Methods of Advanced Data Engineering (MADE) Analysis Report

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Introduction

This project explores the relationship between CO2 emissions and population growth of the countries. The main question addressed is:

Which countries have the lowest amount of increasing CO2 emissions compared to their population growth?

Data Sources

To answer the question, two data sources have been selected for this project: both of them are from The World Bank.

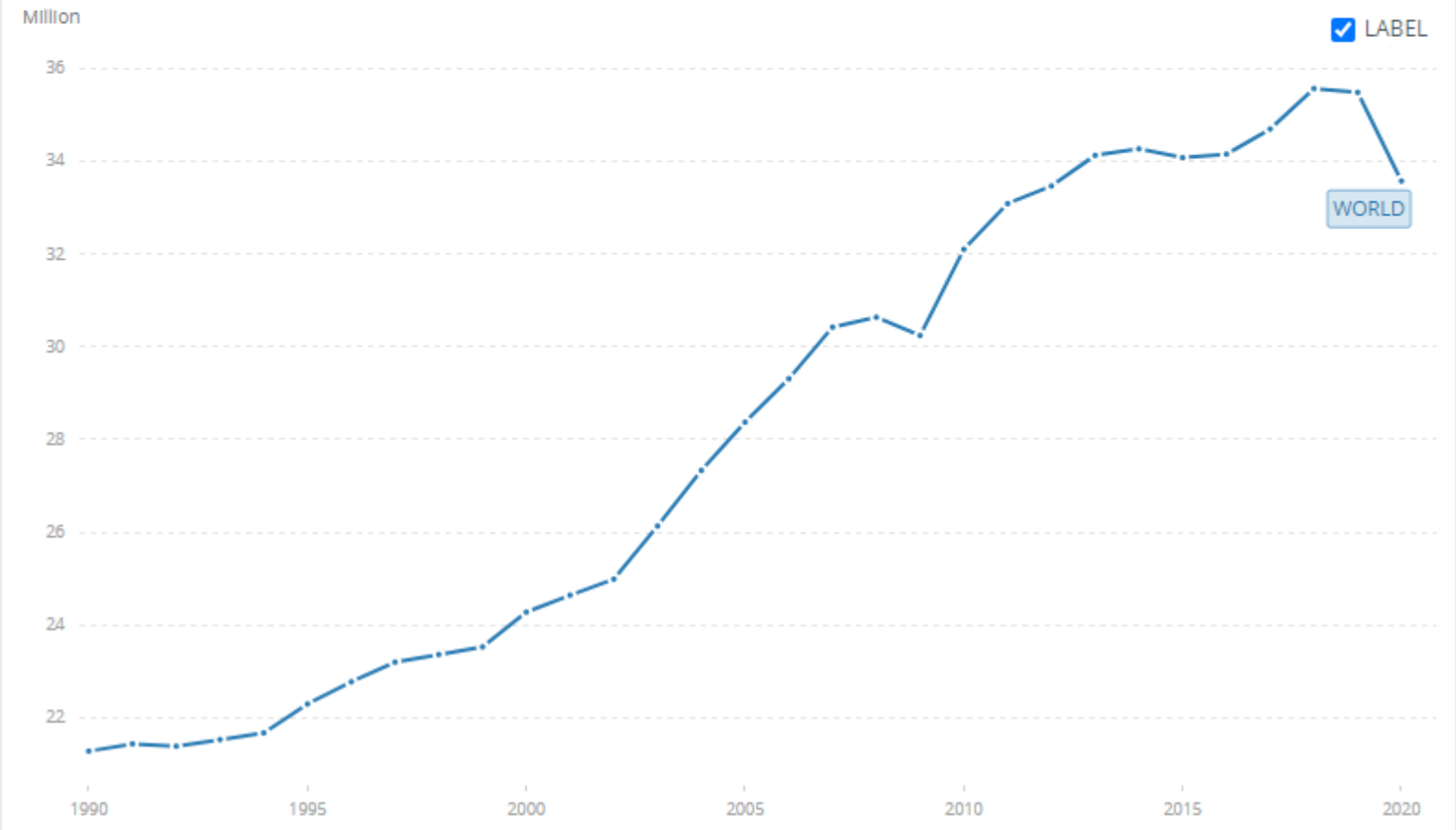
- Data source 1: CO2 Emissions Dataset
- Data source 2: The Total Population Dataset

data.worldbank.org/indicator/EN.ATM.CO2E.KT

CO2 emissions (kt)

Climate Watch Historical GHG Emissions (1990-2020). 2023. Washington, DC: World Resources Institute. Available online at: climatewatchdata.org/ghg-emissions

Line Bar Map Also Show Share Details



data.worldbank.org/indicator/SP.POP.TOTL

Population, total

(1) United Nations Population Division. World Population Prospects: 2022 Revision; (2) Statistical databases and publications from national statistical offices; (3) Eurostat: Demographic Statistics; (4) United Nations Statistics Division. Population and Vital Statistics Reprot (various years).

Line Bar Map

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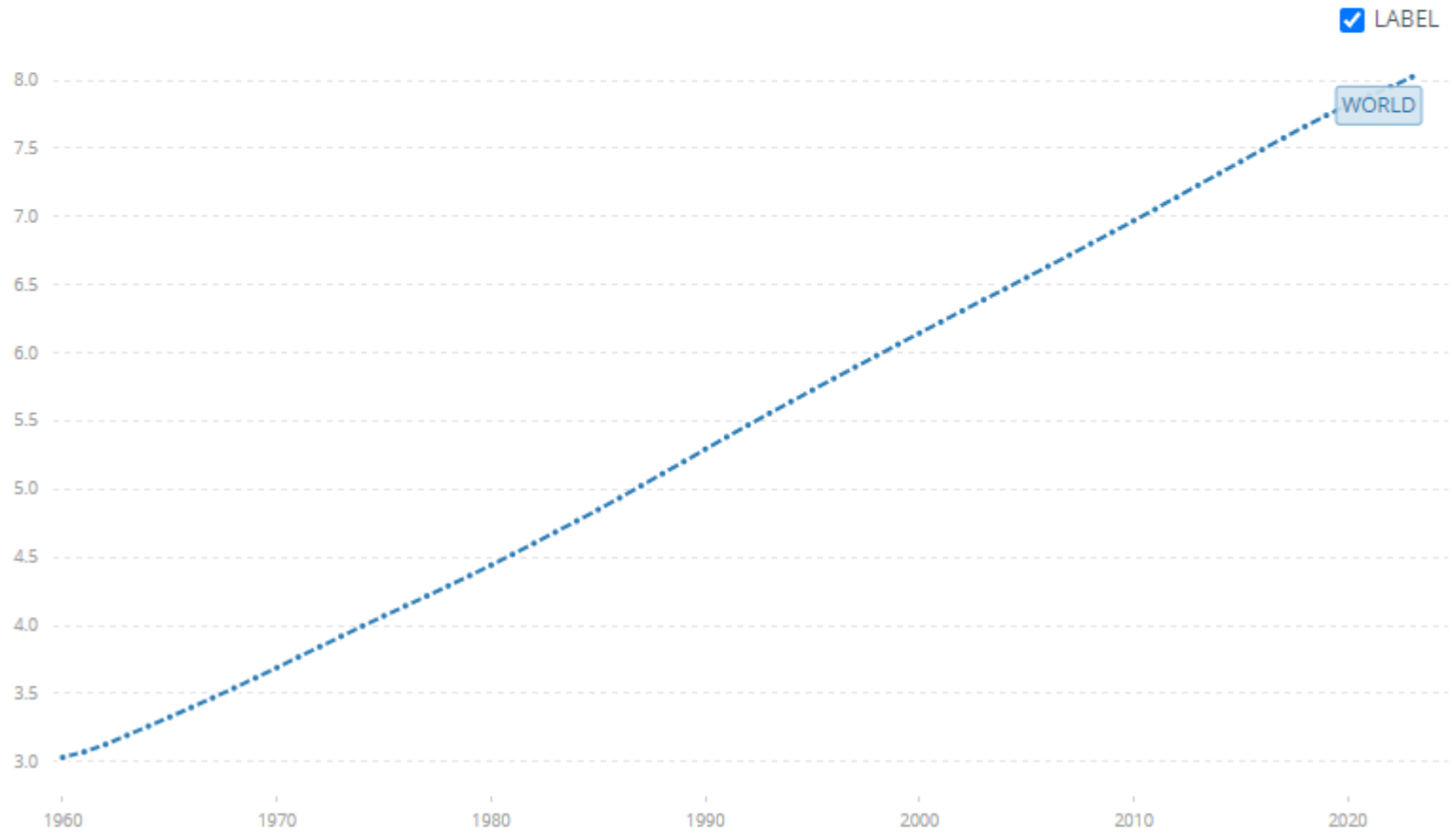

Analysis

To analyze which countries have the lowest amount of increasing CO2 emissions compared to their population growth, the following steps were performed:

1. Define Population Growth:

(Population 2020 - Population 1990) / Population 1990 * 100

2. Define CO_2 Emission Increase:
(CO2 Emissions 2020 - CO2 Emissions 1990) / CO2 Emissions 1990 * 100

3. Compare CO_2 Emission Growth to Population Growth: Analyse and rank the countries based on the ratio of CO_2 emission growth to population growth.

Top 10 countries with the lowest ratio of CO2 emissions growth to population growth:

	Country Name	Population_Growth	CO2_Growth	CO2_Population_Growth_Ratio
0	Marshall Islands	-5.72	10900.00	-1905.51
1	St. Vincent and the Grenadines	-6.98	166.10	-23.79
2	Slovak Republic	3.01	-47.03	-15.61
3	Czechia	3.53	-41.99	-11.91
4	Germany	4.69	-36.84	-7.85
5	Greece	4.92	-32.55	-6.62
6	Italy	4.79	-30.59	-6.38
7	Cuba	6.34	-31.70	-5.00
8	European Union	6.52	-30.91	-4.74
9	Denmark	13.43	-47.37	-3.53

Handling Zero Values - Outliers

In some countries such as the Marshall Islands, the CO2 emission value was recorded as "0" in 1990. In countries where CO2 emissions were originally very low, even a slight increase results in a large proportional change. There might be a more effective way to represent these incremental increases.

Observations on Developed Countries

Economically developed countries with strict environmental regulations, such as Germany, Denmark and Slovak Republic are more likely to control emissions growth despite population increases. This reflects a combination of proactive environmental policies, technological innovation, public engagement in sustainability and favorable economic structures.

Conclusions

Based on the analysis, the following conclusions were drawn:

1. Stringent environmental policies help control emissions despite population growth.

2. Public awareness and sustainable practices reduce energy consumption and emissions.

3. Economies with diverse, less carbon-intensive sectors have lower emissions growth.