**Potential capstone data sources**

***(1) World Bank (CO2 emission, demographics/economical background)***

| Item | Time | url | filename | Remarks |
| --- | --- | --- | --- | --- |
| CO2 emission (kt) | 1960-2018 | https://data.worldbank.org/indicator/EN.ATM.CO2E.KT | API\_EN.ATM.CO2E.KT\_DS2\_  en\_csv\_v2\_3011692.csv | * Data for up to 1990 are sourced from Carbon Dioxide Information Analysis Center, Environmental Sciences Division, Oak Ridge National Laboratory, Tennessee, United States. * Data from 1990 are CAIT data: Climate Watch. |
| PM2.5 (microgram per m3) | 1990,  1995,  2000,  2005,  2010-2017 | https://data.worldbank.org/indicator/EN.ATM.PM25.MC.M3 | API\_EN.ATM.PM25.MC.M3\_DS2\_  en\_csv\_v2\_3016460.csv | * Brauer, M. et al. 2017, for the Global Burden of Disease Study 2017 |
| Total greenhouse gas emissions (kt of CO2 equivalent) | 1970-2018 | https://data.worldbank.org/indicator/EN.ATM.GHGT.KT.CE | API\_EN.ATM.GHGT.KT.CE\_DS2\_  en\_csv\_v2\_3015419.csv | * Data for up to 1990 are sourced from Carbon Dioxide Information Analysis Center, Environmental Sciences Division, Oak Ridge National Laboratory, Tennessee, United States. * Data from 1990 are CAIT data: Climate Watch. |
| Population | 1960-2020 | https://data.worldbank.org/indicator/SP.POP.TOTL | API\_SP.POP.TOTL\_DS2\_  en\_csv\_v2\_3011530.csv | United Nations Population Division. World Population Prospects: 2019 Revision |
| GDP (constant 2010 $US) | 1960-2020 | https://data.worldbank.org/indicator/NY.GDP.MKTP.KD | API\_NY.GDP.MKTP.KD\_DS2\_  en\_csv\_v2\_3011565.csv | - |
| GDP (current $US) | 1960-2020 | https://data.worldbank.org/indicator/NY.GDP.MKTP.CD | API\_NY.GDP.MKTP.CD\_DS2\_  en\_csv\_v2\_3011433.csv | - |
| Manufacturing, value added (current $US) | 1960-2019 | https://data.worldbank.org/indicator/NV.IND.MANF.CD | API\_NV.IND.MANF.CD\_DS2\_  en\_csv\_v2\_3016827.csv | - |
| Medium and high-tech industry (As % of manufacturing value added) | 1990-2019 | https://data.worldbank.org/indicator/NV.MNF.TECH.ZS.UN | API\_NV.MNF.TECH.ZS.UN\_DS2\_  en\_csv\_v2\_3016843.csv | United Nations Industrial Development Organization |
| Electric power consumption (kWh per capita) | 1971-2014 | https://data.worldbank.org/indicator/EG.USE.ELEC.KH.PC | API\_EG.USE.ELEC.KH.PC\_DS2\_  en\_csv\_v2\_3012285.csv | International Energy Agency 2014 |
| Electricity production from oil sources (% of total) | 1971-2014 | https://data.worldbank.org/indicator/EG.ELC.PETR.ZS | API\_EG.ELC.PETR.ZS\_DS2\_  en\_csv\_v2\_3016377.csv | International Energy Agency 2014 |
| Electricity production from coal sources (% of total) | 1971-2014 | https://data.worldbank.org/indicator/EG.ELC.COAL.ZS | API\_EG.ELC.COAL.ZS\_DS2\_  en\_csv\_v2\_3016366.csv | International Energy Agency 2014 |
| Electricity production from natural gas sources (% of total) | 1971-2014 | https://data.worldbank.org/indicator/EG.ELC.NGAS.ZS | API\_EG.ELC.NGAS.ZS\_DS2\_  en\_csv\_v2\_3016373.csv | International Energy Agency 2014 |
| Electricity production from nuclear sources (% of total) | 1971-2014 | https://data.worldbank.org/indicator/EG.ELC.NUCL.ZS | API\_EG.ELC.NUCL.ZS\_DS2\_  en\_csv\_v2\_3016375 | International Energy Agency 2014 |
| Exports of goods and services (current $US) | 1960-2020 | https://data.worldbank.org/indicator/NE.EXP.GNFS.CD | API\_NE.EXP.GNFS.CD\_DS2\_  en\_csv\_v2\_3052968 | - |
| Imports of goods and services (current $US) | 1960-2020 | https://data.worldbank.org/indicator/NE.IMP.GNFS.CD | API\_NE.IMP.GNFS.CD\_DS2\_  en\_csv\_v2\_3052632 | - |
| Real GDP growth rate | 1960-2020 | https://data.worldbank.org/indicator/NY.GDP.MKTP.KD.ZG | API\_NY.GDP.MKTP.KD.ZG\_DS2\_  en\_csv\_v2\_3052565 | - |

***(2) Climate Watch (CO2 emission by use)***

| Item | Time | url | filename | Remarks |
| --- | --- | --- | --- | --- |
| CO2 emission (total excluding LUCF) | 1990-2018 | https://www.climatewatchdata.org/ | co2\_total excluding LUCF.csv | LUCF = Land Use Change and Forestry  Total should include agriculture, bunker fuel, energy, industrial process, and waste |
| CO2 emission (energy-total) | 1990-2018 | https://www.climatewatchdata.org/ | co2\_energy\_total.csv |  |
| CO2 emission (energy-building) | 1990-2018 | https://www.climatewatchdata.org/ | co2\_energy\_building.csv |  |
| CO2 emission (energy-electricity/heat generation) | 1990-2018 | https://www.climatewatchdata.org/ | co2\_energy\_electricity and heat.csv |  |
| CO2 emission (energy-fugitive emission) | 1990-2018 | https://www.climatewatchdata.org/ | co2\_energy\_fugitive emission.csv |  |
| CO2 emission (energy-manufacturing) | 1990-2018 | https://www.climatewatchdata.org/ | co2\_energy\_manufacturing.csv |  |
| CO2 emission (energy-other fuel consumption) | 1990-2018 | https://www.climatewatchdata.org/ | co2\_energy\_other fuel consumption.csv |  |
| CO2 emission (energy-transportation) | 1990-2018 | https://www.climatewatchdata.org/ | co2\_energy\_transportation.csv |  |
| CO2 emission (industrial process) | 1990-2018 | https://www.climatewatchdata.org/ | co2\_industrial process.csv |  |
| CO2 emission (bunker fuel) | 1990-2018 | https://www.climatewatchdata.org/ | co2\_bunker fuel.csv |  |
| CO2 emission (LUCF) | 1990-2018 | https://www.climatewatchdata.org/ | co2\_land use change.csv |  |

***(3) Enerdata*** (<https://www.enerdata.net/research/energy-market-data-co2-emissions-database.html>) (collated from various sources)

From 1990 – 2020, about 70 countries (balance of trade/domestic production of crude oil, oil products, natural gas, coal, LNG, electricity)

***(4) Global Carbon Project*** (<https://www.icos-cp.eu/science-and-impact/global-carbon-budget/2020>)

| Item | Time | url | filename | Remarks |
| --- | --- | --- | --- | --- |
| National Carbon Emission (territorial emission vs consumption emission) | 1960-2019 | https://www.icos-cp.eu/science-and-impact/global-carbon-budget/2020 | National\_Carbon\_Emissions\_2020v1.0.xlsx | May help investigate export of CO2 issues |
| CO2 budget | 1960-2019 | https://www.icos-cp.eu/science-and-impact/global-carbon-budget/2020 | Global\_Carbon\_Budget\_2020v1.0.xlsx | Have some historical estimate before 1900s in one of the worksheets |

| Item | Time | url | filename | Remarks |
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| Leapfrogging Tech Is Changing Millions of Lives. Here’s How |  | https://singularityhub.com/2018/05/06/leapfrogging-tech-is-changing-millions-of-lives-heres-how/ |  |  |
| Africa can enjoy leapfrog development |  | https://www.worldbank.org/en/news/opinion/2017/10/11/africa-can-enjoy-leapfrog-development |  |  |