

Project 2: Analyzing Green House Gases (GHG) Generated from Various sources

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Background

- ▶ Greenhouse Gases surely have increased earth's surface temperatures in the last couple decades.
- ▶ GHG (Green House Gases) are a mixture of CO₂, CH₄, N₂O and other gases such as Hydrofluorocarbons, sulfur hexafluoride & water vapor.
- ▶ These gases absorb the heat radiated from Earth's surface and bounce some of it back on earth, eventually heating earth's surface.
- ▶ Apparently, it was found that these gases have differing global warming potentials when compared with CO₂ (as CO₂ is a direct by-product of burning O&G) – viz:
 - ▶ CH₄ (Methane) molecule – 25 times the global warming potential of a CO₂ molecule
 - ▶ N₂O (Nitrous Oxide) - 298 times the global warming potential of a CO₂ molecule
 - ▶ HFC (Hydrofluorocarbons) – 1430-14800 times the global warming potential of a CO₂ molecule
 - ▶ Sulfur Hexafluoride – 22800 times the global warming potential of a CO₂ molecule
- ▶ CH₄, N₂O and other gases like HCF etc. are a by-product of agriculture & Farming and are not directly related to burning of fossil fuels.

Project Proposal - Summary

- ▶ Per the graph published in the report (*source), the GHG have more or less doubled from 1980 to 2014 when this report was published.
- ▶ The Primary Project task is to:
 - ▶ Identify & Display the major “Specific” sources of emissions in agriculture & farming sector from data available from 1990 to 2019. (CH₄ & N₂O)
 - ▶ Identify & Display global GHG emissions to understand the Agricultural & Farming aspect from separate dataset.
 - ▶ Use Global Oil demand as a vague indicator to CO₂ emissions for comparison purposes

Figure 1. Radiative Forcing Caused by Major Long-Lived Greenhouse Gases, 1979–2013

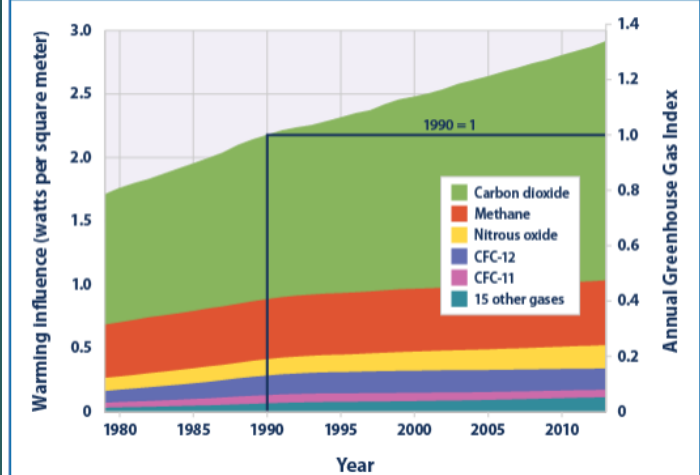
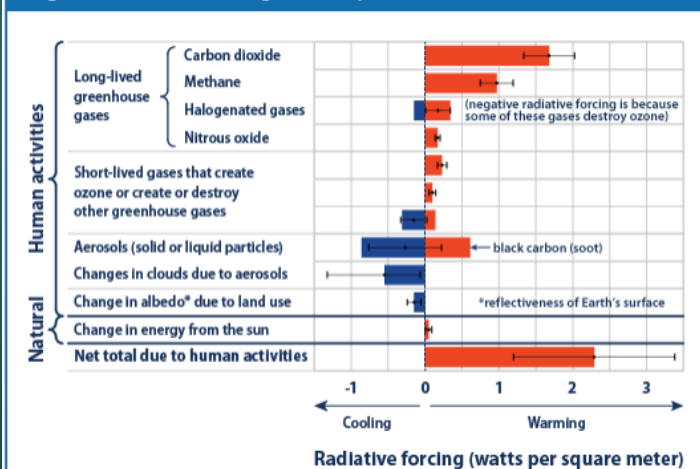


Figure 2. Radiative Forcing Caused by Human Activities Since 1750



*Source: <https://climatechange.lta.org/wp-content/uploads/cct/2015/02/EPA-climate-forcing-2014.pdf/>

Data1– Emissions per sector

► DATA1: Available as CSV, JSON file or API with a html interactive page (We plan on using JSON file for the project)

► <https://datasource.kapsarc.org/explore/dataset/agri-environmental-indicators-emissions-by-sector/table/?disjunctive.area&disjunctive.item&disjunctive.element&sort=-item>

Element		JSON Schema	
Emissions (CH4)	171,749	The following JSON object is a standardized description of your dataset's schema. More about JSON schema.	
Emissions (CO2)	172,888	<pre>{ "title": "agri-environmental-indicators-emissions-by-sector", "type": "object", "oneOf": [{ "\$ref": "#/definitions/agri-environmental-indicators-emissions-by-sector" }], "definitions": { "agri-environmental-indicators-emissions-by-sector": { "properties": { "records": { "type": "array", "items": { "\$ref": "#/definitions/agri-environmental-indicators-emissions-by-sector_records" } } } }, "agri-environmental-indicators-emissions-by-sector_records": { "properties": { "fields": { "type": "object", "properties": { "year": { "type": "string", "format": "date", "title": "Year", "description": "" }, "area": { "type": "string", "title": "Area", "description": "" }, "item": { "type": "string", "title": "Item", "description": "" } } } } } } }</pre>	
Emissions (CO2eq) (AR5)	188,313		
Emissions (F-gases)	182,954		
Emissions (N2O)	183,020		
Emissions Share (CH4)	158,977		
Emissions Share (CO2)	161,491		
Emissions Share (CO2eq) (AR5)	176,275		
Emissions Share (F-gases)	118,103		
Emissions Share (N2O)	170,178		
> Less			

Data2- Global Greenhouse Emissions

- ▶ DATA2: Available as CSV, JSON file or API with a html interactive page
- ▶ We plan to use JSON
 - ▶ https://datasource.kapsarc.org/explore/dataset/emissions_agriculture_energy_e_all_data_norm/table/?disjunctive.em&disjunctive.element

1,007,136 records

No active filters

Global Greenhouse-Gas Emissions

Information Table Analyze Export API Comments (0)

Filters

Search records...

Year

From

to

2018 6,155

2017 6,153

2016 6,157

2015 22,433

2014 22,505

2013 22,328

> More

World Region

Rest Central America 131,535

OECD_Europe 115,618

Western_Africa 108,551

Central Europe 91,518

	Year	ISO_A3	World Region	Country	Compound	IPCC_description	IPCC-Annex	IPCC	Value (Gg)
1	1982	CAN	Canada	Canada	CH4	Main Activity Electricity and Heat Pr...	Annex_I	1.A.1.a	1.4
2	1983	CAN	Canada	Canada	CH4	Main Activity Electricity and Heat Pr...	Annex_I	1.A.1.a	1.4
3	1980	CAN	Canada	Canada	CH4	Main Activity Electricity and Heat Pr...	Annex_I	1.A.1.a	1.1
4	1988	CAN	Canada	Canada	CH4	Main Activity Electricity and Heat Pr...	Annex_I	1.A.1.a	1.7
5	1989	CAN	Canada	Canada	CH4	Main Activity Electricity and Heat Pr...	Annex_I	1.A.1.a	2.2
6	1999	CAN	Canada	Canada	CH4	Main Activity Electricity and Heat Pr...	Annex_I	1.A.1.a	3.9
7	1990	CAN	Canada	Canada	CH4	Main Activity Electricity and Heat Pr...	Annex_I	1.A.1.a	2.2
8	1996	CAN	Canada	Canada	CH4	Main Activity Electricity and Heat Pr...	Annex_I	1.A.1.a	2.9
9	1972	CAN	Canada	Canada	CH4	Main Activity Electricity and Heat Pr...	Annex_I	1.A.1.a	0.9
10	1985	CAN	Canada	Canada	CH4	Petroleum Refining - Manufacture o...	Annex_I	1.A.1.bc	1.1
11	1980	CAN	Canada	Canada	CH4	Petroleum Refining - Manufacture o...	Annex_I	1.A.1.bc	1.0
12	1981	CAN	Canada	Canada	CH4	Petroleum Refining - Manufacture o...	Annex_I	1.A.1.bc	1.0
13	1996	CAN	Canada	Canada	CH4	Petroleum Refining - Manufacture o...	Annex_I	1.A.1.bc	1.8
14	1978	CAN	Canada	Canada	CH4	Petroleum Refining - Manufacture o...	Annex_I	1.A.1.bc	1.3
15	1972	CAN	Canada	Canada	CH4	Petroleum Refining - Manufacture o...	Annex_I	1.A.1.bc	1.2
16	1970	CAN	Canada	Canada	CH4	Petroleum Refining - Manufacture o...	Annex_I	1.A.1.bc	1.0
17	2005	CAN	Canada	Canada	CH4	Petroleum Refining - Manufacture o...	Annex_I	1.A.1.bc	3.4

2013 22,328

> More

World Region

Rest Central America 131,535

OECD_Europe 115,618

Western_Africa 108,551

Central Europe 91,518

Rest South America 67,904

Oceania 63,261

> More

Country

Zimbabwe 4,367

Zambia 4,658

Yemen 3,911

Western Sahara 3,907

Wallis and Futuna 1,012

Virgin Islands_USA 920

> More

Compound

CO2_org_short-cycle_C 62,145

CO2_excl_short-cycle_org_C 302,924

CH4 307,658

N2O 334,409

Data can be sorted with

- Year

- World Region
- Country
- Elements (Specific Greenhouse Gases)
- The IPCC_Description column provides sector

- Annual dataset with 9 columns which could be sorted by columns on right.
- This data helps understand global emissions from all industries to compare with Agri industry

Data 2– Global Greenhouse Emissions

- ▶ DATA2: Available as CSV, JSON file or API with a html interactive page
- ▶ We plan to use JSON (Schema is provided in Introduction Tab)
 - ▶ https://datasource.kapsarc.org/explore/dataset/emissions_agriculture_energy_e_all_data_norm/table/?disjunctive.it%20em&disjunctive.element

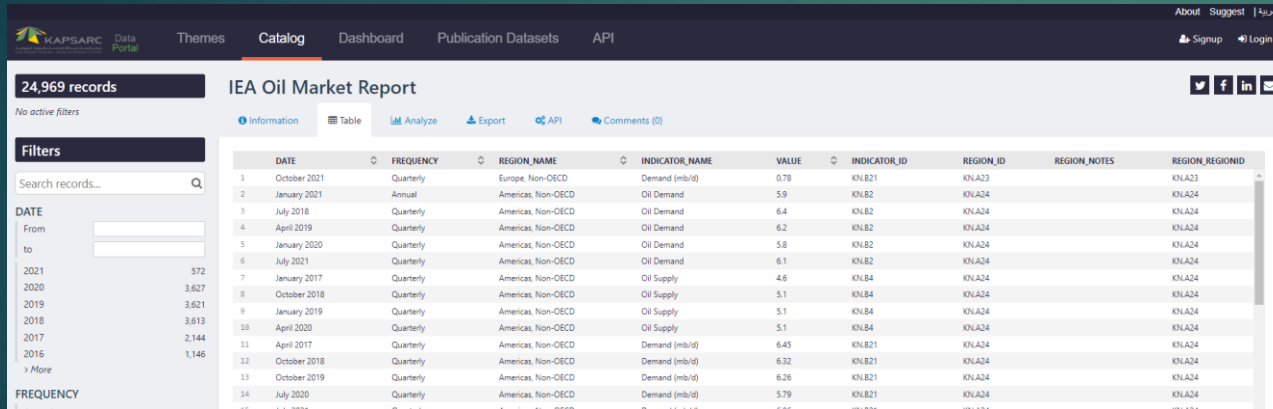
JSON Schema

The following JSON object is a standardized description of your dataset's schema. [More about JSON schema.](#)

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  "type": "object",
  "oneOf": [
    {
      "$ref": "#/definitions/global-greenhouse-gas-emissions"
    }
  ],
  "definitions": {
    "global-greenhouse-gas-emissions": {
      "properties": {
        "records": {
          "type": "array",
          "items": {
            "$ref": "#/definitions/global-greenhouse-gas-emissions_records"
          }
        }
      }
    },
    "global-greenhouse-gas-emissions_records": {
      "properties": {
        "fields": {
          "type": "object",
          "properties": {
            "year": {
              "type": "string",
              "format": "date",
              "title": "Year",
              "description": ""
            }
          }
        }
      }
    }
  }
}
```

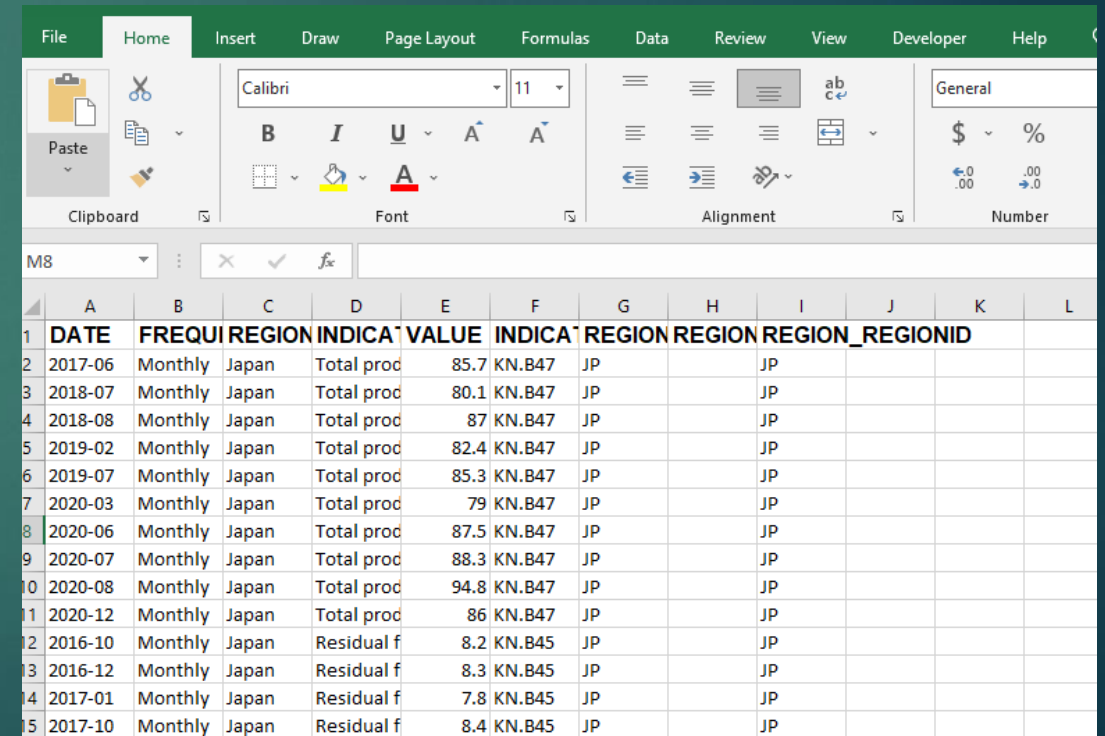
Data 3– Global Oil& Gas Demand

- ▶ DATA3: Available as CSV, JSON file or API with a html interactive page
- ▶ We plan to use CSV (Convert xls to CSV)
 - ▶ https://datasource.kapsarc.org/explore/dataset/iea-oil-market-report-2001-2016/information/?disjunctive.frequency&disjunctive.region_name&disjunctive.indicator_name



The screenshot shows the KAPSARC Data Portal interface. The top navigation bar includes 'Themes', 'Catalog', 'Dashboard', 'Publication Datasets', and 'API'. The main content area displays the 'IEA Oil Market Report' dataset with 24,969 records. A table view is selected, showing columns: DATE, FREQUENCY, REGION_NAME, INDICATOR_NAME, VALUE, INDICATOR_ID, REGION_ID, REGION_NOTES, and REGION_REGIONID. The table lists data for various regions and indicators, including Demand (mmb/d) and Oil Supply (mmb/d) for Europe, Americas, and Asia.

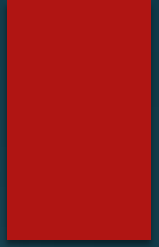
DATE	FREQUENCY	REGION_NAME	INDICATOR_NAME	VALUE	INDICATOR_ID	REGION_ID	REGION_NOTES	REGION_REGIONID
1 October 2021	Quarterly	Europe, Non-OECD	Demand (mmb/d)	0.78	KN.B21	KN.A23		KN.A23
2 January 2021	Annual	Americas, Non-OECD	Oil Demand	5.9	KN.B2	KN.A24		KN.A24
3 July 2018	Quarterly	Americas, Non-OECD	Oil Demand	6.4	KN.B2	KN.A24		KN.A24
4 April 2019	Quarterly	Americas, Non-OECD	Oil Demand	6.2	KN.B2	KN.A24		KN.A24
5 January 2020	Quarterly	Americas, Non-OECD	Oil Demand	5.8	KN.B2	KN.A24		KN.A24
6 July 2021	Quarterly	Americas, Non-OECD	Oil Demand	6.1	KN.B2	KN.A24		KN.A24
7 January 2017	Quarterly	Americas, Non-OECD	Oil Supply	4.6	KN.B4	KN.A24		KN.A24
8 October 2018	Quarterly	Americas, Non-OECD	Oil Supply	5.1	KN.B4	KN.A24		KN.A24
9 January 2019	Quarterly	Americas, Non-OECD	Oil Supply	5.1	KN.B4	KN.A24		KN.A24
10 April 2020	Quarterly	Americas, Non-OECD	Oil Supply	5.1	KN.B4	KN.A24		KN.A24
11 April 2017	Quarterly	Americas, Non-OECD	Demand (mmb/d)	6.45	KN.B21	KN.A24		KN.A24
12 October 2018	Quarterly	Americas, Non-OECD	Demand (mmb/d)	6.32	KN.B21	KN.A24		KN.A24
13 October 2019	Quarterly	Americas, Non-OECD	Demand (mmb/d)	6.26	KN.B21	KN.A24		KN.A24
14 July 2020	Quarterly	Americas, Non-OECD	Demand (mmb/d)	5.79	KN.B21	KN.A24		KN.A24
15 July 2021	Quarterly	Americas, Non-OECD	Demand (mmb/d)	6.08	KN.B21	KN.A24		KN.A24



The screenshot shows a Microsoft Excel spreadsheet with data from the IEA Oil Market Report. The data is organized into columns: DATE, FREQUENCY, REGION, INDICATOR, VALUE, INDICATOR_ID, REGION_ID, REGION_NAME, and REGION_REGIONID. The data covers various regions and indicators, including Demand (mmb/d) and Oil Supply (mmb/d) for Europe, Americas, and Asia.

	A	B	C	D	E	F	G	H	I	J	K	L
1	DATE	FREQUENCY	REGION	INDICATOR	VALUE	INDICATOR_ID	REGION_ID	REGION_NAME	REGION_REGIONID			
2	2017-06	Monthly	Japan	Total prod	85.7	KN.B47	JP		JP			
3	2018-07	Monthly	Japan	Total prod	80.1	KN.B47	JP		JP			
4	2018-08	Monthly	Japan	Total prod	87	KN.B47	JP		JP			
5	2019-02	Monthly	Japan	Total prod	82.4	KN.B47	JP		JP			
6	2019-07	Monthly	Japan	Total prod	85.3	KN.B47	JP		JP			
7	2020-03	Monthly	Japan	Total prod	79	KN.B47	JP		JP			
8	2020-06	Monthly	Japan	Total prod	87.5	KN.B47	JP		JP			
9	2020-07	Monthly	Japan	Total prod	88.3	KN.B47	JP		JP			
10	2020-08	Monthly	Japan	Total prod	94.8	KN.B47	JP		JP			
11	2020-12	Monthly	Japan	Total prod	86	KN.B47	JP		JP			
12	2016-10	Monthly	Japan	Residual f	8.2	KN.B45	JP		JP			
13	2016-12	Monthly	Japan	Residual f	8.3	KN.B45	JP		JP			
14	2017-01	Monthly	Japan	Residual f	7.8	KN.B45	JP		JP			
15	2017-10	Monthly	Japan	Residual f	8.4	KN.B45	JP		JP			

Project Proposed Tasks / strategy



- ▶ Identify major countries with max GHG emissions (select globally)
- ▶ Understand total emissions per year for all sectors
- ▶ Work with dataset with Agriculture & farming for those countries and identify total emissions of methane, nitrous oxide and other gases
 - ▶ Display with graphs (optional – depending on available time)
- ▶ Work with oil Demand CSV to generate yearly oil demand for the selected countries.
- ▶ Load the data into SQL database – as many tables required depending on find...