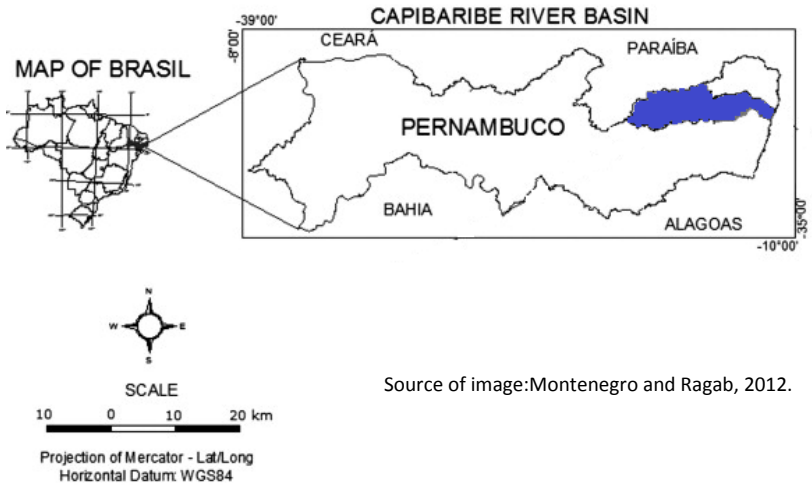
Capibaribe river basin at a glance

Overview - More people rely on the Capibaribe River for water than on any other river in the state, making it a critically important resource in semi-arid northeast Brazil, a region prone to devastating droughts. From 2011 to 2013 the region experienced the worst drought to strike the region in 50 years (NOAA 2013). Pollution and climate change also serve as mounting threats to the river. More complete knowledge of the basin and its social and environmental characteristics is necessary. This factsheet provides an overview of the Capibaribe river basin and is meant to serve as a starting point for further research.



Source of image:Montenegro and Ragab, 2012.

Hydrologic features - The total area of the basin is 7455 km^2 with an average width of 71 km, covering for 7.58% of the area of the state of Pernambuco (APAC 2012). The river is intermittent in the upper and middle reaches and becomes perennial in the city of Limoeira, located in the lower basin. The main tributaries are: riacho Mimoso, riacho Tabocas, riacho da Onça, riacho Carapatós, riacho das Éguas, riacho Caçatuba, riacho Batatã, rio Cotumgubá, rio Goitá, rio Tapacurá, riacho Jataúba, riacho Doce, riacho Topada, riacho do Manso and riacho Cajaí (APAC 2012). The river has 13 major dams which store water for municipal, agricultural, and industrial use (Figure 1). The geology of the region leads to signficant salinization, with most of the river's water too salty for agricultural or domestic use. Issues of salinization become most acute during extended dry periods. Very little groundwater is stored in the basin due to the presence of impermeable crystalline rock near the surface---the Capibaribe River basin is composed of 90% crystalline basement and 10% sedimentary basin (Araujo 2012). Water is often obtained from shallow wells located in the sandy beds of the Capibaribe's tributaries, allowing users to pump surface water directly when water is flowing and pump from the wells during dry periods. Some deep groundwater collects in fractures located in valleys of the basin but it is difficult to predict where these water reserves are located and is generally prohibitively expensive to drill wells to the depth that they are located (approximately 50m deep). However, there are two main aquifers present in the far eastern side of the basin which supply water to Recife. The Boa Viagem aquifer is a shallow quaternary sedimentary unconfined aqufer that averages 50m deep and the Beberibe aquifer is a deep cretaceous sandstone aquifer that averages 200m deep. These aquifers are vulnerable to salinization due to recharge with water from the Capibaribe river.

Geographic and climatic features - The Capibaribe river basin is located the northeastern portion of the state of Pernambuco, bounded by 7 and 8 S latitude and 34 and 36 W longitude (APAC 2012). It originates in the Cariris Velhos mountain range in the district of Jatauba and meets the Atlantic Ocean in the state capital of Recife, flowing intermittently for 280km (APAC 2012). Precipitation and climate are highly variable in the basin as the river travels from the semi-arid interior, with a mean annual precipitation of 600mm and mean temperature of 20.4°C, to the tropical coast, with mean annual precipitation of 2400mm and mean temperature of 26.1°C (Araujo 2013). The spatial variability is due to the influence of two atmospheric systems present in northeast Brazil: the Intertropical Convergence Zone and the Atmospheric Easterly Waves (Secretary of Water Resources (SRH) 2011). Precipitation patterns in the basin are also highly temporally erratic with 60 percent of all rainfall coming during one quarter of the year, from April to July (UNFAO 2000; Montenegro 2012). The total drainage area of the river is comprised of 56.3% natural vegetation, 38.8% agricultural area,3.14% urban areas, and .45% by the river itself (SRH2011).

Socio-economic features- The basin has high socio-economic diversity. The lower basin contains the state capital of Recife and its metropolitan area while the rest of the basin is primarily rural. Sugarcane and ethanol production occur in the lower basin near the coast where there is sufficient precipitation, and these industries are dominated by large-scale companies. In the middle and upper basin, where there is less precipitation, residents primarily relying on small-scale agriculture, ranching, and textile production. Other economic activities in the basin include non-metallic minerals, metallurgy, chemicals, pharmaceutical products, veterinary products, leathers, plastic materials, drinks, transport materials and wood (Auraujo 2013). Comprised of nine states, northeastern Brazil is the poorest region in the country. The state of Pernambuco produced 19.2% of the GDP of the Northeast States, which is 2.7% of Brazil's GDP.

Reservoir	Capacity (m3)	Municipality
Carpina	270,000,00	Lagoa de Itaenga/Lagoa de Carro
Cursai	13,000,000	Paudalho
Eng. Cercino	13,600,000	Cauraru/Brejo da Madre de Deus
Goita	52,000,000	Paudalho/Sao Lourenco da Mata
Juzacinho	327,035,818	Cumaru/Surubim
Machado	6,800,000	Brejo da Madre de Deus
Mateus Vieira	2,752,000	Taquaritinga do Norte
Matriz da Luz	1,250,000	Camargibe
Oitis	3,020,159	Brejo da Madre de Deus
Poco Fundo	27,750,000	Brejo da Madre de Deus/ Santa Cruz do Capibaribe
Sitio Placa	1,167,924	Belo Jardim
Tapacura	92,200,000	Sao Lourenco da Mata
Varzea do Una	11,568,010	Sao Lourenco da Mata

Figure 1: Dams and Reservoirs on the Capibaribe Source: APAC 2013

Institutional features - The Capibaribe river basin supplies water to 1.45 million inhabitants in 42 municipalities, 15 of which are fully within the basin and 26 with administrative centeres in the basin (Araujo 2013). The mean population density of the basin is 190 people/km2 (Aruajo 2013). Only seven of the municipalities in the basin have sewage systems and treatment plants and three of these treatment plants have shown below recommended treatment of waste (PROAGUA 2002). The state capital of Recife, with a population of 3.7 million, accounts for the majority of water use. There are two main institutions that manage water resources, both operating at the state level: Companhia Pernambucana de Saneamento (COMPESA) and Agência Pernambucana de Águas e Clima (APAC). COMPESA is responsible for distributing water for consumption while APAC resolves legal conflicts, monitors, and distributes climatic information. The Capibaribe Basin Committee (COBH) was created in 2007 to increase stakeholder participation in basin management and currently its membership includes municipal governments and several private companies. The main federal law governing water rights is the Politica Estadual de Recursos Hidricos. This law states that pumping of below 43,000L/day is exempt from needing water rights. As such, small-scale farmers do not generally have official water rights.

Current challenges - **Pollution**: The Capibaribe receives substantial domestic, industrial, and agricultural pollution. Many of the towns along its banks dump their sewage into the river directly (World Bank 2009). Pollution from pesticides and fertilizers is also significant. Industrial pollution comes mainly from sugarcane ethanol and clothing production (Gunkel et al 2003). This pollution has led to intense eutrophocation, particularly in the lower basin near Recife (Araujo 2012). The estimated organic load that reaches the river is 32.4 biochemical oxygen demand/day, with 95.7% originating from domestic sources and 4.3% industrial (Pernambuco State Environmental Agency 2010). **Drought and climate change**: Northeast Brazil possesses only 3 percent of Brazil's total freshwater resources. With an average per capita water availability of 1,320 m3/year, Pernambuco is one of the driest states in Brazil (World Bank 2009). In a striking example of this vulnerability, from 2011 until 2013 the northeast region has experienced the most severe drought in five decades, affecting millions of people in Pernambuco, Bahia, and Piaui (NOAA 2012). The upper Capibaribe river basin has been affected the most severely by this recent drought, but it's impacts have also been felt in the lower basin. There is also high variability in precipitation, making northeastern Brazil also vulnerable to floods. Flood events in Pernambuco and Alagoas in 2009 and 2010 forced hundreds of thousands of people to flee their homes, killed dozens, and destabilized the economy in the region (BBC 2009; BBC 2010). **Sand removal:** In its upper reaches, the Capibaribe has been dry for an extended period due to the recent drought and companies have begun taking sand from the river bed. When this happens, the river stores less water in its bed, which residents rely on during dry periods. Some residents have gotten into legal battles with these companies, while others readily sell sand on their property. If this continues, it could pose a major threat to water storage in the river, which thousands of small-scale farmers and ranchers depend on.

Synthesis - The Capibaribe river basin faces human and climatic stressors. Precipitation events are becoming less predictable and more severe. Pollution is increasing significantly due to a growing population and industriliaztion. Given these threats to the river, it is particularly critical that resilient water management is practiced in the Capibaribe river basin.

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See: http://aquasec.org