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

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GEORGIA TECH - DATA ANALYTICS BOOTCAMP – JUNE 11 2022

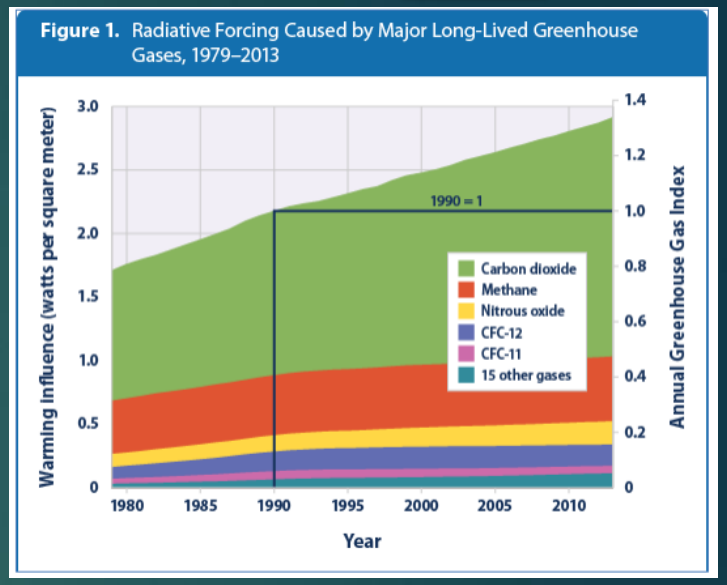
Background

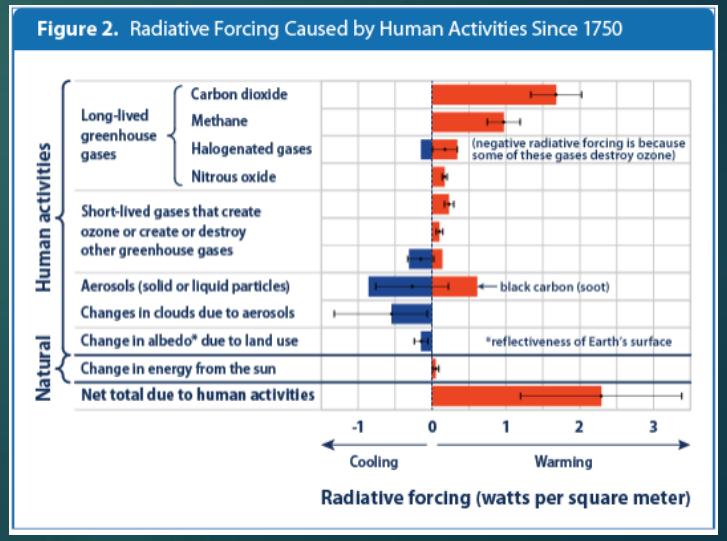
- Greenhouse Gases surely have increased earth's surface temperatures in the last couple decades.
- GHG (Green House Gases) are a mixture of CO_2, CH_4, N_2O and other gases such as Hydrofluorocarbons, sulfur hexafluoride & water vapor.
- These gases absorb the heat radiated from Earth's surface and 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 CO_2 (as CO_2 is a direct by-product of burning O&G) – viz:
  - CH_4 (Methane) molecule – 25 times the global warming potential of a CO_2 molecule
  - N_2O (Nitrous Oxide) - 298 times the global warming potential of a CO_2 molecule
  - HFC (Hydrofluorocarbons) – 1430-14800 times the global warming potential of a CO_2 molecule
  - Sulfur Hexafluoride – 22800 times the global warming potential of a CO_2 molecule
- CH_4, N_2O and other gases like HCF etc. are a by-product of agriculture & Farming and are not directly related to burning of fossil fuels.

Source: https://climatechange.lta.org/get-started/learn/co2-methane-greenhouse-effect/

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:
  - Extract, Transform & Load the Data which provides major "Specific" sources of emissions in agriculture & farming sector from data available from 1990 to 2019. (CH4 & N2O)
  - Load the correct global GHG emissions DataFrame to compare with the Agricultural & Farming aspect from separate dataset.
  - Use Global Oil demand as a secondary indicator to CO2 emissions for comparison purposes

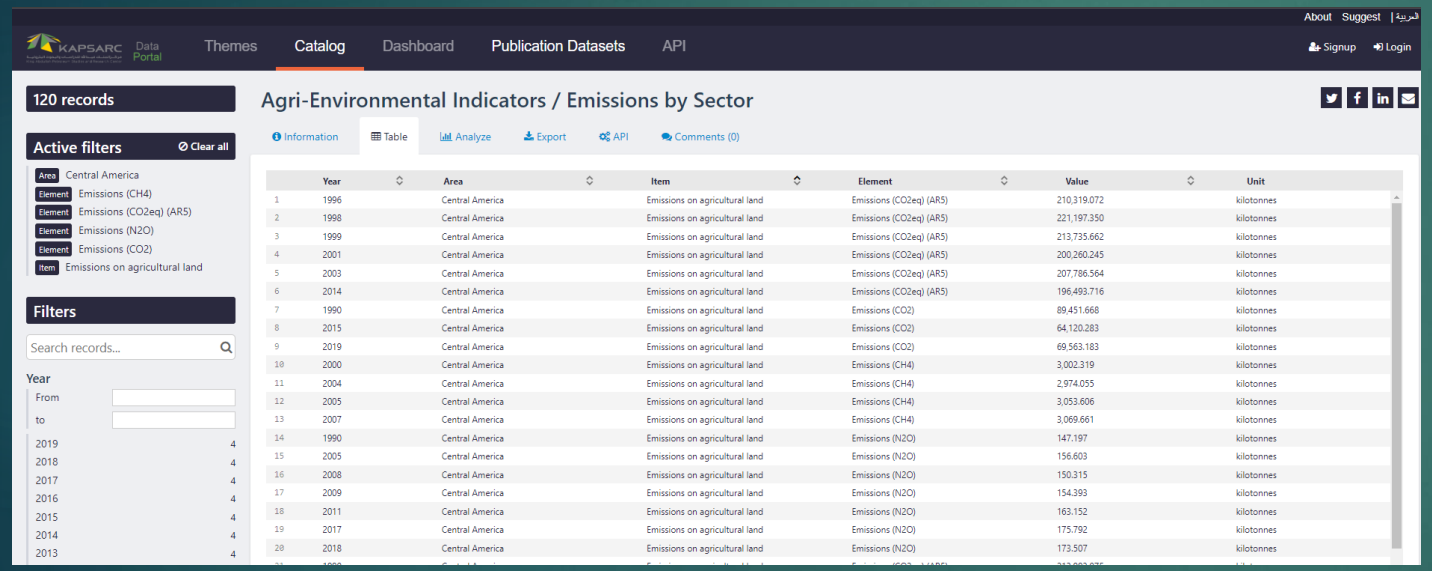




*Source: https://climatechange.lta.org/wp-content/uploads/cct/2015/02/EPA-climate-forcing-2014.pdf/

Data1 – Agriculture 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



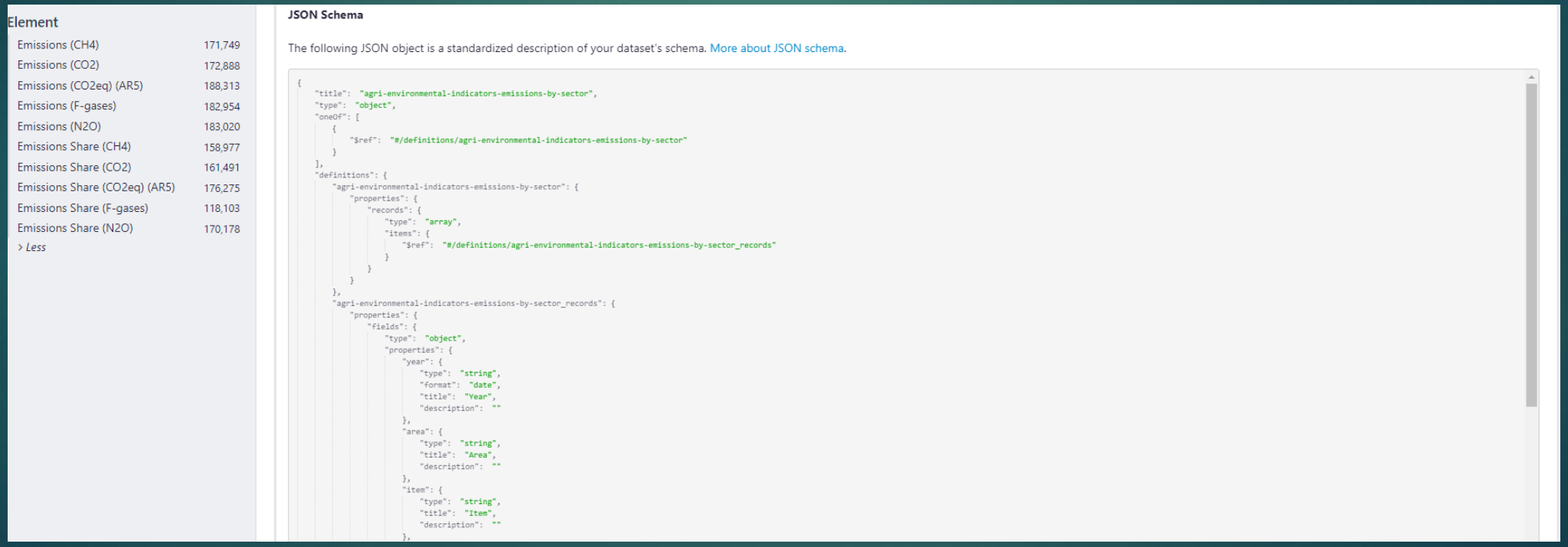
	Year	Area	Item	Element	Value	Unit
1	1996	Central America	Emissions on agricultural land	Emissions (CO2eq) (AR5)	210,319.072	kilotonnes
2	1998	Central America	Emissions on agricultural land	Emissions (CO2eq) (AR5)	221,197.350	kilotonnes
3	1999	Central America	Emissions on agricultural land	Emissions (CO2eq) (AR5)	213,735.662	kilotonnes
4	2001	Central America	Emissions on agricultural land	Emissions (CO2eq) (AR5)	200,260.245	kilotonnes
5	2003	Central America	Emissions on agricultural land	Emissions (CO2eq) (AR5)	207,786.564	kilotonnes
6	2014	Central America	Emissions on agricultural land	Emissions (CO2eq) (AR5)	196,493.716	kilotonnes
7	1990	Central America	Emissions on agricultural land	Emissions (CO2)	89,451.668	kilotonnes
8	2015	Central America	Emissions on agricultural land	Emissions (CO2)	64,120.283	kilotonnes
9	2019	Central America	Emissions on agricultural land	Emissions (CO2)	69,563.183	kilotonnes
10	2000	Central America	Emissions on agricultural land	Emissions (CH4)	3,002.319	kilotonnes
11	2004	Central America	Emissions on agricultural land	Emissions (CH4)	2,974.055	kilotonnes
12	2005	Central America	Emissions on agricultural land	Emissions (CH4)	3,053.606	kilotonnes
13	2007	Central America	Emissions on agricultural land	Emissions (CH4)	3,069.661	kilotonnes
14	1990	Central America	Emissions on agricultural land	Emissions (N2O)	147.197	kilotonnes
15	2005	Central America	Emissions on agricultural land	Emissions (N2O)	156.603	kilotonnes
16	2008	Central America	Emissions on agricultural land	Emissions (N2O)	150.315	kilotonnes
17	2009	Central America	Emissions on agricultural land	Emissions (N2O)	154.393	kilotonnes
18	2011	Central America	Emissions on agricultural land	Emissions (N2O)	163.152	kilotonnes
19	2017	Central America	Emissions on agricultural land	Emissions (N2O)	175.792	kilotonnes
20	2018	Central America	Emissions on agricultural land	Emissions (N2O)	173.507	kilotonnes

- Annual dataset with 6 columns which could be sorted by columns on right.
- This is the primary task for understanding Methane emissions from Agri & farming

Data can be sorted with
– Year
- Area (Major countries)
- Items (Emission Sources or sectors)
- Elements (Specific Greenhouse Gases)

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

Emissions (CH4)	171,749
Emissions (CO2)	172,888
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

JSON Schema

The following JSON object is a standardized description of your dataset's schema. More about JSON schema.


```
{
    "title": "agri-environmental-indicators-emissions-by-sector",
    "type": "object",
    "oneOf": [
        {
            "$ref": "#/definitions/agri-environmental-indicators-emissions-by-sector"
        }
    ],
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                    "type": "array",
                    "items": {
                        "$ref": "#/definitions/agri-environmental-indicators-emissions-by-sector_records"
                    }
                }
            }
        },
        "agri-environmental-indicators-emissions-by-sector_records": {
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                "fields": {
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                    "properties": {
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                            "type": "string",
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                            "title": "Year",
                            "description": ""
                        },
                        "area": {
                            "type": "string",
                            "title": "Area",
                            "description": ""
                        },
                        "item": {
                            "type": "string",
                            "title": "Item",
                            "description": ""
                        },
```
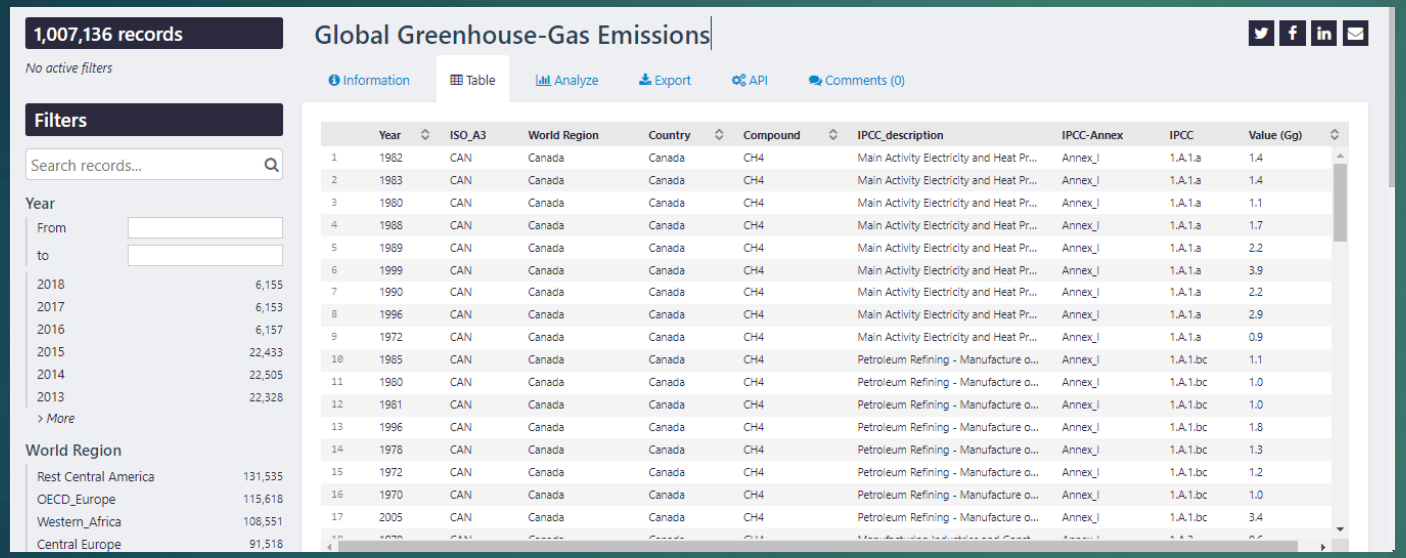

Data2– Global Greenhouse Emissions

- 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.item&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

- 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

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

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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

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.item&disjunctive.element

JSON Schema

The following JSON object is a standardized description of your dataset's schema. More about JSON schema.


```
{
    "title": "global-greenhouse-gas-emissions",
    "type": "object",
    "oneOf": [
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            "$ref": "#/definitions/global-greenhouse-gas-emissions"
        }
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        "global-greenhouse-gas-emissions": {
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                    "items": {
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                    }
                }
            }
        },
        "global-greenhouse-gas-emissions_records": {
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                "fields": {
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                    "properties": {
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                            "format": "date",
                            "title": "Year",
                            "description": ""
                        },
                        "iso_a3": {
```
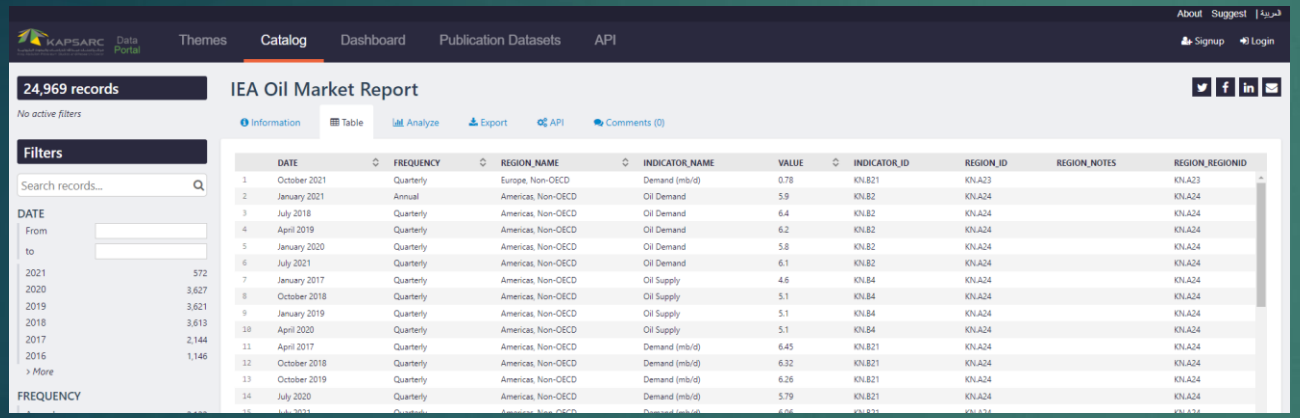
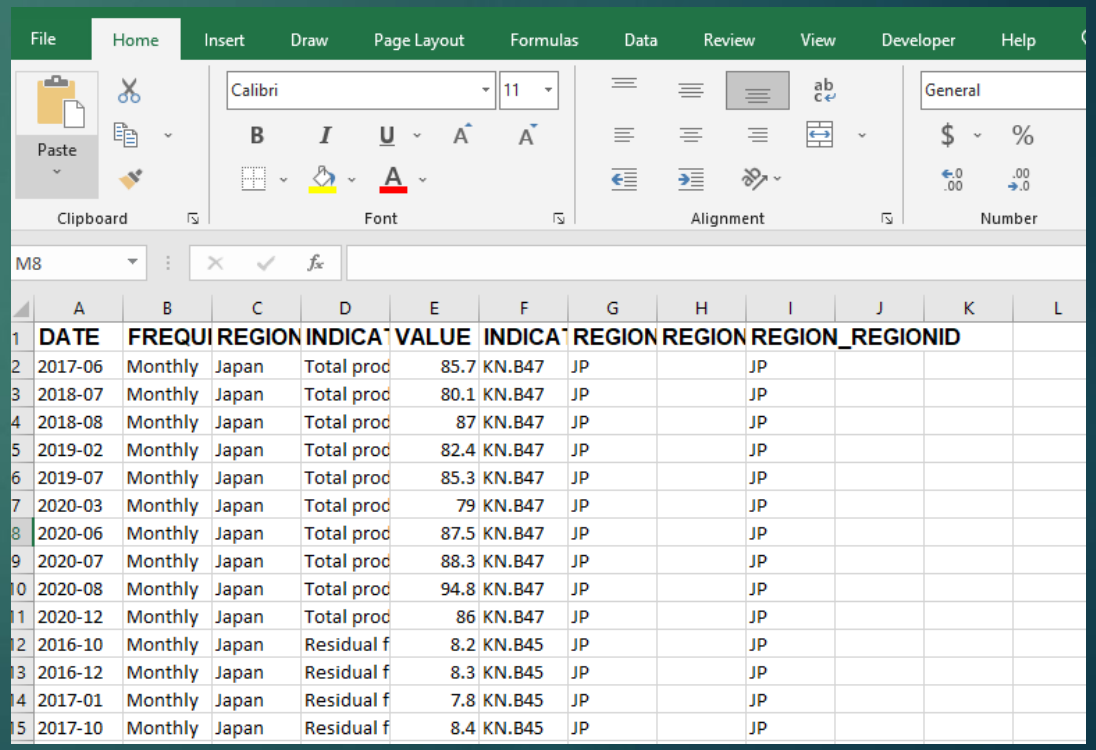

Data 3– Global Oil& Gas Demand

- 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



	DATE	FREQUENCY	REGION_NAME	INDICATOR_NAME	VALUE	INDICATOR_ID	REGION_ID	REGION_NOTES	REGION_REGIONID
1	October 2021	Quarterly	Europe, Non-OECD	Demand (mb/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 (mb/d)	6.45	KN.B21	KN.A24		KN.A24
12	October 2018	Quarterly	Americas, Non-OECD	Demand (mb/d)	6.32	KN.B21	KN.A24		KN.A24
13	October 2019	Quarterly	Americas, Non-OECD	Demand (mb/d)	6.26	KN.B21	KN.A24		KN.A24
14	July 2020	Quarterly	Americas, Non-OECD	Demand (mb/d)	5.79	KN.B21	KN.A24		KN.A24



	A	B	C	D	E	F	G	H	I	J	K	L
1	DATE	FREQUI	REGION	INDICA	VALUE	INDICA	REGION	REGION	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			