bank (Working Draft, 2012; Wijnen *et al.*, 2012)

Morocco Groundwater Governance Case Study – prepared for the World Bank (Working Draft, 2012; Wijnen *et al.*, 2012)

Production of a web-based hydrogeological map for SADC with participation of all 16 countries (SADC, 2010)

Status of groundwater resources management in SADC (Braune *et al.*, 2008; SADC, 2008)

Transboundary Aquifer management in SADC (Peck, 2010, Braune and Xu, 2011)

Transboundary Aquifer management in Niger Basin – Illumedden Aquifer System (Dodo, 2012).

International partners with former groundwater involvement in Africa can make a major contribution towards the establishment of countries' knowledge systems or even in a shared system. The British Geological Survey, for example, has made a major effort to put their historic Africa groundwater studies into the public domain (<http://www.bgs.ac.uk/sadc/index.cfm>) and this has become a tremendous, easily accessible source of information for a large number of African countries. If other Geological Surveys would do the same, there would be a groundwater knowledge platform covering virtually the whole continent.

Lesson 9

Awareness-raising to establish the platform for dialogue

A major purpose of appropriate groundwater information is awareness-raising throughout government and society. Focus areas that were identified are:

- Immediate emphasis is required on a systematic social and economic valuation of groundwater as a commodity for local, national and regional development, undertaken jointly with the key stakeholders and as basis for much improved communication of the groundwater role within the water sector. This is seen as key to increase the level of investment on groundwater.
- Establish a strategic and mutually beneficial relationship/partnership with the media as part of the major awareness challenge for groundwater. The roles of the media need to be understood and targeted. An overall objective should be to improve understanding of groundwater's development role and its part in IWRM.
- Use of visual aids, such as documentary films, and short advert length-slots for both national TV and international (DSTV) to cover most of Africa are seen as critical to raise understanding of the unseen resource.
- By inclusion of 'groundwater and development' in school curricula, education in this regard could be formalized at an early age;

The recent international priority for groundwater information and maps can be seen as an opportunity if it can be focused on building country and region information technical capacity (Global groundwater maps = WHYMAP; support of regional hydrogeological mapping, e.g. BGR in the case of SADC; Transboundary Aquifer identification and monitoring = UNESCO- ISARM and the International Groundwater Resources Assessment Centre-IGRAC).

FUNDING-SUPPORT INTERVENTIONS

Lesson 10

Strategic partnership opportunity at the highest regional level

A major opportunity has arisen to take continent-wide action through a resolution by the African Ministers Council on Water (AMCOW) taken in 2007 at its 6th Ordinary Session in Brazzaville, namely that AMCOW would become the custodian of a continent-wide strategic groundwater initiative. Its vision, shown in Box 25 below, is expressed in a roadmap for an African Groundwater Commission which is to function under the umbrella of AMCOW to facilitate and direct regional, national, and international action on a number of fronts (AMCOW, 2008).

Box 25: Africa Groundwater Initiative by AMCOW

Vision: An Africa where groundwater resources are valued and utilized sustainably by empowered stakeholders.

Thrusts for action

Awareness

This thrust must result in a widespread awareness of groundwater, its developmental role, its hydrological and ecosystem function, its vulnerability to human impact and approaches to its sustainable utilisation by key stakeholders at all levels.

Capacity

This thrust must result in appropriate capacity, including policy and legislation, and institutional and human

resources, to plan and implement sustainable groundwater utilisation at all levels.

Knowledge

This thrust must result in a knowledge base, including monitoring networks, resource assessment, best practice database, information systems and fundamental sciences, to enable the optimal utilisation of groundwater within an integrated water resource management (IWRM) framework

AMCOW (2008).

This, in turn, presents a major opportunity for a coordinated partnership of international players who have supported groundwater in Africa over the years and have waited for this moment to achieve a much more strategic impact. GEF has shown great interest in the poverty alleviation role of groundwater in Africa and would be ready to support a number of sub-regional studies, should there be a political priority for this at the highest levels.

Lesson 11

New methods of financing need to be explored

There is a general sense that clear, agreed objectives will lead to clear financing opportunities:

- Other mechanisms for financing groundwater governance should be explored, in particular the introduction of user-charges and payment for ecosystem services.
- The AMCOW policy direction to create synergy between groundwater infrastructure development and resource assessment and management needs to further explored by both countries and their cooperation partners as a way of sustainable funding for groundwater resource governance.
- The major role that local groundwater resources could have in climate change adaption, presents a strategic opportunity to tap into International climate change adaptation funds.

Section 6: Conclusions and Recommendations

Groundwater's role and governance in Africa

Groundwater is strategically important for socio-economic development throughout the region. Drivers that have a major bearing on its unfolding role and governance include the widespread poverty and food insecurity in the region, the continuing need for a basic domestic water supply in rural areas, rapid urbanization, and the need for drought security as part of all water provision. Drought is endemic in the region and is expected to be exacerbated by climate change. Groundwater's unseen and little understood functioning within the hydrological environment and its common property resource nature contribute to its poor management.

While groundwater management is to be institutionalised as part IWRM, which is the water governance framework throughout the region, its management performance continues to be hamstrung by many impediments towards a more sustainable utilization, including a serious lack of capacity at national, river basin and local level, inadequate resource monitoring and assessment, lack of institutional development at the important local level, and a general lack of awareness and appreciation of its role, which together have a major region-wide impact on social and economic development.

Opportunity for a region-wide groundwater initiative

The importance of groundwater in this region, the cooperative regional IWRM structures and institutions that already exist, the understanding there is already for groundwater at the highest decision-making levels, plus the desire of key international cooperation partners to help turn the situation around and join forces to make an impact, offers a major opportunity to initiate a systematic, region-wide, programme and approach, as envisioned by AMCOW (vision below), for building the capacity required to ensure that groundwater resources are utilized and managed sustainably in Africa. AMCOW already has a Roadmap for the way forward and has created the Africa Groundwater Commission (AGWC) to take the process forward.

'An Africa where groundwater resources are valued and utilized sustainably by empowered stakeholders.'

Ultimate requirement – an institutional reform for groundwater

Groundwater in Africa should be further developed as a vehicle for poverty-alleviation, drought-mitigation and food-security -encouraging optimism, but also avoiding unrealistic expectations and drawbacks. Only a systematic, but flexible, long-term process, driven within a multi-stakeholder-agreed framework, can turn groundwater's present poorly utilized and governed situation around. It is understood that this transformation must lead to, in its broadest sense, a top down facilitation of multiple local actions, thus requiring attention on many development fronts and implementation levels, in particular local, aquifer, basin, national and regional levels.

This process should be addressed strategically, starting with a model institutional framework, developed in a multi-stakeholder dialogue and based on a joint understanding on roles and management requirements of groundwater in different typical environments. Further research to clarify existing coping mechanisms and to identify or test the viability of adaptive strategies could represent a major starting point for an initiative to 'rethink groundwater' The process needs to be knowledge driven and be capable of building widespread community support for courses of action across sectors and administrative jurisdictions. River Basin Organisations should play a major role in making groundwater a fully integrated part of IWRM. National government will have to lead the whole process and will require particular capacity for its groundwater information, planning and coordination responsibilities. The growth of countries' own professional groundwater private sector is also seen as essential to the long-term process of establishing good groundwater governance.

Various partnerships, including international, should be employed to make systematic and sustained progress.

Capacity development

Capacity building is a long-term, continuing process and needs to cover the individual level (human resources development), the institutional level (organizational development) and the creation of an enabling environment in both the public and private sector.

With the recognition of the crucial role of science for African development and the establishment of the NEPAD Water Centres of Excellence to be covering the whole continent, there is opportunity for a much more strategic, comprehensive approach to capacity development.

As part of a more strategic approach, there should be systematic support for and growth of regional facilities such as the SADC Groundwater and Drought Management Institute and use of existing networks, such as Africa Groundwater Net as a key part of the science structures.

Financing

There is still a very poor funding commitment to groundwater resources assessment and management relative to the strategic importance of the resources for a number key development sectors in the region. Particular investment is required in groundwater institutional development.

To rectify the situation, a strategic effort at regional (AMCOW), the RECs, countries and their international development partners will be necessary. This should lead long-term commitments and new ways of financing, e.g. funding of resource management as a portion of the investment of groundwater infrastructure, through basket funding in which groundwater receives its equitable share, through focus on funding for climate change adaptation, through public-private partnerships and through achieving an income from regulating those who have groundwater use benefits, i.e. abstraction, drought security and pollution. As a first step, transboundary and regional communication and experience sharing needs to be raised to a high level.

Foundational action – information & communication

Improved user-focused groundwater information lies at the heart of capacity for every part of the water sector. The vital issue of groundwater data and information management should be addressed strategically, as foundation for improved management by a variety of stakeholders and through cooperation between member states. Focal points include:

- An assessment of information needs, sources of existing data and information and major gaps.
- The setting of standards for groundwater data collection and management, with emphasis on appropriateness and value for money.
- Achievement of a major increase in data accessibility.

Systematic groundwater monitoring needs to be implemented in every country. It should include the status of the resource in terms of quantity and quality as well as its use by the various economic sectors. Critical information products for various stakeholders need to be developed together with them:

- Groundwater status and future conditions reporting should become a core part of state of water resources monitoring;
- Focused groundwater information should help pave the way for greater participative management and informed regulation;
- Appropriate information needs to cross divides and support awareness creation at multiple levels, from multilateral donors and policy makers to stakeholders at grassroots level.

Start developing communication mechanisms and platforms – good governance needs good communication and a place where all stakeholders can share. Forums are required for all levels of stakeholders, including ministerial and grassroots levels. This need is an important cost factor in the participation process.

.....Foundational action – information & communication

Immediate emphasis is required on a systematic social and economic valuation of groundwater as a commodity for local, national and regional development, undertaken jointly with the key stakeholders and as basis for much improved communication of the groundwater role within the water sector. This is seen as key to increase the level of investment on groundwater.

Introduce knowledge management as on-going contribution from the groundwater science sector to the water sector. This would include sharing, archiving and effective communication of knowledge products.

International partners with previous Africa involvement have a major role to play in helping build and populate the knowledge platform as quickly as possible.

Roll-out of the information thrust should be strategically anchored in existing initiatives, e.g. institutional capacity building, local government support and disaster management.

Strategic partnerships for groundwater and development in Africa

Partnerships at all levels, focused through a common purpose and strategy, must become the key that will overcome bottlenecks, open doors and sustain initiatives towards a sustainable development and utilization of the strategic groundwater resources available throughout the continent. Some of the key partners and suggested roles, to move the Initiative forward, are:

AMCOW

To lead and fast-track a strategic Africa Groundwater Initiative, with the Africa Groundwater Commission as its instrument for advice and coordination.

Regional Economic Communities (RECs)

To promote and facilitate implementation of the Initiative at sub-regional, River Basin Organisation and country level.

African Union

To promote groundwater for African development strategically and support its on-going implementation through its various institutions, in particular AMCOW and AMCOST (Science and Technology).

African Development Bank

To financially support the initiative in strategic areas and moments in time, as it already did in the coming together of an Africa Groundwater Initiative.

Global Water Partnership

To systematically introduce groundwater for African development into capacity development for IWRM at region, REC, RBO and country level.

UNESCO

To act as international counterpart for an Africa Groundwater Initiative and represent the International Cooperation Partners on the Africa Groundwater Commission;

To fully use and grow its programmes, e.g. the ISARM programme, as flagship programmes for the Africa Groundwater Initiative;

To empower its local institutions (centres, chairs) to play their advice and networking roles fully.

...Strategic partnerships for groundwater and development in Africa

International Association of Hydrogeologists (IAH)

To strategically expand Africa membership of this global groundwater professional association;

To work closely with the UNESCO-IHP to play a continent-wide advocacy and capacity building role;

To play a lead role in the development of the information / communication component of the Africa Groundwater Initiative.

UNEP

To introduce and support groundwater systematically in green economy strategies and programmes for Africa to help establish its range of ecological services and its crucial climate change adaptation role.

World Bank

To support a groundwater transformation in Africa through its global groundwater experience, its GW-MATE knowledge products and through its international experts.

FAO

To help set up relevant country groundwater statistics for regional and global reporting;

To play a lead role in developing groundwater's role for food security in Africa.

IWMI

To help introduce a strong social science and community focus in a 'groundwater for livelihoods' thrust of an Africa Groundwater Initiative.

GEF

To help anchor the whole Africa Groundwater Initiative with a strategic transboundary groundwater programme in each Regional Economic Community.

UN-Water Africa

To provide highest level coordination and support, allowing the UN family to achieve maximum impact in groundwater for Africa's development.

National Partners

To build country institutions and capacity for groundwater governance through active participation in the regional Initiative and building its own strategic partnerships in the country water sector. Long-term twinning arrangements will be particularly important.

Private sector

To strategically support groundwater governance nationally and locally through their motivation, knowledge, resources and networks (e.g. mining sector and ICT sector).

Civil society

To help communities become a key player in good governance of their local groundwater resources.

Knowledge sector

To build strategic partnerships in order to establish information and knowledge as the glue that will hold the different parts of the water sector together and thus will build 'groundwater for development' at every level.

Water Research Commission of South Africa

To provide groundwater knowledge management support and to promote the development of country R&D capacity.

"It takes a village to raise a child" (African proverb)

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