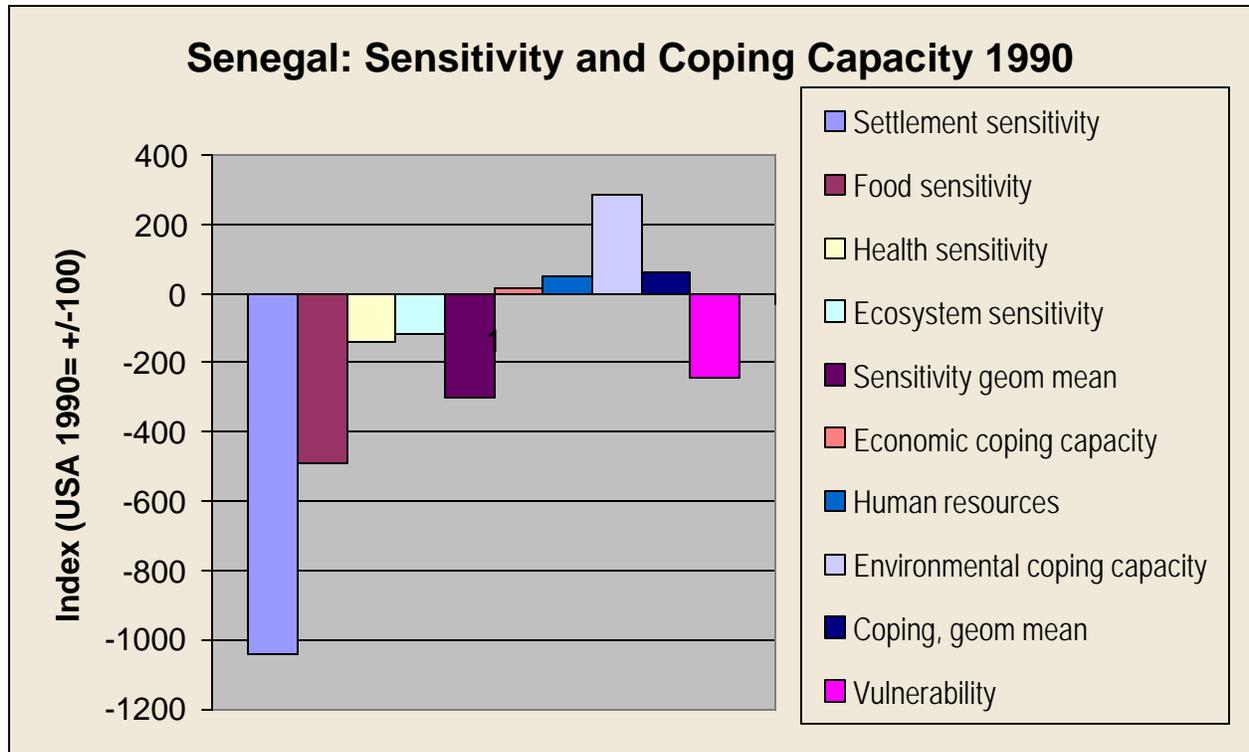


## **THE CASE OF SENEGAL: VULNERABILITY TO CLIMATE VARIABILITY AND CHANGE**

The Republic of Senegal is a small country (196,190 sq km, slightly smaller than the US's South Dakota) on the northwest coast of Africa. Its population is 9,723,149 (July 1998 est.) and growing quickly, with 48% of Senegalese under the age of 14. The infant mortality rate is high (61.2 deaths per 1,000 live births in a 1998 estimate), and average life expectancy is only 57.37 years. Only 33% of the population is literate (age 15 or over who can read and write) – 43% of the males and 23% of the females. Senegal is primarily agricultural: about 60% of the population pursue agriculture. While estimates vary, approximately 27% of the land is arable and 30% is used for livestock. Principal food crops are millet, cassava, sorghum, rice, maize, and pulses. Groundnuts are the chief cash crop. Natural resources include fish, phosphates and iron ore. After seeing its economy contract by 2.1% in 1993, Senegal made an important turnaround, thanks to a reform program, with real growth in GDP of 5.6% in 1996 and 4.7% in 1997. Annual inflation has been pushed below 3% and the fiscal deficit has been cut to less than 1.5% of GDP. Investment has been steadily rising from 13.8% of GDP in 1993 to 16.5% in 1997. Private activity now accounts for 82% of GDP. Industry in the cities, especially Dakar, is growing (7.4% in 1996): manufactures include cement, processed food, beverages, textiles, clothing leather, footwear, and metal goods.

Senegal is covered mostly with savanna, which becomes semi-desert in the Sahel region of the north and northeast. The climate is tropical – hot and humid. Natural hazards include seasonal floods in the lowlands and periodic droughts. Current environmental issues include wildlife populations threatened by poaching, deforestation, overgrazing, soil erosion, desertification, and over-fishing.

Senegal's degree of vulnerability to climatic events was clearly demonstrated during the severe drought of the 1970s and early 1980s, when "local systems were clearly unable to cope and even massive external assistance in the form of emergency famine relief and health support could not prevent huge losses of life" (Wang'ati 1996: 72). This observed baseline vulnerability is captured in the indicator scores for Senegal in our experimental calculations. Figure 1 portrays the static picture of vulnerability that is painted using 1990 data for our 16 proxy variables, combined into four indicators of sensitivity/resistance and three indicators of coping capacity, and then scaling these values against US scores for 1990. These scores indicate that Senegal has relatively high vulnerability (compared to the United States). This is driven by extremely high sensitivity of settlements to climate variability/change due to poor access to clean water and sanitation, and a relatively large number of individuals whose settlement is at risk from storm surges or flooding. Another key factor is Senegal's relatively high food insecurity, as a result of its less modernized agricultural system and the high reliance of Senegalese on basic crops.



In the impacts literature, Senegal is most often included in studies of the Sahelian region. (More often, one of the larger countries, such as Ethiopia, is the focus of study.) For example, Burton et al. (1993) recount the improvement of domestic water supplies in the Sahelian zone, which encouraged larger herds and population expansion. When drought struck, vulnerability proved to be high, “and the marketing and other economic measures taken by governments caused severe distress to cultivators as well as herdsmen” (Burton et al. 1993:51). Glantz (1987) notes the complex interactions among land use practices, migration, and drought, along with the debates over development and disaster aid (often competitors for the same funding) raised during drought events. MacIntire (1993) points out that Sahelian pastoralists are often the hardest hit by drought and that evidence of food shortages resulting from droughts are often poorly measured and all but ignored until after there is widespread suffering. Wang’ati (1996) emphasizes the fragility of the regional ecosystem and the historically wide variations in rainfall to identify the greatest vulnerabilities as land degradation and displacement of pastoralists. Suggested sustainable development strategies include maintenance of vegetative cover, provision of urban employment as less and less grazing land is available for pastoralism, and continued improvements in soil and water conservation for more intensive agriculture and livestock production within the limits of natural climate variability.