Challenges Facing the Drinking Water Sector in Sudan

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ABSTRACT: This paper focuses on the current situation of the drinking water supply sector in Sudan and the constraints that obstructs the sector from achieving the Millennium Development Goals (MDG). Based on the results of recent studies of the Sudan Household Health Survey (SHHS) and the Water Supply and Sanitation in Sudan Turning Finance into Services for 2015 and Beyond Country Status Overview Report, only two thirds of the population has access to safe water within the distance specified by the MDG as 1000 meters from their homes.

Drinking water supply in urban centers is mainly from groundwater supplemented by treated surface water from the two Niles or any other seasonal streams whereas in rural areas groundwater from alluvial or basement complex aquifers could be the only source of drinking water.

In order to accomplish the drinking water development goals, Sudan has to enhance water supply coverage for the remaining one third of the total population with in the coming five years.

However there are many constraints and challenges that have to be overcome to accomplish these goals. Such challenges as administrative or operational are discussed in this paper in some details together with the on going efforts to reverse the current situation. It also suggests recommendations for better performance of water supply sector in Sudan.

1. INTRODUCTION

Sudan's population is around 32 millions. Most of this population lives on just 15% of the country's land which is the area along the two Niles. The rest lives around water wells away from the Niles. The climate is arid to semi arid and characterized by a wide range of rainy seasons. However the need for water is rapidly increasing in the country. Many projects were carried out to provide means to meet with the growing demand for water, as shown in Table 1.
Water is supplied mainly from seasonal or intermittent sources depending on the amount and distribution of the rainfall as well as the perennial sources that comprise the Nile River system. Groundwater is widely used for water supply for both rural and urban dwellings.

The urban population is supplied with surface water from treatment plants. Water Hardness Removal Units are not commonly used at this stage. Water is also supplied from boreholes, where groundwater is directly pumped into network without any treatment or disinfection.

The rural population away from the Niles is served mainly from boreholes and/or Haffirs, these are seasonal rain water and runoff collecting reservoirs. Some of these Haffirs are supplied with gauges to prevent dead animal or big tree lumps from getting to the reservoir. The modified ones are supplied with small sand filters and sedimentation units.

Many rural areas are not connected to the main distribution systems where a user has to get water from a main tap. Some areas are simply not supplied directly at all and people have to transport water from long distance water supplied area.

Despite many attempts to improve water supply provision, shortages and cutoffs still exist that can only be related to factors such as the insufficiency of the supply systems, poor network distribution, leaks and random expansions, power supply shortages, inadequate funds and untrained manpower.

Table 1 Annual Projection of the Water Consumption (Billion Cubic metres), Source Ministry of Irrigation and Water Resources 1998

Annual projection of the water consumption by year 2003				
Year	**Irrigation**	**Water Supply**	**Animals & Others**	**Total**
2000	17.5	0.4	1.3	19.2
2010	27.1	1.1	3.9	32.1
2020	32.6	1.9	5.1	39.6
2030	40.3	2.5	5.3	48.0

It has been estimated in many studies that the total renewable water resources for Sudan as 35 billion cubic meters per year. Therefore, the figures shown in Table1 indicate that the country will experience water shortages for both irrigation and drinking supply purposes. Such challenging situation cause for proper planning and management of water resources includes water conservation and water supply augmentation from many conventional and non conventional sources such as water harvesting and possibly reuse of treated water.

2. WATER RESOURCES MANAGEMENT HISTORY IN SUDAN

Currently water resources management in Sudan, is carried out at different levels. The national level that provides policy guide lines for administrative levels and the regional level that provide guide lines for local water management tasks and plans of action, as shown in Fig.1.and Fig.2.Before this, the draft document of the Sudan National Water

Policy divided the development of water policy into two eras: pre-1992 and post-1992(Abd Elraheem 2010).

During the first era the main water regulations were based on the 1951 Regulations which are licensing regulations for pumping water from the Nile according to the Nile Pump Control Act (NPCA) of 1939. This was recently modified in the Water Resources Act of 1995. In addition there are about ten other pieces of fragmented legislations. There was no policy for selling water in the country (Abd Elmageed 2000).

The second era began with the National Comprehensive Strategy for Development in (1992- 2002). This strategy sets a number of policy objectives and strategies most of them were oriented towards solving the Water Resources problems and developing these resources. At that time the Irrigation and Water Resources Sector was embodied as a sub sector in The Ministry of Agriculture. Then developed into The Ministry of Irrigation and Water Resources (MIWR), and National Water Corporation (NWC) as part of (MIWR), in the years of 1992 and 1994, as shown in Table 2.

Table 2 Key dates and Events in the reform of the water sector Sudan, source Abd Elraheem, 2010.

Date	Event	Date	Event
1905	Urban Water Supply Authority	1994	National Rural and Urban Corporation merged into National Water Corporation (NWC)
1919	Rural Water Section Ministry of Works	1995	NWC part of MIWR
1925	Ministry of Agriculture, department of Irrigation	1999	National Council for Water Resources
1965	Rural and Urban Water Corporation	2005	NWC becomes PWC
1980	WES Program	2010	Sanitation between MOH and MIWR
1990	WES within PWC		
1992	Ministry of Irrigation and Water Resources		

3. THE COUNTRY MDG STATUS

In December 2006 Sudan Household Health Survey was carried out. The indicators used to carry out the (SHHS) survey were as follows:-

1- Use of improved resources for drinking water supply.
2- Methods used to clear turbid water.
3- Time per day consumed to fetch water from the nearest water resource.
4- Family member responsible for fetching water.

Based on the findings of this survey, the (MDG) and Country Status Overview were reported. Accordingly, the result was 65% of Sudan's population (75% urban and 56%rural) has access to a minimum of 20 liters per capita per day within a distance of 1000 meters from their homes, (source Country Status Overview, 2009). In order to achieve the (MDG) for drinking water, the country has to attain 82% access to improved drinking water sources, (source Country Status Overview, 2009).

4. CHALLENGES FACING THE WATER SECTOR REGARDING SAFE WATER PROVISION

In the past decade (1996- 2005), Sudan has experienced a declination in safe water access. This situation is largely attributed to population increase, inconsistency of budget and poor sector management. The last five years have witnessed a noticeable improvement. It should be noted that water sector officials has acknowledged this shortage and related it to many existing challenges. Such challenges could be summarized as follows:-

4.1 Institutional challenges, governance/ autonomy

There are several institutions and water sectors at different levels that govern water resources development and management. At state level, the key institution is the state Water Corporation (SWC) which functions under the auspices of the Ministry of Planning and Public Utilities. At federal level, the key ministries are the Ministry of Irrigation and Water Resources, the Ministry of Health, the Ministry of Agriculture and the Ministry of Environment. Under the Ministry of Irrigation and Water Resources are the Public Water Corporation (PWC) and the Groundwater and Wadi Directorate (GWWD). Similarly, there are various acts and strategies under different institutions and sectors. Important relevant acts are the Water Resources Act of 1995, the State Water Corporation Acts of 1998 and the Public Water Corporation Act of 2008. As indicated above, authority in the water sector is mostly fragmented and responsibilities are distributed among various institutions without effective or institutionalized mechanism of coordination. This often leads to conflicting actions and lower impacts of projects that could have a much better return (Abdou and Salih, 2011).

4.2 Administrative issues

The administration of the water sector plays a vital role in the provision of safe water, yet it is facing with many challenges such as the water tariff. At the state level it requires approval by State Government and the State Legislative Assembly before being put into practice. The tariff system permits various charges for different user categories in the society based on the consumption rate. More challenges are related to the tariff structure review to meet the operation and maintenance costs, improper collection mechanism as well as conflict between local municipalities and Water Corporation in responsibilities. This has created many disputes over time with the local municipalities as water supply

technical bodies along with the financial and operational constraints that has lead to the inadequate capacity to store and deliver advanced water supply systems.

4.3 Operational challenges

This includes technical methods dealing with the wider aspects of drinking water abstraction and management, as its integration with other sources of water. Other operational challenges in rural areas lie in the maintenance centers. These centers were established long time ago with aged equipments and inadequate technical staff. This is accompanied with some government decisions that have negative impacts on services by applying subsidized water tariffs mainly for political reasons. Various operational challenges include the supply networks problems due to poor construction, lack of maintenance and or unplanned expansions that may eventually lead to water losses due to leakages or breaks in the water networks. Also problems could be related the use of house pumps as well as the use of old technologies. Many water harvesting projects collapsed due to technical faults and poor design. Other operational challenges could include the Nile water expensive treatment on high turbidity seasons and the large scale emergency in Darfour and South Sudan, where most NGO's spend money on relief projects.

4.4 Hydrological constraints

In Sudan groundwater used for domestic and irrigation purposes, can be abstracted from water yards for deep wells, hand dug wells, open hand dug wells or large diameter open shaft wells. Groundwater resources suffer from many problems such as the poor quality due to urban water injection as in towns or natural contamination with heavy metals and high salt content as in other areas.

Most of the groundwater reservoirs are not well exploited in Sudan due to lack of data or inadequate water resources management. The basement and hard rock aquifers potentials are not well determined especially on terms of recharge and flow mechanism so as to provide sites for successful drilling and safe water supply. Such problems also include the rise of water table above the ground level due to urban water injection in towns threatening surface water resources and buildings. While in other areas, groundwater levels suffer from sharp drops that could be related to over abstraction. The hydrology of wadis is very complex and not well understood and water harvesting techniques are not properly implemented. To improve this situation better understanding of wadi hydrology system is needed regarding rainfall- runoff relations, channel transmission losses and interaction between runoff and the underlying alluvial aquifers.

5. ON GOING EFFORTS TO REVERSE THE CURRENT SITUATION

Efforts were not spared to help and reverse the ongoing situation. Such efforts as, the Water Sanitation and Hygiene program (WASH) that has become a national policy in all water sectors. Also the introduction of system co ordination between the different water sector bodies for better provision of drinking water along with the introduction of the private sector as a partner. The development of The Sudan Country Status Overview

reflects the present on going situation, suggesting reasonable strategic plans for the water sector that includes capacity building encompassing the sectors past experience.
Water harvesting linked to artificial recharge to the underlying formations is one of the most effective methods used in the country for water conservation especially in wadi systems along with the traditional water harvesting systems. New techniques are implemented such as the modified Haffirs and wells dug up stream the main control structure that is normally constructed in the main stream of the wadi. Some earth damps were constructed across selected wadis for water storage used for drinking. Small scale of modern irrigation methods were introduced in small farms around Khartoum city as pilot schemes. The conjunctive use of surface and groundwater was introduced in Darfur area where surface and groundwater are often available at the same location. Surface water is highly seasonal it was very useful to exploit groundwater at times of low or no surface water (Abdou and Salih, 2011).

6. CONCLUSION AND RECOMMENDATIONS

There are many constraints holding the water sector in Sudan from achieving the pre-setted millennium development goals (MDG) regarding drinking water.

The inconsistencies of financial support lead to unstable sector strategic plans. Many operational difficulties regarding water network and supply contributes to the inconsistent supply of drinking water in many areas.

The legislative framework indicated by the constitution of the Sudan provides the legal umbrella for the water resources management in the country with no strong measures regarding water pollution or over abstraction.

The lack of strategic plans regarding the management of water resources has created instability and frequent change of drinking water institutional set up. This has created many disputes over time with the local municipalities as technical bodies along with the Water Corporation as the administrative body that has lead to the inadequate capacity to deliver advanced performance systems.

The present water administration structure ignores the non conventional water resources such as the sewage and the irrigation runoff water, where the inadequacy of water supply may affect the sanitation and hygiene standards as well. In this aspect drinking water resources management can’t be viewed in isolation from the social and economic development in Sudan. Therefore, it is recommended that reliable data acquisition concerning surface and subsurface hydraulic parameters along with the consistent monitoring of aquifers is a wise step towards good strategic planning. As well as to facilitate the flow of information between the different research institutes and the decision making bodies to plan and conduct water supply schemes. Also the integration of water resources management and policy making not only for surface and groundwater but also for all the natural resources on local and regional grounds.

7. REFERENCES

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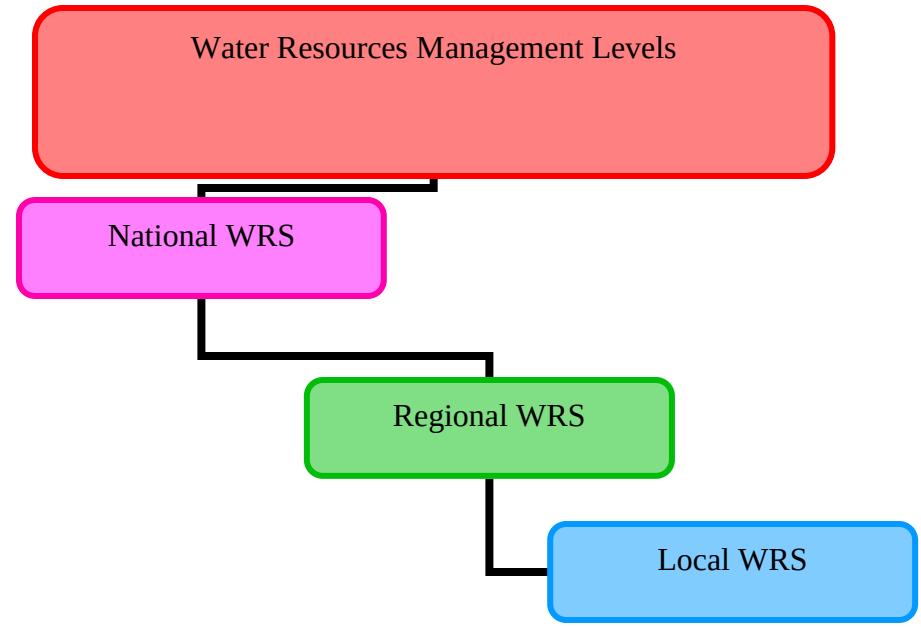

Fig.1. Water Resources Management Levels, Sudan

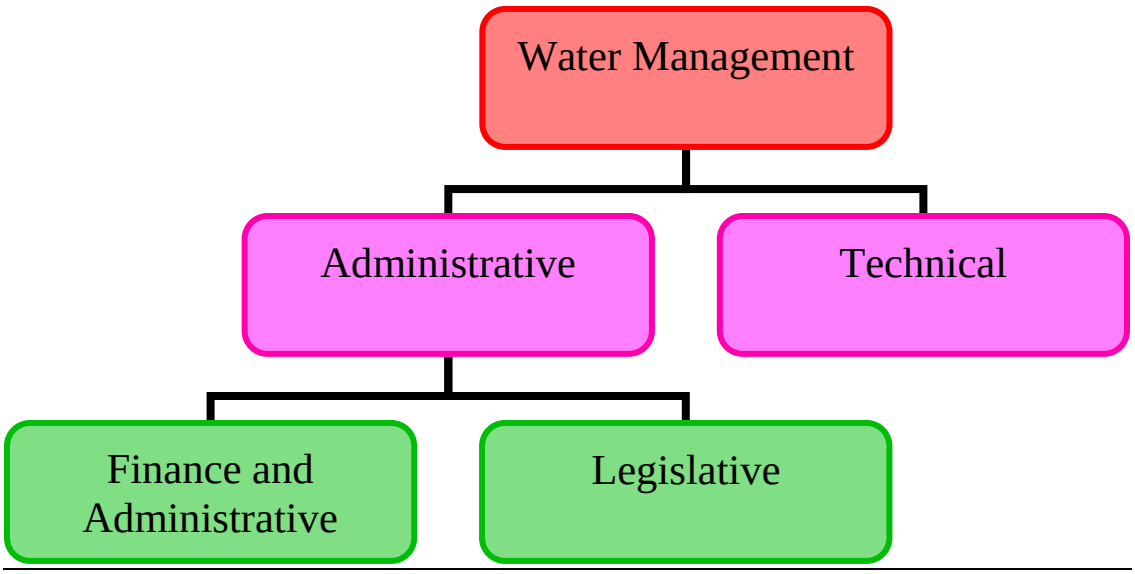

Fig. 2. Groundwater Resources Management in Sudan

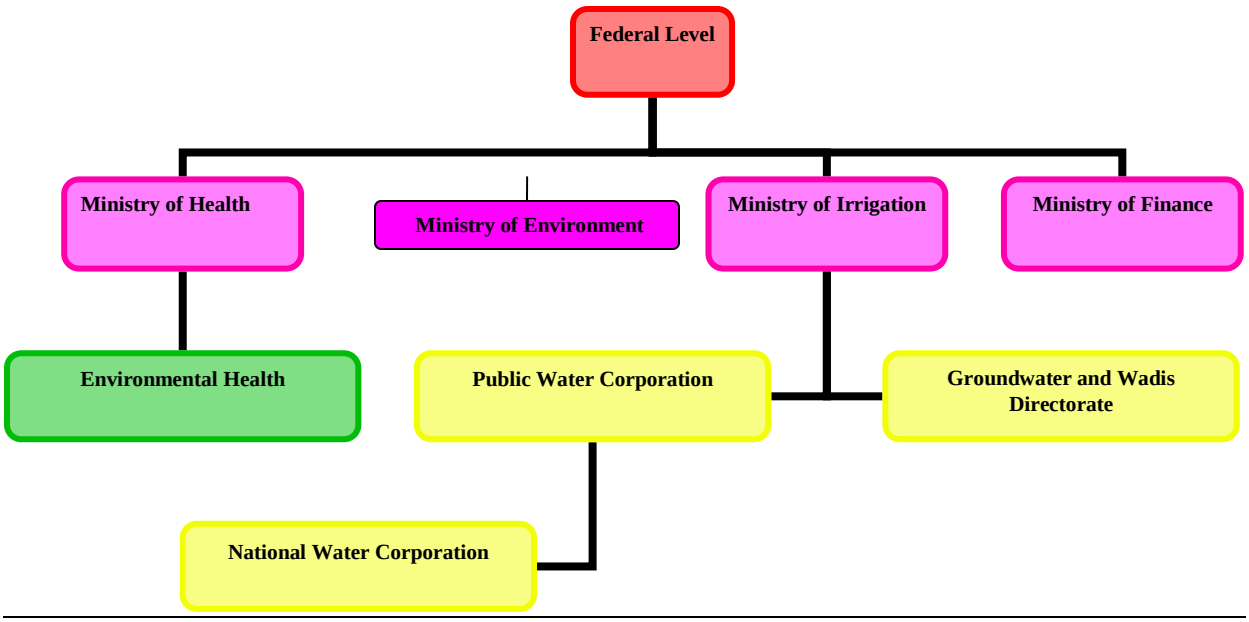

Fig. 3. Federal Role and the Relationships in the Water Supply Sector

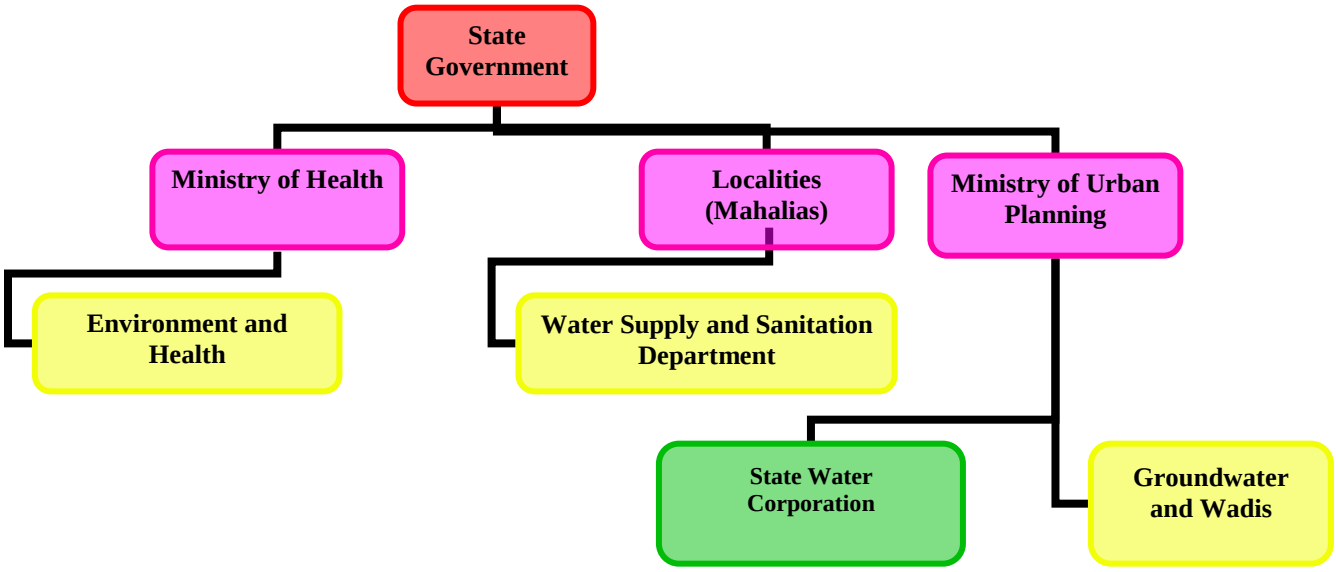

Fig. 4. State Role and the Relationships in the Water Supply Sector

Intake at the Blue Nile Khartoum