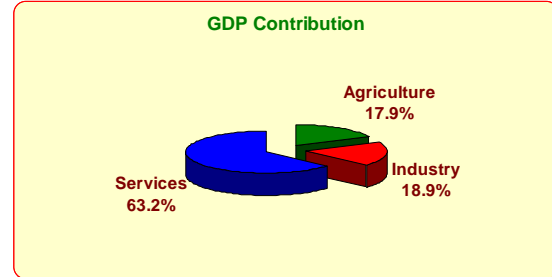


Senegal: Climate Risk Factsheet



GDP (US\$ billion; 2006) ¹ :	8,2
Population (million; 2006):	11.7
Land Area (1,000 sq. km)	192.5
Agricultural land (percentage of total land area, 2005 ²):	42

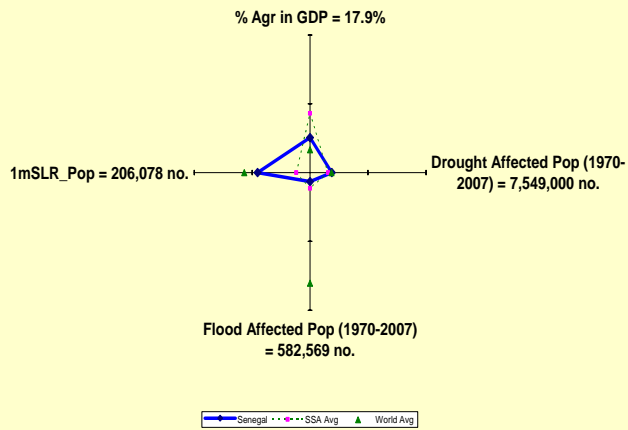


Observed Historical and Current Climate Trends	Projected Future Climate Trends
<p>Temperature: The average temperature in the region was 27.80°C between 1960-1990 (Cline, 2007).</p>	<p>Temperature: The climate simulations summarized by Cline (2007) project an average temperature of 31.51°C between 2070–99 (Cline 2007). Associated with rising temperature are increased evaporation rates that are likely to exacerbate the stress on water resources and affect the length of the growing period.</p>
<p>Rainfall: Sahel is the gateway to the Sahel, which experienced a long-term drying trend. Rainfall amounts are generally low and characterized by high variability across space and time. The annual average between 1960-1990 was 1.95 mm/day (Cline 2007).</p>	<p>Rainfall: Rainfall projections for the Sahel are highly uncertain. Both, wetter and drier scenarios are in the realm of possibility. For Senegal, the results summarized by Cline (2007) suggest a further decrease in annual average rainfall, which would amount to an average value of 1.80 mm/day between 2070-99. A decrease in rainfall should be considered a real possibility in strategic development planning over the medium and long-term. In conjunction with increasing temperatures, the implications for pastoralists and agricultural livelihoods are a concern.</p>
	<p style="text-align: center;">Time-series Of Normalized GDP Growth And Precipitation</p>

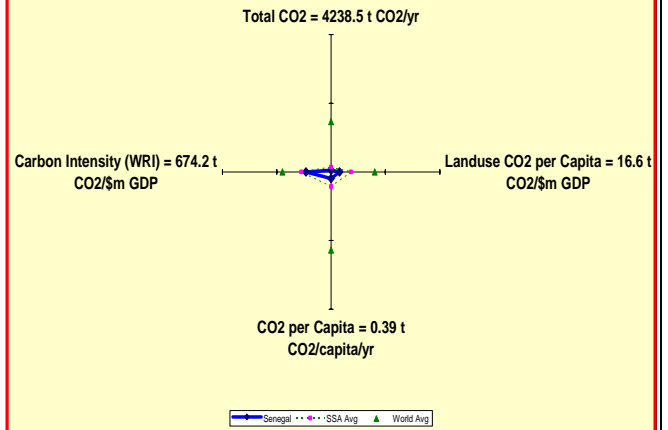
¹ World Bank, 2007, World Development Indicators. Available at: <http://ddp-ext.worldbank.org/ext/DDPQQ/showReport.do?method=showReport>

²World Bank, 2007, The Little Green Data Book

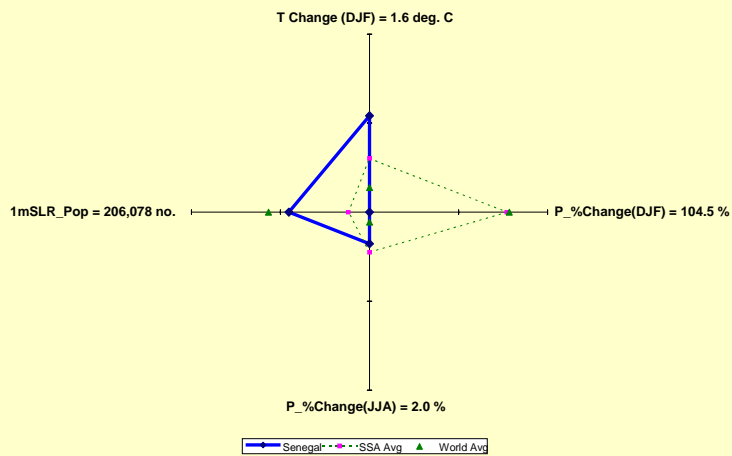
Climate Vulnerability Diamond - Senegal



Mitigation Climate Diamond - Senegal



Climate Impact Diamond - Senegal



Key Sectors Affected

Agriculture: Senegal is primarily an agrarian society. The major crops include peanuts, rice, corn, beans, sorghum, cotton, and millet. Soil diversity, climatic conditions and underground water resources all help to divide the country into six homogeneous zones known as agro-ecological zones. Rice production has been insufficient in spite of major investments especially in the valley of the River Senegal, with the building of the Diama dam, and the Manantali, which evens the flow of the River Senegal. The production of other crops (cotton, peanuts, cereals etc) has also decreased. Rural depopulation has increased and the food deficit has worsened because of the growth in urban population and the divergence between the agricultural production system and consumption.

Water Resources: Most of Senegal falls within the Sahelian zone, and has irregular and uncertain rainfall and generally poor soils. Rainfall is relatively high and dependable in the south, but in the north of the country the climatic shift it has experienced during the past 25 years has resulted in crop and livestock production becoming even more difficult, if not marginal. The Sahara desert has been growing and creeping further and further south into Senegal. The chief rivers that navigate the land and finally drain into the Atlantic are Senegal, Gambie, Saloum and Casamance.

Health: Projected increases in the interannual variability of climate would have marked implications for the impact of seasonal epidemic diseases such as malaria. The WHO has outlined a series of possible health impacts due to climate change which include Schistosomiasis, etc. (refer to Table below) In addition, according to the UNFCC, under the 1-m scenario, it is estimated that at least 110,000-180,000 people-or 1.4-2.3% of the 1990 population of Senegal-are at risk. Nearly all of these people are located south of the Cape Verde peninsula; the bulk of the population at risk lives south of Rufisque.

Table: Climate Change and Health (WHO)

Environmental changes	Example diseases	Pathway of effect
Dams, canals, irrigation	Schistosomiasis	▲ Snail host habitat, human contact
	Malaria	▲ Breeding sites for mosquitoes
	Helminthiasis	▲ Larval contact due to moist soil
Agricultural intensification	River blindness	▼ Blackfly breeding, ▼ disease
	Malaria	▲ Crop insecticides and ▲ vector resistance
	Venezuelan haemorrhagic fever	▲ rodent abundance, contact
Urbanization, urban crowding	Cholera	▼ sanitation, hygiene; ▲ water contamination
	Dengue	Water-collecting trash, ▲ <i>Aedes aegypti</i> mosquito breeding sites
	Cutaneous leishmaniasis	▲ proximity, sandfly vectors
Deforestation and new habitation	Malaria	▲ Breeding sites and vectors, immigration of susceptible people
	Oropouche	▲ contact, breeding of vectors
	Visceral leishmaniasis	▲ contact with sandfly vectors
Reforestation	Lyme disease	▲ tick hosts, outdoor exposure
Ocean warming	Red tide	▲ Toxic algal blooms
Elevated precipitation	Rift valley fever	▲ Pools for mosquito breeding
	Hantavirus pulmonary syndrome	▲ Rodent food, habitat, abundance

▲ increase ▼ reduction

Energy: In Senegal, forest-based traditional fuels (firewood and charcoal) are mainly used for household cooking purposes, represented 53% of Senegal’s final energy consumption, and 76% of charcoal consumption was in the principal urban areas. Over the years, the operation of the charcoal industry had resulted in (i) the gradual loss of forest cover (approximately 30,000 ha per year) and thus of the ecosystem’s carbon sequestration capacity and biodiversity; (ii) the degradation of the rural environment (particularly soils); (iii) the impoverishment of the rural areas; (iv) an acceleration of rural exodus; and, (v) a massive transfer of wealth from the rural communities to a few urban-based wood fuel traders (World Bank, Infobrief #122, 2006). Senegal has been confronted with serious energy supply difficulties for the last three years and cannot meet demands for gas, petrol and electricity (IRIN Report 74934, 2008).

Recommendations for Improved Management of Climate Risks

Overall Objective: Improve climate-smart development through appropriate institutional and investment activities.

SECTOR	Enabling Environment/ Capacity Building	Investments
Capacity Building & Cross-cutting	<ul style="list-style-type: none"> - Develop and strengthen the Knowledge Base <ul style="list-style-type: none"> o Data and information – acquisition, analysis, dissemination, utilization o Enhanced hydro-meteorological monitoring systems, and improved and expanded human resources in the hydrological and meteorological services o Analytical tools and products tailored to sector needs o Information on adaptation options based on pilots, field tests and research o Early warning systems o Information exchange networks to enable access to and exchange of data and information between all levels of user and decision makers - Regional and National Networks – Networks of agencies and policy makers, experts, knowledge bases, data and information, research and field experience (pilots, tests) is crucial to stimulating and facilitating investment in adaptation 	<ul style="list-style-type: none"> - Introduce modern technology for data collection, transmission and assessment; Introduce the use of compatible standards and systems to enhance data and knowledge sharing across sectors; - Strengthen and expand systematic observations of meteorological and hydrological parameters; strengthen the technical capacity of hydro-met services including the development and dissemination of knowledge products to enhance the adaptation of project design and implementation to climate variability and change; - Strengthening and develop early warning systems for drought and flood hazards and natural disasters to improve preparedness, response and recovery in all the sectors (agriculture, health, natural resource, and energy)
Agriculture (including irrigation, watershed management & community development)	<ul style="list-style-type: none"> - Develop flood, drought and drainage risk maps to enhance sector development planning - Combine risk mapping with river basin and sub-basin water resource assessments including rainfall variability - Improve awareness and analytical underpinning of sustainable land management practices to reduce pressures on natural resources and enhance resilience to climate variability - Support medium and long-term strategic planning efforts focused on economic diversification 	<ul style="list-style-type: none"> - Scale up investment in research and extension services to enhance production and farm incomes with a new emphasis on adaptation to climate variability and change - Pilot and upscale in sustainable land management focused on reducing erosion and natural resource degradation and enhancing soil fertility - Invest in piloting new, drought resistant crops, cropping patterns (at farm scale), and new and cost efficient technology packages (both for adaptation and carbon sequestration) to enhance adaptation in areas with high climate variability and vulnerability to change - Scale up investment in the introduction of irrigation and water management systems and appropriate technologies, especially water conservation in drought prone areas - Scale up investment in livelihood focused participatory rural develop including sustainable land management, watershed management and community driven development (CDD) approaches - Pilot risk insurance schemes including indexed crop insurance
Water Resources Mgt	<ul style="list-style-type: none"> - Improve technical capacity of water resource management agencies including hydro-met and groundwater management services - Institutionalize multi-sector, integrated water resources planning and management - Strengthen the analytical and modeling capability of water resource agencies to utilize enhanced hydrologic and metrological data acquisition and monitoring networks and support river basin and sector development and management planning 	<ul style="list-style-type: none"> - Scale up investment in: <ul style="list-style-type: none"> o River basin and sub-basin water resource assessments and the associated institutional capacity to sustain such program on a continuous basis o Development of decision support systems (DSS) including hydrologic models and other analytical tools to enhance sector planning and risk assessment o Implement new mechanisms to disseminate these assessments, DSS and tools to support enhance strategic planning in sectors that are dependent on the basins natural resources
Energy	<ul style="list-style-type: none"> - Strengthen electricity utilities to improve their efficiency and financial viability - Strengthen sector strategic planning to include a greater emphasis on climate vulnerability and climate change risk by introducing: <ul style="list-style-type: none"> o Assessment of vulnerability of supply systems, 	<ul style="list-style-type: none"> - Support the expansion and development of regional electricity grid interconnections - Scale up investment in electricity access and energy efficiency - Review the effects of climate variability and climate change on the reliability and capacity of existing and

SECTOR	Enabling Environment/ Capacity Building	Investments
	<ul style="list-style-type: none"> - including hydropower and the development of other renewable sources less sensitive to climate <ul style="list-style-type: none"> o Assessment of climate change impacts on demand o Expand off-grid expansion opportunities (potential for renewable energy) o Grid extension - Carbon finance opportunities 	<ul style="list-style-type: none"> - potential hydropower facilities and developments; Accelerate expanded pre-investment studies of hydropower and other renewable sources for grid and off-grid electricity supply - Coordinate grid and off-grid electricity access planning with rural development and forestry sectors and SLM programs to support efforts to reduce fuel-wood harvesting and use
Transport	<ul style="list-style-type: none"> - Enhance the capacity of road and transport sector agencies in the area of strategic planning to identify and incorporate climate vulnerability into sector plans and project designs 	<ul style="list-style-type: none"> - Review and revision of planning and design standards for river and stream crossing, and cross drainage, in regions with existing and potentially increased future flood hazard including increases in high intensity rainfall - Increase the use of flood, drought (greater access to network) and drainage risk mapping in sector planning in rural and urban areas - Introduce risk assessment into the selection of design standards including pavement type
Urban Development, Water Supply and Flood Management	<ul style="list-style-type: none"> - Enhance strategic supply planning capability of urban water supply utilities including climate vulnerability and risk assessment of water supply sources - Strengthen urban development planning based on improved flood and drainage hazard mapping 	<ul style="list-style-type: none"> - Invest in infrastructure upgrading and improvement to mitigate and adjust to changing flood and drainage hazard patterns - Invest in urban services to reduce flood and drainage risks including housing relocation, reduced encroachment into flood hazard areas, secure solid water management
Health	<ul style="list-style-type: none"> - Develop/strengthen climate-related surveillance systems (as part of overall monitoring system) - Increase awareness of health related climate vulnerability and increase capacity to incorporate adaptation in to the health care system 	<ul style="list-style-type: none"> - Invest in disease vector control systems - Invest in increased surveillance of existing and emerging threat areas affected by climate variability and climate change
Forestry, Biodiversity and Coastal Zone Management	<ul style="list-style-type: none"> - Strengthen capacity to monitor forest and biodiversity resources, evaluate their status and threats and formulate actions - Develop and test new governance arrangements for forest resources 	<ul style="list-style-type: none"> - Invest in forest resource management to enhance climate resilience, enhance livelihoods of people living near and in forest areas, and promote resource conservation - Invest in reforestation and afforestation, and in their sustainable management - Invest in forest fire prevention, risk surveillance, and response

As can be seen, many of these investments to reduce climate risks involve faster sustainable development, careful assessment of vulnerability, strengthening institutional capacity, and re-orienting investments.