Greenhouse Gas Emissions in Senegal

Senegal Numbers at a Glance (2011)

31.65 $MtCO_2e$*
Total GHG emissions (0.07% of world total)
World: 46,906 $MtCO_2e$

13,330,737
Population
World: 6,964,618,177

2.37
tCO_2e per capita
World: 6.73 tCO_2e

US$10,580 Million
GDP**
World: US$54,034 Billion

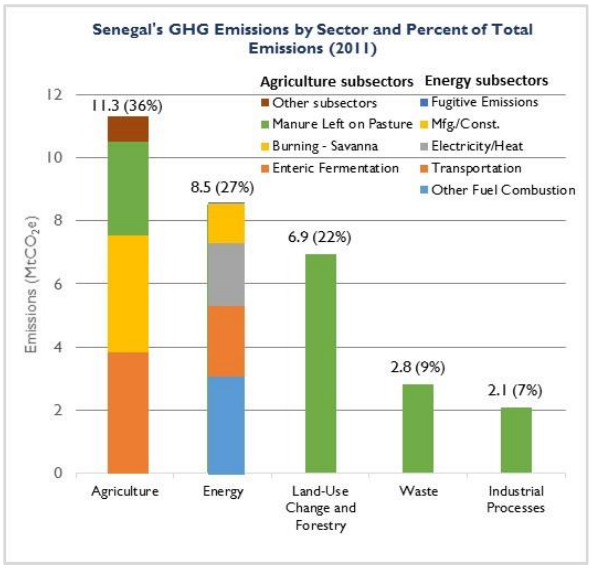
2,986.8
tCO_2e/million US$ GDP
World: 868 tCO_2e/million US$ GDP

+8 $MtCO_2e$ (+36%)
Change in GHG emissions (1990–2011)
World: +12,969 $MtCO_2e$ (+38%)

Sources: WRI CAIT 2.0, 2016. Emissions including Land-Use Change and Forestry
*Million metric tons of carbon dioxide equivalent
**Gross Domestic Product (GDP) in constant 2005 US$

Greenhouse Gas (GHG) Emissions by Sector

According to the World Resources Institute Climate Analysis Indicators Tool (WRI CAIT), the majority of Senegal's 2011 GHG emissions were from the agriculture sector (36%) and energy (27%), followed by emissions from land-use change and forestry (LUCF) (22%), waste (9%), and industrial processes (IP) (7%).[1] Within the agriculture sector, enteric fermentation from livestock and savanna burning contributed 67% of the sector emissions.[2] Other fuel combustion and transportation contributed approximately 62% of energy sector emissions.[3]



Sources: WRI CAIT 2.0, 2016, FAOSTAT, 2016

In the LUCF sector, Senegal's Third National Communication (TNC) to the UNFCCC, which includes a GHG inventory for the year 2005, shows LUCF as a net carbon sink rather than a source of emissions during that year, absorbing 11.4 $MtCO_2e$ more in 2005 than was emitted by activities in this sector.[4] The discrepancy between the TNC and WRI CAIT may be due to the use of different data sources, with the former based on silviculture data from the inventory work of the Sustainable and Participatory Energy Management Project (PROGEDE)[5] whereas WRI CAIT draws on international data from the Food and Agriculture Organization (FAO) for LUCF sector emissions.[6] Despite the significant difference in the LUCF sector, the TNC inventory and WRI CAIT both show agriculture to be the highest emitting sector, followed by energy.

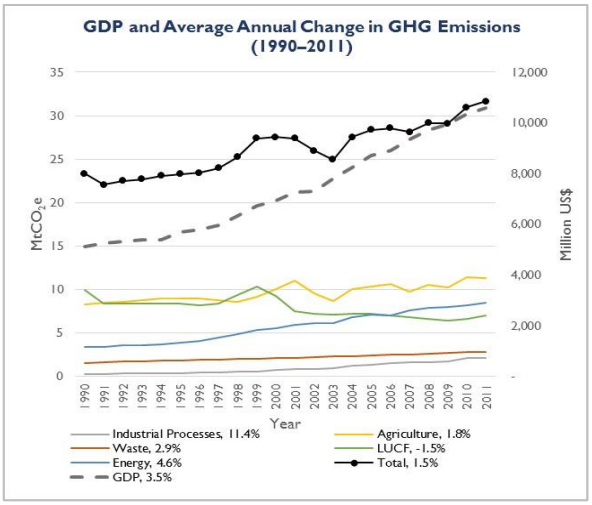
Change in GHG Emissions in Senegal (1990-2011)

According to WRI CAIT, Senegal's GHG emissions increased by 8 $MtCO_2e$ from 1990 to 2011. The average annual change in total emissions during this period was 1.5%, with sector-specific average annual changes as follows: agriculture (1.8%), energy (4.6%), LUCF (-1.5%), waste (2.9%), and IP (11.4%). The change in emissions in the highest emitting sectors is discussed below.

[1] World Resources Institute Climate Analysis Indicators Tool (WRI CAIT 2.0, 2016). Global Warming Potentials (GWPs) are from the Intergovernmental Panel on Climate Change (IPCC) Second Assessment Report (SAR).
[2] Food and Agriculture Organization of the United Nations Statistics Division (FAOSTAT). Emissions – Agriculture total, viewed on November 24, 2016.
[3] WRI CAIT 2.0, 2016 and FAOSTAT, Emissions – Agriculture total, viewed on November 22, 2016. Other Fuel Combustion includes emissions from biomass combustion (charcoal or fuel wood), stationary and mobile sources (not allocated in the Transportation sub-sector) and other sectors and other emissions not specified elsewhere. See WRI, CAIT Country Greenhouse Gas Emissions: Sources & Methods, 2015.
[4] Republic of Senegal. Senegal's Third National Communication (TNC) to the UNFCCC, 2016. The inventory uses GWPs from the IPCC SAR. The TNC notes that inventory uncertainties are mainly in the agriculture and LUCF sectors.
[5] For background information on the Programme de Gestion Durable et Participative des Energies Traditionnelles et de Substitution (PROGEDE), see Senegal PROGEDE: Traditional Biomass Energy and Poverty Alleviation, viewed on December 7, 2016.
[6] WRI notes that WRI data is useful as reference only and may not coincide with LUCF emissions reported by countries to the UNFCCC (WRI, CAIT Country Greenhouse Gas Emissions: Sources & Methods, 2015).

Agriculture: Agriculture emissions increased 36% from 1990 to 2011,[7] driven by enteric fermentation, manure left on pasture, and burning savannah.[8] Between 1990 and 2012, the livestock population (excluding poultry) grew from 2.8 million[9] to 15.7 million.[10] Senegal's TNC notes that livestock farming contributes to the livelihood of around 30% of Senegalese households. Pastoralists and agro-pastoralists mainly raise cattle, sheep, and goats. Agriculture is mainly rain-fed with common crops being groundnuts, cotton, sugar cane, and cereals. The TNC cites land cover statistics that indicate an increase in the area cultivated taking place at the same time as a decrease in savannah, with a large part of the clearing taking place in savannah areas more favorable to rain-fed agriculture.[11]

Energy: Energy emissions increased 5 $MtCO_2e$ between 1990 and 2011, driven by other fuel combustion and transportation.[12] During this time, biofuel production doubled.[13] According to the TNC, 55.5% of households use fuel wood for cooking and 11% use charcoal. In 2013, households consumed 1,735,219 tons of fuel wood and 482,248 tons of charcoal, equivalent to a harvest of 3,778,326 m^3 of forest wood resources.[14] As of 2011, 84% of electricity generation was by oil, 8% by hydropower, and 8% by a combination of natural gas, biofuels, and other sources.[15] About 56% of the population in Senegal has access to electricity.[16] In the transportation sector, there were 347,901 vehicles in 2011, representing an increase of almost 40% since 2005, of which 75% are used vehicles with an average age of 11 years. Almost 74% of vehicles are in Dakar.[17] Public transport in Dakar is dominated by informal operations of old and highly polluting minibuses locally known as "Cars Rapides" and "Ndiaga Ndiaye."[18] In 2005, the government launched the national bus fleet renewal program and introduced 1,300 new minibuses in several cities, including Dakar. The program is expected to end in 2018.[19]



Source: WRI CAIT 2.0, 2016

Carbon Intensity: GHG Emissions Relative to Gross Domestic Product (GDP)

According to WRI CAIT data, Senegal's GHG emissions increased 36% from 1990 to 2011, averaging 1.5% annually, while GDP increased 107% in the same period, averaging 3.5% annually. Although GDP grew faster than GHG, as of 2011, Senegal's economy emitted approximately 3 times more GHGs relative to GDP than the world average, indicating significant potential for improvement.

Climate Change Mitigation Targets and Plans

Senegal's Intended Nationally Determined Contribution (INDC) is part of the development strategy, the Emerging Senegal Plan. In the INDC, Senegal commits to unconditionally reduce its GHG emissions by 3%, 4%, and 5% by 2020, 2025, and 2030 respectively, through mitigation actions in the energy, agriculture, forestry and other land use, industry, and waste sectors. These targets could be expanded to 7%, 15% and 21% with receipt of international financial, technical, and market mechanisms support. In the agriculture sector, the INDC states that Senegal will develop and implement the Recovery and Acceleration Program of Senegalese Agriculture. In the energy sector, Senegal will strengthen the distribution of electricity through a renewable energy program (solar, wind, and hydro) and rural electrification. In 2016, the Ministry of Energy and Development of Renewable Energy prepared the latest version of the National Rural Electrification Program which aims to achieve rural electrification of 60% nationally in 2017, and universal access to electricity by 2025. In transportation, Senegal aims to strengthen the public transport system through Bus Rapid Transit.

[7] WRI CAIT 2.0, 2016.
[8] FAOSTAT, 2016.
[9] FAO, Senegal Livestock Sector Brief, 2005.
[10] Senegal National Agency for Statistics and Demography, 2012 Economic and Social Situation in Senegal, 2015.
[11] Republic of Senegal, TNC, 2016.
[12] WRI CAIT 2.0, 2016.
[13] International Energy Agency (IEA), Statistics: Balances, 1990 and 2011. Biofuels and waste include biogas, liquid biofuels, industrial waste, municipal waste, and primary solid biofuels and charcoal (IEA, Balance Definitions, viewed on November 26, 2016).
[14] Republic of Senegal, TNC, 2016.
[15] International Energy Agency (IEA). Statistics Senegal: Electricity and Heat, 2011.
[16] The World Bank, Access to electricity (%) population, Senegal, 2012.
[17] Senegal National Agency for Statistics and Demography, Economic and Social Situation in Senegal – Transport, 2005 and 2011.
[18] Papa Elimane Faye, Modernization and/or Sustainable Transportation System in Dakar: Identification of Problems and Mode Requirements, 8th International Conference on Traffic and Transportation Studies Changsha, China, 2012.
[19] Dakar Urban Transport Executive Board, Activities, viewed on November 26, 2016.