



Policy, Legal and Institutional Development for Groundwater Management in the SADC Member States (GMI-PLI)



Gap Analysis and Action Plan - Scoping Report

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Final

Angola



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CONTENTS

| | |
|--|-----------|
| ACKNOWLEDGEMENTS | ii |
| LIST OF FIGURES | v |
| LIST OF TABLES | v |
| LIST OF ACRONYMS | vi |
| 1. INTRODUCTION | 1 |
| 1.1. Socio-economic drivers | 2 |
| 1.2. Water resources | 3 |
| 1.2.1. Status of water resources (surface, groundwater and transboundary)..... | 3 |
| 1.2.2. Groundwater environment and ecology | 5 |
| 1.2.3. Status of groundwater infrastructure | 5 |
| 1.2.4. Groundwater supply and demand | 5 |
| 2. METHODOLOGY | 7 |
| 2.1. Overview..... | 7 |
| 3. POLICY | 10 |
| 3.1. Evolution..... | 10 |
| 3.2. Policies to support groundwater management | 10 |
| 3.3. Gaps and challenges identified | 11 |
| 3.4. Enablers required to unlock these gaps/challenges | 11 |
| 4. LEGISLATION | 13 |
| 4.1. Evolution..... | 13 |
| 4.2. Legislation to support groundwater management | 14 |
| 4.3. Gaps and challenges identified | 17 |
| 4.4. Enablers required to unlock these gaps/challenges | 20 |
| 5. STRATEGY AND GUIDELINES | 22 |
| 5.1. Evolution..... | 22 |
| 5.2. Strategies and guidelines to support groundwater management | 22 |
| 5.3. Gaps and challenges identified | 24 |
| 5.4. Enablers required to unlock these gaps/challenges | 24 |
| 6. INSTITUTIONAL FRAMEWORK | 26 |
| 6.1. Evolution..... | 26 |
| 6.2. Institutional arrangements to support groundwater management | 27 |
| 6.3. Gaps and challenges identified | 29 |



6.4. Enablers required to unlock these gaps/challenges 31

7. CHALLENGES TO IMPLEMENTATION 34

8. ACTION PLAN..... 36

9. REFERENCES..... 41

Appendix A: Literature Inventory List..... 42

Appendix B: Stakeholder List 43

Appendix C: Desired Future State 45



LIST OF FIGURES

| | |
|---|----|
| Figure 1: General institutional framework of the water sector in Angola | 27 |
| Figure 2: Different bodies involved in the groundwater sector in Angola | 28 |

LIST OF TABLES

| | |
|---|----|
| Table 1: Stakeholders consulted to respond to the questionnaire | 44 |
| Table 2: Enablers required to unlock policy gaps and challenges | 11 |
| Table 3: Frames 1-articles of the law of waters that lack of regulation (PNA, 2017) | 18 |
| Table 4: Enablers required to unlock these gaps and challenges | 20 |
| Table 5: Enablers required to unlock these gaps/challenges | 24 |
| Table 6: Enablers to address institutional gaps and challenges | 31 |
| Table 7: Action Plan _ ‘Must Haves’ | 36 |
| Table 8: Action Plan _ ‘Should Haves’ | 37 |
| Table 9: Action Plan _ “Could Haves’ | 39 |
| Table 10: Action Plan _ “Won’t Haves’ | 40 |

LIST OF ACRONYMS

| ACRONYM | DEFINITION |
|-------------------|---|
| COBA | Engineering and environmental consultants |
| DNA | National Water Board |
| DNB | National Department for Biodiversity |
| DNTNA | National Directorate of Environmental Technologies and Regulate Matters. |
| DPEA | Provincial Directorates of the Waters |
| GABHIC | Cunene River basin |
| IGEO | Geology of Angola |
| IGRAC | International Groundwater Resources Assessment Centre |
| INRH | National Water Resources Institute |
| IRSEA | Regulatory Institute of Electricity and Water Services |
| MDGs | Millennium Development Goals |
| MINAGRI | Ministry of Agriculture and Forestry |
| MINAMB | Angola Ministry of Environment |
| MINEA | Ministry of Energy and Water |
| MoSCoW | Must, Should, Could, Won't |
| NGOs | Non-governmental organizations |
| OABH | Watershed Management Bodies |
| PAT | Programme Water for All |
| PGDURH | General plans of development and use of water resources |
| PLANIRRIGA | National Irrigation Plan for Angola |
| PNEA | National Strategic Program for water |
| REF | Economic and Financial Regime |
| SADC | Southern African Development Community |
| SADC-GMI | Southern African Development Community – Groundwater Management Institute |
| SEA | State Secretariat for Water |
| SDG | Sustainable Development Goal |
| Uíge | Regional Directions: Regional Directorate North |

1. INTRODUCTION

The Southern African Development Community - Groundwater Management Institute (SADC-GMI) initiated a consultancy to identify gaps at national and regional levels, develop action plans for addressing the gaps and pilot some quick-win actions with the aim to create an enabling policy, legal and institutional environment for effective groundwater management. The consultancy comprises two phases. Phase 1 includes of a gap analysis by SADC Counterparts of the state of the national groundwater policy, legislation and general regulatory framework in each of the member states. The gap analysis is based on the Desired Future State document prepared by the consultancy team. Phase 2 will include targeted advocacy/training workshops, a Member State roadmap and guidelines. This report presents the outcomes of the gap analysis for South Africa.

This report analyses gaps and challenges in groundwater management in Malawi. It is contributing to the overall objective of creating an enabling policy, legal, and institutional environment for effective groundwater management through identification of gaps at national level and development of action plans for addressing the gaps. It states the current status, gaps or challenges and what it would take to address the identified gaps and challenges.

The lack of governance and the irregular use of groundwater constitutes a real threat to the security of public water security which if not managed sustainably may jeopardize Angola's progress towards achieving universal access to drinking water. Although the groundwater resources in Angola are not well-understood, groundwater is a fundamental source of water for some of Angola's population. Groundwater is a key source of water for a number of municipalities that are supplied and serviced by boreholes. Groundwater presents itself as a viable part of the solution to the water constraints of Angola. Angola is currently divided into 18 provinces, further subdivided into 164 municipalities and 557 communes. There is no updated information/live database on groundwater that can help estimate existing borehole numbers.

Groundwater is more and more a solution for surface water-scarce areas and serves as a viable alternative source especially given the need to expand water access to meet increasing demand in the face climatic variability.

This study aimed at assessing the shortfalls within Angola's groundwater management policies, strategies, legislative and institutional environment in order to identify the necessary actions to strengthen the existing groundwater management framework. As part of the analysis, a minimum effective groundwater management platform called the desired future state, was set to define the desirable minimum state for groundwater management.

Achieving effective and sustainable groundwater management standards of governance is necessary as it contributes significantly to achieving national and international standards for sustainable development (SDGs) including meeting the basic human needs of food, water and the protection of ecosystems.

1.1. Socio-economic drivers

In Angola, public water supply consists of urban, peri-urban and rural supply. The consumption of water is utilised for industrial and domestic purposes, trade as well as services. The water and sanitation sector in Angola is in the process of reform, for which there have been defined strategic guidelines, programs and executive plans, aligned with an important set of key instruments, in particular:

- ✓ The commitments of Angola in relation to the Millennium Development Goals-MDGS, related to the water and Sanitation Sector;
- ✓ Long-term development strategy, Angola 2025, which calls for clear targets for human development, which are of course a set of challenges for the Water Sector;
- ✓ The program of development of the Water Sector and the program of the Government in relation to the Water Sector, was established as mission «**Act to provide the population with access to safe drinking water in urban and rural areas, as well as access to water for economic activities**», there were programs that included investment plans and established goals of expanding coverage, seeking to impact the most needy population;
- ✓ Plans have been developed for water supply and sanitation, to 17 provincial capitals and a time horizon up to 2030.
- ✓ PAT (program water for all) is nationwide and in their initial stage (2007) covered all the provinces with emphasis on the rural population, is coordinated by a Technical Committee. Initially, the schedule for implementation was five years old, but after eleven years, the Committee still stands- in-Office has failed to achieve the goals envisaged.

Hydroelectricity: In the last decade, the production of electricity in Angola was mostly water-borne. The country's extent of hydroelectrical development is a reflection of Angola's geographical characteristics, topography and climate, where it is favoured by the existence relatively good rainfall, coupled with abundant water flows and low temporal variability.

Industry: The industrial sector, and specifically the food processing industry accounts for the largest consumption of water in the country.

Angola's industry consists of various sub sectors/units that manufacture among other things, ceramic products, food products, the liquor industry, garment industry, wood industry, furniture and metal fabrications, as well as pharmaceutical products, etc.

The industrial sector contributes significantly to the development of Angola's various provinces. Notably, the economic and social development trends predict a sharp growth in water intensive industries that will result in an increased demand for water, hence the need to improve groundwater management as an alternative source to the growing demand.

Irrigation: The characterization of the use of water resources in irrigation sector requires a country-wide survey of existing areas, sources of water used, the types of cultures practiced, and of existing irrigation systems and their efficiencies. The PLANIRRIGA database, shows that, at present, most of the irrigated area focuses on the river Queve units (about 24.9% of the total irrigated area) and the Middle Kunene (23.5%), followed by descending order low Kwanza (11.2 %) and the watershed of Catumbela (9.2%). Angola needs to significantly increase agricultural production contributing to:

- Food security of the country.
- Exportation's decrease.
- Job creation and rural development.

Irrigation is one of the fundamental factors in agricultural development in various regions, in particular the Northwest, the Kwanza, the Midwest, the Cunene, in the Southwest, Kuvelai, Cubango and When. An important part of the annual water consumption of the agricultural sector takes place in the dry season, which may result in some situations of shortage in certain regions.

Livestock: Livestock plays an important role in the reconstruction of Angola and is a business priority for food security, ensuring the consumption of the rural population. According to the estimate of livestock by provinces, presented at the National Conference on Agriculture in 2016, almost all of the cattle are concentrated in the provinces of Huíla, Cunene, Namibe and Benguela, where live more than 60% of small ruminants. The livestock sector will be in the future, one of the major consumers of water in the vast majority of the hydrographic units.

1.2. Water resources

The GENERAL REGULATIONS GOVERNING USE of WATER RESOURCES, CHAPTER I General provisions ARTICLE 1º defines the regime of general use of water resources, including the planning, management and mechanisms of economic and financial remuneration, ARTICLE 2º (Framework application) sets which is applicable to surface and ground waters, including streams, lakes, ponds, swamps, springs, lakes, estuarine areas and other bodies of water, without prejudice of their beds, and vicinity.

1.2.1. Status of water resources (surface, groundwater and transboundary)

The existence of cross-border rivers (transboundary river basins), especially in situations of water scarcity, calls for cooperation in development of the resource between the riparian states, as a means of managing against conflict. Angola shares five of the major river basins in the region:

- Cunene (partilhada com a Namíbia)
- Kuvelai (shared with Namibia)
- Cubango/Okavango (shared with Botswana and Namibia)
- Zambêze (shared with 7 SADC countries more)
- Congo/Zaire (shared with over 10 countries of Central Africa)

For some international river basins shared by Angola, the plans are complete or nearing completion, as is the case of Cunene, Cubango, Zambezi and Kuvelai. The Executive of Angola attaches great importance to the issue of transboundary/shared water resources. This is reflected in the appointment in 2003 of an Interministerial Commission to the international waters agreement coordinated by Minister of energy and water. The agreements covered the Kuvelai (shared with Namibia); Cubango/Okavango (shared with Botswana and Namibia); the Zambêze (shared with 7 other SADC countries); and the Congo/Zaire river (shared with over 10 countries of Central Africa).

The Office for the administration of the Cunene River basin (GABHIC) has a function to oversee the development of the river for which it was created. Important to note is that groundwater management is included in river basin management under the territorial management unit. It should be noted that the aquifer systems in Angola do not necessarily align (perfectly) with the hydrographic basins. Cross border aquifers present a significant set of challenges for international policy different from those related to watersheds. Angola shares several aquifers with other countries (according to IGRAC, 2017). These include;

- Côtier Aquifer shared with the Republic of Gabon, Republic of Congo and the Democratic Republic of Congo;
- Dolomite aquifer shared with Democratic Republic of the Congo;
- Cuango shared with Democratic Republic of the Congo;
- Kuvelai-Etoshia Aquifer, shared with Namibia;
- Caprivi Sub-basin Kalahari/Karoo Aquifer North, shared with Botswana, Namibia and Zambia; and
- Coastal Sedimentary Basin aquifer, which it shares with Namibia.

Water policies in Angola are based mainly on surface water resources. While groundwater is of significance in terms of the role it plays in meeting the demand in some municipalities, the focus on surface water resources development and management may be associated with lack of political will for development of groundwater resources, as well as the institutional and territorial configuration to operate in terms of surface water resources.

The lack of explicit reference to groundwater in existing water law, could have significance in the limited investment in groundwater specific developments compared to prioritized surface water projects in Angola. For Angola to achieve its goal in terms of drinking water, which is to increase rural coverage to 80% by 2026, groundwater should play a significant role. Effective groundwater development would require addressing existing knowledge and/information gap which is linked to insufficient data /research on groundwater. It would also require the consolidation of integrated management of water resources (conjunctive use that considers all viable water alternatives including groundwater). Furthermore, for Angola to take advantage of the true potential of underground water, including management, there is need to considerably strengthen institutional policies, which should address groundwater institutional capacity needs.

1.2.2. Groundwater environment and ecology

The determination and management of ecological conditions of water constitute a key factor for the sustainability of aquatic ecosystems, as well as the satisfaction of other uses. Currently, Angola does not yet have complete studies establishing the ecological flow, depending on the specifics of the hydrographic units.

There is a provision under PNEA admitted book for Environmental Uses, which reflects on aspects of environmentally sustainable utilisation of water resources. It provides for a minimum annual average allocation of 15% of the total water is provided to cover natural values and conservation, providing a considerable safety margin with regard to the sustainable utilisation of all the river basins.

1.2.3. Status of groundwater infrastructure

The typical water infrastructure of Angola includes fields of groundwater boreholes, water supply schemes, dams, river water works, inter-basins and transfer channels. The estimates of renewable groundwater water resources in Angola points to about 58 km³/year. Although there are operational boreholes all over the country, groundwater reserves are not generally developed significantly due to easy availability of surface water. The most important aquifers are found in sedimentary deposits, whose depth vary between 10 and 30 metres, around Huambo; between 5 and 30 metres in the coastal areas and up to 200 m in the semi-arid areas of southern Cunene River basin.

The boreholes are designed primarily to meet the household needs. The aquifers recharge, in the pastoralist dominated semi-arid region in Angola is very low. According to results of groundwater models, prepared in 1996, the aquifers are vulnerable to overexploitation (LNEC 1996). Aquifers recharge decreases, generally from North to South and from East to West of the Cunene River basin. The aquifer recharge is also influenced by the favourable hydrological properties of certain geological formations in the area, which provide more complexity to the general trend. Relatively low groundwater flows in the Cunene River area can be attributed to high rates of evaporation coupled with the low surface flows in the river. The southern region of Angola presents a highly variable climate with great irregularity in the distribution of rainy episodes over a hydrological year and between successive hydrological years. The low rainfall, high evaporation rates and relatively steep relief, are factors that result in a relatively low recharge which may provide the appearance of problems related to the depletion of the aquifer.

1.2.4. Groundwater supply and demand

Most of urban areas receive supply from surface water sources, but the provincial capital of Malange, Benguela, Lubango and Namibe, as well as the urban areas of Tombwa and Lobito, depend on groundwater, to a greater or lesser extent. According to data of the National Strategic Program for the water 2013-2017, the southern and southwest parts of Angola have the majority of available groundwater information. This information indicates that many boreholes have been drilled and registered in this area. In the remaining provinces, there is inadequate information on groundwater sources (boreholes). An important network on groundwater is located in the provinces of Cunene (40%),

Namibe (30%) and Huíla (15%) for a total of 85%, and also in Malange (5%) Benguela (7%) and Cabinda (3%).

In general, the use of groundwater is concentrated in coastal areas and in southern Angola, where conditions are more arid and surface water available are on a smaller scale. In rural areas with higher incidence, particularly of groundwater obtained depend on the yield of bore holes, hand-dug wells and springs. It is common for farmers and livestock keepers, to build their own boreholes.

2. METHODOLOGY

2.1. Overview

This assignment focused on identifying the legal, policy and institutional gaps and opportunities to sustainable groundwater management in SADC member states, and this report is specific to Angola. The methodology consisted of a desktop review of available literature, engagement on gaps in groundwater management with stakeholders from across various sectors was conducted through administering a standardized online questionnaire.

Literature was collected and is made available in **Appendix A**. The review of existing information was based on different white and grey literature collected from various researchers, government departments, NGOs, donor reviews and reports, research theses and consultant reports.

Several individuals/institutions (**Appendix B**) were engaged for data collection using the structured questionnaire, based on the Desired Future State, elaborated on below.

The desired future state has been contextualised for the SADC region, taking into account:

- The high levels of groundwater dependency in many SADC countries, in rural areas in particular;
- The variety of geohydrological contexts;
- High levels of poverty, gender disparities, social exclusion and pollution; and
- Relatively low levels of state capacity – skills, infrastructure and finance.

It sets out the *minimum* requirements that support the delivery of national, regional and international developmental goals, including the Sustainable Development Goals, meeting basic human needs to water, energy and food (the WEF nexus), and the protection of ecosystems that are dependent on groundwater.

The sections below describe, at a high level, what is considered to be the minimum best practice for policy, legislation and subsidiary legislation, regulations and standards for effective groundwater management. For a more detailed description of the desired future state, see **Appendix C**.

The **minimum policy requirements** that should be in place are:

- A long-term policy to protect groundwater by preventing pollution and overuse.
- The social, economic and environmental values of groundwater are all recognised.
- The human right to water is recognized and a rights-based approach to groundwater management is taken.
- Groundwater is recognised as a highly important source of domestic and agricultural water supply and a key resource for poverty alleviation, food security, and the sustainable economic development of rural areas.
- The biophysical and ecological linkages between ground and surface water for their use, protection and management are recognised, including land use zoning for groundwater protection and recharge (conjunctive use).
- The importance of the maintenance of the ecological integrity of wetlands in groundwater management is recognised (recharge zones).

- Intersectoral collaboration is promoted and facilitated.
- The need for adaptive management is recognised.
- The roles of various stakeholders and water users in groundwater management is recognised and participation of stakeholders is promoted and facilitated.
- An apex body that is responsible explicitly for GW management and playing the role of custodian/trustee on the part of the state is clearly defined.
- Effective institutional arrangements are coordinated at transboundary, national and local levels.
- Public access to geohydrological data held by the state is promoted and facilitated.
- Additional environmental principles necessary to protect and sustain groundwater are mandated, including: the precautionary principle, the principle of gender equity and social inclusion (GESI), the principle of subsidiarity, and the principle of intergenerational equity.

The **minimum legislative requirements** that should be in place are those that explicitly address the use, management, and protection of groundwater and provides the necessary tools for the state to regulate, manage, control, protect and develop groundwater resources in conjunction with surface water resources. At a minimum, legislation and/or subsidiary regulations should:

- Provide the status of groundwater noting that all water has a consistent status in law, irrespective of where it occurs, and there is explicit reference to groundwater and conjunctive use management; and recognise the human right to water recognized in groundwater legislation, facilitating prioritization of drinking water and basic human needs, as well as small-scale users.
- Regulate groundwater quantity by providing conditions for accessing groundwater through water use authorisations system that does not discriminate (especially against the rural poor), is not tied exclusively to land tenure and enables effective compliance monitoring and enforcement.
- Provide groundwater protection mechanisms that includes regulating pollution (point source and non-point source), regulates depletion, regulates abstraction and recharge (usually via permitting) and provides for the sustaining wetlands;
- Enables integrated planning through specifying the need for long term plans (at catchment or basin level) to ensure the sustainable use of groundwater, including drought management plans and cross-sectoral coordination.
- Make provision for institutional arrangements including the mandate, competence and power of the relevant authorities, enabling the integrated management of groundwater and surface water resources, engaging in the arbitration of competing demands and diverging interests regarding groundwater abstraction and use, and support the collaborative engagement with other sector authorities, competent for public health, land-use planning, soils management, and waste management.
- Support effective stakeholder engagement through specifying when and how stakeholders, the public and/or other water users are to be engaged in the development of laws and regulations, planning, decision making and self-management regarding groundwater and should specifically address the issue of the involvement of women and youth in decision-making and the implementation of groundwater supply schemes.

- Provide for Monitoring and data collection to support regulation including protocols for data collection, management, exchange and dissemination, including standardization and harmonization of data, as well as national monitoring and information systems for the management of data and information.
- Regulate to ensure water conservation and efficiency of use.
- Support compliance and enforcement through clear mechanisms for promoting compliance with groundwater regulations through enforcement provisions that enable inspections, the imposition of fines and/or additional administrative penalties and other instruments to address failure to comply with the law.
- Conflict resolution mechanisms and/or the right to appeal.
- Enable the development of regulations on any relevant matter in the legislation to regularise aspects of groundwater management and incentivise appropriate use of groundwater resources.

The actual **requirements for subsidiary regulation** will differ from country to country, according to their own National Legislation. However, it is important to understand the extent to which critical issues around groundwater management have been translated into regulations. Below are some examples of how this could look.

- Subsidiary legislation or regulations pertaining to use, protection including on-site sanitation, borehole drilling, and appropriate financial and economic regulatory tools e.g. water pricing.
- Clear protocols and standards on data collection and storage.
- Templates for municipal by-laws.
- Community management of groundwater and community participation in groundwater management.

From an **institutional perspective**, it is critical that countries have as a minimum, a dedicated Ministry for water resource management, which is also the custodian for ground water management. Noting that the groundwater is a localised resource, decentralised institutions at trans-boundary, catchment and local government level are crucial, where groundwater management fits into overall mandate for water resource management.

3. POLICY

3.1. Evolution

The Ministry of energy and water has an organic structure defined in the Presidential Decree No. 77/10, May 24, (2010) where he approves the respective Organic Statute. Article 1 of the Organic Statute of MINEA States that this is the Ministerial Assistant Department of the President of the Republic which aims to propose formulating, driving, implementation and control of the Executive policy in the fields of energy, water and sanitation. The Presidential Decree No. 253/10, of November 16, (2010) sets the Organic Statute of the National Institute of water resources.

The Organic Statute INRH stipulated by Presidential Decree No. 205/14 of 15 August indicates that the functions of the INRH are: a preparation of national water resources Policy, planning and ensure the management of water resources, with a view to the efficient and sustainable use of water resources. It holds the responsibility over general plans for the development and use of water resources of each river basin, including a sub-programme inventory. It ought to keep a record in the public domain, with regards to the watercourses, lakes, ponds, swamps, springs, and estuarine areas as well as other bodies of water. The purpose of the General Development Plans is to provide at national level, plans such as the safety planning of dams. Therefore, INRH fills an important space in the management of water resources of the country. TMAR, taking over many water resource management functions, is provided for in the legislation which provides for the creation of Regional Directorates and offices of basin management Catchment areas. This gives them the responsibility for the economic and financial regime, to manage a conservation area in the hydrographic network, and to manage impacts and environmental risks and their proximity relationship with users. Currently, in accordance with article 118 of the General regulations governing use, the INRH is responsible for planning activities and management of water resources at the level of river basins. It is also responsible for the effective creation and installation of watershed management bodies (OABH). Currently there is only the office which deals with the integrated management of water resources of the watershed of the rivers Cunene, Cubango and Kuvelai, GABHIC. The INRH provides for the creation of the following Regional Directorates: Regional Directorate North (Uíge), Regional Directorate East (City of Luena), and the Regional Centre (Benguela City or city of Huambo).

3.2. Policies to support groundwater management

With the creation of the National Institute for water resources, was initiated the process of normative and institutional development of the water sector in Angola. The purpose of this agency is the planning of water resources at national level, with the aim of implementation of a national water resources policy, to instill a new dynamic in the management of both surface water and the groundwater.

The preliminary draft of the General regulations governing use of water resources which defines the general regime, attaches to this organ the national water resources Plan that includes groundwater. The INARH offers a service as an administration office for river basin, responsible for management. This fits

among other functions, such as the development and implementation of the General Plan of development and use of water resources of the basin. In addition to the Ministries in Water catchment areas, Provincial Governments also have competence in monitoring the implementation of economic programmes and plans of government investment and assignments in the preparation of their reports. Regarding the regulation on water quality, the Presidential Decree No. 261/11, Diário da República, series I no. 193, assigned to the Ministry of the environment the responsibility for coordinating solid guarantee water quality. Among other powers contained in the Organic Statute of the Ministry of the environment, is the coordination of strategies and policies for the protection, preservation, environmental management and preservation and rational use of renewable natural resources.

3.3. Gaps and challenges identified

a) - No policies exist specifically for groundwater. There are only general regulations for water resources in general, law No. 6/02, of 21 June 2002 (water Law), as described in article 2 "the present law applies the inland waters, both surfaces, constituting part of the hydrological cycle.

b) There are no specific policies that highlight biophysical and ecological linkages between groundwater and surface water the law does not specify policies for groundwater protection, under article 110 (Presidential Decree No. 82/14). However, the zones defined refer only to the protection of surface water resources. It is recommended to have a definition of protection zones for groundwater resources.

c) – There is hardly any recognition/uptake of the roles of various actors and water users in the management of groundwater (Government, private sector, research bodies, civil society, etc.)_ This despite the Presidential Decree No. 09/13, of 31 January 2013 establishing the national water Council and the watershed Councils, girded themselves specifically in the General Regulation, which proposes to be led by representatives of different Ministerial Departments, provincial governments, representatives of users or users, Professional and economic organisations and representatives of the community.

d) – Weak or hardly existent cross-sectoral collaboration between the Ministry of energy and water, Ministry of agriculture and forests and the Ministry of natural resources and Oil, which is necessary to promote and facilitate better coordination in groundwater management.

3.4. Enablers required to unlock these gaps/challenges

Table 1: Enablers required to unlock policy gaps and challenges

| Groundwater gap/challenges | Enablers |
|---|--|
| a) - No policies exist specifically for groundwater. There are only general regulations for water resources in general, law No. 6/02, of 21 June 2002 (water Law), as | <ul style="list-style-type: none"> Promote effective groundwater management, contributing to the sustainability and rational use of general water availability; better to concentrate on groundwater as an alternative water source |

| Groundwater gap/challenges | Enablers |
|--|--|
| <p>described in article 2 "the present law applies the inland waters, both surfaces, constituting part of the hydrological cycle.</p> | <p>(conjunctive uses) rather than seek explicit groundwater laws. This promotes integrated WRM</p> <ul style="list-style-type: none"> Integrate set of administrative actions that control the policies on an aquifer system, in order to satisfy water resources policy; |
| <p>b) There are no specific policies that highlight biophysical and ecological linkages between groundwater and surface water the law does not specify policies for groundwater protection, under article 110 (Presidential Decree No. 82/14). However, the zones defined refer only to the protection of surface water resources. It is recommended to have a definition of protection zones for groundwater resources</p> | <ul style="list-style-type: none"> Promote the adoption of public policies specifically aimed at protection of groundwater resources, aiming to integrate from multiple uses of the watershed and reservoir, assuring appropriate balance between the withdrawal of groundwater and aquifer recharge |
| <p>c) – There is hardly any recognition/uptake of the roles of various actors and water users in the management of groundwater (Government, private sector, research bodies, civil society, etc.)_ This despite the Presidential Decree No. 09/13, of 31 January 2013 establishing the national water Council and the watershed Councils, girded themselves specifically in the General Regulation, which proposes to be led by representatives of different Ministerial Departments, provincial governments, representatives of users or users, Professional and economic organisations and representatives of the community.</p> | <ul style="list-style-type: none"> Integrated water resources management requires incentives to promote role playing and a sense of responsibility and accountability among all users and actors especially in the municipalities that depend heavily on groundwater. <p>e.g. municipalities having to report on groundwater status say on a quarterly basis and developing a database for to start record keeping.</p> |
| <p>d) – Weak or hardly existent cross-sectoral collaboration between the Ministry of energy and water, Ministry of agriculture and forests and the Ministry of natural resources and Oil, which is necessary to promote and facilitate better coordination in groundwater management.</p> | <ul style="list-style-type: none"> Enlarge the geological knowledge to support the implementation of an integrated management system between groundwater and the surface water, since currently the management is focused on the component of surface water, the fact that this greater visibility and greater availability of data and studies. It is necessary to undertake detailed studies in order to determine the geological potential of each province; and, identifying their potential cross-border, availability, water quality, vulnerabilities and risks, in order to propose a sustainable use and management of this complex watersheds. |

4. LEGISLATION

4.1. Evolution

The Constitution of the Republic of Angola (2010) is the highest legislative document that reflects on elements of groundwater management. In the Constitution, the following laws are relevant to the water sector in general.

- Law No. 05/98 of 11 June 1998 – law of the environment.
- Law No. 06/02 of 21 June 2002 – Law of waters.
- Law No. 51/04 of 23 July 2004, law on Environmental impact assessment.

In addition, over the years the following instruments have been developed to address key water resources and environmental issues for environmentally sustainable water resources management:

- Decree No. 59/07 of 13 July 2007– environmental licensing.
- Presidential Decree No. 261/11, 06 October 2011 – regulation on water quality.
- Presidential Decree No. 09/13, 31 January 2013 – National Strategic Plan for water (2013-2017).
- Presidential Decree No. 82/14, of 21 April 2014 - General regulations governing use of water resources.
- Presidential Decree No. 83/14, of 22 April 2014 – Regulation of public water supply and wastewater sanitation and
- The National Water Plan-2017-2025;

a) The management of water resources in Angola is based on a set of laws (Acts) including the Law of waters, of 21 June 2002. The Act applies to inland waters (including both surface and groundwater). It contains 80 articles across six chapters including: I) General Provisions; II) General principles of water management; III) general use of water; IV) protection of water; V) Offences and VI) transitional and final provisions. One of the fundamental aspects of this law is enshrined in Article 5 which highlights that natural resources are state property and are part of the public domain. Notably this right is "inalienable and imprescriptible". The political and social scope of this principle is emphasized more in the chapter concerning the "general use of water", in particular with the "classification of uses" (article 22). The principle aims to satisfy household needs, including the basic water needs of individuals and their family members, as well as water for domestic animals and irrigation, provided that they are not for commercial purposes (article 23). Private uses of water may only be granted subject to license or grant (article 24) and are always de-prioritised in favour of common uses, since article 33 emphasizes priority of water for the population, water supply and sanitary needs, over other private purposes. The same article stipulates that conflicts resulting from lack of water to meet different objectives will be weighted on the basis of the "socio-economic profitability and environmental impact of their uses." It is incumbent that the institutions responsible for the management of water resources, establish priorities at the level of the basin. The general management principles constitute a fundamental part of the legal framework

which aims to frame a policy choice in the field of water resources, since it is these principles that will achieve the objectives. The law enshrines the principle of integrated resource management and adopting the river basin as the geographical unit of management of water resources. User participation on the obligation of intersectoral coordination resulted in the expression of a need to ensure the "compatibility of water management policy with the general policy of regional planning and environmental policy" (article 9) and the need to respect obligations resulting from international commitments. These are regarded as fundamental recommendations for the management of water resources.

b) Presidential Decree No. 82/14 of 21 April 2014 approves the General regulations governing use of water resources which include regulating public water supply and wastewater sanitation. Without prejudice to legislation in force, this decree applies to private water supply systems and wastewater sanitation, with respect to the licensing of activity, technical requirements of the respective facilities and their safety, complementarity of systems, the quality of drinking water and wastewater treatment standards and to comply with the standards of public health and environment.

c) The Presidential Decree n° 261/11-on regulation on water quality. This decree assigns to the MINAMB the responsibility for coordinating water quality. Among other powers contained in the Organic Statute of the MINAMB, is the coordination of strategies and policies for the protection, preservation, environmental management and preservation and rational use of renewable natural resources.

d) Presidential Decree No. 9/13 – approval of the National Strategic Program for water (PNEA)

This presidential decree approved the national strategic Program for water (PNEA). The PNEA is a multi-thematic programme, which uses all the existing information collected from various institutions with the relevant elements, namely: Ministry of Territorial Planning and development, Ministry of energy and waters, Ministry of agriculture, Ministry of fisheries, Ministry of industry, Ministry of Petroleum and Mineral Resources, through the Geological Institute of Angola, Ministry of environment and the COBA (an engineering consulting company). The process is reliant on knowledge generated by this company (COBA) from numerous studies and has been preparing these studies/reports for Angola, for more than 30 years, in the field of water. Among relevant documents prepared by COBA are, the national irrigation plan of Angola-PLANIRRIGA, master plans for water supply and sanitation in many province capitals and smaller localities, and Hydroelectric potential assessment studies for several river basins.

4.2. Legislation to support groundwater management

At national level there is no specific legal framework that addresses groundwater management explicitly. However, the general law 06/02 of 21 June 2002 makes some reference to groundwater resources, in certain sections and articles, although a few points are not clear. Sections and articles that apply to groundwater in particular are as follows:

SECTION II inventory of resources, water balance and registration, article 11 (General Inventory and water balance) specifies the following:

1. The supervisory body is responsible for the General inventory of water resources in quantity and quality aspects and their periodic update, in order to support planning and integrated management.
2. The water balance provides the balance between surface and underground water resources, including currently available and potential resources, and their present and future demand.
3. Rules and techniques of conducting the inventories and balance of water resources are set out in the regulation itself.

SECTION III coordination and institutional organization, Article 14. (Institutional unit) specifies the following:

1. The main unit upon which rests the management of water resources is the water catchment area.
2. The institution responsible for the management of water resources of the basin has its powers set out in government regulation, Article 26 (Use the right to exploit the Earth), which sets out the following in points 1. (a), (b) and (c) below:

1. The holders of the right to the use and exploitation of the Earth, in order to meet their household needs and the normal and foreseeable needs of agriculture, can, without licensing and free of charge, in accordance with the regulation, use:

- a) The waters of lakes, ponds and marshes inside of their plot, except for cases in which by their size or importance, require use or license granting access;
- b) The waters of the springs, running freely, that no crossing the boundaries of its plot or cast on a chain;
- c) Groundwater not included in protected areas, provided they do not disturb their regime, nor the possibility to their quality.

SECTION II Uses subject to licence or concession, article 41 (Subject) states:

1. The private use of water depends on the licensing when such use does not significantly alter the quality of the water and the environmental balance, in accordance with the procedure established in regulation.
2. Also depends on the licensing:
 - a) The prospecting, extraction and use of groundwater, except as provided in subparagraph (c) of article 26. of this law.

Article 26. (Use the right to exploit the Earth)

1. The holders of the right to the use and exploitation of the earth, in order to meet their household needs and the normal and foreseeable needs of agriculture, can, without licensing and free of charge, in accordance with the regulation, use:

- a) The waters of lakes, ponds and swamps, existing within its site, except in the cases in which, by their size or importance, such use or license granting access;
 - b) The waters of springs, running freely, that no crossing the boundaries of its plot or cast on a chain;
 - c) Groundwater not included in protected areas, provided they do not disturb their regime, nor their quality; and
 - d) Rainwater.
2. The uses referred to in the preceding paragraph may not affect pre-existing common uses, when traditionally established, or the rights of any third party.

SECTION III, article 64 (search, capture and use), sets:

1. The research, collection and use of groundwater, wants to sprout naturally or not, shall be subject to the general regime for use of the waters set out in this law.
2. The technical requirements to meet the research, collection and use are fixed by government regulation.
3. The preceding paragraph of this article shall not apply to common uses regulated in article 22. ⁹ When carried out outside the urban perimeters or in urban areas that don't have public water distribution network, or the supply is inadequate.
4. The exception provided for in paragraph 1 is drawn up on the basis of the estimated potential of groundwater or of their importance.

Article 65 (restrictions on the use of underground water)

Under this article, the use of groundwater is guided by the following conditions:

- a) The maintenance, in aquifers, balancing between the renewal of the freshwater and extractions, to ensure a continuous use under the same physical, chemical and biological conditions ;
- b) Optimization of aquifers being used sustainably, while extracting only the maximum benefit possible;
- c) The creation of water protection zones for booking and maintenance of aquifers;
- d) The integrated management of surface and groundwater.

CHAPTER IV protection of water, Common Provisions section I, article 66 (protection) provides for the protection of public domain waters against pollution and aims to:

- a) Achieve and maintain an adequate level of water quality;
- b) Prevent the accumulation of toxic or dangerous compounds capable of polluting groundwater;
- c) Avoid anything that might cause degradation of the water table.

Article 67 (Prohibited Activities): In general, the following activities shall be prohibited:

- a) Carry out evictions directly or indirectly beyond the ability to debug auto bodies of water;
 - b) Accumulating solid waste, waste or any substance in sites and conditions that contaminate or create a risk of contamination of water;
 - c) Engage in any activities that involve or may involve a risk of pollution or degradation of the public water domain;
 - d) Any amendment to the scheme, quality and use of water, which can jeopardise public health, natural resources, and the environment in general or the security and national sovereignty.
- Article 68° (prevention and control) provides for financial considerations necessary for the fulfilment of the obligations laid down in the respective concession contracts and or license.

4.3. Gaps and challenges identified

- a) - Although there is some sections and specific articles for groundwater, still, some points are not clear. Section 1 common provisions, article 66 (protection). Article 110 (Presidential Decree 82/14), define zones of protection of water resources however; the areas defined refer only to surface water resources.
- b) -There is no specific legal framework that addresses explicitly the use, management and protection of groundwater, and that provides tools needed for the State to regulate, manage, control, protect and develop the groundwater resources in together with surface water resources,
- c) - On the regulation of the quality of groundwater, the Presidential Decree No. 261/11 Adopted water quality standards in General. However, as regards the definition of water quality goals for different underground sources, the above-mentioned Presidential Decree, is missing does not define the legislation is silent.
- d) -It is not clear in the legislation the relationship the classification of storage quantity nor the quality of surface water chemistry and their interaction with groundwater.

Article 66 provides that the protection of the public domain waters against pollution aims to:

- Achieve and maintain an adequate level of water quality;
- Prevent the accumulation of toxic or dangerous compounds capable of pollute groundwater;
- Avoid anything that might cause degradation of groundwater

e) The legislation does not specify the need for drought monitoring systems that extend beyond the precipitation, surface water and food security to the State of the groundwater supply, including the appropriate forecast hydrogeological conditions-future.

f) The legislation does not include clear mechanisms to promote compliance of groundwater, there are no uniform rules, administrative procedures and technical specifications for the preparation of contracts execution of holes, there are no regulations requiring hiring companies or supervisory teams

j) Although a complex set of agreements regulate the transboundary river basins in southern Africa, there is a gap in relation to treaties and agreements about the groundwater, which may be a potential cause of future conflicts.

k) water law, is characterized by a large scope that extends to the entire hydrological cycle, including surface and ground waters, which advocates and encourages intersectoral articulation, the main watershed planning and management unit, which clarifies the public ownership of all waters, while recognizing and prioritizing the common uses, in particular associated with traditional practices, which endows the State of essential tools for planning and management of water resources, including the national plan and the plans of the basin, the granting of licences and concessions and financial arrangements based on taxes and tariffs, calling for the participation of communities and stakeholders to listening and that assumes the international commitments resulting from the sharing of cross-border basins (art. 76). However, this law refers to a very high number of diplomas to regulate, while they are not in force do not allow your full implementation and consequent final evaluation of their potential and limitations.

Table 2: Frames 1-articles of the law of waters that lack of regulation (PNA, 2017)

| Article and paragraph | Subject | Form of regulation |
|------------------------|---|-------------------------------------|
| Art. 8, no. 1 | Spills and drainage of waters | Regulation |
| Art. 11, n.º 3 | General inventory and water balance | Government Regulation |
| Art. 12º n.º 6 | Records | Government Regulation |
| Art. 14º, n.º 2 | Institutional management unit | Government Regulation |
| Art. 16º, n.º 3 | Institutional consultation | Government Regulation |
| Art. 18º, n.º 2 | National Fund of water resources | Government Regulation |
| Art. 25º, n.º 7 | Conditions and purposes allowed in private use | Government Regulation |
| Art. 26º, n.º 3 | Use the right to exploit the Earth | Regulation |
| Art. 29º, n.º 3 | Calamities | Government Regulation |
| Art. 31º, n.º 2 | Easements | Regulation |
| Art. 32º, s/n.º | Rainwater drainage and residual liquid sanitation | Regulation |
| Art. 34º, s/n.º | Methodology and applications procedures | Ministerial diploma of guardianship |
| Art. 42º, s/n.º | Assignment of license | Regulation |
| Art. 62º, s/n.º | Training fees | Government Regulation |
| Art. 63º, n.º 3 | Rates | Own degree |
| Art. 64º, n.º 2 | Research, collection and use | Government Regulation |
| Art. 68º, n.º 2 | Disease prevention and control | Regulation |

| Article and paragraph | Subject | Form of regulation |
|------------------------|-----------------|--------------------|
| Art. 71º, n.º 1 | Protection zone | Regulate diploma |
| Art. 73º, n.º 2 | Sanctions | Regulation |

General regulations governing use of water resources were recently presented as a proposal. This general regulation makes many legal provisions contained in the law of waters, following precisely the broad guidelines set out in this law. The General provisions are presented in more detail containing content and requirements of the general plans of the development and use of water resources within various river basins and the national water resources plan. This legislation (art. 2) is shallow with regards to the purpose of all the waters that are underground. The scope is also thematic in nature with regard to water resources plans, since they (devem Art. 6º, alínea a) are "based on a joint approach and linked the technical aspects, cultural, institutional and environmental use of water resources". In subparagraph (d)) of the same article is the obligation to involve all stakeholders in the management and use of water resources. This involvement and participation is the responsibility of the National Councils of water and Watersheds.

The intersectoral nature of the plans referred to in subparagraph (e)) of the same article stipulates that the plans must be read in conjunction with the planning of the sectors of use. With the planning is the provision for creating (Art. 10th) of the National Council for water and watershed councils. This reaffirms the watershed as the basic unit of management (article 12, paragraph 1) and the establishment of river basin Administration offices (article 12, paragraph 2).

Title II, on general use of water resources, contains quite detailed policies and procedures for the assignment of use of water resources, including permits and concessions. It specifies what uses of water are not subject to title, namely "common uses", "uses arising from the right of use of land", "navigation, floating, recreation and sports", "fishing" and "communal and aquaculture research ". The subject uses the title are "water", "rejection of effluents", extraction of inert "and" economic "aquaculture.

The title III, on Economic and financial Regime of general use of water resources, sets out fairly detailed way to determine the rates and tariffs for the use of hydraulic infrastructure and water, respectively. This considers water rates and wastewater. There are various methods for the calculation of the tariff values and way of charging. Title IV deals with Eviction, Expropriation and servitude, while title V deals with the discipline, including supervision and misdemeanors and, finally, title VI transitional and final provisions.

Within these titles, two aspects deserve special mention. Firstly, Art. No. 117 stipulates that "the activities of planning and management of watersheds that do not have administration offices corresponding watersheds are ensured, on a transitional basis, by provincial governments, through the respective agencies with jurisdiction over waters, observing, to this end, the standards, guidelines and recommendations of a general nature or from specific national water resources Institute.

4.4. Enablers required to unlock these gaps/challenges

Table 3: Enablers required to unlock these gaps and challenges

| Groundwater gap/challenges | Enablers |
|--|--|
| a) - Although there is some sections and specific articles for groundwater, still, some points are not clear. | <ul style="list-style-type: none"> • Development of groundwater specific implementable plans/actions in alignment with already existing general water laws that can easily be interpreted with respect to groundwater |
| b) -There is no specific legal framework that addresses explicitly the use, management and protection of groundwater, and that provides tools needed for the State to regulate, manage, control, protect and develop the groundwater resources in together with surface water resources, | <ul style="list-style-type: none"> • Development of Normative and regulatory tools and instruments for planning, managing and regulating groundwater source use/exploitation. |
| c) - On the regulation of the quality of groundwater, the Presidential Decree No. 261/11 Adopted water quality standards in General. However, as regards the definition of water quality goals for different underground sources, the above-mentioned Presidential Decree, is not specific on groundwater quality. | <ul style="list-style-type: none"> • Improve water quality regulations to include aspects unique to the sustainable maintenance of good groundwater quality • Establishment of regulations and standards requiring the certification of companies, based on technical criteria for setting; and standardization, administrative procedures and technical specifications for implementing contracts and supervision of holes. |
| d) -It is not clear in legislation the relationship between the classification of storage quantity and the quality of surface water chemistry and the interaction with groundwater. | <ul style="list-style-type: none"> • Create a body responsible for hydrogeological data storage of projects implemented, with up-to-date records and information freely available and used in the preparation of subsequent studies specifications |
| e) The legislation does not specify the need for drought monitoring systems that extend beyond the precipitation, surface water and food security to the State of the groundwater supply, including the appropriate forecast hydrogeological conditions-future. | <ul style="list-style-type: none"> • Develop Set national guidelines for monitoring of groundwater for future integration of monitoring networks and information systems. These guidelines are important in order to reconcile and normalize the common procedures among the provinces, in order to build the foundations for the definition of the network design in river basins, hydrogeological or local, according to their specificities. |
| f) The legislation does not include clear mechanisms to promote compliance of groundwater, there are no uniform rules, administrative procedures and technical specifications for the preparation of contracts execution of holes, there are no regulations requiring hiring companies or | <ul style="list-style-type: none"> • Create regulations that require the hiring of companies or teams of supervision during the construction. Because surveillance is essential to ensure that the contractor obey specifications and the quality of construction, as well as all the necessary information. |

| Groundwater gap/challenges | Enablers |
|--|---|
| <p>supervisory teams</p> <p>g) Although a complex set of agreements regulate the transboundary river basins in southern Africa, there is a gap in relation to treaties and agreements about the groundwater, which may be a potential cause of future conflicts.</p> | <ul style="list-style-type: none"> • Create joint regulations of international agreements and treaties on groundwater with the same degree of sophistication with surface waters, which could avoid a potential cause of future conflicts. |

5. STRATEGY AND GUIDELINES

5.1. Evolution

In view of the definitions of PNA, generating an adequate response to the problems and possibilities that were carried out, the water balance between availability and water requirements is based on the values of the current needs to be met and projected /future needs for 2017 and assessment of (current and projected) water availability. This assessment is performed by hydrographic unit, to obtain a spatial vision of critical situations of existing or planned water shortage for the country. In general, groundwater resources are retained in this study as a strategic reserve for use in exceptional situations of drought, which may be primarily used in water supply to rural population and sporadically, in some regions, to meet the needs of small irrigation schemes.

The underlying assumptions for simulating the current and future water balance are sufficiently conservative and therefore ensure greater robustness in the face of uncertainty factors that are always associated with the estimates related to the quantification of water resources, whether surface or underground. Little is known regarding water quality in the country, in the absence of a national network of water quality.

Regulatory and institutional aspects of water resources management.

With the approval of the law of 2002 and with the creation of the National Institute for water resources, was the introduction of the process of normative and institutional development of Angola. These first two instruments were just the start of a long way go to create conditions in Angola for the better management of water resources in general including groundwater. In addition to a wide range of legislative documents missing in various aspects of management of water resources, which must be formulated and approved, institutional aspects are especially highlighted in the management of water resources in general. In the units in the Southwest and Kuvelai, where surface water resources are very scarce and should be allocated as a priority to the supply of water to people and livestock, the groundwater resources could assume greater importance in these units in particular populations, for livestock supply and irrigation.

5.2. Strategies and guidelines to support groundwater management

The National Strategic Program for water (PNA) presents a structure outlined to provide a practical tool for careful analysis and Integrated Water industry in Angola, which is inherently general, and comprehensive in nature, in order to ensure the necessary adaptability to the specific characteristics of the various regions of the country. The PNA, is especially focused on groundwater with the following strategies;

- a) Characterization of groundwater resources in quantity and quality, the national and regional level.

- b) - Realization of the water balance of the availability and uses of water;
- c) - Identification and characterization, spatially and temporally, of the major problems, such as floods, droughts, erosion, etc., as well as current and potential conflicts of use of water;
- d) - Identification of measures and actions;
- e) - Definition of a physical and financial program.

In this document are the diagnosis of the current situation of water resources, are balanced socio-economic development scenarios and their relationship with the water resources in the context of the application are set out objectives, measures PNA and proposal for a physical and financial programming for a temporary 20-year horizon, framed by a set of action programmes in the field of construction of infrastructure (sanitation and irrigation) and the implementation of actions necessary to compliance with environmental objectives. The implementation of the programmes of action represents an investment Estimated (2015-2040): 110 000 Million USD (MINEA).

PNA programming was based on investments in the following components: Direct investment in infrastructure (including studies, projects, supervision and technical assistance) in the following sub-sectors: water supply and sanitation, livestock, irrigation and other; Strengthening of knowledge (planning studies, research and development ...); Strengthening and modernization of the Institutional, Legal and Regulatory Framework of the Sector of water, creating economic and financial mechanisms to support investment in the water sector. Gaps and challenges identified

- a) The national strategic plan (PNA) has a maximum duration of 15 years and General plans of development and use of water resources (PGDURH) has a maximum duration of 10 years. The PNEA does not determine the period from which the review before the expiry of the plans.
- b) There are no mechanisms for strong connection between user sectors and provincial governments and in General to all stakeholders (stakeholders and affected)
- c) Within the framework of the National Strategic Plan for water (PNA), no assessment of underground resources considering the problem of global climate change since the same will have a key role to suppress the needs of populations. Mainly in southern Angola.
- d) The (PNA) doesn't make an analysis or sets policies, proactive actions, and insightful accompanying the rapid growth of the areas and the impacts on groundwater resources.
- e) The regulation on the quality of water, approved by Presidential Decree No. 261/11, establishes standards, the Regulation is incomplete and outdated water quality in the water is a little known in the country, not there is a national network of water quality.

5.3. Gaps and challenges identified

- a) Need for stronger liaison mechanisms between the users and the provincial governments and in General to all stakeholders
- b) Need for sustainability strategy in terms of integrated water resources management
- c) Limited hydrogeological knowledge on inter-provincial and cross-border aquifers,
- d) Poor Monitoring of groundwater which heightens/promotes unregulated groundwater pollution through unmonitored/unregulated activities.

5.4. Enablers required to unlock these gaps/challenges

- a) Create strong liaison mechanisms between the users and the provincial governments and in General to all stakeholders (stakeholders and affected
- b) Ensure sustainability required an integrated water resources management
- c) Expand and consolidate the hydrogeological knowledge on inter-provincial and cross-border aquifers, identifying their potential, availability, water quality, vulnerabilities and risks, in order to propose the planning, the management and sustainable use.
- d) Create mechanisms for qualitative and quantitative Monitoring of groundwater is one of the most important instruments to support strategies, preventive actions and policies of use, protection and conservation of the resource underground water.

Table 4: Enablers required to unlock these gaps/challenges

| Groundwater gap/challenges | Enablers |
|--|---|
| a) Need for stronger liaison mechanisms between the users and the provincial governments and in General to all stakeholders | a) Create strong liaison mechanisms between the users and the provincial governments and in General to all stakeholders (stakeholders and affected |
| b) Need for sustainability strategy in terms of integrated water resources management | b) Ensure sustainability required an integrated water resources management |
| c) Limited hydrogeological knowledge on inter-provincial and cross-border aquifers, | c) Expand and consolidate the hydrogeological knowledge on inter-provincial and cross-border aquifers, identifying their potential, availability, water quality, vulnerabilities and risks, in order to propose the planning, the management and sustainable use. |
| d) Poor Monitoring of groundwater which heightens/promotes unregulated groundwater pollution through | d) Create mechanisms for qualitative and quantitative Monitoring of groundwater is one of the most important instruments to support strategies, preventive |



| Groundwater gap/challenges | Enablers |
|---|--|
| unmonitored/unregulated activities | actions and policies of use, protection and conservation of the resource underground water |

6. INSTITUTIONAL FRAMEWORK

6.1. Evolution

The institutional development of the water sector, in Angola, is based on the legal framework and the policy instruments adopted, based on the following institutional matrix:

- Consultation bodies, including the National Water Council and the Councils Regional Watersheds;
- Direct central administration Organ of the State of the Water Conservancy Ministry of energy and water; among the various tasks of this Ministry which are relevant for the water sector, enshrined in Article 2 are:
 - a) propose and promote the implementation of the policy pursued by the energy sector and water;
 - b) strategies, promote and coordinate the exploitation and the rational use of energy and water resources, ensuring sustainable development;
 - c) draw up, within the framework of the general planning of economic and social development of the country, sectoral plans related to their areas of activity;
 - d) Propose and promote the national policy of electrification, the general use of your water resources protection and conservation, as well as the policy of water supply and wastewater sanitation.
 - e) Propose the institutional model for the implementation of the activities of collection, adduction, transmission, distribution and commercialization of drinking water, in the areas of water and wastewater sanitation and promote your implementation;
 - f) Define, promote and ensure the quality of public service in your area;
 - g) License, supervise and inspect dams and water supply systems and sanitation;
 - h) Collaborate with the Local Government bodies of the State in the elaboration and implementation of programs of electrification, water supply and support for rural development, urban and peri-urban areas; more general public policy of water resources has positive virtues.
 - Indirect State administration bodies, including the National Institute of water resources and river basin management;
 - Sectoral technical committees of International river basins;
 - Organ of economic regulation in the field of water services (Governor);
 - Public water and sanitation Companies.

In accordance with the principles laid down in the law, the institutional context consists of the following structure:

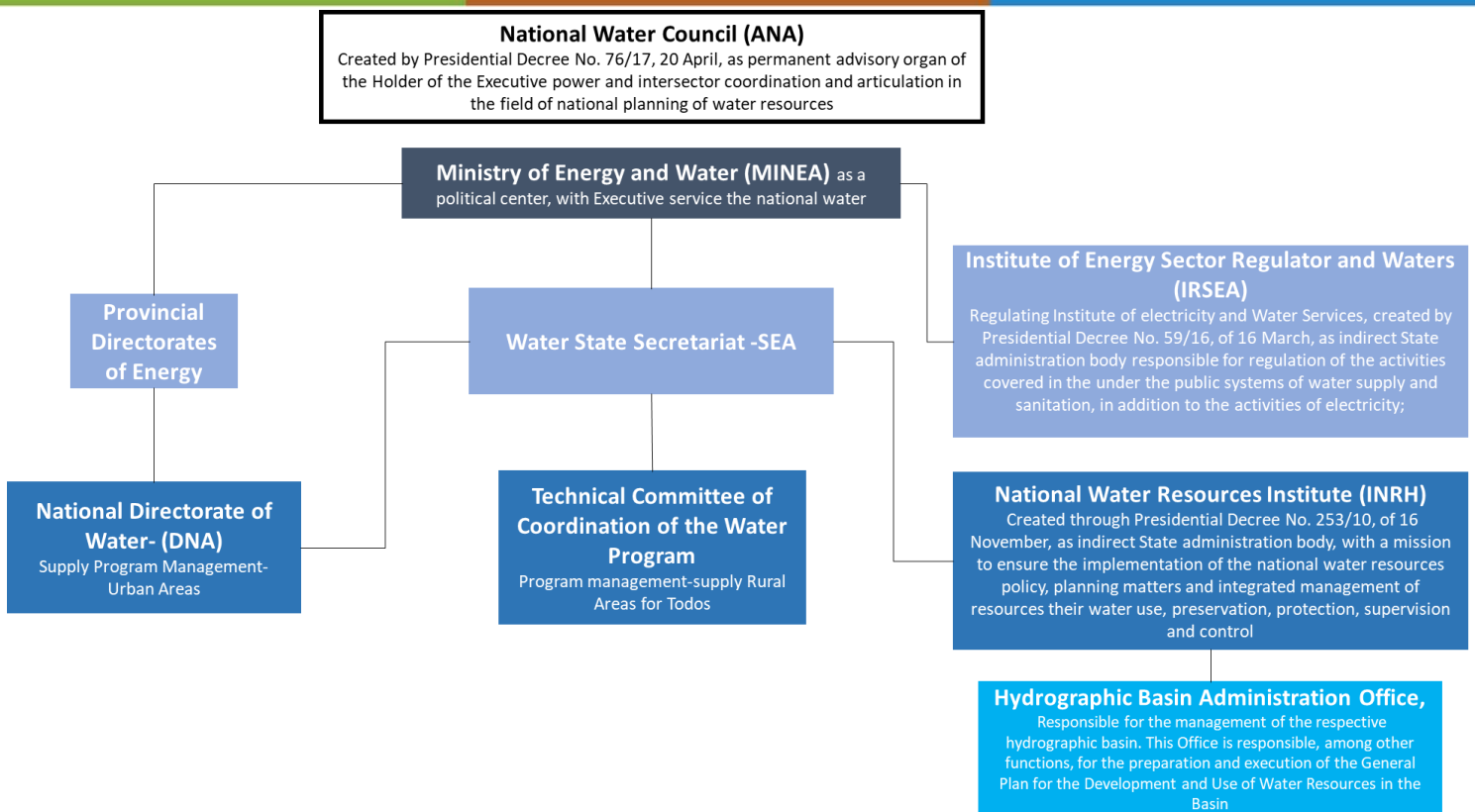


Figure 1: General institutional framework of the water sector in Angola

6.2. Institutional arrangements to support groundwater management

According to the legal and institutional framework of Angola, the Ministry of energy and water (MINEA) assumes the responsibility of the management of water resources.

The general policy assigns the management and development of water resources, as well as the skills development to state institutions.

The institutional organization around water resources management involves the participation of various institutions which include; ministries responsible for major uses of water such as supply of stocks; industrial supply; sanitation; energy; and irrigation.

The Ministry of environment (MINAMB) is characterised by very transversal skills and water is an environmental component. As a result, the mission of this Ministry is to lead, run and control the Executive policy relating to the environment in perspective of protection, preservation and conservation of environmental quality, pollution control, conservation and enhancement of the natural heritage, as well as the preservation and rational use of natural resources. Water resources are not mentioned explicitly, but only implicitly as a natural resource.

The relevance of the Ministry of agriculture and forestry (MINAGRI) on water resources- It is clear that agriculture is the biggest user of water resources. The unit of this Ministry that relates most closely with water management, is the National Directorate of Rural Engineering. This unit is responsible for the following assignments:

- a) develop and promote programmes, studies and projects related to the agricultural exploitation and rural engineering;
- b) accompany the management, maintenance and operation of infrastructure, agricultural facilities, as well as the facilities and equipment of surface and ground water within the Sector;
- c) to study and promote the use of low-cost intermediate technologies; and
- d) Control, check and approve the use of hydraulic equipment and agricultural mechanization.

The Ministry of natural resources and oil has relevance on groundwater resources. The Ministry keeps geological records on formations and the phreatic aquifer. But nothing in the organic law of this Ministry assumes/considers the management of groundwater resources. It should be noted that these considerations are based just on theory/reading.

Currently in Angola, there are several bodies that operate in the field of groundwater, but in practice do not have effective coordination between them. The major players in the sector and their interlinkages are represented in the schematic institutional structure below:

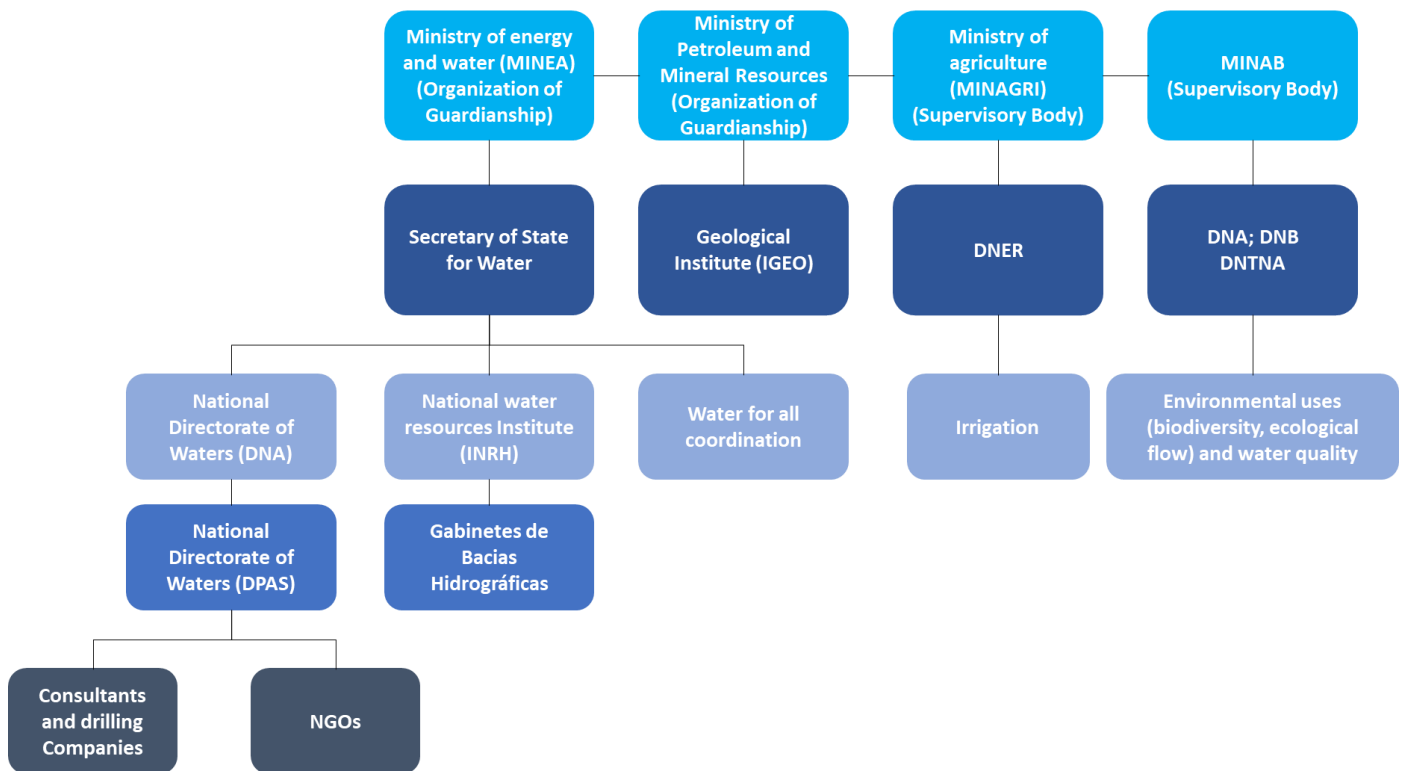


Figure 2: Different bodies involved in the groundwater sector in Angola¹

¹ MINEA - Ministry of energy and water. MINADERP - Ministry of agriculture and Rural Development. MINAMB - Ministry of environment. INRH - National Water Resources Institute. DNA - Directed national of water. DNER Site - Direction National agricultural and Rural Engineering Hydraulic. DNA - Directed Environmental National. DNB - National Directorate of Biodiversity DNTNA - National Directorate of Environmental Technologies and Regulate Matters.

6.3. Gaps and challenges identified

The institutional framework connected directly to the Ministry of energy and water sector, comprises two subsectors, namely:

- i. The Sub-sector of water supply and sanitation (**DNA**)
- ii. The Subsector connected to planning of water resources, including surface and ground waters (**INRH**)

(i) National Directorate of Waters (DNA)

This is an organ of the direct administration of the Angolan State, which deals with issues related to the policies and strategies of the Sector of water supply and sanitation on the urban cycle, inside the structure has an area for groundwater, in Currently, though, from the point of view of specialized technique, the Department has only one hydrogeologist.

For a few years, this Department has benefited from technical assistance of Cuban advisers, but, due to financial crisis, cooperative relations have been disrupted. In their structure, DNA has the in (Groundwater) – a company formally legalized, but that has equipment donated by Japanese cooperation and sounders operating for more than 20 years in the drilling sector. Among the information requested include the following limitations: there is a pre-defined service relationship between the DNA and the DPEA's Provincial Directorate of water and sanitation), in practice, the technical assistance occurs often in time the DNA projects implementation at provincial level, the provinces do not have technical autonomy, procedures have fewer specialists to the sector.

There is no database of drilling companies, nor a regulation requiring the certification of it. There is no definition and standardization of procedures for the execution of holes in most part of the contracts is not preceded by studies of Hydrogeology or geophysics. There is no practice of conserving samples resulting from drilling, for lack of a mandatory regulation, conditions and appropriate structures for conservation, as well as an institution linked to the water sector, with records up to date and information available.

(ii) National water resources Institute (INRH)

Represents an indirect State administration body, attached to the Ministry of energy and water; does the planning and management of water resources, in General, including groundwater as part of the public domain. However, for the groundwater Sector, has a Department of registration, licensing, water quality and environment constituted, from a technical point of view, by a few skilled technicians. In General, the INRH works with a team under 20% of its overall human resources needs.

Among the information requested during the interview, the following limitations:

- a) The INRH) does not have a database of existing holes, or the drilling companies register;
- b) The INRH) is taking ongoing registration of existing borrowings from the country, with the purpose of license;

c) The Presidential Decree 82/14, of 21 April, provides for, among other things, the establishment and functioning of the economic and financial Regime (REF) water resources (the REF involves the recording and the monitoring of uses), which summarizes a work that is developed by the Department of registration of the INRH, which, due to the lack of human resources, cannot respond to supervision of large number of underground water catchment in the country. The main difficulties of the sector are the lack of human resources for research and exploration of groundwater; the weak intersectoral coordination (energy and water/Ministry of natural resources, through the Geological Institute of Angola (IGEO).

d) Version of MINEA in 2014, there is a "direct Executive service", the DNA, which deals with both water resources and water supply and sanitation and another body under the same auspices, the INRH, which is of indirect State administration, but that if occupies only of water resources.

Paradoxically, the DNA assumes a leading role in the formulation of policies and the INRH arises fundamentally in terms of implementation of such policies, there some organized in this formulation, which is likely to create situations of blocking or conflict. In addition, the junction in DNA of assignments aimed at "cross" management of water for various purposes with assignments aimed at a specific use (supply and sanitation) does not seem prudent and resembles the join in the same organism functions of regulator and regulated entity. Indeed, the management of water resources, in your cross-strand all uses, has strong analogies with a regulatory function to the extent that you must resolve conflicts between uses and ensure your integration, while the supply and sanitation.

(iii) Coordination of the program "water for all"

The program "water for all" was a Government initiative, whose implementation began in 2007. This program had as its principal objective to ensure access to clean water in adequate conditions to at least 80% of the rural population of Angola, coordinated by a technical Committee, the schedule for implementation was five years old, but after eleven years, the Committee still lies in the exercise of its functions and failed to achieve the goals envisaged. Among the information requested during the interview, the following limitations:

Most of the projects of the program "water for all" were coordinated and carried out by provincial and municipal Governments; during execution there was no local teams training for service and maintenance of the systems; hydrogeological studies were carried out in not more than 3000 holes run; was not performed an inventory of data holes (available and easy to access); on most of the holes run did not exist any kind of supervision.

The DNA, which is responsible for water supply for rural populations, it has not been integrated during the elaboration phase, nor during the implementation phase. There is no technical information of more than 3000 holes (lithological description, database of fully georeferenced holes).

(iv) **Office for River Basin Management, Sectoral technical committees of International river basins,** are indirect State administration body, with a mission to ensure the management and integrated water resources management of river basins, in this context due to the easy availability of surface water the underground waters are not in General, developed significantly and integrated into water resource management by these organs, currently the management is focused on the component surface water relegating groundwater to a second plan.

(v) Institution of higher education (Academy)

- a) With objective to evaluate the process of integration of the academic community, the courses linked to the water sector, we conducted a survey to 20 students and submitted to the questionnaire a faculty expert in Hydrogeology at the Agostinho Neto University, for over 20 years existing, where are Given the discipline of Hydrogeology and water resources management, respectively on the fourth and fifth years in the Department of geology of the requested information during the interview, the following limitations:
- b) Non-existence of training protocols with public or private institutions that operate in the field of groundwater.
- c) The non-involvement of students as trainees in the various projects implemented by the Government.
- d) The lack of funding to carry out the field lessons, equipment and specific laboratories for the development and practical studies of topics related to groundwater.

6.4. Enablers required to unlock these gaps/challenges

Table 5: Enablers to address institutional gaps and challenges

| Groundwater gap/challenges | Enablers |
|---|---|
| Lack of consolidation between institutions | <ul style="list-style-type: none"> ▪ Consolidation of a network of institutions dedicated to integrated management of surface and underground water resources with projects related to the protection of groundwater quantity and quality. |
| Poor distribution and sharing of information | <ul style="list-style-type: none"> ▪ It is necessary to produce didactic materials and make them widely publicized and distributed as well as offering formative nature courses for those professionals and informative to the general public on education in groundwater. |
| Limited power of the State | <ul style="list-style-type: none"> ▪ The supervisory power of the State is limited and only a broad awareness of the population expected to produce the effects necessary for the conservation of groundwater resources, in |

| Groundwater gap/challenges | Enablers |
|--|---|
| | <p>this sense, the link of the universities should be strengthened.</p> |
| <p>Lack of clarity regarding borehole drilling and maintenance</p> | <ul style="list-style-type: none"> ▪ A project to encourage settlement of boreholes, should be a top priority, is to build a site user to user support of boreholes, operating as a public information service, and contemplating: guidance for drilling and regularization; typical project well; location of future well regarding existing boreholes (and present the award) |
| <p>The current national water plan is not well implemented</p> | <ul style="list-style-type: none"> ▪ The implementation of the recommendations of the national water Plan is necessary in order to make the definition of borders and competences between the National Water Board (DNA), the national water resources Institute (INRH) and the provincial directorates of Waters (DPEA) |
| <p>Lack of relevant education and training in the groundwater industry</p> | <p>It is necessary the qualification and training of cadres for the groundwater industry</p> |
| <p>Absence of effective water planning to cater for the different needs</p> | <ul style="list-style-type: none"> • With the increasing needs of water, not only due to agricultural growth, industrial, irrigation and livestock, but also due to new living standards of urban and rural populations, we need to think proactively in the utilization of water resources underground, whether domestic or cross-border. To this end, it is necessary to go for a water planning seriously for the benefit of the populations. |
| <p>Lack of meaningful stakeholder engagements</p> | <ul style="list-style-type: none"> ▪ Consolidation of active participation of the water resources civil organizations in the decision-making process. These organizations may provide the following groups: (i) inter-municipal consortia, (ii) river basin associations, (iii) regional, local or sectoral associations of water users, (iv) organizations, academic and |

| Groundwater gap/challenges | Enablers |
|---|--|
| | <p>research techniques, (v) non-governmental organizations (NGOs).</p> |
| <p>Weak cross-sectoral collaboration</p> | <ul style="list-style-type: none"> ▪ Strengthen cross-sectoral collaboration between the Ministry of energy and water, Ministry of agriculture and forestry, Ministry of natural resources and Petroleum and the Ministry of the environment. |

7. CHALLENGES TO IMPLEMENTATION

POLICIES

- Sectoral fragmentation of various tasks related to groundwater policy formulation, your management and use.
- Produce and disseminate basic information about groundwater.
- Map the underground water resources, cross-border and National rank in terms of hydrogeological characteristics and future requirements
- Promote policies of drawing up plans of development of groundwater resources directed by the Ministry of energy and water, through the national water resources Institute.
- Promote research and development
- Integrated management of surface and underground water resources

LEGISLATURE

- Total water law regulations
- Improve the legal and regulatory Framework of groundwater
- Framing the national water Program (NAP), in physical and financial programming of government forms to establish real and concrete deadlines and implementation of measures and actions envisaged, taking into account the Executive nature of short, medium and long term of the respective program.
- Revision of the legal framework accompanied by reforms in institutional management and administration model of underground water, adapting to new requirements.
- Regulate the use and management of underground water resources for different purposes.
- Encourage drilling practices as well as the legalization of boreholes

INSTITUTIONAL

- Intentional information asymmetries between the different protagonists that are relevant to the formulation of policies of underground water, for your management and use.
- The lack of motivation and the political will to get involved in the groundwater industry organization.
- Territorial differences between hydrographic and administrative borders that can lead to a decoupling between availability and sources of supply.
- Insufficient scientific, technical training, infrastructural and of the various protagonists to formulate and implement policies on groundwater.
- Unstable or insufficient financial deposits which hamper effective implementation of responsibilities particularly the sub-sector of groundwater level
- Difficulty in ensuring the transparency of the proceedings before the various users, often as a result of lack of commitment, concern, awareness and participation of those users.
- Limited interaction research/academia with groundwater practice.

- Limited institutional capacity / Clarify and operationalize effectively and efficiently the institutional framework for the management of groundwater resources.
- Implement an integrated management model taking into account not only the water catchment area but also the hydrogeological basin, whereas the aquifer
- Definition of boundaries between the national water Board (DNA), national water resources Institute (INRH), provincial directorates of the waters (DPEA) and the Geological Institute (IGEO).
- Spread knowledge about groundwater addressed to representatives of different Ministerial Departments, provincial governments, representatives of professional and economic organisations, users and representatives of the community.
- Update periodically the information sector, through Biophysics and articulation between various entities responsible (INRH, DNA, MINEA, MINAGRI, etc).

8. ACTION PLAN

The MoSCoW method of prioritisation has been used to develop the action plan. This method identifies the *Must have*, *Should have*, *Could have*, and *Won't have* elements for the Groundwater Management Regulatory Framework.

Table 6: Action Plan _ 'Must Haves'

| Prioritisation | Element | Description |
|--|---------------|--|
| Must have: <i>those elements of the regulatory framework that are critical</i> | Policy | <ul style="list-style-type: none"> Consistently coordinate the policies of GW with other areas ▪ Recognition of groundwater as strategic resource ▪ Awareness campaigns: Dissemination of technical information on groundwater through workshops, publishing reports, briefing book on the internet and in mass media etc. ▪ Inventory recovery program on abstraction of groundwater in the country through public policies especially focused on protection of groundwater resources. ▪ Expand the geological knowledge to support the implementation of an integrated management system between groundwater and the surface water |
| | Legislative | <ul style="list-style-type: none"> ▪ Approve specific regulations for the groundwater subsector ▪ Create regulations and standards requiring the certification of companies which act in the groundwater sector, based on technical criteria ▪ Standardize administrative procedures and technical specifications for implementing contracts and supervision of holes ▪ Raise awareness and encourage users of groundwater resource for the legalization of the boreholes. ▪ Set national guidelines for monitoring of groundwater for future integration of monitoring networks and information systems. ▪ Create joint regulations of international agreements and treaties on groundwaters with the same degree of sophistication with surface water. |
| | Institutional | <ul style="list-style-type: none"> ▪ Implement an institutional framework with a clear assignment of responsibilities ▪ Separate clearly GW management the management of user sectors ▪ Give the necessary attention to financial sustainability and the role of fees ▪ Involve all stakeholders in the decision-making ▪ Develop the training to all levels of Government and users ▪ Check out institutional stability to the management model of groundwater resources ▪ Improving integrity and transparency ▪ Adopt mechanisms for the definition and promotion of regional and cross-border aquifers management; |

| | | |
|--|---------------------|---|
| | | <ul style="list-style-type: none"> ▪ Discussion, strengthening of institutional structures and application of instruments for groundwater management at national level. ▪ Definition or creation of an institution responsible for hydrogeological data storage of projects implemented, with up-to-date records and information that can be freely available. |
| | Strategy/Guidelines | <ul style="list-style-type: none"> ▪ Develop regulations and standards for the use and protection of aquifers which consists in carrying out surveys and basic studies needed to support data base in Angola. ▪ Encourage drilling practices as well as the legalization of boreholes in Angola there are a large number of irregular boreholes, drilled indiscriminately, without authorization and without technical Manager enabled. ▪ Implement an integrated management model taking into account not only the water catchment area but also the hydrogeological basin, whereas the aquifer. ▪ Promote research and development that aims to foster studies priority lines of research, in order to generate in-depth knowledge on fundamental themes for the protection and management of aquifers. |
| | | <ul style="list-style-type: none"> ▪ Plan of groundwater quality monitoring that the law does not define aimed at compliance with the presidential decree 261/11. ▪ Adopt mechanisms for the definition and promotion of regional and cross-border aquifers management; ▪ Discussion, strengthening of institutional structures and application of instruments on groundwater management at national level. ▪ Define a department responsible for hydrogeological data storage of projects implemented, with up-to-date records and information that can be freely available. |

Table 7: Action Plan _ ‘Should Haves’

| Prioritisation | Element | Description |
|----------------|---------|--|
| Should have | Policy | <ul style="list-style-type: none"> ▪ Establish policy for the development of plans of development of groundwater resources by the Ministry of energy and water, through the national water resources Institute. ▪ Expansion of hydrogeological knowledge base to support the implementation of a truly integrated management system. ▪ Protocols between companies operating in the sector of ground water and higher education institutions. ▪ The involvement of newly formed in projects implemented by the Government. ▪ Policies for implementation of a national plan for compiling all information produced in the sector (scanned files with scientific and technical specifications of the holes made at the |

| | | |
|--|---------------------|--|
| | | level of provinces, NGOs, data companies ´ drilling etc. |
| | Legislative | <ul style="list-style-type: none"> ▪ Development of other legal instruments in the form of ministerial-level executive decrees or ministerial orders suited the groundwater ▪ Guidelines and Regulations in order to harmonize and standardize common procedures among those involved in the management of groundwater resources, in order to build the foundations for the definition of the network design in river basins, hydrogeological or local, according to their specific needs |
| | Institutional | <ul style="list-style-type: none"> ▪ Preparation of integrated plans for use of surface and groundwater resources Strengthening the knowledge, planning studies, research and development of groundwater ▪ Promote the integration of groundwater resources component in other sectoral policies ▪ Elaborate programs of awareness of the population about the efficient use and conservation of groundwater |
| | Strategy/Guidelines | <ul style="list-style-type: none"> ▪ Integrate a set of administrative actions of the organs that control the policies in General, in order to regulate and create a specific legal framework that satisfies the groundwater resources. ▪ Develop awareness campaigns on the costs and benefits of groundwater management aimed at the general public ▪ Inventory and delimit the public domain of groundwater ▪ Integrate into case studies of the watershed managers having regard to the aquifer. ▪ Adapt and refine criteria for grants and oversee the use of underground water resources in Angola. ▪ Establish criteria of adequacy of construction technique of groundwater <p>Create a national registry of groundwater resources and subsequently perform the registration and integrating all groundwater users</p> |

Table 8: Action Plan _ “Could Haves’

| Prioritisation | Element | Description |
|----------------|---------------------|---|
| Could have | Policy | <ul style="list-style-type: none"> Develop political, legal and institutional aspects for the sub-sector of groundwater Formulate and implement policies on a scale suitable for the subsector GW Climate change related studies adapted to local projects to scale with priority to the South of Angola. Coordinate and execute public policy arising from the agreements and conventions Ensure the implementation of the Strategic action programme of National water resources adapted to climate change Generate management models that are able to deal with the problems associated with specific hydro-geological characteristics of resources. |
| | Legislative | <ul style="list-style-type: none"> Drawing up legal instruments, regulations and regulatory (use, protection, quality, license, pollution and environment) for the planning, operation and management of groundwater. Proposal to create joint regulations of international agreements and treaties on the transboundary Aquifers. Strengthening and modernization of the Institutional, Legal and Regulatory Framework of groundwater Guideline for developing information systems to access data on the groundwater resources in parallel with the implementation of monitoring systems. |
| | Institutional | <ul style="list-style-type: none"> Implementation of structuring projects for scientific knowledge to the training, a possible water shortage context, as a result of climate change, mainly in the South of Angola. Coordination and preparation of plans, programmes and national projects concerning groundwater and monitor the development of its activities, within the principle of integrated management of water resources; Promote technical and scientific cooperation with national and international entities in the area of their mission; |
| | Strategy/Guidelines | <ul style="list-style-type: none"> Biophysical, socio-economic characterization, land use planning and heritage. Reconstruction of the historical series. Evaluation of Underground Water Deposits and general characterization of groundwater users Sectors. Comprehensive assessment of groundwater resources in southern Angola. Analysis of hydrological variation and rapid growth because of new environmental problems, such as floods and droughts. |
| | Policy | <ul style="list-style-type: none"> The uncertainty of implementation of policies related to |

| | | |
|--|--|--|
| | | <p>underground waters by decision makers.</p> <ul style="list-style-type: none"> ▪ The uncertainty of producing management plans that are able to deal with the problems associated with specific hydro-geological characteristics of resources as well as their classification in terms of hydro-geological characteristics and future requirements. |
|--|--|--|

Table 9: Action Plan _ “Won’t Haves’

| Prioritisation | Element | Description |
|-------------------|---------------------|---|
| Won’t have | Legislative | <ul style="list-style-type: none"> ▪ Uncertainty of the adequacy of the legal, political and institutional framework in relation to groundwater resources in Angola |
| | Institutional | <ul style="list-style-type: none"> ▪ Consolidation in the organizational domain, weak bureaucratic barriers and technical incompetence in groundwater governance on the part of the organs of guardianship. |
| | Strategy/Guidelines | <ul style="list-style-type: none"> ▪ Doubt in accept and implement proposals for revising policy, legal, regulatory and institutional national instruments for strengthening the management of groundwater resources |

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APPENDIX A: LITERATURE INVENTORY LIST

| Year | Title of document | Author | Publisher | Report number | Link(if it is a website document) |
|------|--|----------------------|-----------------------|--|---|
| 1998 | Lei n.º 05/98, de 11 de Junho – Lei de Bases do Ambiente. | Assembleia Nacional | Diário da República | I Série N° 2004. Lei Bases do Ambiente | Link |
| 2002 | Lei n.º 06/02, de 21 de Junho – Lei de Águas. | Assembleia Nacional | Diário da República | I Série N° 49. Lei de Águas. | Link2 |
| 2004 | Lei n.º 51/04, de 23 de Julho, Lei sobre a Avaliação de Impacte Ambiental. | Assembleia Nacional | Diário da República | I Série — N.º 75 | Link3 |
| 2007 | Decreto n.º 59/07, de 13 de Julho – Licenciamento Ambiental. | Government of Angola | Diário da República | | Link4 |
| 2011 | Decreto Presidencial n.º 261/11, de 06 de Outubro – Regulamento sobre a Qualidade da Água. | | Diário da República | Iª Série n.º 22 d | Link5 |
| 2013 | Decreto Presidencial n.º 09/13, de 31 de Janeiro – Plano Nacional Estratégico para Água (2013-2017). | Government of Angola | Diário da República | Iª Série n.º 22 | Link6 |
| 2014 | Decreto Presidencial n.º 82/14, de 21 de Abril - Regulamento de Utilização Geral dos Recursos Hídricos. | Government of Angola | Diário da República | I Série-N.0 74 | MINEIA - Ministério da Energia e Águas. Plano de Acção do Sector de Energia e Águas 2013-2017 |
| 2014 | Decreto Presidencial n.º 83/14, de 22 de Abril - Regulamento de Abastecimento Público de Água e de Saneamento de Águas Residuais e o Plano Nacional da Água – 2017-2025; | Government of Angola | Diário da República | I Série-N.0 75 | Link7 |
| 2014 | Decreto Lei nº 181/14 de 28 de Julho | Government of Angola | . Diário da República | I Série N° 138 | Link8 |
| 2016 | Resolução n.027/16 de 22 de Julho | Government of Angola | Diário da República | I Série - N." 122 | Link9 |

APPENDIX B: STAKEHOLDER LIST

Full list of Stakeholders

| Title | Name | Surname | Affiliation | Role | Sector Group | Cell Number | Email: | Priority (yes/no) |
|-------|-----------|----------|---------------------------|-----------------|---------------------|--------------------|--|-------------------|
| Mr | Pedro | Silva | DNA-MINEA | Engineer | National Government | 244 923 523 330 | dombelas@hotmail.com | yes |
| Mr | Helder | Martins | Agostinho Neto University | Hydrogeologist | Academia | 244 923 241 050 | hnobriga72@gmail.com | yes |
| PHD | Gabriel | Miguel | CTN/MINESCTI | Director | National Government | 244 924 360 200 | gabrielctangola@gmail.com | yes |
| Mr | Narciso | Ambrosio | INRH-MINEA | Department boss | National Government | 244 923 647 899 | narciso.ambrosio@inrh.gov.ao | yes |
| Mr | Pinto | Fiel | UNICEF | Engineer | ONG | 244 923 571 954 | pintofiel@hotmail.com | yes |
| Mr | Manuel | Quintino | INRH-MINEA | Director | National Government | 244 924 986 232 | manuel.quintino@inrh.gv.ao | yes |
| Ms | Mónica | Cipriano | INRH-MINEA | Cosultora | National Government | 244 935 521 881 | monica.cypriano@gmail.com | no |
| | Maida | Gomes | INRH-MINEA | Department boss | National Government | | maida.gomes@inrh.gv.ao | no |
| Mr | Francisco | Ferreira | INRH-MINEA | Department boss | National Government | | Franciscoferreira@inrh.gv.ao | no |

Stakeholders consulted to respond to the questionnaire

| Name | Position | Stakeholder Group |
|----------------------------|---|-------------------|
| Mr Pedro Silva | Institution, Designation | Government |
| Mr Pedro Silva | NATIONAL WATER DIRECTORATE (DNA) | Academia |
| Mr Manuel Quintino | AGOSTINHO NETO UNIVERSITY (UAN) | Government |
| Mr Narciso Ambrosio | NATIONAL WATER RESOURCES INSTITUTE – (INRH) | Government |
| Mr Pinto Fiel | NATIONAL WATER RESOURCES INSTITUTE – (INRH) | NGOs |

Appendix C: Desired Future State

SUMMARY of groundwater status in Angola on the basis of the assessment of policies reviewed and compared with the minimum Need for effective implementation of the instruments of National Policy of water resources in the management of groundwater requirements for the desired future.

Reflection of Policy Framework as per the minimum requirement for the Desired Future State

| Minimum requirement for the desired future | Status | Comment |
|--|--------------------|---|
| Need for effective implementation of the instruments of National Policy of water resources in the management of groundwater | Partially achieved | Strengthening and coordination between the organs, water resources managers support the management of national and transboundary aquifers. Expand and consolidate the hydrogeological knowledge on national and cross-border aquifers, identifying their potential, availability, water quality, vulnerabilities and risks, in order to propose the planning of management and use sustainable. |
| Formulate and implement policies to an appropriate scale of groundwater | Partially | The analysis about water policies in Angola is based strictly on the surface water, being an essential factor to governance of water resources which you can't dissociate the political, institutional and territorial configuration, affecting between other aspects, the insignificance of groundwater by "law" in view of the importance attributed to surface resources |
| The social, economic and environmental values of groundwater are all recognized; | achieved | Although it is included in general these values are recognized as much surface water as well as the underground |
| The involvement of women and youth in decision-making and in the implementation of underground water supply schemes | Partially achieved | The Angolan society is matriarchal; the women is a figure responsible for taking care of the family. The great distance between the water collection points and communities are made by women and young people would be important be involved in the definition of community policies relating to groundwater |
| A long-term policy to protect groundwater by preventing pollution and overuse. This policy is comprehensive, implemented at all appropriate levels, consistent with other water management policies and be duly taken into account in other sectoral policies; | Not achieved | The policy makes a clear reference to the groundwater and the implementation at the appropriate level is not satisfactory |
| An institutional framework with a clear assignment of responsibilities | Not Achieved | Sectoral fragmentation of the various tasks related to the formulation of policies of groundwater and with their management and use, especially with regard to various agencies and ministries, with individualist attitudes |

| | | |
|--|--------------------|--|
| Consistently coordinate policies of groundwater and with other sectoral policies and involve all stakeholders in the decision-making | Partially | Although not a decree specifically to groundwater, but the Presidential Decree No. 09/13 of 31 January, created the national water Council and the Councils of river basins, which are managed by representatives of different Ministerial departments, Governments, Provinces, representatives of users or users, professional and economic organizations and representatives of the community. |
| Produce and make public data and quality information on groundwater | Not Achieved | Intentional information asymmetries between the different protagonists that are relevant to the formulation of policies for groundwater management and their use |
| Institutional stability of the management model of water resources | Partially achieved | Insufficient scientific capacity, technical training, infrastructural and of the various protagonists to formulate and implement water policies and to define the best strategies for groundwater |
| Social and institutional management policies adapted to climate change | Not reached | It is as relevant to the existence of policies and procedures that, internally, leading to better management and use of groundwater and, externally, to concerted administration of transboundary groundwater resources. |

Reflection of Legal Framework as per the minimum requirement for the Desired Future State

| Minimum requirement for the desired future | Status | Comment |
|---|--------------------|---|
| Total water Law regulations, and the preparation of regulatory and normative instruments of planning of groundwater | Partially achieved | 16 Years after approving the water law, the same has not been fully regulated, However, this law refers to a very high number of diplomas to regulate, while they are not in force does not allow their full application and consequently, the assessment end of their potentialities and limitations. |
| Approval of regulations and standards for groundwater management | Not achieved | At national level, there is no specific legislation that addresses explicitly the use, management and protection of groundwater, which can provide necessary subsidies to regulate, manage, control, protect and develop water resources underground in conjunction with surface water resources |
| Institutional and regulatory aspects of the management of groundwater resources | Not achieved | The current legislation for water resources in general do not fit with the current with new scientific and technical demands on groundwater need to update the legislation and create a legal and institutional framework, whose general law establishes the fundamental principles that guide the conduct of all actors in the management and use of underground water |
| Recognition of groundwater as an important | Partially | The law provides for the recognition of |

| Minimum requirement for the desired future | Status | Comment |
|--|--------------------|--|
| source of domestic supply and rural areas agricultural | achieved | groundwater as an important source of domestic and agricultural supply and a crucial resource for poverty reduction, food security, and sustainable economic development of rural areas, since the South of Angola uses groundwater. |
| Specific national legislation on water quality | Not achieved | The lack of specific national legislation on water quality makes the classification and the framework for a particular purpose. In Angola, relating to the quality of water, the legislation is silent. |
| Provide legal and regulatory instruments for qualitative and quantitative monitoring of groundwater | Not achieved | Aims to subsidize planning and stock control, as well as enable preventive maintenance activities; Evaluation of connection between groundwater and the surface water and the relationship with the associated terrestrial ecosystems; Mitigating the effects of drought and climate change with the water resource plans Perform water management aimed at water and food security and access to water as a human right in the face of climate change scenario and its reflections on the issue population migration and health. Evaluation of impacts of multiple uses and application of standards, economic recovery and public environmental accounting as a grant to the development of scenarios. Create standards for regulating and defining areas of recharge and groundwater upwelling of support of groundwater boreholes. -Check the spatial and temporal changes in quality and quantity of groundwater, trying to emphasize trends; |
| Drilling practices as well as the legalization of boreholes | Partially achieved | Despite the legal requirements, there are a large number of irregular boreholes, drilled indiscriminately, without authorization and without technical Manager enabled. Actions will be necessary in relation of the awareness of the resource's users to encourage them to the legalization of the boreholes. |
| Regulations relating to vulnerability and the risk of contamination, especially in areas where the groundwater is an important source in the public water supply | Partially | Is a tool that should support, public bodies, users, teaching and research institutions, in local studies projects for the development of the sub-sector of groundwater, to the development of various measures towards:-drawing up maps of exploitation of aquifers in order to subsidize the granting of groundwater; -Regulation on protection of recharge areas and perimeters of protection of borrowings; -Regulations related to overshoot to salines and wedges of contention control of salinization processes in coastal regions |

| Minimum requirement for the desired future | Status | Comment |
|---|-------------|--|
| Rules of use and protection of aquifers | Not reached | Strengthening the capacity of response and exercise of authority on the part of government bodies and the proper articulation of monitoring and surveillance systems |
| Legal, regulatory and normative instruments that may ensure the HR governance underground in Angola | Not reached | Instruments needed to ensure governance and shared management of aquifers in National/provincial and International Directions; -Contribute to the design of the planning, implementation and maintenance of basic networks of qualitative and quantitative monitoring of groundwater, of a regional nature; The preparation of guidelines for the implementation, maintenance preventive and recovery for works of water uptake; -Subsidize actions of protection and conservation of groundwater; -Promote the knowledge and maintenance of the ecological function of groundwater and surface water; -Identify water use conflicts-Propose guidelines for the zoning of soil use and occupation. |
| Promote research and development | Weak | Objective promote studies priority lines of research, in order to generate knowledge and to fill in existing gaps in fundamental themes for the protection and management of aquifers. Such knowledge should be developed inter-institutionally to facilitate the exchange of experiences, duplication of efforts and at the same time promote training of professionals and dissemination of qualified technical information . |
| Standardization of HR management underground | Not reached | Uniformity of rules for drilling of groundwater deployment. Preparation of studies on the groundwater management of the various regional aquifers prioritizing the southern Angola. |
| Legislation that enables the classification of storage quantity, quality of surface water chemistry and their interaction with groundwater. | Not reached | The need to adapt the legislation allows the classification of storage quantity, quality of surface water chemistry and their interaction with groundwater. |

Reflection of Institutional Framework as per the minimum requirement for the Desired Future State

| Minimum requirement for the desired future | Status | Comment |
|--|-----------|--|
| Fragmented institutional framework and organisational management (surface and groundwater) | Partially | Implement an integrated management model taking into account not only the water catchment area but also the hydrogeological basin, taking into account the aquifer |
| Creation of data Base | Partially | Information management and preparation of an inventory of water points on primarily the |

| Minimum requirement for the desired future | Status | Comment |
|---|--------------------|--|
| Training, communication and Social Mobilization | Not reached | transboundary groundwater resources. Is the need for training in groundwater, because the information, courses and works in the field of Hydrogeology are scarce. The little society meets and discusses the issue and initiatives are rare for mobilization and environmental education that incorporate the theme. Regarding to groundwater management, difficulties and the lack of integration are even bigger, with the need to make efforts to promote the integration of activities and thematic activities related to integrated water resources management |
| Intersectoral collaboration is promoted and facilitated for the needs and the impacts of different sectors (for example, land, agriculture, mining, energy, and environment) are taken into account in the management of groundwater. | Partially achieved | Weak inter-sectoral collaboration between the Ministry of energy and water, Ministry of agriculture and forests and the Ministry of natural resources and Oil. |
| Produce and disseminate basic information on groundwater | Partially | Aims to overcome the barrier of ignorance "about the occurrence, circulation and supply potential for groundwater and intends to reach a diverse audience including, among others, organs that deal with some aspect of the water resource and users of groundwater in General. |
| Capacity-building in the area of groundwater in Angola | Partially | Highlights the lack of human resources with appropriate training to all levels of the institutions in the sector. This lack of appropriate professionals, clearly represents a major limitation for the implementation of both the national strategy of regional initiatives |
| Instruments to ensure shared governance between the central Governments provincial governments, users and civil society | Partially achieved | Collaboration between the institutions in the water sector and the different actors (stakeholders) within a certain area. Survey of training needs, monitoring and evaluation: survey and approach to new requirements of capacity-building. General public awareness about pressing issues of management and use of underground water. Sharing of experiences of best practices and lessons for review of future programmes. |
| Give the necessary attention to financial sustainability and the role of fees | Partially achieved | That trust is a precondition for the social and political sustainability of the institutions in the sector. This theme gains special relevance in the field of water resources management, given the cross-cutting nature and the fact that their being an essential resource for all economic activities without exception, as well as to the socio-economic development and for the well-being of |

| Minimum requirement for the desired future | Status | Comment |
|---|--------------|--|
| Financing | Not achieved | the populations. The stability and continuity of the budgets available for the underground water sector, are essential for an efficient structuring of the sector and to achieve sound management of water resources, the costs on the basis of fees for use of water resources, whether captures are rejections of effluents |
| Seek partnership and support universities, research centers, technical associations of users in carrying out studies, works, publications focusing on groundwater | Not achieved | On mobilization of universities and research centers for the development of studies and research on focusing on groundwater allows to promote technology transfer in the area of operation and management through partnerships and cooperation agreements technique with technical associations and users of groundwater |