Once Upon a Time an Opará – an Ocean River

by Lucigleide Nery Nascimento[1]

On its nearly 2,700 kilometer-long northward and then eastward journey to the Atlantic Ocean, the *São Francisco River* drains eight percent of Brazil's territory (Figure 1), an area of the size of Spain, Portugal and Denmark combined, mostly consisting of *Savannah* and *Steppe* biomes. The basin is home to almost 8% of Brazil's population (CBHSF 2004), and two sentences define the river's importance and the locals' dependence on it: "if the *São Francisco* River dies, it will be the end of us all;" and "there is no life without the *São Francisco*" (Clothes washer #1, Personal Communication, 01 Aug 2006, *Juazeiro*-BA; Clothes washer #2, Personal Communication, 16 May 2007, *Pirapora*-MG). Indeed, according to a major Brazilian literary writer, Guimarães Rosa (1908-1967), in the backlands of the Northeast, the *Sertão*, the "*São Francisco* is the only river," the "capital river" (Rosa 1983, p. 55, p. 220). It is hydrologically and socially important. It is one of only a few permanent sources of water for many. Some fifty-seven percent of the basin is located in a drought-prone semi-arid climatic zone (CBHSF 2004).

Watershed vs. Country Area
Source: derived from georeferenced data available from http://siscom.ibama.gov.br/shapes visited on October 10, 2009 (IBAMA 2009).

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Indigenous native people, white Europeans, and African slaves and escapees comprised the inhabitants of the basin during Brazilian colonial times (1500-1815) (CODEVASF 1978). The river served two major purposes for the nation: (1) its resources allowed population settlement in the basin, and (2) the main course and its tributaries linked inland regions, which could be accessed by boat (Rocha 1983) (Figure 2). The indigenous native people, the *Tupi*, named it the Ocean River (*Opará*), on account of its dimensions.

***Benjamim Guimarães* Steamship**
Source: Lucigleide Nascimento, 2007
Note: Transport by boat was crucial to the local economy. The different types of vessels carried everything, with cargos including salt, people, cattle, mail and money (Rego 1936, Gautherot and Frota 1995). Today, for tourism, the *Benjamim Guimarães* is the last steamship that still sails the Old Chico. Built in 1913, in the United States, it navigated the Mississippi and Amazon rivers before the *São Francisco* (Silva, *et. al*. 2000).

In Brazil, from the 1930s to early 1990s, the state invested in the provision of basic inputs and infrastructure in the nation. By the 1950s, electricity shortages and a growing demand for energy caused by urbanization-cum-industrialization challenged Brazilian development (Brewer for The New York Times 20 Nov 1954) and influenced the government-instigated changes. The first station producing electricity on a large scale, *Paulo Afonso I*, went online in 1954. Through power lines, electricity started to flow outward from the valley in the same year (CHESF 1998). Today (2017), nine dams govern the flow of the *Velho Chico* (Elderly Chico) (Figure 3).

Luiz Gonzaga Hydropower station, Source: Lucigleide Nascimento, 2004

Federal pro-energy policies favored large-scale irrigated agriculture in the valley, by providing a planned, steady water supply and the electricity to pump it. Furthermore, the federal government has directly implemented policies and actions for the agricultural sector, such as irrigation projects. The fruits of the basin now reach beneficiaries of the ecosystems services of the *Velho Chico* in places as far as the United States and some European nations.

A hydropower corporation maintains the average flow level of 1,815 m^3/s under normal circumstances. The ten-year management plan for the basin (2004–2013) established a minimal daily average discharge volume of 1,300 m^3/s, though at times flow rates above this must occur (CBHSF 2004; ANA Resolution # 412 of Sep 22, 2005). The National Water Agency – ANA (Agência Nacional *de* Águas) – and the National Electric System Operator – ONS (*Operador Nacional do Sistema Elétrico*) – are in charge of establishing criteria for the utilization of water resources and overseeing the use of water in reservoirs (Law n° 9.984 of July 17, 2000, Article 4). The discharge below its ecological level contributes to the river's ecosystems collapse: change in the water's characteristics, destruction of habitat and disturbance of species' reproductive cycles (Nascimento 2010).

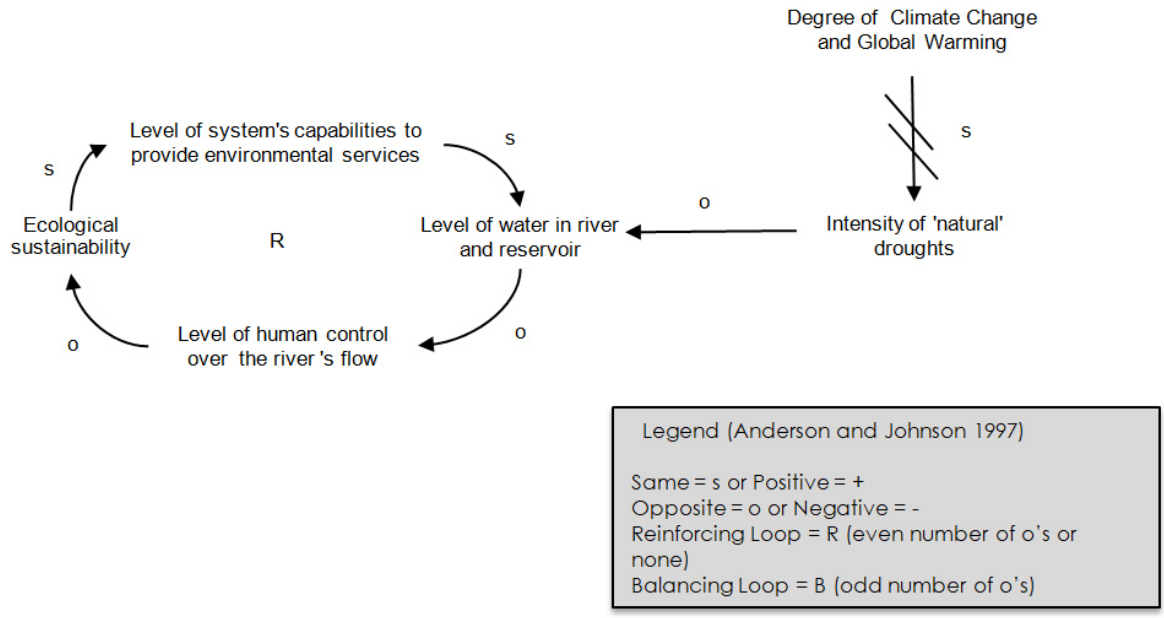
The years from 2012–2017 have been characterized by a period of extreme drought. According to the National Electric System Operator's demands, the National Water Agency reduced the discharge from *Sobradinho* and *Xingó* reservoirs to assure power generation and, in accordance with ANA, the multiple uses of the water resources of the basin. The temporary resolutions have allowed a discharge as low as 550 m^3/s, but the actual drought is so severe that restrictions were also imposed upon irrigators: water withdrawal on Wednesdays is forbidden until November 30, 2017 (ANA Resolution # 1.043 of June 19, 2017).

The two principal uses of this river of nationwide importance are as a power generator and as a source of irrigation. It has affected the provision of other ecosystem services too, disturbing fish, the fishery and fishermen, and traditional riparian agriculture. Nevertheless, the impacts of the droughts have negatively influenced even those uses.

Drought can be defined as a lack of water or a water volume below the average available under normal local conditions for humans and other species (Tallaksen and Lanen 2004). Studies have linked such events

in the Northeast Region of Brazil to temporal and spatial inter-annual variability of rainfall; the topography of the region; and high soil reflectivity (Nascimento 201?; SBPC 2005; Serebrenick 1953). Water scarcity also has been connected to climatic anomalies such as *El-Ninõ*; to alterations in the position of the Intertropical Convergence Zone (Nascimento 201?, Davis 2001); to the increase in the emission of greenhouse gases; and to the hole in the ozone layer.[2]

Climate change will reduce the water available in arid zones (IPCC 2014) (Figure 4). Marengo et al. (2007) asserted that climate projections confirm an increase in water deficit in the Northeast Region of Brazil. The National Water Agency's studies have showed an abnormal precipitation regime in the 2012-2014 period for that same area (ANA 2015; ANA 2013).



São Francisco River System - Source: Lucigleide Nascimento, 2017

Repeated longer-lasting droughts affect the semi-arid region of the basin. The valley has already been the context for water-use conflicts, which have even resulted in deaths and two much-publicized episodes of hunger-strike (2005 and 2007) by a Brazilian Catholic Bishop to protest the diversion of the *São Francisco River* (Silva 2013; Nascimento 2007). Extreme events in the Southeast and the Northeast Regions have resulted in higher energy bills for the larger society. Because of water scarcity, it became impossible to produce power, and subsequently Brazil replaced hydropower with thermal power, a more expensive form of electricity generation. Under unfavourable climatic conditions (droughts), the discharge has been kept below its ecological level and, at the river's mouth, among other consequences, the waters of the *Opará* now fight against invasion by the Atlantic Ocean. The conflict between non-consumptive (e.g. hydropower) and consumptive uses (e.g. irrigation, domestic water supply) will worsen in the future due to climate change and a growing demand for water, food and energy.

2 Despite the positive effects of the Montreal Protocol to regulate the use of and phase out substances that deplete the ozone layer, the hole still exists, mainly over Antarctica.

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