Chapter 65

Congo Basin's Shrinking Watersheds:

Potential Consequences on Local Communities

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ABSTRACT

Rainfall time series data from three sites (Kinshasa, Luki, and Mabali) in the western Democratic Republic of Congo were analyzed using regression analysis; rainfall intensities decreased in all three sites. The Congo Basin waters will follow the equation $y = -20894x + 5483.16$; $R^2 = 0.7945$. The model suggests 18%-loss of the Congo Basin water volume and 7%-decrease for fish biomasses by 2025. Financial incomes generated by fishing will decrease by 11% by 2040 compared with 1998 levels. About 51% of women (N= 408,173) from the Lake Tumba Landscape fish; their revenues decreased by 11% between 2005 and 2010. If this trend continues, women's revenues will decrease by 59% by 2040. Decreased waters will severely impact women (e.g. increasing walking distances to clean waters). Increasing populations and decreasing waters will lead to immigrations to this region because water resources will remain available and highly likely ignite social conflicts over aquatic resources.

INTRODUCTION

Climate change is a scientifically established fact now (Walther et al., 2005), even though the magnitude of its multiple, diversified and multidimensional effects remain mostly in the domain of mathematical modeling. Discussions on the mitigation of climate change and adaptation processes (social, cultural and biological) remain at the core of scientific and political debates (Aiken et al. 1992; Fletcher, 1997; Fletcher, 2000; Hobbs & Knausenberger, 2003; Hughes, 1986; Inogwabini et al., 2006) because they are diversified and multidimensional, and will vary throughout the world (IPCC, 2007). The nature and the magnitude of these impacts have, however, yet to be described for different geographic environments

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and locations. This is even more important for the tropical region of Central Africa where documented evidence is scanty (Halpin, 1998; Inogwabini et al., 2006; Sonwa et al., 2009). Informed guesses and mathematical projections convey the message that climate change's effects in Central Africa may range from drier conditions in areas adjacent to as deserts (Sahara and Kalahari) where water occurs in shortage to high floods in coastal habitats directly adjacent to oceans due to increased water levels as a result of the melting of polar ice (Halpin, 1998).

Unfortunately, however, long-term field data that can document changes which highlight the effects of climate changes over the past years are difficult to find for Central Africa (Edwards & White 2000; Pimm, 2007; Sonwa et al., 2009). Lack of data fosters the use of surrogate data that can predict the effects of climate variation in Central Africa. One of those surrogates has been the linking of phenological data to weather patterns (Tutin & White, 1998), direct measurements of water levels (Colombant, 2005), using direct meteorological data and looking at their trends (Inogwabini et al., 2006). The use of long time series meteorological data as a proper detector of the effects of the climate change is fully justified by the fact that if climate change will affect water level, then drier conditions in the terrestrial Central Africa region are, logically, linked to water cycles, especially rainfall regimes over the continent. However, continuous time series data on rainfalls are difficult to find in Central Africa to document the trends and extents of felt changes (Halpin, 1998). Furthermore, where there are continuous long time series data, the analytical capabilities have made it difficult to determine understandable trends that crude data can convey. Even less available are data on effects of climate change on local economies, health, security and biodiversity (Sonwa et al., 2009; Stern, 2007).

MAIN FOCUS OF THE CHAPTER

This chapter presents three long term data from three locations in the western Democratic Republic of Congo (Figure 1), with the aim of presenting these long time series data in a single analytical framework and discussing patterns that emerge from that analysis in the context of global climate change. The chapter links trends in rainfall and surface area Congo Basin watershed and projects potential effects of these trends to the level of the central Africa region. Combining these projected effects with field data freshwater resources, the paper discusses inferred effects on climate changes on local populations.

STUDY SITES

Rainfall data were collected from (1) Mabali, (2) Kinshasa and (3) Luki. Mabali is located near the equatorial line (Inogwabini et al., 2006). Located in the *Cuvette Central*, weather patterns are believed to be stable (Bultot & Griffiths, 1972). The Cuvette Central is a lowland, flat and heavily flooded equatorial region. It is characterized by *terra firma* forest (forest whose floor remains dry for most of the year), *swampy forest*, and diverse types of savannahs inundated and terra firma (Evrard, 1968; Leonard, 1951 & 1952; White, 1983). The *Cuvette Central* is the lowest point within the Congo Basin and once constituted a water retention point during the late Miocene when many African inland basins were still *endorheic* (Roberts, 1975; Thieme et al., 2005). Kinshasa is a town of nearly 9,000,000 people (Aveling et al., 2003) and located south-west of the Mabali. Adjacent habitats to this mega city are essentially composed of wooded savannas on a sandy soil. Kinshasa is located at Pool Malebo, an open water sur-