Project summary

The Effects of Enhanced Hydrocarbon Extraction Technologies on Greenhouse Gas Emissions from Upstream and Midstream Oil and Gas Industry

Problem Statement:

The purpose of this project is to examine established Greenhouse Gas (GHG) Emissions data and determine if there is a correlation between accelerated hydrocarbon (Crude oil and Natural gas) production through horizontal drilling and hydraulic fracturing in the most recent decade and GHG emissions rates. If a correlation is found, additional analysis may be able to reveal the causal source. The project will focus on three GHGs, Carbon-Dioxide (CO_2), Methane (CH_4), and Nitrous-Oxide (N_2O).

Questions to Answer:

Is there a correlation between increased hydrocarbon production and industry sector GHG emissions? Does the correlation apply to the industry as a whole or to one or more individual components?

Source Datasets:

1. **Dataset Name: Greenhouse Gas Emissions Data**

Source: US Oil and Gas Upstream (Exploration & Production) and Midstream (Pipelines and Storage) facilities can be accessed from the U.S. Environmental Protection Agency (EPA) FLIGHT database.

Location: https://ghgdata.epa.gov/ghgp/main.do

Access Method: **F**acility **L**evel **I**nformation on **G**reen**H**ouse gases **T**ool (FLIGHT) database can be accessed through the website: https://ghgdata.epa.gov/ghgp/main.do

Download the data in excel format after applying appropriate filters.

Format: Excel spreadsheets

Dataset Size: Six excel spreadsheets with a total of 41K records.

2. **Dataset Name: Emission Data from other Industrial Sectors**

Source: Emissions data from other Industrial sectors can be downloaded from the EAP data store. We will use this data to compare GHG emissions from Oil & Gas systems and other industrial sectors.

Location: https://cfpub.epa.gov/ghgdata/inventoryexplorer/#industry/allgas/source/all
Access Method: Web Scraping if there are no popups preventing web scraping, otherwise use the manual download option.
Format: CSV or Web Scraping, CSV name will be IndustryWiseGHGEmissions.csv, if we're not able to scrape it from the web.
Dataset Size: 243 records

3. **Dataset Name: Crude Oil and Natural Gas Production**

U.S. Field Production of Crude Oil, U.S. Natural Gas Gross Withdrawals; Yearly

Top Emitters

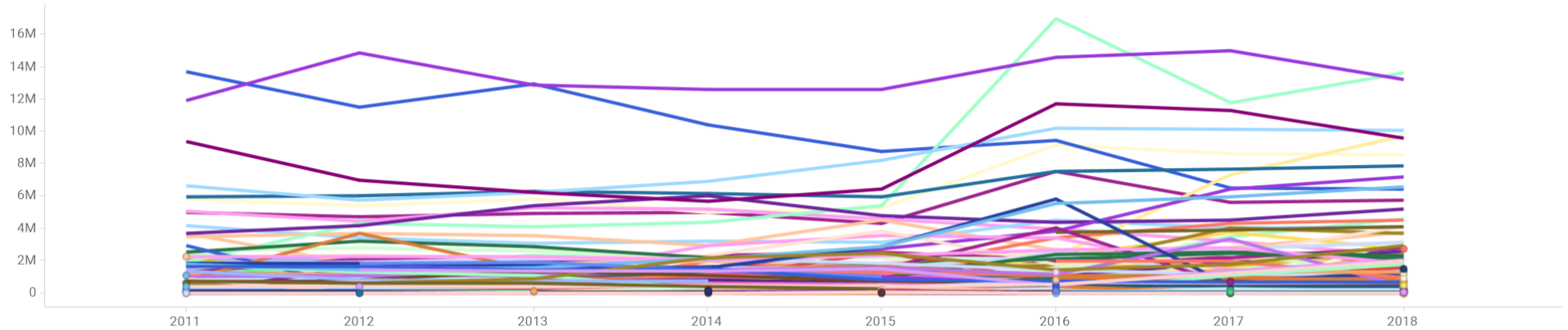
Greenhouse Gas Emissions from top US Oil & Gas Companies (in METRIC TONS CO2e)

REPORTING YEAR

COMPANY NAME	2011	2012	2013	2014	2015	2016	2017	2018
ENERGY TRANSFER PARTNERS	1932428.50	4347338.40	4124251.90	4358246.90	5399094.80	16982839.60	11793393.00	13645082.50
EXXONMOBIL	11883564.13	14835260.57	12883495.87	12571713.03	12625440.08	14564928.04	15013833.88	13231477.10
KINDER MORGAN	6642763.49	5718302.06	6262773.16	6937417.48	8233217.21	10184033.09	10151125.90	10084071.27
DCP MIDSTREAM	1354784.92	1640147.86	1992208.80	2249943.27	2400336.88	2273631.94	7298924.68	9748064.28
WILLIAMS	9389094.85	6990798.44	6234089.37	5669428.67	6428270.24	11702910.93	11291678.82	9576416.17
BP AMERICA	5842378.98	5410241.29	5843165.63	5026566.27	5253293.73	9180476.88	8604676.60	8537390.90
ENTERPRISE PRODUCTS PARTNERS	5933711.55	6019396.31	6289954.22	6153018.38	5968484.13	7534329.18	7669436.64	7895746.99
HILCORP ENERGY	336100.91	414369.55	757024.80	1584991.79	2752913.33	3858958.33	6423428.43	7222181.60
TARGA RESOURCES	1785376.79	1469321.55	1548662.93	2148241.61	2843397.66	5517271.47	5924004.28	6573751.32
CONOCOPHILLIPS	13725695.06	11477010.97	12938759.29	10403863.88	8794703.16	9418947.67	6482285.18	6449134.17
ANADARKO PETROLEUM	4978620.79	4753682.37	4934025.90	4966138.70	4347877.13	7532956.48	5644206.74	5753435.59
EOG RESOURCES	3695422.00	4154040.00	5424472.00	5994572.00	4773869.00	4413393.00	4532773.00	5219444.00
CHENIERE ENERGY	62314.00	62003.00	59473.00	173624.00	181518.00	1302963.00	3505691.00	4555262.00

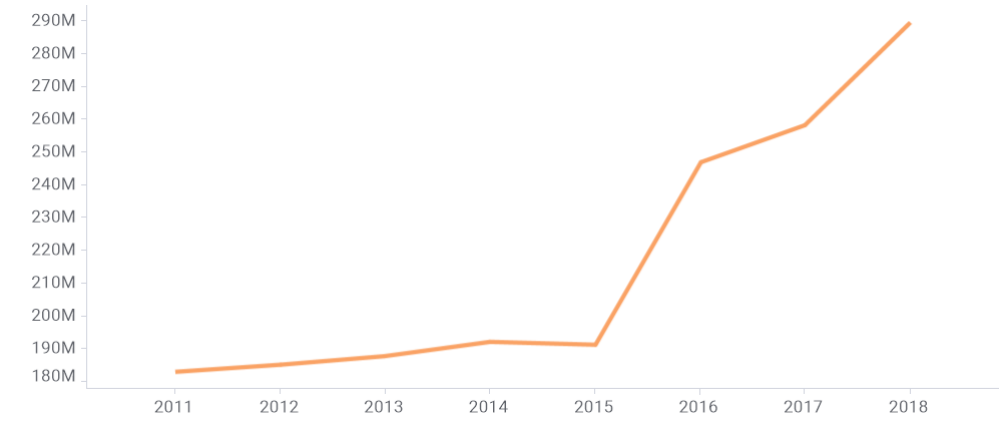
COMPANY NAME

Sum(GHG EMISSIONS)

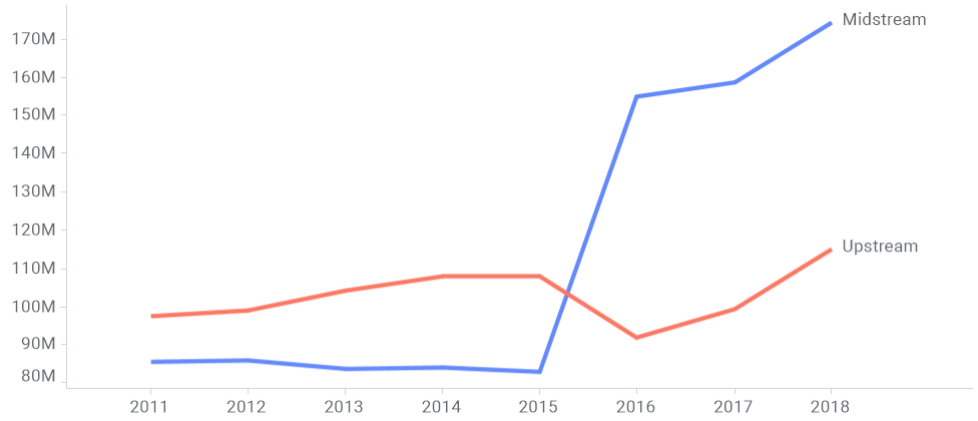


Emission from Upstream&Midstream

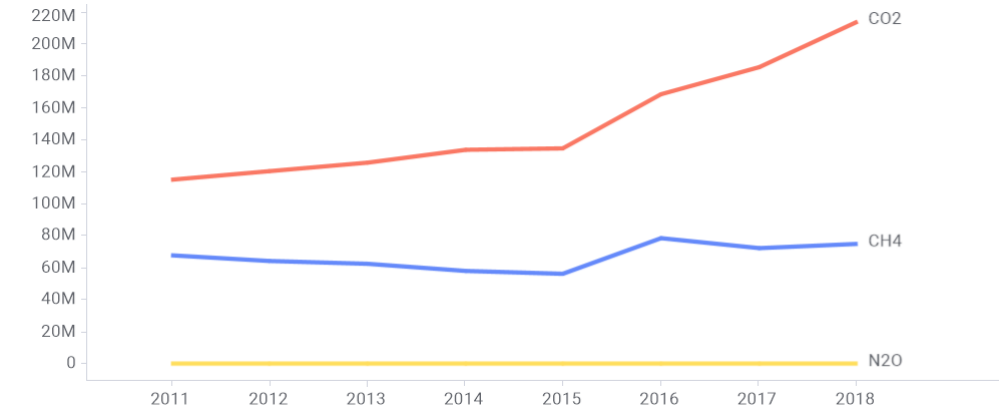
Total emissions between 2011 to 2018 - (METRIC TONS CO2e)



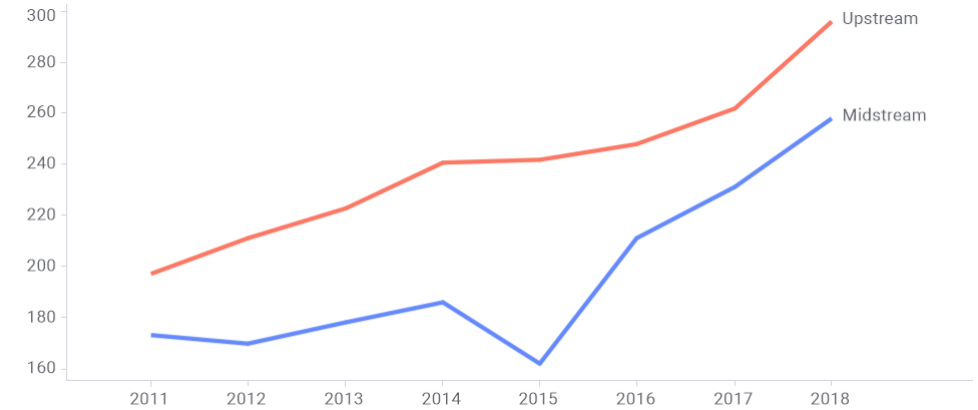
Emissions by sector



Emissions by Gas

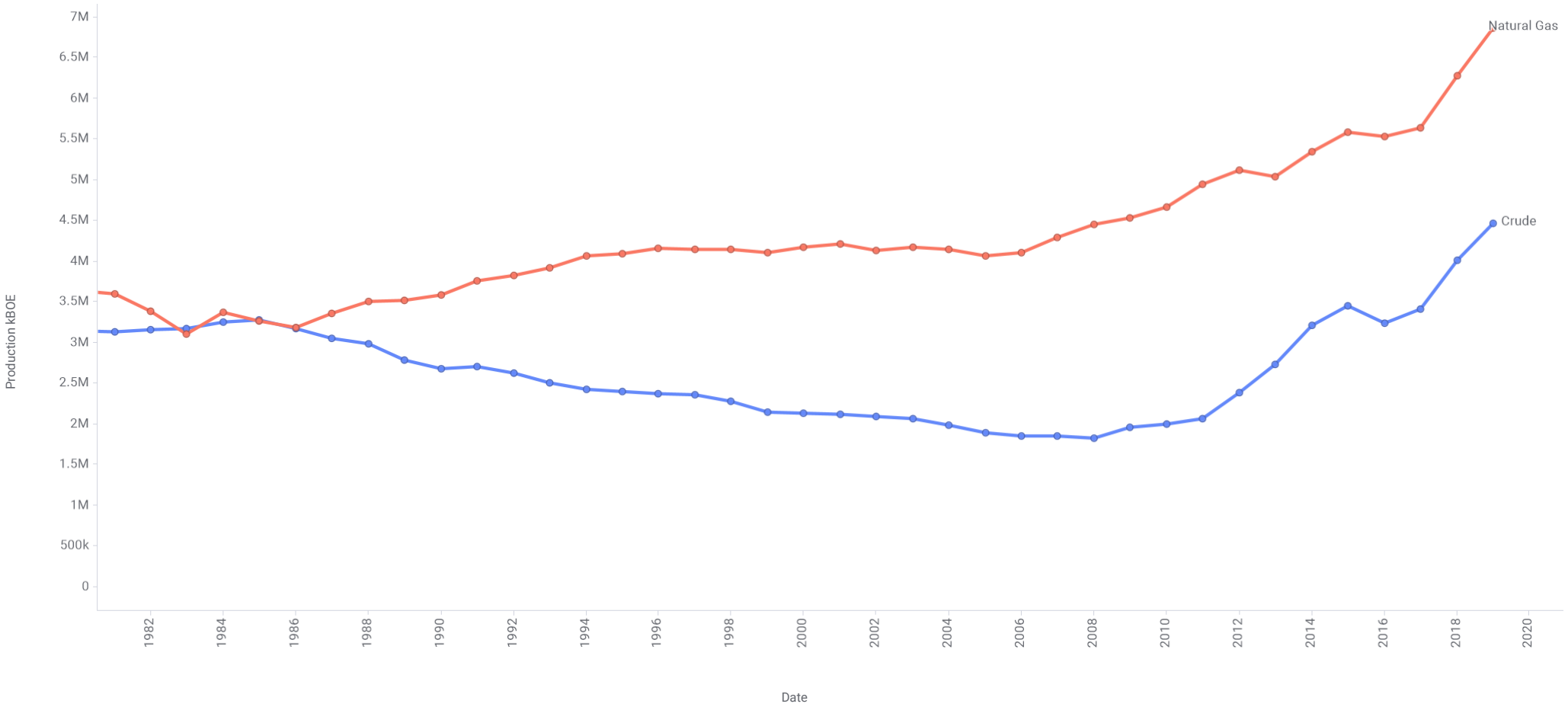


Number of Operators



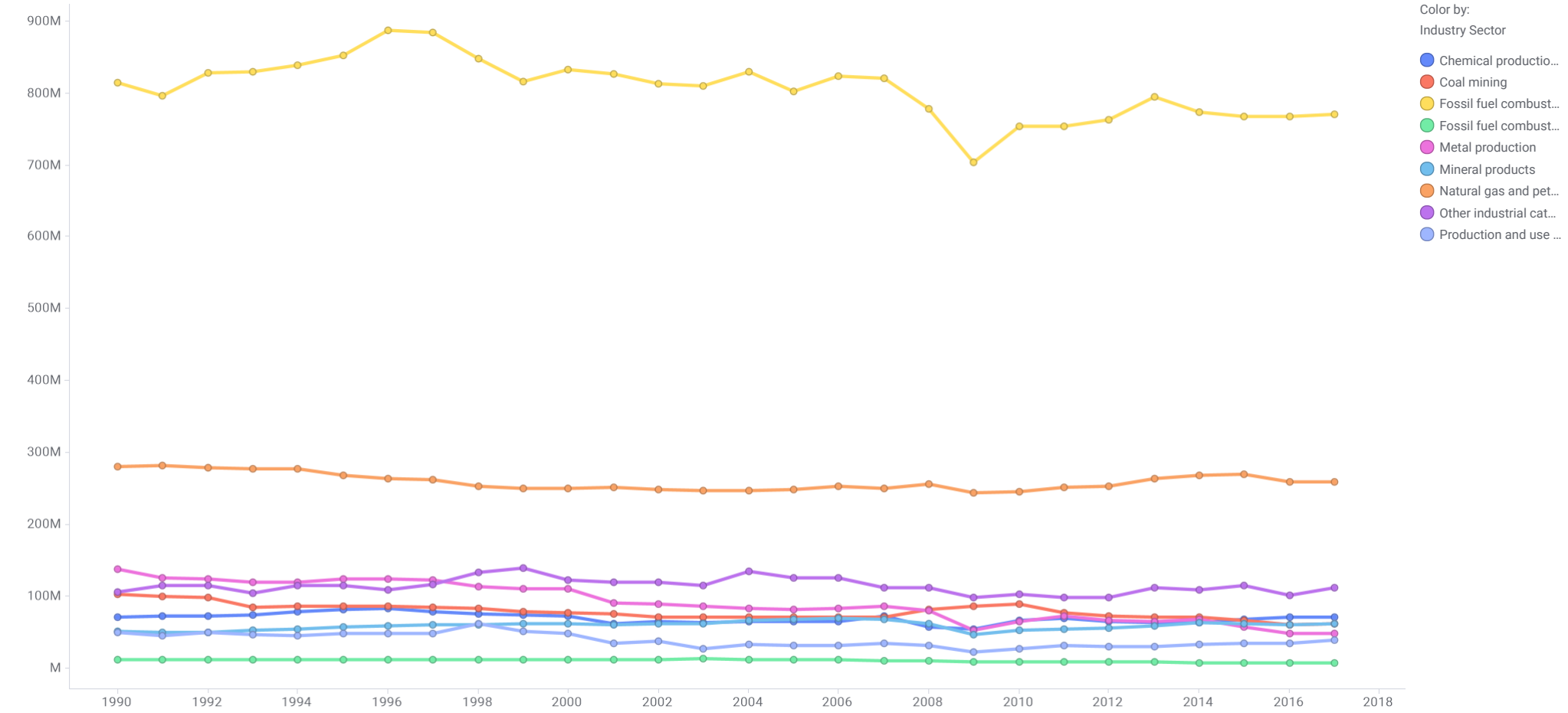
Production Data

Annual Production in Barrel of Oil Equivalents(BOE)



Comparison with Other industries

Emissions Compared to other industries (Million Metric Tons of CO2 equivalents)



Production VS Emission

Oil and Gas Production vs GHG Emissions