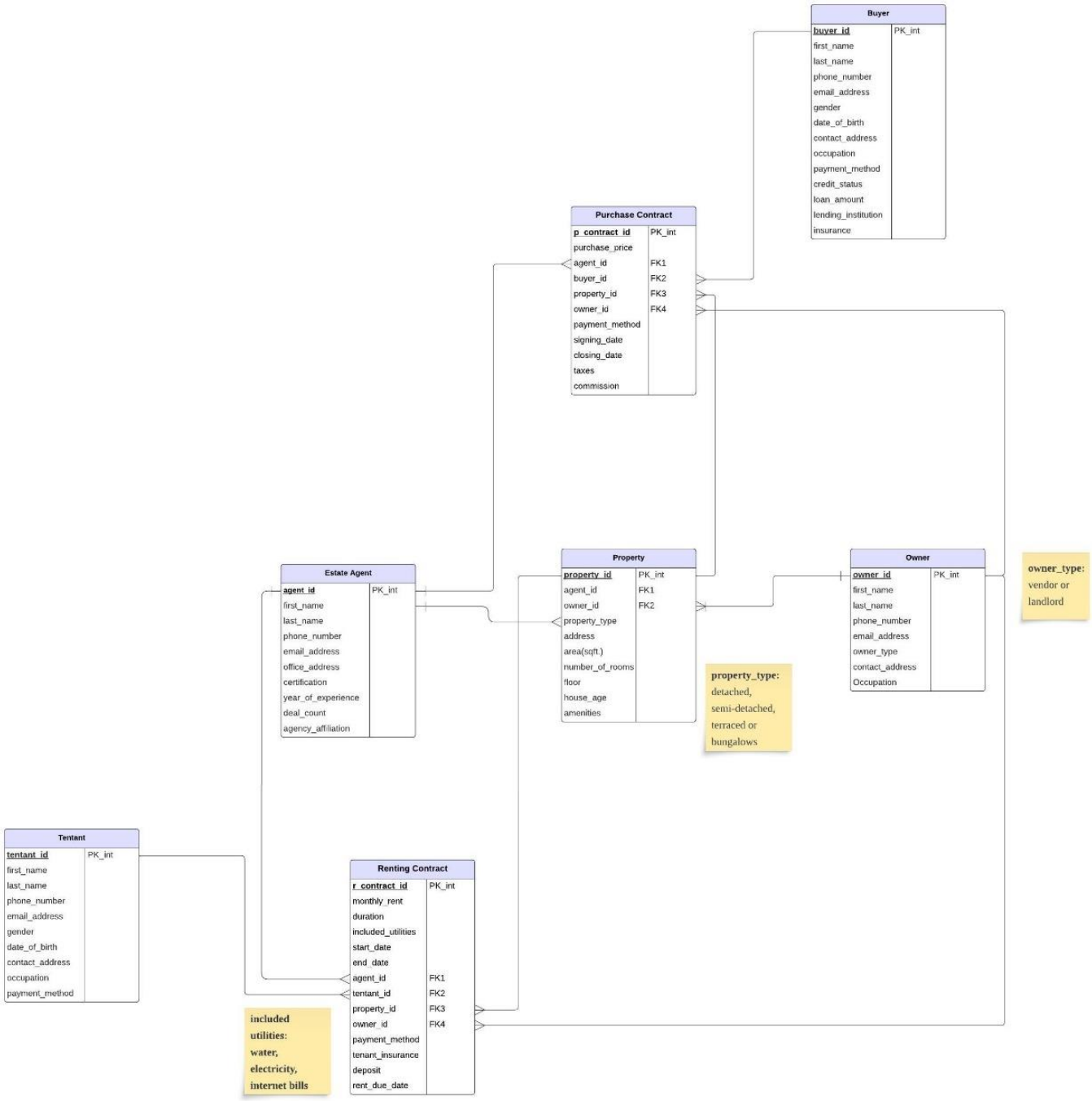
Data Analytics in Action Report

728 words

1. Estate agency database: ER diagram



2. Data Cleaning and Processing

Column name	Situation of the column	Cleaning actions/steps	Justification/Explanation
Continent	Data typos	Using the 'replace' function changes only the values that are	Figure 1 shows that there are some typos in the name of continents through y axis.

		specified in the dictionary and leaves the rest as they are.	
CO2kt	Missing data	We cannot drop the missing data because they account for 5.64% in the column. Therefore, we impute missing 'CO2kt' values by the mean 'CO2kt' of the corresponding continent.	The reason for missing non-random missing data (MNAR) is related to the value itself. Some rows with missing CO2kt have their country names that belong to the territories of countries, whereas according to the website of the data source, only countries that are parties to the UNFCCC are listed [1], so these territories do not have a separate additional CO2kt value.
HealthPC$	Missing data	Corrected missing HealthPC$ values for Saudi Arabia and Albania using WHO data. Other missing values were imputed using the continent's mean HealthPC$.	The missing values fall under MNAR. According to the WHO website, there is no information available for regions that are not members of the United Nations. Liechtenstein, not being a WHO member, also lacks data in this regard. As for Saudi Arabia and Albania, the missing data can be found on the website. Therefore, the missing data for these two rows will be handled using the official raw data.

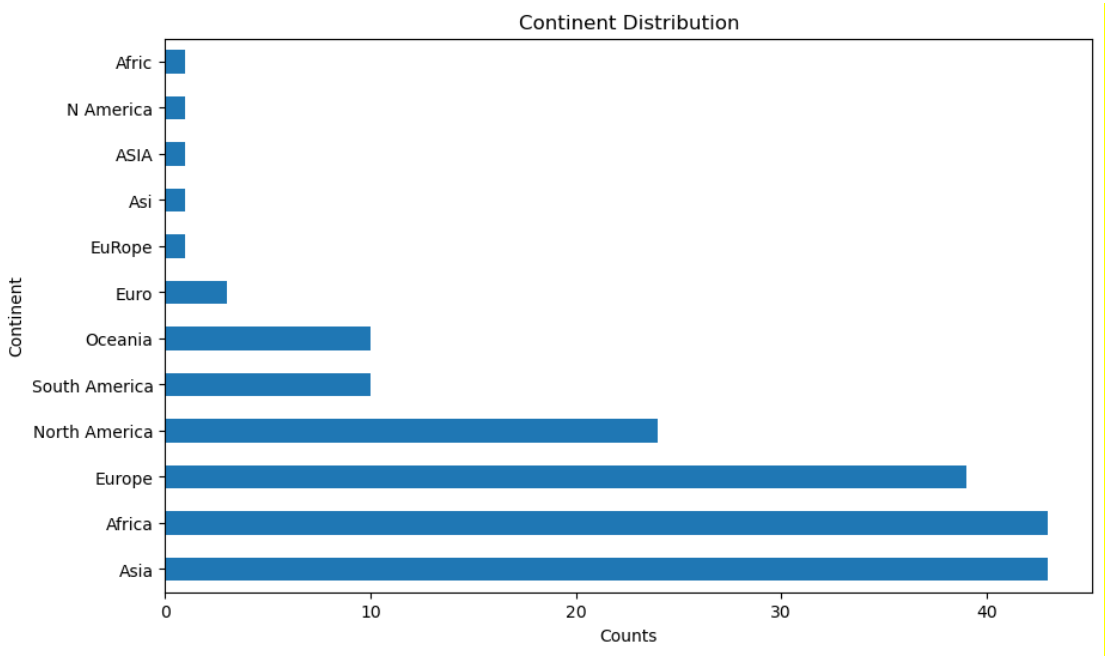


Figure 1 – Continent Distribution: the number of countries in each continent

3. Report on the Impact of Covid-19 on Global Economic Development

3.1 Global Overview

COVID-19 dramatically altered the global economy, as Figure 2 shows. Key economic indicators highlight a marked drop in CO2 emissions, tied to decreased economic activities. Lower global trade reduced transportation demand, and travel bans affected airlines. Additionally, the pause in industrial activities, including factory shutdowns and halted coal mining, further lowered CO2 emissions. [2].

In the short term, there is a clear positive correlation between CO2 emissions and economic activity, which explains why Figure 2 shows both CO2 emissions and GDP per capita decreasing simultaneously.

The OECD report indicates varying patterns in healthcare spending among countries during the epidemic. Increases were noted in countries with higher COVID-19 testing and treatment costs, while those with extensive containment measures and reduced non-COVID-19 services may have seen decreased expenditures [3].

Interestingly, agricultural output and population grew during the epidemic; further analysis will be conducted to identify the least affected regions.

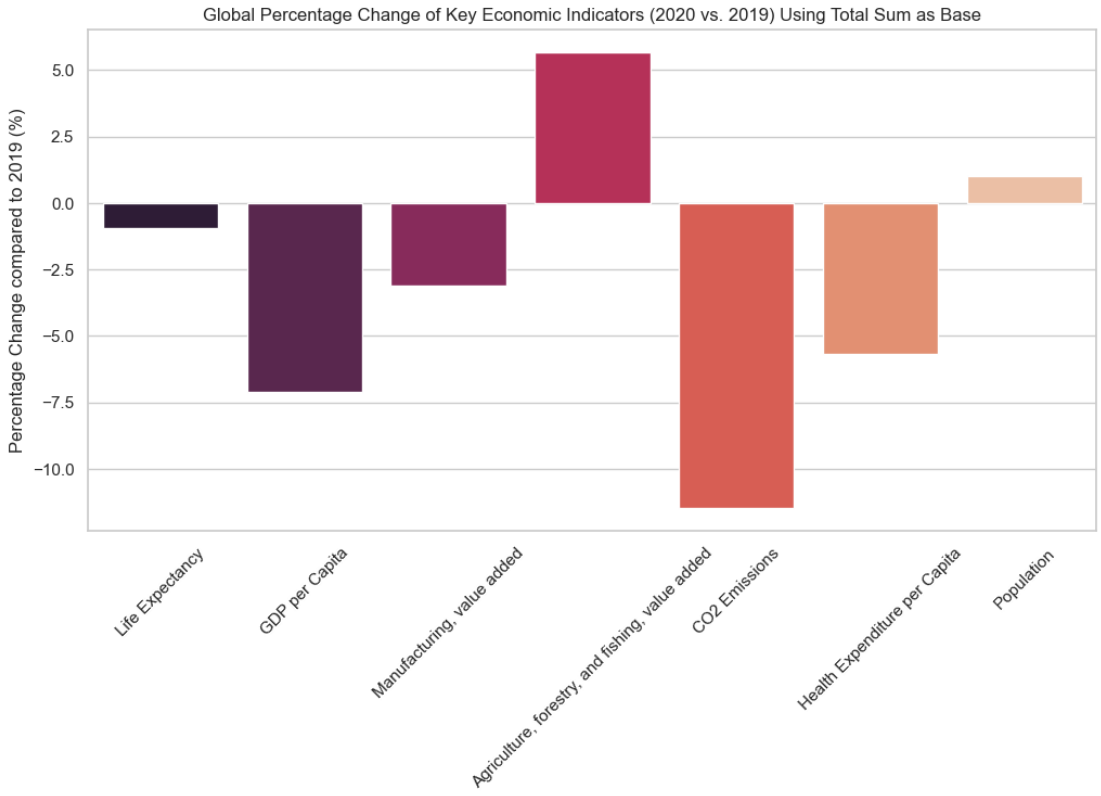


Figure 2 – The Changes of Key Economic Indicators

3.2 Individual Analyses - Declining Indicators

Figure 3 shows economic indicators by continent. There's a positive correlation between GDP and CO2 emissions, both generally decreasing. North America shows the largest drop in emissions, while Oceania's healthcare spending increases relative to other continents.

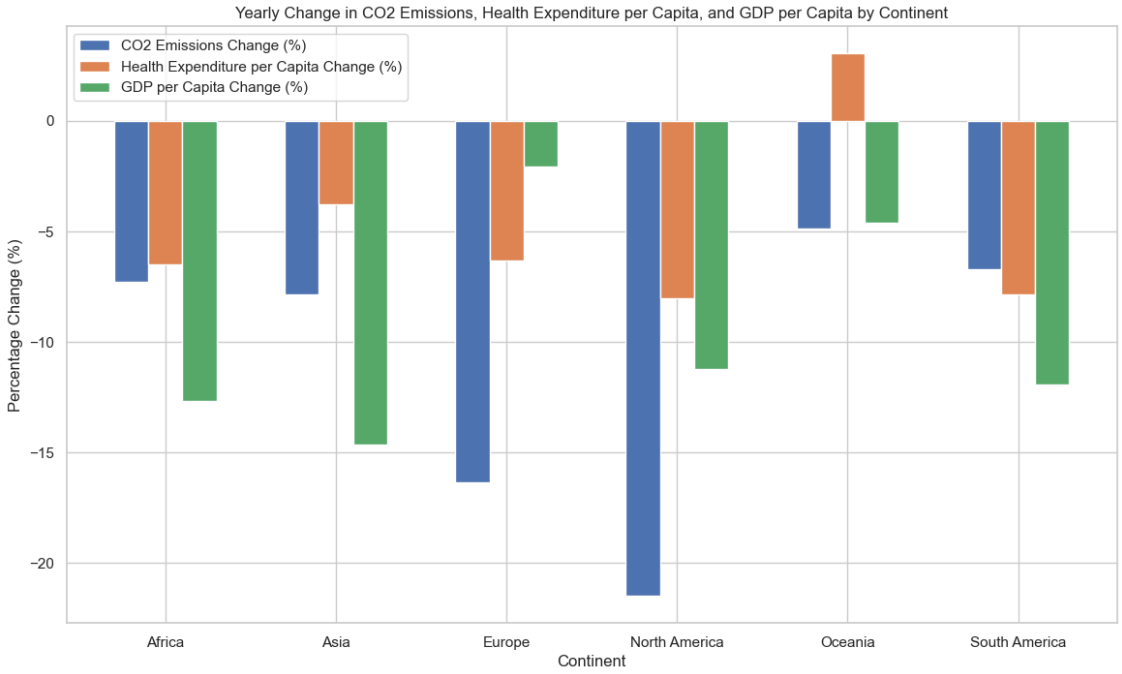


Figure 3 – The Changes of CO2 Emission, Health Expenditure and GDP per Capita

Figure 4 indicates the US experienced the biggest drop in CO2 emissions, attributed by the US EIA to reduced coal and electricity demand, and major changes in travel, sports, work, and leisure activities,

leading to lower transport sector emissions [4].

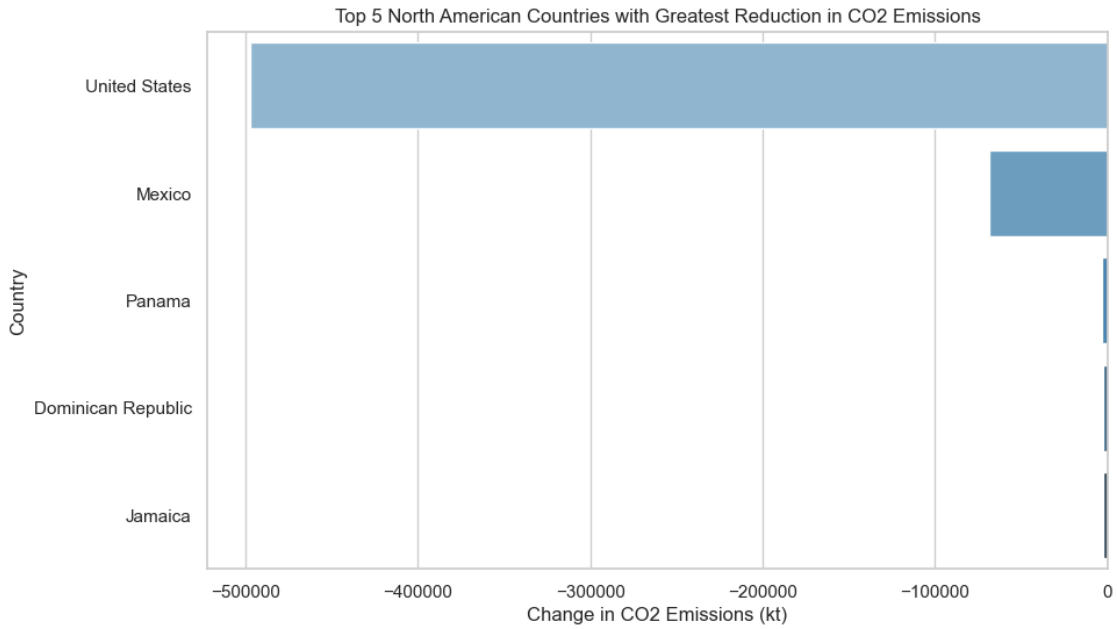


Figure 4 – Top 5 North American Countries with Largest CO2 Emission Reductions

Australia significantly increased its per capita healthcare expenditure within a year to control COVID-19 (Figure 5).

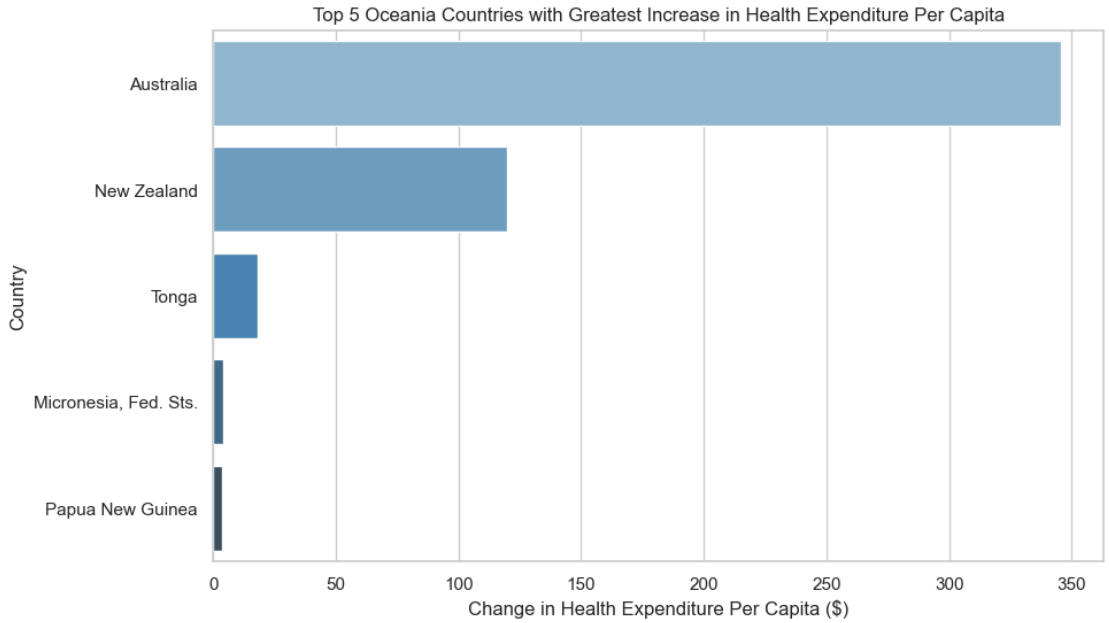


Figure 5 – Top 5 Oceania Countries in Per Capita Health Expenditure Increase

3.3 Individual Analyses - Rising Indicators

Figure 6 shows population and agricultural output changes by continent during the pandemic. Europe saw the least population growth, while Africa had the most. In agriculture, North America, Asia, and Africa increased output, but Oceania, particularly Australia, faced a decline due to foreign worker shortages impacting vegetable, fruit, and nut farms [5].

During the pandemic, the reason the United States (Figure 7) was able to maintain normal growth in agricultural output is thanks to government support. For example, programs like the Paycheck Protection Program (PPP) and the Coronavirus Food Assistance Program (CFAP) paid billions of dollars to American farmers and ranchers as financial aid. Additionally, the continued trade of agricultural products also contributed to this increase rather than a decrease in this indicator [6].

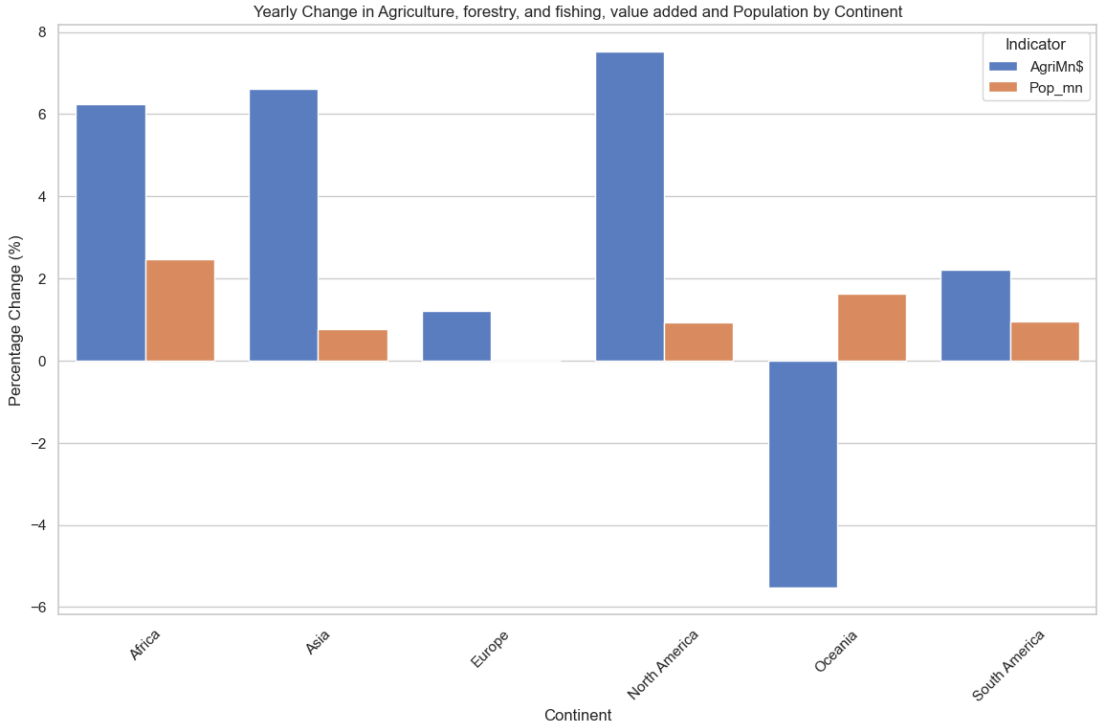


Figure 6 – The Change of Population and Agriculture, forestry, and fishing, value added

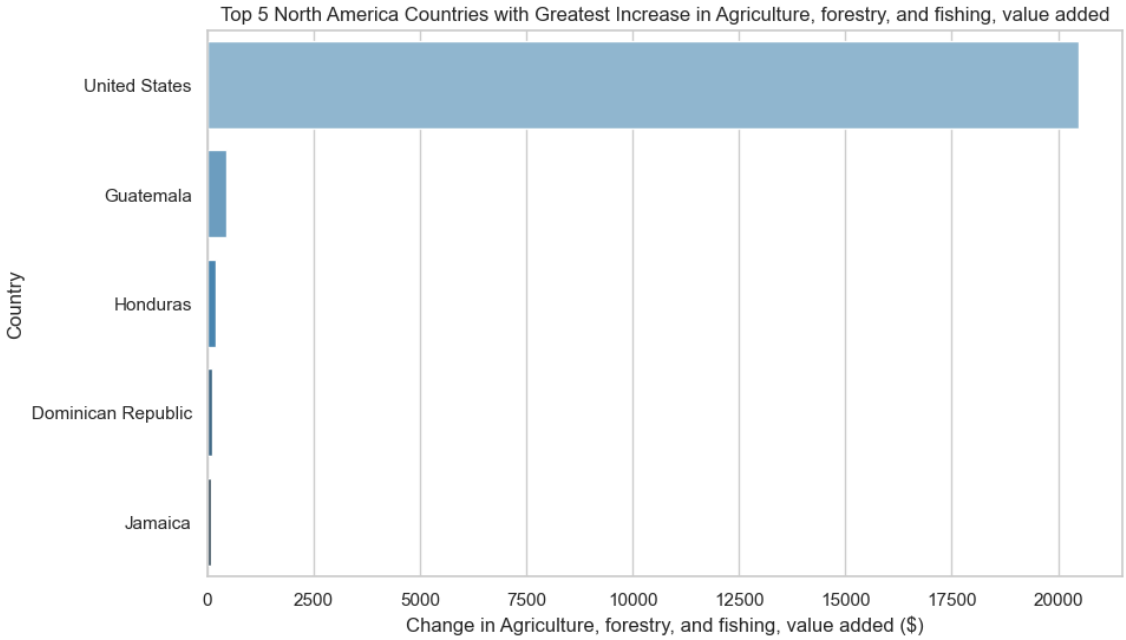


Figure 7 – Top 5 North American Countries with Greatest Increase in Agriculture, forestry, and fishing, value added.

4. Reference

[1] World resources institute. (2024). CLIMATE WATCH. https://www.climatewatchdata.org/about/faq/countries

[2] Ronaghi, M., & Scorsone, E. (2023). The Impact of COVID-19 Outbreak on CO2 Emissions in the Ten Countries with the Highest Carbon Dioxide Emissions. *Journal of Environmental and Public Health*, *2023*, 1–2. https://doi.org/10.1155/2023/4605206

[3] OECD (2021), "Health expenditure per capita", in Health at a Glance 2021: OECD Indicators, OECD Publishing, Paris. DOI: https://doi.org/10.1787/154e8143-en

[4] U.S. energy information administration. (2023, November 29). *U.S. Energy-Related Carbon Dioxide Emissions, 2022*. U.S. Energy Information Administration. https://www.eia.gov/environment/emissions/carbon/

[5] WTO secretariat. (2020, August 26). *COVID-19 AND AGRICULTURE: A STORY OF RESILIENCE*. WORLD TRADE ORGANIZATION. https://www.wto.org/english/tratop_e/covid19_e/agric_report_e.pdf

[6] Giri, A.K., Subedi, D., & Kassel, K. (2023). *Distribution and examination of Coronavirus Food Assistance Program payments and Forgivable Paycheck Protection Program loans at the state level in 2020* (Report No. AP-116). U.S. Department of Agriculture, Economic Research Service. https://dx.doi.org/10.32747/2023.8134138.ers