

GREENHOUSE GAS EMISSIONS

LEBANON

GREENHOUSE GAS (GHG) EMISSIONS BY SECTOR

Lebanon's total GHG emissions in 2012 (the most recent year with complete data), were 24.34 MtCO_{2e}, totaling .05% of global GHG emissions. The energy sector serves as the predominant source of GHG emissions in Lebanon, at 21.14 MtCO_{2e}, with the subsectors of electricity/heat and transportation constituting the majority of energy emissions. The waste sector is the next largest emitter at 1.89 MtCO_{2e}, while the agriculture and bunker fuels sectors were relatively minor emitters, at .73 MtCO_{2e}. The land-use change and forestry sector (LUCF) was a net sink for GHG emissions.¹



Together with USAID partner, the Association for Forest Development and Conservation, Lebanese youth contribute to the reforestation of the Forest of Peace in Kawkaba.

LEBANON NUMBERS AT A GLANCE (2012)

24 MtCO_{2e}*

Total GHG emissions
(.05% of world total)

World: 46,049 MtCO_{2e}

4,424,888

Population
(.06% of world total)

World: 6,978,430,729

5.42

tCO_{2e} per capita
(82% of world total)

World: 6.6 tCO_{2e}

\$7,245

GDP Per Capita**
(93% of world total)

World: \$7,771

748

tCO_{2e}/million US\$ GDP (88% of world total)

World: 849

Lebanon GDP: \$32,058 million
World GDP: \$54,232,135 million

+16.95 MtCO_{2e} (+229%)

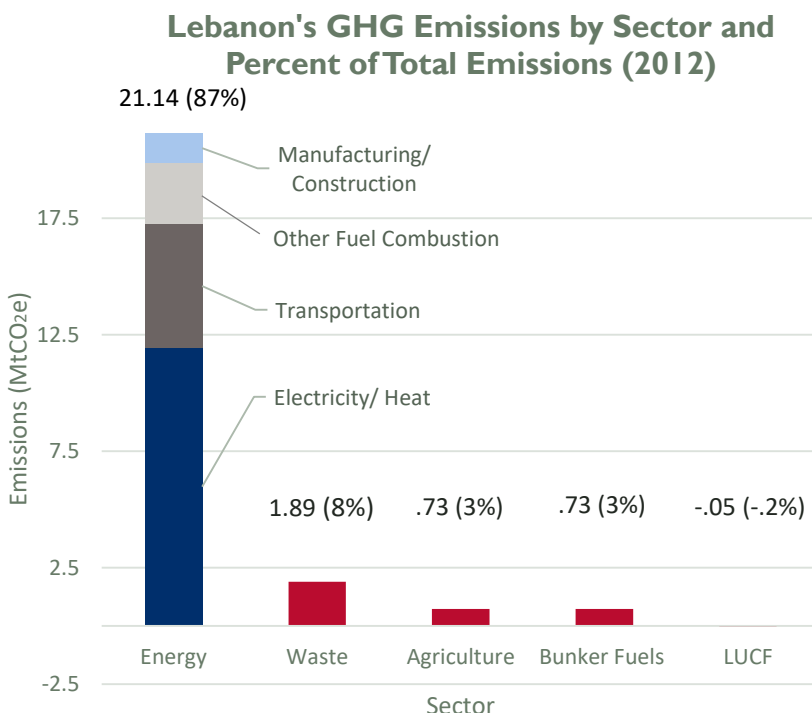
Change in annual GHG emissions (1990-2012):

World: +13,635.1 (+42%)

Source: WRI CAIT 2.0, 2016

*Million metric tons of carbon dioxide equivalent

**Gross Domestic Product in constant 2005 US\$



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¹ World Resources Institute Climate Analysis Indicators Tool (WRI CAIT) 2.0, 2012.

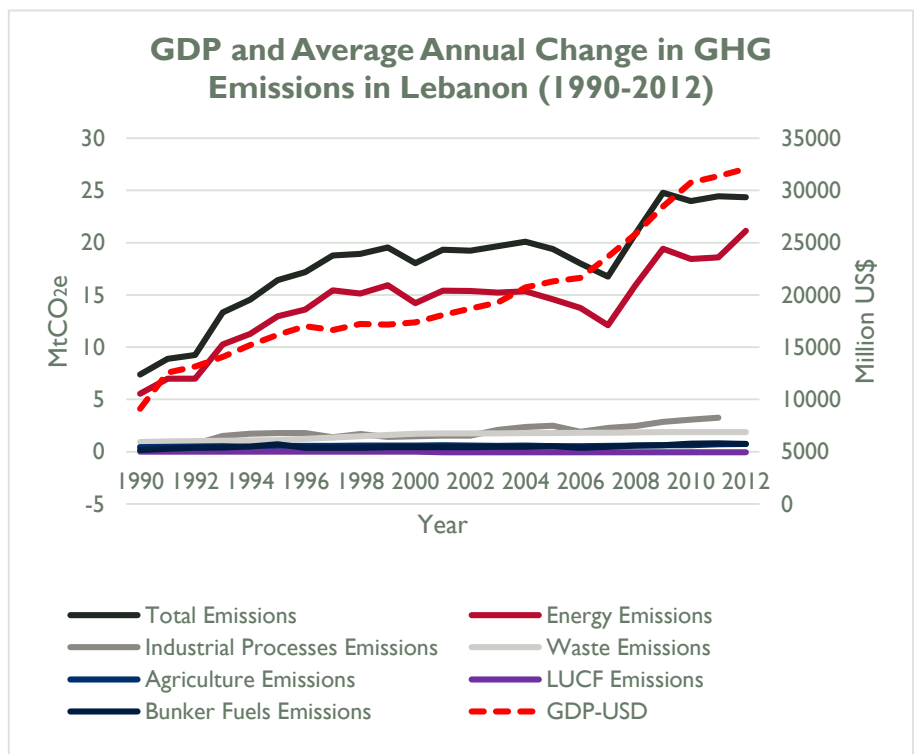
CHANGE IN GHG EMISSIONS IN LEBANON (1990-2012)

GHG Emissions in Lebanon increased 229% between 1990 and 2012 (from 7.39 MtCO_{2e} in 1990, to 24.34 MtCO_{2e} in 2012). The average annual change in total GHG emissions over that period was 6%, with sector-specific annual increases as follows: industrial processes (28% – through 2011²), bunker fuels (16%), energy (13%), waste (5%), and agriculture (3%). The LUCF sector became a net sink in 2001 and reductions continued to exceed emissions from 2001 through 2012.³

The energy sector, however, had the largest overall increase in emissions during this period, from 5.54 MtCO_{2e} in 1990 to 21.14 MtCO_{2e} in 2012. Throughout, energy has remained the largest contributor to GHG emissions, contributing to 75% of total emissions in 1990 and 87% of total emissions in 2012. Contributions from electricity/heat and transportation increased the most in the sector, with electricity/heat emissions rising from 2.77 MtCO_{2e} in 1990 to 11.95

MtCO_{2e} in 2012; transportation emissions increased from 1.84 MtCO_{2e} in 1990 to 5.29 MtCO_{2e} in 2012. (Renewables are a very new industry in Lebanon, with hydropower accounting for 4.5% of total energy production.⁴ GHG emissions associated with renewables are negligible).

After energy, the waste sector saw the next largest increase in emissions during 1990-2012, from 0.94 MtCO_{2e} in 1990 to 1.89 MtCO_{2e} in 2012. The waste sector, including waste water, is responsible for the majority of methane (CH₄) emissions in Lebanon, while solid waste disposal on land is the highest emitting category within the waste sector.⁵



CARBON INTENSITY: GHG EMISSIONS RELATIVE TO GDP

Lebanon's GDP increased at a slightly greater rate than total GHG emissions from 1990 (\$9,106 million) to 2012 (\$32,058 million), signaling that carbon intensity has decreased relative to 1990. Given that energy sector emissions make up the majority of total GHG emissions in Lebanon, energy sector growth essentially mirrors total GHG emissions from 1990 to 2012. However, while economic growth and total emissions were closely

² 2012 was the first year on record that industrial processes emissions were "n/a"

³ World Resources Institute Climate Analysis Indicators Tool (WRI CAIT) 2.0, 2012.

⁴ National Greenhouse Gas Inventory Report and Mitigation Analysis for the Energy Sector in Lebanon, Ministry of Environment, 2015. <http://climatechange.moe.gov.lb/viewfile.aspx?id=225>

⁵ Waste and Waste Water, Ministry of Environment. <http://climatechange.moe.gov.lb/waste>

linked from 1990 to 1992, a decoupling can be observed from about 1992 until 2006, where the connection between the two becomes more pronounced. GDP grew steadily between 2007 and 2010, but began to drop off following the Syria crisis due to reduced foreign direct investment, a slowdown in the real estate sector, and significant declines in tourism.⁶ Total emissions followed a similar pattern.

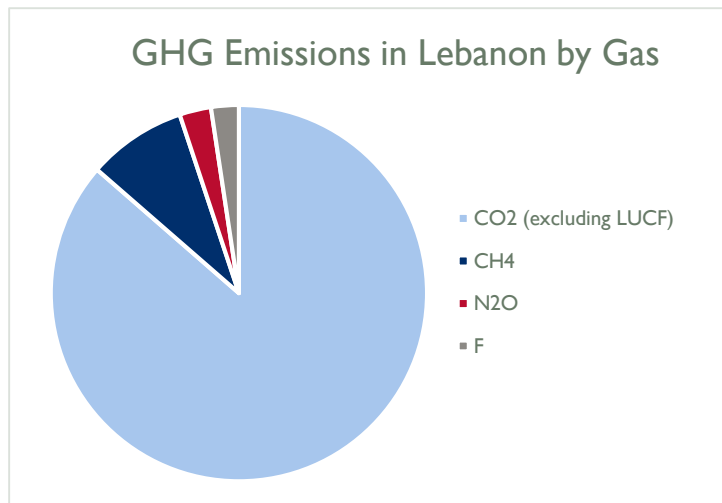
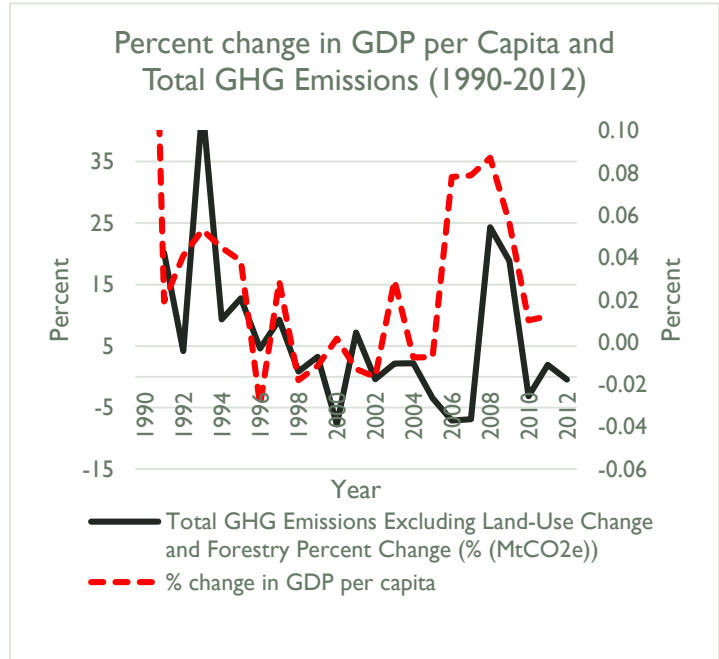
CLIMATE CHANGE MITIGATION TARGETS AND PLANS

Lebanon has developed various *mitigation scenarios* to reduce GHG emissions in the country's Second National Communication to the United Nations Framework Convention on Climate Change (UNFCCC).⁷ These mitigation scenarios, by sector, follow below.

ENERGY SECTOR

ELECTRICITY:

- Mitigation Scenario 1: Implementation of the Ministry of Energy and Water's (MoEW's) latest policy paper for the electricity sector, in addition to capacity expansion post-2015 to keep up with demand. The policy paper provides a global framework for the electricity sector, including initiatives on both the supply and demand side to generate additional capacity in an efficient manner with minimal environmental impacts.⁸
- Mitigation Scenario 2: Implementation of MoEW's policy paper but with a full switch of oil-fired power plants to natural gas by 2030, an increase in the penetration rate of renewable energy technologies (17% by 2030), and no electricity imports.



⁶ Syria's War Threatens Lebanon's Fragile Economy, Atlantic Council, 2013.

https://www.files.ethz.ch/isn/166941/lebanons_fragile_economy.pdf

⁷ The mitigation scenarios are excerpts from Lebanon's Second National Communication to the United Nations Framework Convention on Climate Change. The full report can be viewed here: <http://climatechange.moe.gov.lb/viewfile.aspx?id=19>

⁸ The full Policy Paper for the Electricity Sector can be viewed here: <http://climatechange.moe.gov.lb/viewfile.aspx?id=121>



Public transportation in Lebanon.



Cedar seedlings grow at a USAID-funded nursery maintained by Lebanon's Association for Forests, Development and Conservation.



A Sudanese farmer prepares his land for irrigation on the banks of the river Nile in Khartoum.



Microorganisms turn the waste into high-quality organic fertilizer that is sold to commercial and small-hold farms.

MANUFACTURING INDUSTRIES AND CONSTRUCTION:

- Mitigation Scenario 1: Recovery and utilization of waste heat for power generation in cement plants.
- Mitigation Scenario 2: Partial substitution of fossil fuels with alternative fuels or less carbon-intensive fuels.

TRANSPORTATION:

- Mitigation Scenario 1: Revitalization of the Public Transport System.
- Mitigation Scenario 2: Implementation of a car scrappage program.

INDUSTRY SECTOR

- Mitigation Scenario: Increase the additive blend in cement production. For example, an increase in the share of additive (i.e., fly ash) from 27.66% to 35% would reduce emissions by an average of 1.32% of CO₂.

AGRICULTURE SECTOR:

- Mitigation Scenario 1: Field level measures (e.g., improve manure management, plowing techniques, and irrigation efficiency).
- Mitigation Scenario 2: Research, education, assistance, infrastructure and institutional measures.

FORESTRY SECTOR:

- Mitigation Scenario 1: Maintain and conserve existing forest carbon sinks.
- Mitigation Scenario 2: Afforestation and reforestation including agroforestry and silvopastoral systems.
- Mitigation Scenario 3: Substitute fossil fuels with forest-based biofuels: a Clean Development Mechanism (CDM) option.

WASTE SECTOR:

- Mitigation Scenario 1: Landfill with gas recovery for electricity generation.
- Mitigation Scenario 2: Waste incineration and energy production (waste-to-energy plants).

For more information on Lebanon's strategy to reduce GHG emissions, please see [Lebanon's Second National Communication to the United Nations Framework Convention on Climate Change](#).