

WATER GOVERNANCE AND WATER MANAGEMENT SYSTEMS FOR SUSTAINABLE DEVELOPMENT IN TEKEZE RIVER BASIN

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ABSTRACT

This paper examined water governance and management systems in Tekeze River basin. Methodologically, the paper employed qualitative research approach which critically examines the existing scanty literature and governmental policy documents. The findings of the study revealed that in Tekeze River basin there are no bilateral agreements made among riparian states. In Tekeze River the water governance system is highly politicized. The existence of frequent conflict in the region disrupts otherwise prohibits cooperation over Tekeze River. Tekeze River is highly affected since riparians of the basin have no demarcated boundaries. There is no effective water governance system, which is vital for efficient and cooperative utilization, among the riparian actors. There is no cooperative utilization of Tekeze water resources among riparian states. Generally, Tekeze River basin lacks both institutional and legal arrangement among riparian states which has prevented sustainable water development, water governance and management of the basin.

Keywords: water governance; water management; sustainable development; Tekeze River; Riparian states; conflict and cooperation

INTRODUCTION

Many rivers and lakes, basins, and aquifers extend over more than one state. As such, the international character of many freshwater resources requires states to establish effective water resource management. Yet, national interests often conflict, points of view often differ, and international relations are sometimes bad (Yacob, 2007:22). He further argued ‘While the need for and dependence on the shared water resources are on the increase the pattern of unsustainable utilization and management of the water resources has not yet been changed’(Yacob, 2007:22).

Ethiopia has been described as the water tower of Northeast Africa. The country has twelve river basins and twenty natural and artificial lakes.¹ From these rivers, four of them are local and the remaining are trans-boundary Rivers including Tekeze River.² The riparian of Tekeze River are Ethiopia, Sudan and Eritrea (Fikru et al., 2018). Yet, there is no legal and institutional framework between Ethiopia, Sudan, and Eritrea concerning the utilization and management of the basin. Furthermore, there are no researches conducted in the area except for some governmental reports and proposals.

The general objective of this paper is, therefore, to examine water governance and management systems of Tekeze river basin. To this end, the aspects of hydrological and riparian issues of the Tekeze River, the conflict and cooperation, nature of water management system and legal and institutional issues, and the economic significance of basin are the central concerns in which the study strives to explore.

Methodologically, the study is both descriptive and interpretative. It does not try to provide an extensive account of the issue at hand rather it is desk research that reviews authoritative works with the aim to understand the aspects of Tekeze river water governance. To this end, relevant literature is identified and reviewed by consulting secondary resources including government documents, books, and journals.

GEOGRAPHICAL /ENVIRONMENTAL DESCRIPTION OF TEKEZE RIVER

The climate of the Tekeze basin can be divided into two ³(Fikru et al., 2018). First, the region west of Simien Mountain has two seasons type of climate. The wet season in this region lasts about four months from June to September. Second, the climate of the region east of Simien Mountain characterized by three seasons, with a dry season from October to February, a small rainy season that covers a period from mid-February to mid-May and the main rainy season that covers the period June to September (Solomon, 2009). The water balance in the basin consists of available water from rainfall and return flow. Water supply and irrigation accounts to less than 1% and 12 to 13 % flows out of the basin in the form of surface water. The remaining 87 to 88 % is lost through evaporation (Fikru et al., 2018).

THE HYDROLOGICAL SYSTEM OF TEKEZE RIVER BASIN

The Tekeze River basin is situated in the Northwest of Ethiopia, between latitudes 11 40 and 1512 north and longitudes 3630 and 3950 east (Fikru et al., 2018). The Tekeze basin includes the smaller Angereb (an area about 13,327 km²) and Goang (area about 6,694km²) basins. Both rivers cross Sudan's border to the south of the Tekeze

¹UNESCO World Water Assessment Program (2004) National Water Development Report for Ethiopia

²*The Ethiopian Name for Atbara River in Sudan.*

³ Classification is based on mean monthly rainy patterns.

River and join the Tekeze River downstream in Sudan to form Atbara River, one of Nile's tributary. The area of the entire Tekeze basin is about 86,510 km². From this, the basin of Tekeze inside Ethiopia is about 82,350 km². A relatively small part of the basins of the minor stream is established along the Sudanese border which covers an area of 3,023 km² and the rest in Eritrea.⁴

The length of the Tekeze River, from its source at the springs near Lalibela and flows, generally, in the western direction to the Sudan border for about 600 km. The main tributaries of the Tekeze, which originate in the highlands of the east side of the Simien Mountain, are the Zamrta, Tserare, Geba, and Wori.⁵ Tekeze River is a major tributary of the river Atbara that in turn flows into the Nile downstream of the confluence of the Blue and White Niles at Khartoum. The river slope is quite steep in the mountain stretch, more than 1.5%, and gradually decreases to 0.3% and finally to 0.1% near the Sudanese border.⁶



These pictures clearly demonstrated the origin and flow of Tekeze River from Ethiopian highlands to Sudanese border to form Atbara and latter to join Nile. The Ethiopian part of Tekeze River Basin has an average elevation of 1850 masl. About 70% of the basin lies in the highland at an altitude of over 1500 masl. The upper reaches of the

⁴ Ethiopia, FDRE, Federal Democratic Republic of Ethiopia (1998), Tekeze River Basin Integrated Development Mater Plan Study, Main Report, Volume I, Addis Ababa

⁵.Ibid

⁶ Ibid

Tekeze are surrounded by mountain ranges, the elevation of which is over 2000m. 40% of the total basin area has over 2000 masl elevation. The elevation of the Basin in the lowland ranges from 1000 to 500 masl. In the west about 5000km² area of (1500km² lies in Ethiopia), the basin is almost flat land (Fikru et al., 2018).

THE ECONOMIC SIGNIFICANCE OF TEKEZE RIVER

THE ECONOMIC SIGNIFICANCE OF TEKEZE RIVER TO ETHIOPIA

According to the Tekeze River Basin Integrated Development Master Plan Main Report (1998), there are different potential areas of economic activities along the basin. Yet, the river is completely undeveloped. The major development potentials of the basin include the Presence of deep gorges and steep slopes for hydropower development, Large-scale irrigation potentials, the river channels have the potential for fish production, farm forestry practices is currently at its pace in the basin, good potential in the lowlands to grow incense and gum trees, and closure of degraded lands is welcomed thus, indicating the knowledge of the resource base.

The small scale mixed farming is the dominant economic activity in the whole Tekeze river area. It accounts for more than 97% of farm households. Although the proportion of livestock farmers in the whole basin is low, in the lowlands of Northwest of the basin there are farmers who own cattle and goats in large numbers and totally depend on livestock production. On the highlands, on the other hand, there are farmers who are totally depending on crop production. Similarly, River fishery is not well developed in the Tekeze basin due to various reasons. The rugged natures of the landscape together with the seasonal flow of many streams make it difficult to develop the sector in the highlands. However, in the lowlands, some of the rivers and streams and rivers flow all over year round and there is potential to increase fish production (Fikru et al., 2018).

Moreover, the construction of Tekeze hydroelectric power offers another economic worth for Ethiopia. Tekeze Dam is a double-curvature arch dam in the Tigray region of northern Ethiopia on the Tekezé River, a Nile tributary that flows through one of the deepest canyons in the world.



The above two pictures showed the Tekeze Hydropower dam. At the time of completion, the 188 meters (617 ft) high dam was Africa's largest arch dam. It was Ethiopia's largest public works project. The dam helped to reduce power shortages as Ethiopia's power demand increases.⁷ The dam is functional and generating power from Tekeze River.

⁷ http://www.google.com/Tekez%25C3%25A9_Dam&ei=vbqvU9vmDKLB0QXbrIG4Cw&usg=AFQjCNH2BNGg

According to the Tekeze River Basin Integrated Development Master Plan Main Report (1998), the major limitations or constraints for development of the Tekeze basin include: absence of steep drops and high flow for short period associated with rain, annual variability of river flows, insufficient quantity and poor quality of food supply, infectious diseases and parasites, shortage of skilled manpower, undeveloped selection and breeding practices, lack of pricing and marketing policies, and weakness of government organizations at local level to organize forest protection and management.

ECONOMIC SIGNIFICANCE OF ATBARA RIVER FOR SUDAN

The Khashm el-Girba project is the major project along the Atbara river basin. In this respect, in 1964, a dam was built on Atbara in order to provide irrigation water for the Khashm el-Girba agricultural scheme as well as hydroelectricity.⁸ The agricultural scheme was developed partly for resettling Sudanese Nubians (whose land was flooded after the building of the Aswan High Dam that submerged 500 kilometers of the Nile Valley in Egypt and Sudan) and partly for nomads that were encouraged to become sedentary. However, the dam has not functioned as planned. Siltation and subsequent loss of storage capacity is now a well-known problem for dams on the Nile, with both economic and ecological implications.⁹

The annual siltation rate in the reservoir is estimated at 40 million m³ yearly, and the storage capacity of the dam was severely reduced only seven years after the dam was completed. For this reason, the reservoir has been flushed annually since 1970. This is naturally causing mass mortality of fish. The original capacity of the dam was 1.3 billion m³, which has now been reduced to less than half with implications for both storing of irrigation water and electricity production. One of the aims of the new dam projects on Upper Atbara and Setit is to reduce the siltation of the Khashm el-Girba reservoir.¹⁰

Moreover, currently, Sudan is building a dam complex comprising Rumela Dam at Upper Atbara River and Burdana Dam at Setit River in Eastern Sudan. The site of the twin dam is located 20 km upstream from the junction of the Atbara and Setit rivers and about 80 km to the south of the Khashm el-Girba Dam. The Rumela Dam on Atbara will have a height of 55 meters and the Burdana Dam on Setit will have a height of 50 meters. The two dams will be connected and have a total length of 13 kilometers. The project includes the construction of hydropower stations on both Rumela and Burdana Dams with a total installed capacity of 135 MW, which should be capable of producing 380 GWh per year. The objective of the project is to support the development of Eastern Sudan, through enhancement of agricultural production, generation of hydropower and potable water utilizing locally available water resources from the Atbara and Setit rivers. The Project also aims to increase agriculture production in New Halfa area currently irrigated by Khashm El-Girba Dam, as well as, the development of new land consisting of 150,000 ha in Upper Atbara.¹¹

WATER MANAGEMENT SYSTEM AND LEGAL/INSTITUTIONAL ISSUES

It is widely recognized that the institutional structures at the national, trans-boundary and regional levels are a

aGKdnRRjKUXkJMxkMkdDhQ&bvm=bv.69837884,d.bGQ accessed on May 26/2017

⁸<http://preservethemiddlenile.wordpress.com> accessed on June 24/2017.

⁹ Ibid

¹⁰ Ibid.

¹¹ Ibid

precondition for sustainable development and management of transboundary waters and for lasting cooperation among the riparian States (Verhoeven, 2011). Effective transboundary water management starts at the national level, where coordination and cooperation between different ministries and water-related institutions are needed, as are sufficient financing and political commitment.¹² Hence, from the entire area of the Tekeze river basin, that is about 86,510 km², Ethiopia owns about 82,350 km².¹³ This fact necessitates the need to look into the water management system, legal and institutional issues in Ethiopia.

INSTITUTIONAL ARRANGEMENTS FOR WATER RESOURCES MANAGEMENT IN ETHIOPIA

Institutional arrangements for water resources development and management in Ethiopia are organized into different levels. At the federal level, the Ministry of Water and Energy (hereafter the ministry) is the sole federal government institution established to manage the country's water resources.¹⁴ The ministry has mandates to formulate policy and legal frameworks, to establish relevant institutions, set standards, commission studies, plan and develop water supply and sanitation, irrigation, hydropower, and other energy forms, and water resources administration, protection, monitoring, and allocation. Moreover, the ministry also handles trans-boundary water issues. Accordingly, the Ministry of Water and Energy bears a special responsibility for water resource development and river basin planning in the Tekeze river basin.¹⁵

At basin level, River Basin Organizations comprising a Basin High Council and River Basin Authorities are being established in order to ensure integrated water resources management at a basin level. To date, there are three RBAs for the Abbay, Awash and Rift Valley Lake basins. At regional level water resource bureau in each regional state deal with the development of water resources for domestic water supply, either directly for larger borehole drilling programs, or indirectly through funding for local Woreda government and their water offices (tasked with planning, implementing and/or backstopping spring development, lower-cost wells and sanitation). The regional bureau also plans, finance and implement small-scale irrigation projects.

LEGAL FRAMEWORK FOR WATER RESOURCES MANAGEMENT IN ETHIOPIA

The legal framework for water resources management in Ethiopia covers policy, strategy, proclamations, regulations, and directives. The Ethiopian Water Resources Management Policy, formulated in 1999, is in line with the principles of integrated water resources management. The policy framework is based on four pillars: domestic water supply and sanitation/hygiene, irrigation and drainage and hydropower development.¹⁶ The Ethiopia Water Sector Strategy is the implementation roadmap for the policy. The Ethiopian Water Resources Management Proclamation No. 197/2002 provides a legal basis for water resources administration. The Proclamation sets out allocation priorities, permitting and charging arrangements, and the broad framework for water resources development and management.¹⁷ In addition, detailed implementation procedures and arrangements for permitting are set out in Ethiopian Water Resources Management Regulation No.115/2005.A Basin High Council and Authorities Proclamation (No 534/2007)

¹²UN (2008) Trans boundary waters: sharing benefits and responsibilities.

¹³Ethiopia, FDRE, Federal Democratic Republic of Ethiopia (1998), Tekeze River Basin Integrated Development Mater Plan Study, Main Report, Volume I, Addis Ababa

¹⁴ See Proclamation No. 691/2010

¹⁵ Ibid

¹⁶ Ministry of Water and Energy (1999) 'Ethiopian Water Resources Management Policy'. Addis Ababa: Ethiopia.

¹⁷ MoWE (2002) 'Ethiopian Water Resources Strategy'. Addis Ababa: MoWE

and subsequent regulations that have established RBAs and River Basin Organizations (RBOs), together with the Irrigation Development Incentive Proclamation, provide the main legal basis for water resources development and management in Ethiopia. On the other hand, there is a lingering paradox between the need to utilize the huge potential of the water resources for much-needed development and the lack of economic and institutional capacity at the national level compounded by the absence of cooperation at the sub-basin level.¹⁸

WATER MANAGEMENT, LEGAL AND INSTITUTIONAL ISSUES IN THE REGION

The international character of many freshwater resources requires states to establish effective water resource management. In this respect, the existence and the role of institutional structures at the transboundary level remains critical for sustainable development and management of transboundary waters and for lasting cooperation among the riparian States (Verhoeven, 2011). Yet, legal and institutional arrangements for water utilization and management are not available in the Tekeze/Atbara river basin riparian states particularly Ethiopia and Sudan (Fikru et al., 2018).

The lack of water management, legal and institutional arrangement between the major Tekeze river basin riparian states has prevented significant progress with respect to sustainable water development and management. Moreover, the Tekeze river basin is one of the sub-systems of the Nile water system. Thus, this fact calls to see and examine the hydro-politics of the Tekeze river basin in the broader context of the hydro-politics of the Nile river basin. In this regard, in his analysis of the regional context of water utilization in the Eastern Nile basin, Yacob stated that:

At present, there are no legal or institutional arrangements to harmonize upstream-downstream water utilization interests at sub-basin or basin levels. Nor are there any mutually acceptable customary modalities, which might be acceptable for inter-riparian water utilization and management. The lack of active engagement to mitigate the numerous water-related problems interests at sub-basin or basin levels. Nor are there any mutually acceptable customary modalities, which might be acceptable for inter-riparian water utilization and management (2007:30).

However, a sound legal framework is essential for stable and reliable cooperation. At the global level, the 1997 Convention on the Law of Non-Navigational Uses of International Watercourses represents an important step forward. The Convention was adopted by the United Nations General Assembly and provides a legal framework for inter-State cooperation on international watercourses. However, it is not yet entered into force. For instance, Equitable and reasonable utilization and the not causing significant harm rule are already part of international customary law.

RIPARIAN ISSUES OF TEKEZE RIVER BASIN

With regard to settlement patterns along the Tekeze river basin, the 1995 population of the basin, extrapolated from the 1994 population census results, is about 6.4 million in the economic basin area and 4.7 million within the hydrographic boundaries. The difference of 1.7 million people, representing 27% of the economic basin area population, lives in the border *woredas* outside the basin boundaries. The total population of the border *woredas* amounts to 61% of the economic basin area population. Population densities vary widely within the basin. The western half of the basin consists of lowlands which are sparsely populated, with densities of 0-25 inhabitants per km² (Dawit, 2010).

¹⁸ Yacob Arsano(2007), *Ethiopia and the Nile: Dilemmas of National and Regional Hydro politics*

On the other hand, the eastern side of the basin consists of highlands showing much higher densities in the range of 100 to 120 inhabitants per km². The highest population densities, locally up to 200 inhabitants per km², are found in a narrow ring around the eastern highlands. The population is largely rural. The urban population constitutes 12% of the total population with reference to the economic basin area and 10% with regard to the hydrographic basin area. In general, about 56% and 46% of the basin is situated in the Amhara (4 zones) and Tigray (4 zones) Regional states, respectively. There are two large, one medium, 12 small towns and 34 rural centers in the basin. The population of the basin is estimated to be 4,724,164. The Rural population (93%) is expected to increase by threefold in 50 years and the urban population is by tenfold.¹⁹

CONFLICT AND COOPERATION OVER TEKEZE RIVER

The Tekeze river basin is one of the sub-systems of the Nile water system whose upper streams rise in northern Ethiopia.²⁰ The sub-system contributes 8.2 Bcm to the total annual flow of the Nile waters (FDRE, 1999; Yacob, 2007:85). Thus, as the sub-basin of the Nile, Tekeze River is also shared by the Nile basin states in general and Ethiopia, Sudan and Eritrea in particular.

Since time immemorial, Sudan and Ethiopia share the longest border and people. More than anything, the major rivers of Sudan including Atbara originate in Ethiopia. Irrespective of this fact, however, water largely remains as a source of tension than cooperation between the two countries (Cascao, 2008).

Hence, Sudan is the only Nile basin country, which signed the 1959 agreement with Egypt. Moreover, Sudan and Ethiopia have agreed on several gestures of goodwill, including the 1980 and 1991 protocols to cooperate on the Nile waters development. Yet, there has not been a known bilateral or multilateral water development venture between Ethiopia and Sudan. Furthermore, Yacob stated 'In the present conflagration of upstream-downstream confrontation Sudan generally behaves like a downstream state, although its relations with Egypt have been not so friendly from time to time' (2007:196).

On the other side, Sudan and Ethiopia can enhance cooperation by win-win projects shared between the two countries (Verhoeven, 2011). There are great needs for joint cooperation between the two countries to reduce sediment transportation and to increase the recharge to groundwater going to the Nile (Betrie et al., 2011). But all these joint projects have to be negotiated; integrated projects are projects that integrate hydropower's generation, irrigation, watershed management, and navigation, fishing and flood control. Thus, unless Sudan works with Ethiopia, its fields and plains continue to be flooded and its dams continue to be filled up with silt and pebbles carried down from the Ethiopian highlands. Moreover, the quantity and quality of the waters Sudan receives may also not be sustainable (Verhoeven, 2011).

By enhancing joint projects between Ethiopia and Sudan to build dams and construct irrigation projects, the Nile countries can enhance peace and stability in the region. Without this principle, it is not possible to satisfy human needs for the present and coming generations (Fikru et al., 2018). The benefits of joint projects include maximizing water resources, linking the issue of water to other resources, establishing supranational organizations, better use of

¹⁹ Central Stastical Agency report(1995)

²⁰ Yacob Arsano(2007), *Ethiopia and the Nile: Dilemmas of National and Regional Hydro politics* .

technology, basin-wide conservation, and positive spillover for political relations, environmental protection, and combating drought (Verhoeven, 2011).

Moreover, Ethiopia boasts a regional comparative advantage, ecologically and economically, in hydropower and has the potential to generate up to 45,000 megawatts of electricity (Solomon, 2009). Thus, there is a strong case for building regional economic interdependence around an energy deal exchanging Sudanese oil for Ethiopian electricity and thus providing a new framework for political relations (Verhoeven, 2013). Joint energy initiatives could provide a greater, cleaner and more reliable power supply for both Sudan and Ethiopia as each country grapples with providing jobs for burgeoning populations and services to marginalized areas (Verhoeven, 2011).

CONCLUSION

The study has examined the water governance and management systems in Tekeze River basin. It clearly stipulated the role of effective water governance and management among riparian states. Regardless of the increasing dependence on the shared water resources, poor level of water resources utilization and management remains unchanged. Mostly, the issue is more complicated by the international character of Tekeze River, the absence of legal and institutional mechanisms of water governance, lack of cooperation among riparian states, and absence of joint hydropower and other water development projects among riparian states.

Tekeze River has ample economic opportunities for economic development to major riparian actors. From the Ethiopian side, despite the huge economic potentials of the Tekeze River, the actual utilization of the river remains completely undeveloped. The presence of deep gorges and steep slopes for hydropower development and large-scale irrigation potentials are some of the major development potentials of the basin. On the other hand, small scale mixed farming remains the dominant economic activity in the whole Tekeze river area. High flow for a short period associated with rain shortage of skilled manpower and annual variability of river flows are some of the major limitations or constraints for the development of the basin. From the Sudanese side, we have highlighted the fact that the Khasm el-Girba project is the major project along the Atbara river basin.

In Ethiopia, institutional arrangements for water resources development and management are organized at federal, basin and regional levels. The legal framework for water resources management in Ethiopia covers policy, strategy, proclamations, regulations, and directives. Yet, at the inter-riparian state level, there exist a lack of legal and institutional arrangements for water utilization and management. In this regard, the Tekeze River basin remains as a source of tension than cooperation between the riparian countries namely Ethiopia, Sudan, and Eritrea. On the other hand, there is a great need for joint cooperation between Ethiopia and Sudan

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