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Greenhouse Gas Emissions in Madagascar

Madagascar Numbers at a Glance (2011)

57 $MtCO_2e$*
Total GHG emissions (0.12% of world total)
World: 46,906 $MtCO_2e$

21,678,934
Population
World: 6,964,618,177

2.65
tCO_2e per capita
World: 6.73 tCO_2e

US$5,881 Million
GDP**
World: US$54,034 Billion

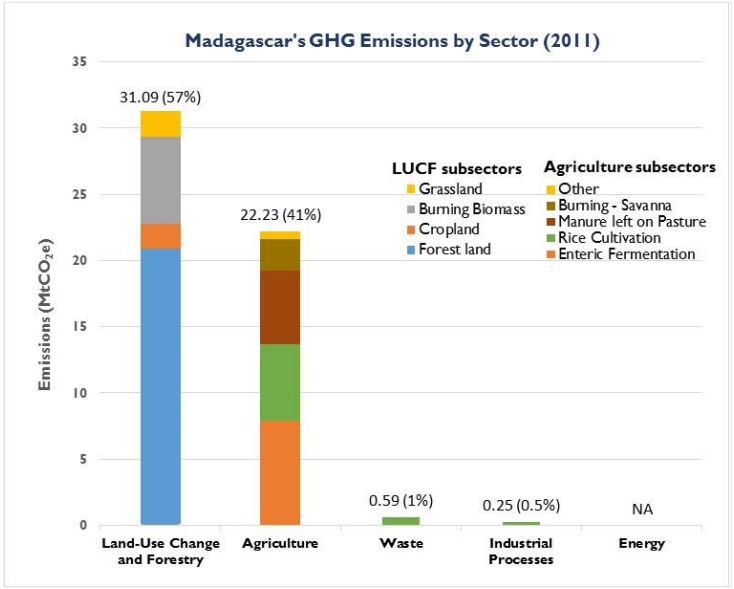
9,769
tCO_2e/million US$ GDP
World: 868 tCO_2e/million US$ GDP

-3.5 $MtCO_2e$ (-6%)
Change in GHG emissions (1990–2011)
World: +12,969 $MtCO_2e$

Sources: WRI CAIT 2.0, 2015
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[1]

According to the World Resources Institute Climate Analysis Indicators Tool (WRI CAIT), Madagascar's 2011 GHG profile was dominated by emissions from land use change and forestry (LUCF) and agriculture, which combined contributed 98% of total GHG emissions. WRI CAIT does not report GHG emissions from the energy sector for Madagascar,[2] but the U.S. Energy Information Agency (EIA) reports 1.8 $MtCO_2e$ for Madagascar's energy sector emissions in 2011, equal to approximately 3% of the total emissions reported by WRI CAIT.[3] Madagascar's Second National Communication (SNC) to the UNFCCC, submitted in 2010, tells a different story. The SNC includes a GHG inventory for the year 2000, which shows that 2000 emissions were dominated by agriculture (90%), followed by the energy sector (9.1%), and presents the LUCF sector as a large net CO_2 sink, absorbing more carbon dioxide than was emitted.[4] The SNC contains no references for the source of the inventory data, so the reliability of the emissions estimate is difficult to confirm. In contrast, WRI CAIT data for the same year show that LUCF was the largest emitter in 2000 (62%), followed by agriculture (37%).



Sources: WRI CAIT 2.0, 2015; FAOSTAT, 2016
WRI CAIT does not present energy sector emissions for Madagascar

Change in GHG Emissions in Madagascar (1990-2011)

According to WRI CAIT, Madagascar's GHG emissions decreased by 3.5 $MtCO_2e$ from 1990-2011. The average annual change in total emissions during this period was -0.1%, with sector-specific average annual changes as follows: LUCF (-0.5%), agriculture (0.4%), waste (3.1%) and IP (19.3%).[5] The change in emissions in selected sectors during this time is discussed below.

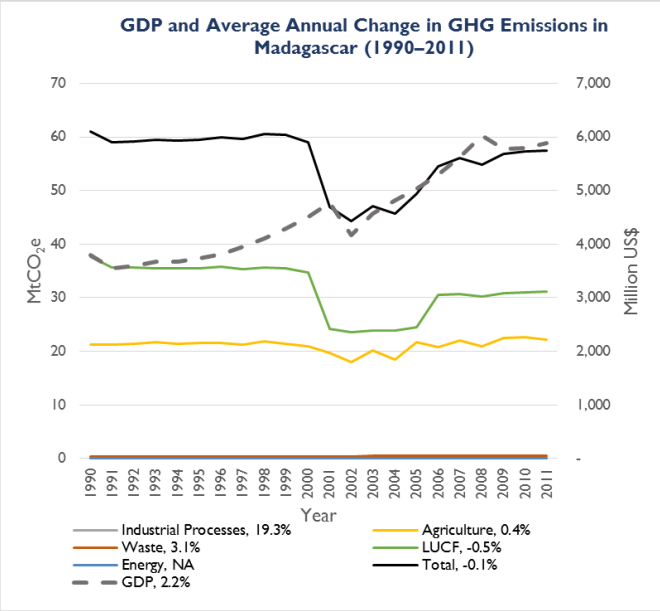
LUCF: Madagascar's LUCF emissions decreased 18% from 1990-2011, yet the sector remains the largest source of GHG emissions.[6] Madagascar's forest ecosystems are jeopardized by significant deforestation and forest fragmentation.[7] "Slash-and-burn" agriculture to clear land for rice cultivation accounts for 80-95% of deforestation, and extraction of timber for fuelwood and

[1] World Resources Institute Climate Analysis Indicators Tool (WRI CAIT 2.0, 2015).
[2] For energy sector emissions, WRI CAIT uses data from the International Energy Agency (IEA). Since there is no IEA data for Madagascar, energy sector emissions are not presented in the graphs in this fact sheet.
[3] EIA International Energy Statistics, 2014: http://www.eia.gov/cfapps/ipdbproject/IEDIndex3.cfm?tid=90&pid=44&aid=8.
[4] Madagascar, Madagascar's Second National Communication (SNC) to the UNFCCC, 2010.
[5] WRI CAIT 2.0, 2015.
[6] Ibid.
[7] Harper G, Steininger M, Tucker C, Juhn D & Hawkins F. 2007. 'Fifty years of deforestation and forest fragmentation in Madagascar'. Environmental Conservation, vol. 34, pp 325-333.

charcoal production accounts for the remaining 5-20%. There has been some improvement, as annual deforestation rates decreased from an average of 0.8% from 1990 - 2000 to an average of 0.5% from 2000 - 2005. In the decade from 2003-2013, Madagascar quadrupled the amount of protected forests from approximately 3% in 2003 to 12% in 2013.[8] Since 2010, however, illegal logging has again been on the increase due to governance failures and political turmoil.[9]

Agriculture: Madagascar's agriculture emissions grew 4.3% from 1990-2011, with rice cultivation driving this growth.[10] Between 2000 and 2010, total rice production more than doubled from 2.5 million tons to 4.7 million tons.[11] The SNC notes that to mitigate this trend, Madagascar promoted crop diversification and seasonal rotation of crops, and has encouraged farmers to improve seeds, agricultural practices and techniques. Livestock also contribute to Madagascar's agriculture emissions, although enteric fermentation and manure left on pasture declined 1.8% and 0.3% respectively between 1990 and 2011.[12] This correlated with the number of livestock decreasing sharply by 25% from 1990-2002 and recovering to approximately 1990 levels by 2011.[13]

Energy: According to the EIA, Madagascar's energy sector emissions increased by 63% from 0.96 $MtCO_2e$ in 1990 to 1.84 $MtCO_2e$ in 2011.[14] The SNC states that the "energy industries" subsector (electricity, heating, and fossil fuels production) accounted for 34% of energy emissions in 2000, making it the largest contributor to the sector's GHG emissions. Although the electricity access rate in Madagascar is very low – estimated at 12% in 2013 – the electricity available is carbon intensive, with 67% of power generated by diesel fuel. Most of the population uses kerosene for lighting, which emits both CO_2 and black carbon.[15] Transportation accounted for 32% of energy sector emissions in 2011. Madagascar's aging vehicle fleet, hilly terrain, and low travel speeds all exacerbate GHG emissions from vehicles.[16]



Source: WRI CAIT 2.0 Database, 2015

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

Madagascar's GHG emissions decreased 6% from 1990 to 2011, averaging -0.1% annually, while GDP grew by 55%, averaging 2.2% annually. Political crises in 2002 and 2009 caused large GDP contractions of 14.9% and 6.6%, respectively.[17] Consequently GDP growth has not kept up with population growth. In 2010, 82% of Madagascar's population earned less than $1.90 per day.[18] Madagascar's key development challenge is to accelerate economic growth; yet, there is potential to also reduce GHG emissions from GHG intensive activities.

Climate Change Mitigation Targets and Plans

Madagascar's Intended Nationally Determined Contribution (INDC), submitted to the UNFCCC in September 2015, states that Madagascar aims to reduce its GHG emissions by 14% by 2030 compared to a Business as Usual (BAU) scenario, conditioned on financial support from the international community. Proposed mitigation actions include reforestation, enhanced forest and grassland monitoring, climate-smart rice farming techniques, increased hydropower and solar energy, sustainable cookstoves, and energy efficiency. Madagascar's INDC builds on national policies, including the 2010 National Climate Change Policy, which aims to reduce Madagascar's vulnerability to climate change, mitigate emissions, and reduce deforestation. Madagascar is also working on a proposal for REDD+ Readiness. Currently, there are five ongoing REDD+ pilot projects in the country and at least six more being developed.[19]

[8] World Bank, Madagascar Country Environmental Analysis (CEA), Taking Stock and Moving Forward, May 2013.
[9] Grantham Research Institute on Climate Change and the Environment, 2015 Global Climate Legislation Study – Madagascar, 2015.
[10] Food and Agriculture Organization of the United Nations Statistics Division (FAOSTAT), viewed June 14, 2016: http://faostat3.fao.org/browse/area/129/E.
[11] Madagascar Ministry of Agriculture, Statistical Yearbook, 2003 and 2009-2010: http://instat.mg/agriculture/annuaire-statistiques-agricoles-2009-2010/.
[12] FAOSTAT, viewed June 14, 2016: http://faostat3.fao.org/browse/area/129/E.
[13] FAOSTAT, viewed June 14, 2016: http://faostat3.fao.org/download/Q/QA/E.
[14] EIA International Energy Statistics, 2014: http://www.eia.gov/cfapps/ipdbproject/IEDIndex3.cfm?tid=90&pid=44&aid=8.
[15] Madagascar Ministry of Energy, Expression of Interest to participate in the Scaling Up Renewable Energy In Low Income Countries Program (SREP), 2013.
[16] World Bank, Madagascar Country Environmental Analysis (CEA), Taking Stock and Moving Forward, May 2013.
[17] African Development Bank, Madagascar: Combined Report on the 2014-2016 Interim Country Strategy Paper (I-CSP) and the Country Portfolio Performance Review (CPPR), 2014.
[18] World Bank, World Development Indicators, 2015: http://databank.worldbank.org/. Data reported for years available, in 2011 dollars at purchasing power parity.
[19] Grantham Research Institute on Climate Change and the Environment, 2015 Global Climate Legislation Study – Madagascar, 2015.