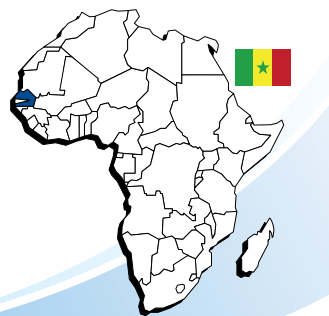


7.15 Senegal



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Capital city	Dakar
Population (2005 est.)	11,800,000 (2.3% growth)
GDP per capita (USD 2005 est.)	\$1 792
Life expectancy at birth (2005 est.)	62.3 years (male - 60.4, female - 64.4)
Land and water area	196,190 km ² (land - 192,000, water - 4 190)
Length of coastline	531 km
Highest point of elevation	Diakha 581 m
Coral reef area (2001 est.)	0ha recorded
Mangrove area (2005 est.)	115,000 ha
Marine protected areas (2007 est.)	1 455.42 km ² (12.95% of total territorial waters)
Capture fisheries prod. (2006 est.)	377,685 metric tones
Aquaculture fisheries prod. (2006 est.)	200 metric tones

Coastal Climate: Most of Senegal has a typically tropical climate, but the northern regions lie in the sub-tropical semi-arid belt called the Sahel. November to May is generally dry, the rainy season starts in June and the maximum rain occurs in August. Temperature ranges from 16 - 25° C along the coast during the cold season and 20 - 32° C in the country side. During the rainy season (June-October) temperature ranges from 25 - 40° C.

Coastal Geomorphology: The coastal belt of Senegal is composed of a number of physiographical units from north to south: 1) mud, 2) sandy, 3) very fine sand, 4) medium to large grain sand, 5) rocks, 6) discontinued rocky and marshy zone. The continental shelf goes, to a depth of up to 200 m and is larger in the south than in the north. The Kayar Pit is a large depression in the north, dropping from a depth of 10 m. The rockiest zone is around Dakar and along the north coast until Mboro.

Coastal Currents and Tides: Senegal has a cold and hot season with two very different current characteristics. The hot season is from July to October. Following, the cold season is from December to May with two transitional periods separating them (June and November). During

the cold season the trade winds (wind from north-west to the north-east) are established and generate a cold deep-water up welling towards the surface at the coast which supports trophic enrichment. These two seasons are also marked by two large different marine currents: the current of the Canaries and Equatorial current.

In addition there are three large swells present:

- The swell of north-north-west which takes place all the year
- The swell of south-south-west appearing during the winter period
- The swell of west occurs around November

Senegal has semidiurnal tides, the highs range from 0.2 to 2.0 m.

Coastal Observations: There are two tide gauge stations on the Senegalese coast, located at Saint Louis and Dakar. During phase III of the ODINAFRICA project, a new tide gauge was installed in Dakar and has been operational since November 2007. There are seven coastal oceanographic stations: St Louis, Kayar, Yoff, Goree, Thiaroye, Mbour and Cap Skiring. In addition, there are also three meteorological stations.

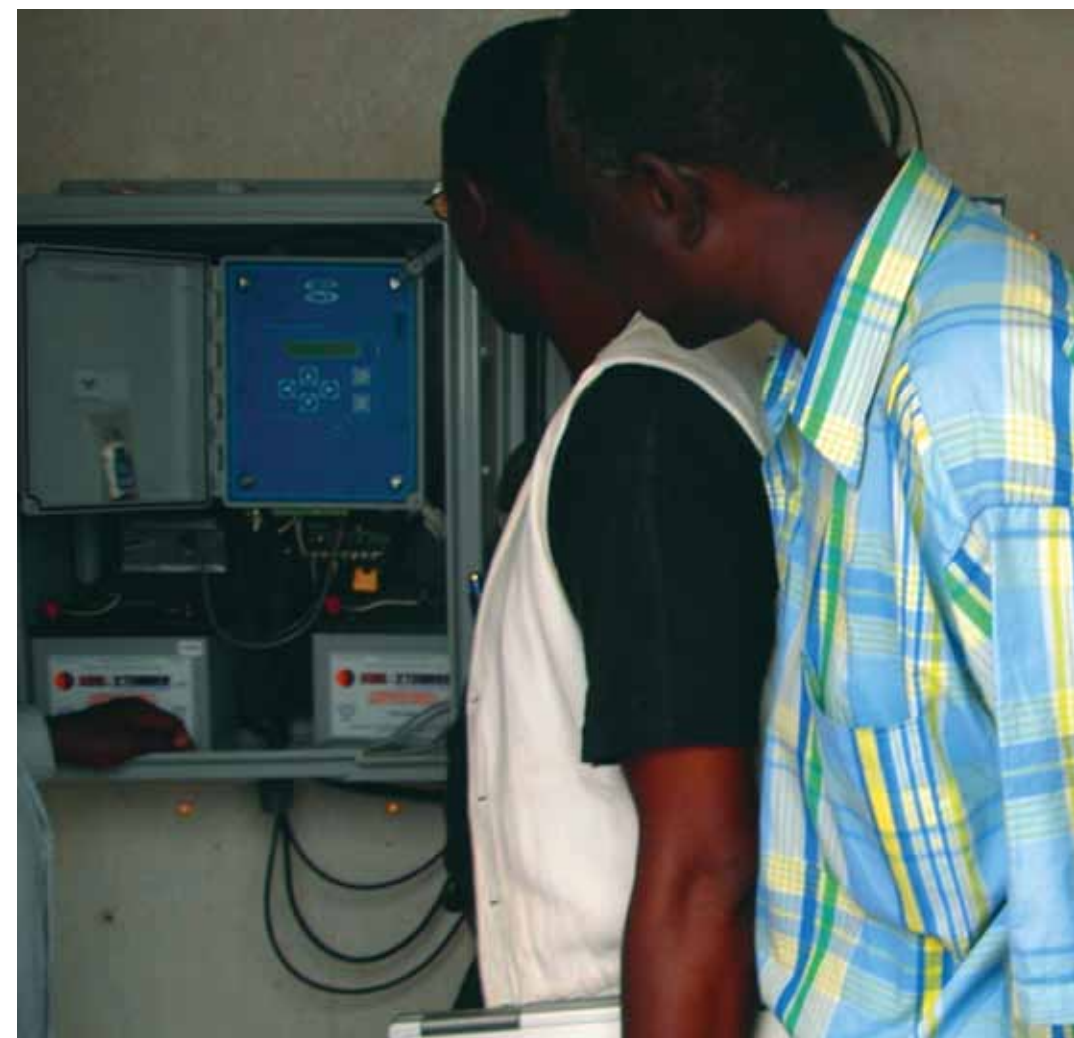
Ports and Harbours: Dakar Port Authority manages the country's main port located in the capital. It is located at the western most sea front side of the African Continent and is the first port of call by northbound vessels, and the last deep sea port for southbound vessels. In addition, this port has a strategic point in the region as a gateway for some landlocked neighboring countries. There are also ports in Kaoloack, Saint Louis and Ziguinchor.

Coastal Economy: Coastal tourism is a major source of income and Saint Louis, Dakar, Gorée, Mbour, Saloum and Cap Skiring are the main tourist zones. In the Dakar region, there is a pink lake which is a tourist area, with salt extraction activities as an additional source of income for the local population.

Fisheries: Fish are the major source of protein for the local population in Senegal. The fish resources along the Senegalese coast are of two types, artisanal and industrial fisheries. The artisanal fishery is concentrated between the beach and the shore, while the industrial

fishery is composed of demersal fish and shrimp. Marine fisheries are a major source of income contributing approximately \$US 350 million per year. Annual landing is around 300,000 tones/year, with 600,000 direct and indirect jobs. Total inland landing is less than 10,000 tones/year. Major stocks are fully or overexploited and landing had decreased since 1995.

Figure 1. NODC team visiting the new gauge in Dakar (PAD, Phares & Balises) - Photographer Anis Diallo, January 2008 -www.nodc-senegal.org/actualanis.htm.



Mineral Resources: The main mineral resources available are phosphate, ore, iron and marble. Offshore petroleum is available on the border with Guinea Bissau.

Agricultural Products: Most of the land in the coastal area is of low agricultural potential. The north border from Dakar to St Louis (Niayes) supports the growing of vegetables and some fruits.

Other Marine Resources: The mangrove forest is a source of domestic fuel wood and timber for roofing houses. Its roots are also collected and used in building structures for smoking oysters. Its degradation in the last two decades has now led to new regulations requiring replanting projects for its restoration.

ADDRESSING KEY COASTAL ISSUES AND HOT SPOTS

Experts taking part in a national assessment of environmental and social issues and impacts identified a number of hot spots (currently suffering measurable degradation), sensitive areas (likely to be subjected to some degradation in the future); and major issues of concern. These are reproduced in Table 1 (ACOPS, 2002c).



Figure 2. The Senegalese research vessel RV Itaf Deme.

Table 1. Results of the Integrated Problem Analysis undertaken for Senegal (ACOPS, 2002c).

Major issue of concern overall for the country
<ul style="list-style-type: none"> • Modification of stream flows – Changes in the hydrodynamic regimes has resulted in observed “inverse” estuaries like those of Saloum and Casamance. • Modification / destruction of ecosystems • Chemical pollution
Hot spots
<ul style="list-style-type: none"> • The Djoudj bird national park which is located in the north-western part of the Senegal delta • Hann Bay located south-east of the capital Dakar • Djiffere located on the Sangomar spit that limits the Saloum river
Sensitive areas
<ul style="list-style-type: none"> • The Sénégal delta – located in the north on the border with Mauritania • The Saloum estuary – located centrally • The Casamance estuary – located in the south

Two decades of drought in the 1980's caused the increase of salinity in Saloum and Casamance estuaries (up to 160 parts per tonne) during the dry season. This is exacerbated by the changes in hydrodynamics of the system with reduced flows being a major issue of concern (Table 1). Furthermore, this has had additional effects, causing a loss of biodiversity, affecting the growth of fish, and the degradation of mangrove forests. Due to the construction of dams (Diama in Senegal and Manatali in Mali - for agricultural and electricity purposes), the Senegal River has lost biodiversity, with a resultant decrease in fish landing.

The Senegal coast is off the main marine highway used by oil tankers, which also offload oil at the port of Dakar for Senegal and the land locked country of Mali. This presents a potential threat to the environment.



Figure 3. Fishing along the beach at Thiaroye near Dakar
(photo credit: Anis Diallo, 2004).

DEVELOPMENT AND ACHIEVEMENTS OF THE NODC

The Senegalese National Oceanographic Data and Information Centre (NODC) was established on 13th October, 2001 during the second phase of the ODINAFRICA project. The data centre is hosted by the Centre de Recherches Océanographiques de Dakar-Thiaroye (CRODT) and the information centre by the Direction des Pêches Maritimes (DPM).

The information centre is leading marine information activities for Senegal at the national and international level. It also is acting as national partner for many resources sharing programmes including ASFA of FAO, OCEANDocs, and IAMSLIC.

Products and services available are as follows:

- Develop information tools and services for research and decision making including mapping products such as the marine atlas
- Analyse, edit, and distribute data on CD-ROMs and the internet
- Provide data and information products such as statistics, atlas of ocean variables
- Assist in global and regional data and information management
- Create and maintain inventory and meta data bases including a directory of national ocean experts
- Develop standards on documentation and data processing
- Participate in the development of data and information management plans for sustainable fishing, oceanographic and coastal and marine ecosystems
- Promote the development of data and information exchange at national, regional and international level through the IODE/IOC/UNESCO system.



Figure 4. Direction des Pêches Maritimes.

The beneficiaries of these products and services are: scientists, students, NGO's, government, private sector. Further information can be found on the website:

Centre - www.nodc-senegal.org/cndoanis.htm

Products - www.nodc-senegal.org/produitanis.htm

Services - www.nodc-senegal.org/servicanis.htm

MARINE RELATED PROGRAMMES AND ORGANIZATIONS

The following are organizations that work in collaboration with the Senegalese NODC (www.nodc-sengal.org/reseauanis.htm):

- Centre de Recherches Océanographiques de Dakar-Thiaroye (CRODT), Parc de Recherches ISRA/HANN, BP. 2241 Dakar
- Centre de Suivi Ecologique (CSE): rue Léon G. Damas. BP. 15532, Dakar, Fann
- Délégation aux Affaires Scientifiques et Techniques (DAST): Bulding Administratif, 5ème étage, pièce 525

- Département de Géographie (Chaire Unesco/UCAD): BP. 5005, Dakar-Fann
- Département des Sciences/UCAD: Campus Universitaire, UCAD, Dakar
- Direction de l'Environnement et des Etablissements Classés (DEEC/Ministère de l'Environnement et de la Protection de la Nature): 106, rue Carnot, Dakar
- Direction de la Météorologie Nationale (DMN): BP. 8257, Dakar-Yoff
- Direction de la Pêche Continentale et de l'Aquaculture (DPCA/Ministère de la Pêche): Route du Front de Terre, Dakar. BP. 11979 Dakar
- Direction de la Protection et de la Surveillance des Pêches (DPSP/Ministère de la Pêche): Fenêtre Mermoz, Dakar
- Direction des Parcs Nationaux (DPN): Zone Parc Zoologique de Hann
- Direction des Pêches Maritimes (DPM): 1, rue Joris BP. 289 Dakar
- Fonds Mondial pour la Nature (WWF): Sacré Cœur III, villa 9446, Dakar
- Institut de Recherche pour le Développement (IRD): Hann, BP. 1386, Dakar
- Institut Fondamental d'Afrique Noire (IFAN/UCAD): BP. 206, Dakar
- Laboratoire d'Etude et de Recherches en Géomatique (LERG): Campus Universitaire de l'ESP. BP. 25275, Dakar-Fann
- Laboratoire de Physique Atmosphérique (LPASF): Campus Universitaire de l'ESP
- OCEANIUM: Route de la Corniche EST, BP. 2224, Dakar
- Parc National des Iles de la Madeleine (PNIM/ Direction des Parcs Nationaux): Corniche Ouest, Dakar
- Port Autonome de Dakar (PAD), Phares & Balises
- Société Nationale d'Aménagement et d'Exploitation des Terres du

Delta du Fleuve Sénégal et des vallées du Fleuve Sénégal et de la Falémé (SAED/Ministère de l'Agriculture): Route de Khor, BP. 74 St Louis

- SOS-Environnement: BP. 1008, Dakar. (ONG)
- Sous Commission Région des Pêches (CSRP): km 10 5 Bd du Centenaire de la Commune de Dakar
- Union Mondiale pour la Nature (UICN): Avenue Bourguiba, Dakar
- Université Cheikh Anta DIOP (UCAD): Avenue Cheikh Anta Diop, Dakar
- West African Association for Marine Environment (WAAME): 21, cité Belvédéré, Dalifort. BP. 26352, Dakar. (ONG)
- Organisation pour la Mise en Valeur du Fleuve Sénégal (OMVS), 3 Place de l'Indépendance, 3ème Etage. BP. 3132 Dakar
- Haute Autorité chargée de la coordination de la Sécurité Maritime, de la Sûreté Maritime et de la Protection de l'Environnement Marin (HASSMAR)



Figure 5. A laboratory at CRODT, Dakar, Senegal.

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