

# A COMPARATIVE CASE STUDY OF THE POLITICS AND POLICY DEVELOPMENT OF SUSTAINABLE WATER RESOURCES: SOUTHERN AND EASTERN AFRICA

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Given today’s political climate, water security is viewed by many in the developed world as an issue of threats to existing water sources, issues pertaining to maintaining both water quality and quantity. The reality for the most people in the developing world, though, is that access to water itself is an insecure issue. For most developing countries, the concern is not primarily about maintaining or developing sustainable water resources. The greater concern is with obtaining water in the first place in order to promote development and satisfy the demands of an ever-growing population, especially as urban development generates greater demands. Water security is inexorably tied to the food security and development of a region.

Water resources can serve as a stabilizing influence within a region as well as a destabilizing influence. Ideally, cooperation among nations with regard to water resources will lead to greater overall cooperation and political stability. On some levels, recognition of the need to create sustainable water resources does exist. Various interregional cooperative schemes exist, such as the Southern African Development Community (SADC), and the Nile Basin Initiative (NBI). In order to achieve water security, nations need to balance water demand with creating a sustainable and equitable supply. This often depends on creating functioning water pricing policies and incentives for conservation at a time when demand may often outstrip implementation of policies and infrastructure.

In this paper, we will examine the policies and development of sustainable water resources in two regions of Africa: southern Africa with Botswana as a case study and eastern Africa with Eritrea as a case study. Both countries have a freshwater availability of approximately 2.8 km<sup>3</sup>/yr (Table 1), but due to historical and geographical factors, strategies differ. Botswana currently derives most of its freshwater from groundwater, while Eritrea is dependent almost exclusively on precipitation for its agriculture.

**Table 1: Relevant data for the selected countries**

	<b>Botswana</b>	<b>Eritrea</b>
Area (km <sup>2</sup> )	600,370	121,320
Major drainage basins	Okavango, Limpopo, Orange, Zambezi	-
Arable land (percent of total)	0.61	3.78
Average annual precipitation (mm)	300-560 <sup>a</sup>	450-690 <sup>a</sup>
Population (millions)	1.59	4.4
Population growth rate	0.76*	3.8
Per capita freshwater availability (m <sup>3</sup> /yr)	1760	630

Data from CIA, 2002; \*Ashton, 2003; <sup>a</sup>Conley, 1996

Eritrea is dominated by an extension of the Ethiopian highlands in the west, descending to the coastal plains. The highlands can receive up to 69 cm of rainfall but the coastal plains tend to be hot and arid (Geraghty and Temnewo, 2000). Most of the population and agricultural activities tend to be concentrated in the Central Highlands. 80% of the population is involved in farming or herding. Most of the rain comes in during July to October, highly torrential and erratic, providing the main source of water to the country.

A major objective of Eritrea has been to increase food security, in order to reduce dependence on foreign aid (Geraghty and Temnewo, 2000). This has led to a drive in increasing water security. To this end, a National Water Policy was drafted in 1997. Its main objectives are to inventory existing water supplies, establish a resource center for such data, and to improve planning, assessment and management of these water resources. Involvement of the entire community is seen as vital for project success.

Use of hand dug well or boreholes is widespread to augment water supplies, but there is no indication of any extensive high yield aquifer (Geraghty and Temnewo, 2000). Borehole wells are generally up to 60 m deep, ideally solar operated to pump water into a reservoir. Typical hand pump production is approximately 5550 l/day, so at a minimal consumption rate of 50 l/capita/d, a handpump can serve 1100 people (Carter et al, 1996). The cost of creating a borehole well is about \$9900 (Carter et al, 1996). There is a danger in this resource being overdeveloped, as groundwater levels in some regions have fallen by up to 10 m.

Harnessing rainfall appears to represent the greatest opportunity for increasing water availability in Eritrea. By constructing small dams to store peak runoff, water can be retained to increase supplies for irrigation and domestic use. Terracing agricultural plots also appears to aid in reducing soil erosion as well as retain rainwater and thereby increase infiltration (Geraghty and Temnewo, 2000).

Botswana has several instances of inland drainage, with the largest being the Okavango River which terminates in the Okavango Delta. The country is predominantly flat or gently rolling tableland, with the Kalahari Desert in the west. While the country does intersect with several major river basins (Table 2), it does not really supply much of the flow of those rivers, and consequently also does not have a high dependence on precipitation for its water supply. Agriculture makes up only 4% of the GDP, with most of Botswana's relatively stable economy derived from the diamond mining industry and tourism. Like Eritrea, though, a high importance is placed on food security, which requires water security.

**Table 2: Botswana's contribution to its major drainage basins**

	Area (km <sup>2</sup> ) <sup>c</sup>	Area (% of basin)	MAR contribution (%)
Orange <sup>a</sup>	103000	9	negligible
Limpopo <sup>a</sup>	87000	20	3
Zambezi	80000 <sup>d</sup>	6 <sup>d</sup>	minimal
Okavango <sup>b</sup>	230000	21	2 (river) + 24 (onto delta directly)

Data from <sup>a</sup>Turton, 2003; <sup>b</sup>Ashton, 2003 and <sup>c</sup>Conley, 1996; <sup>d</sup>Mutembwa, 1998

Botswana's current water use trends developed out of its historical past, with boreholes being developed to aid cattle grazing in the communities in the 1930s (Peters, 1984). As with water holes in the American West, these boreholes represented opportunities for cattle ranching to expand into new territory. Up until the 1970s, ranching was restricted in the Okavango Delta due to the presence of the tsetse fly, but with modern advances, even the Okavango Delta is coming under pressure for increased ranching.

Botswana has an established Water Utilities Corporation (WUC), servicing 330,000 customers in 1998 at an average of 84 million liters daily. The corporation maintains a policy of cross-subsidy to protect domestic consumers at all economic levels. In addressing water needs for its people, it is paramount the state remain cognizant of the three core principles to water development - sustainability, equity and efficiency.

A major concern of Botswana's is the status of the Okavango Delta. Currently, it is underdeveloped, largely because the Delta has been recognized and valued as a unique environment. Much of the tourism sector that maintains the Botswanan economy, along with diamond mining, is centered around the Okavango Delta. Namibia has signaled its intention to divert water for the Windhoek metropolitan regions by 2020. Botswana, itself, is debating the necessity for a diversion from the Okavango to Gaborone, the capital and largest urban area. A dam built on the outlet of the Okavango Delta is now being recharged by groundwater. Fears that diversions could negatively impact the delta are present in any consideration of the Okavango River Basin Commission (OKACOM).

Continuing challenges to water development in these regions are the variability in climate, as well as the on-going urbanization. These will likely combine to increase water pressures. Water consumption levels in Eritrea are currently at 10l/c/d (Geraghty and Temnewo, 2000), much less than the 20-45l/c/d recommended by WHO. Only about 10% of the rural communities and 30% of the urban communities in Eritrea have direct access to water (Geraghty and Temnewo, 2000).

Currently 38% of Africa lives in urban areas, and urbanization rates are some of the highest in the world. As seen in other regions, rates of urbanization often outstrip the ability of a community to provide the necessary infrastructure. Asmara is urbanizing at 3%, while Gaborone is growing at 8% (WHO, 2000). During droughts, people tend to migrate to the urban centers or the fringes of the delta. This urbanization will continue to increase demands, as urban dwellers typically consume more water per capita.

Even with the low population growth of Botswana, immensely impacted by the HIV/AIDS epidemic, population growth rates in neighboring countries will generate an increased demand, especially in Angola, which has not yet started water abstraction projects. With climatic change, or even just the sustained droughts that southern and eastern Africa continually are experiencing, increasing amounts of conflicts can be expected, both on a community scale and inter-regionally. As precipitation is expected to decrease in both Eritrea and Botswana, the amount of groundwater mining will increase, presumably to unsustainable levels. As water sources become scarcer, the grain yields will decrease, increasing foreign dependence, a situation counter to current policy goals.

In this paper, we will investigate the impact of Botswana's national water policy and management on the Nature and success of the country's food security strategy since independence in 1966. Special attention will be devoted to the current National Development Plan Period and particularly to the decision to construct the North-South Water Carrier to transport Okavango River water to major population centers in the southeastern part of the country, including Gaborone. Similarly, we will examine water development schemes in Eritrea and detail ties of water security to food security. Attention will also be given to the impact of proposed water pricing schemes on urban poor versus government-managed, subsidized municipal water. By examining the strategies for securing sustainable water resources in varying parts of the world, we hope to evaluate strengths and weaknesses of water policies, as discussed in the National Research Council's Agenda for Water Resources Research.

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