



Investigation between Economic Development, Renewable Energy, and CO2 Emissions Within Three Model Countries

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Introduction

These countries were selected due to their similarities in renewable energy, but differences in other factors are shown here:

Country	Renewable Energy Used	Economic Zone	EPI Ranking ¹	Climate
Bhutan	Hydroelectric	Periphery	131	Tropical to Alpine
Costa Rica	Hydroelectric, Wind	Semi-periphery	30	Tropical
Sweden	Hydroelectric, Wind, Solar	Core	5	Temperate to Subarctic

“Core” countries are the manufacturers and developers of goods while the “periphery” countries are those that supply raw materials to the core countries. The “semi-periphery” are countries that are located between the two other zones with economic elements of both core and periphery countries.

Data and Methods

Data on CO2 emissions per capita, GDP per capita, total population, and percentage of electricity produced by renewables was gathered from the World Bank², CIA World Factbook³, and Economic Freedom databases⁴.

Data collected spanned the years 1990 to 2016 allowing for a multidecadal analysis.

A comparative analysis was conducted using the data from the three countries to examine trends between renewable energy percentage, GDP per capita and CO2 emissions per capita. Single variable graphs were created using the World Bank website and multivariable graphs were created using Excel.

For this analysis, CO2 emissions will serve as a proxy for environmental degradation as it is a major greenhouse gas and has data readily available.



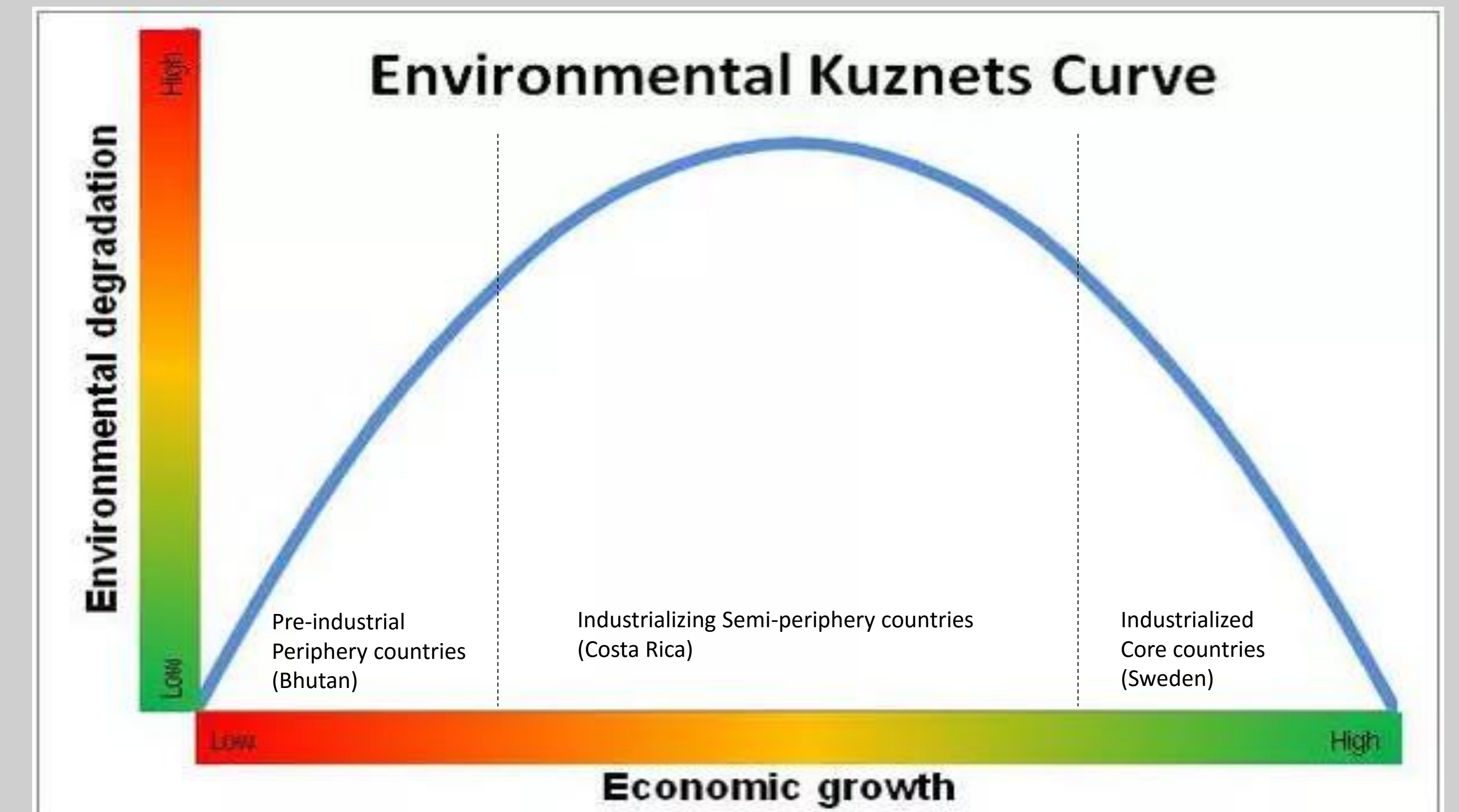
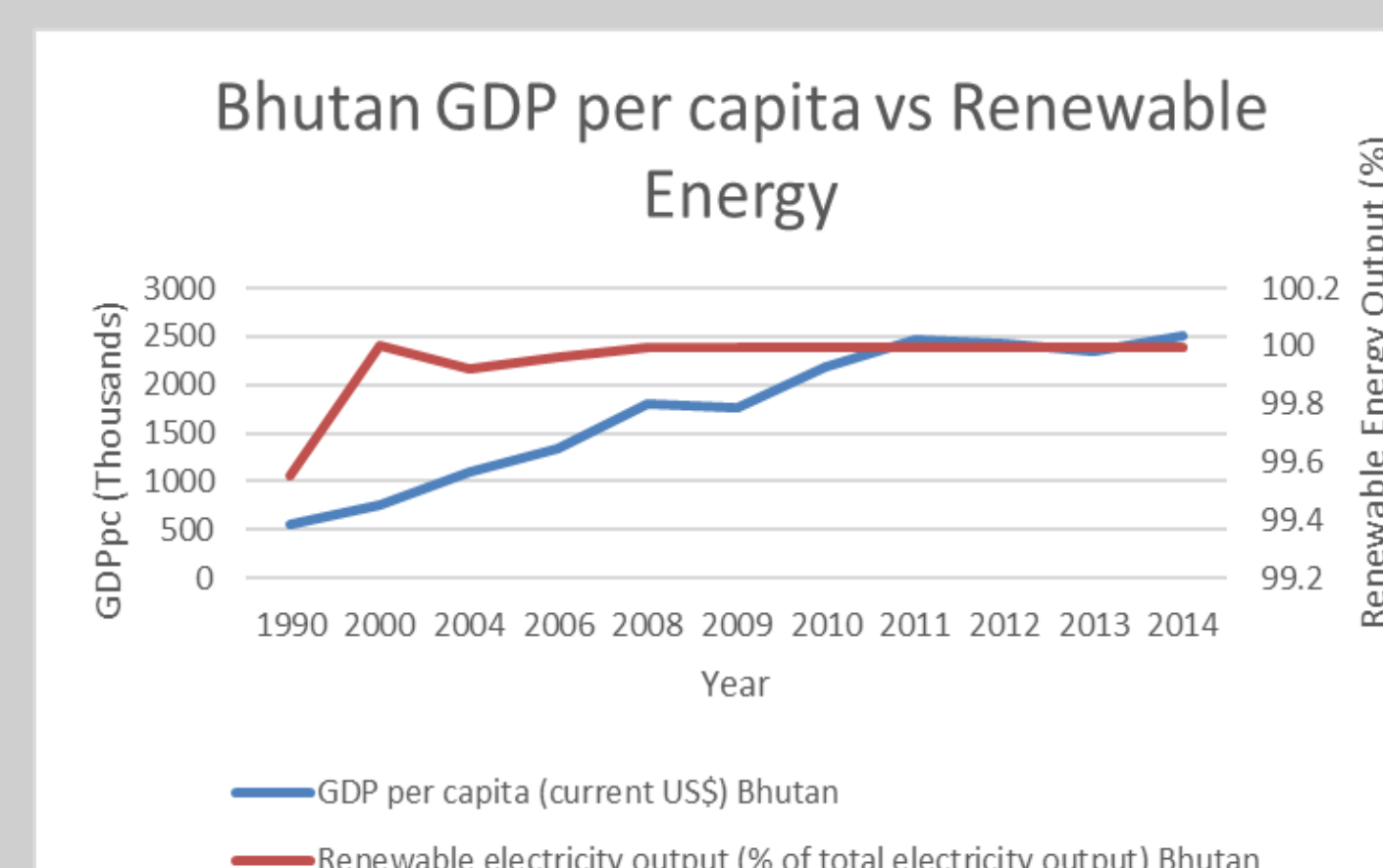
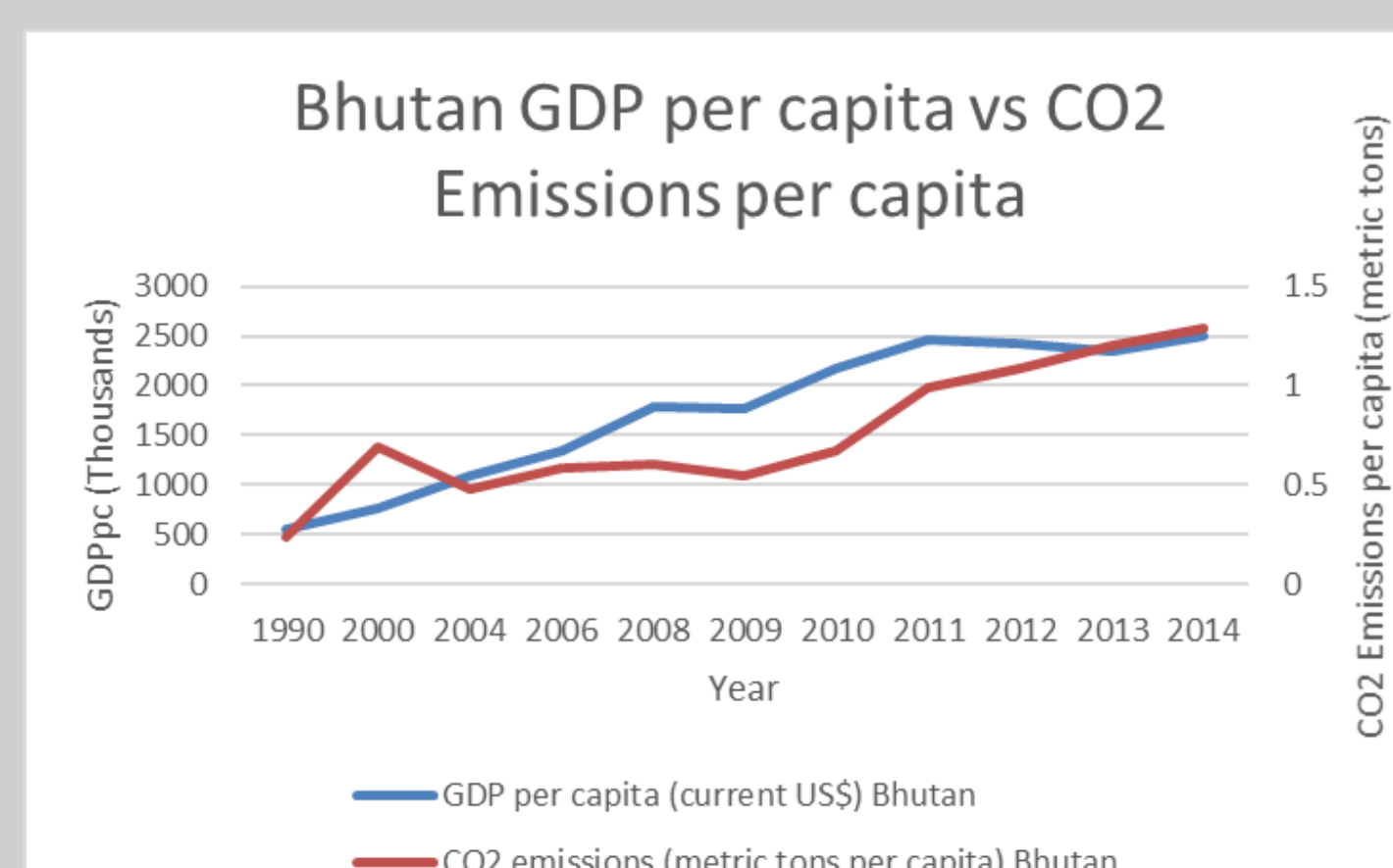
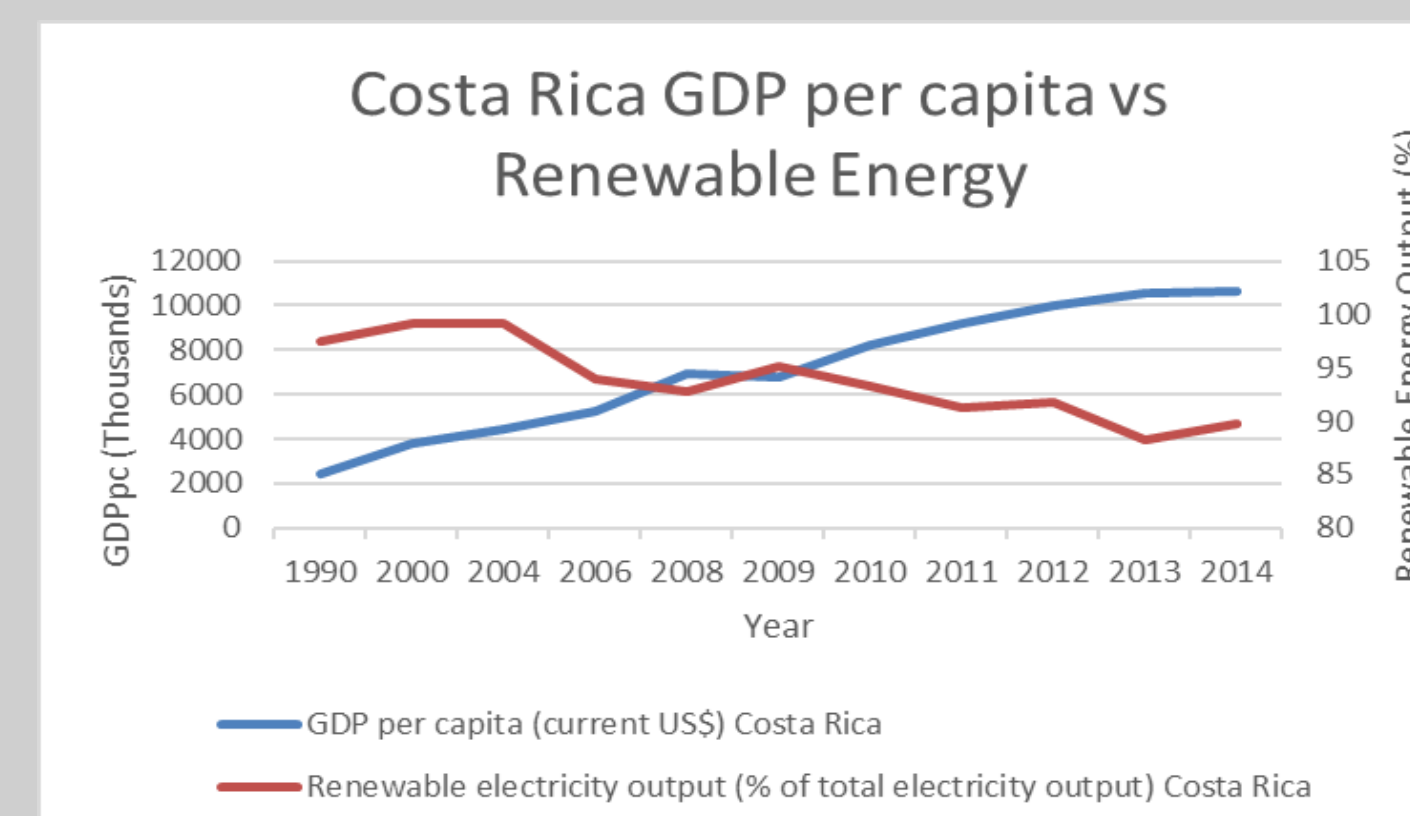
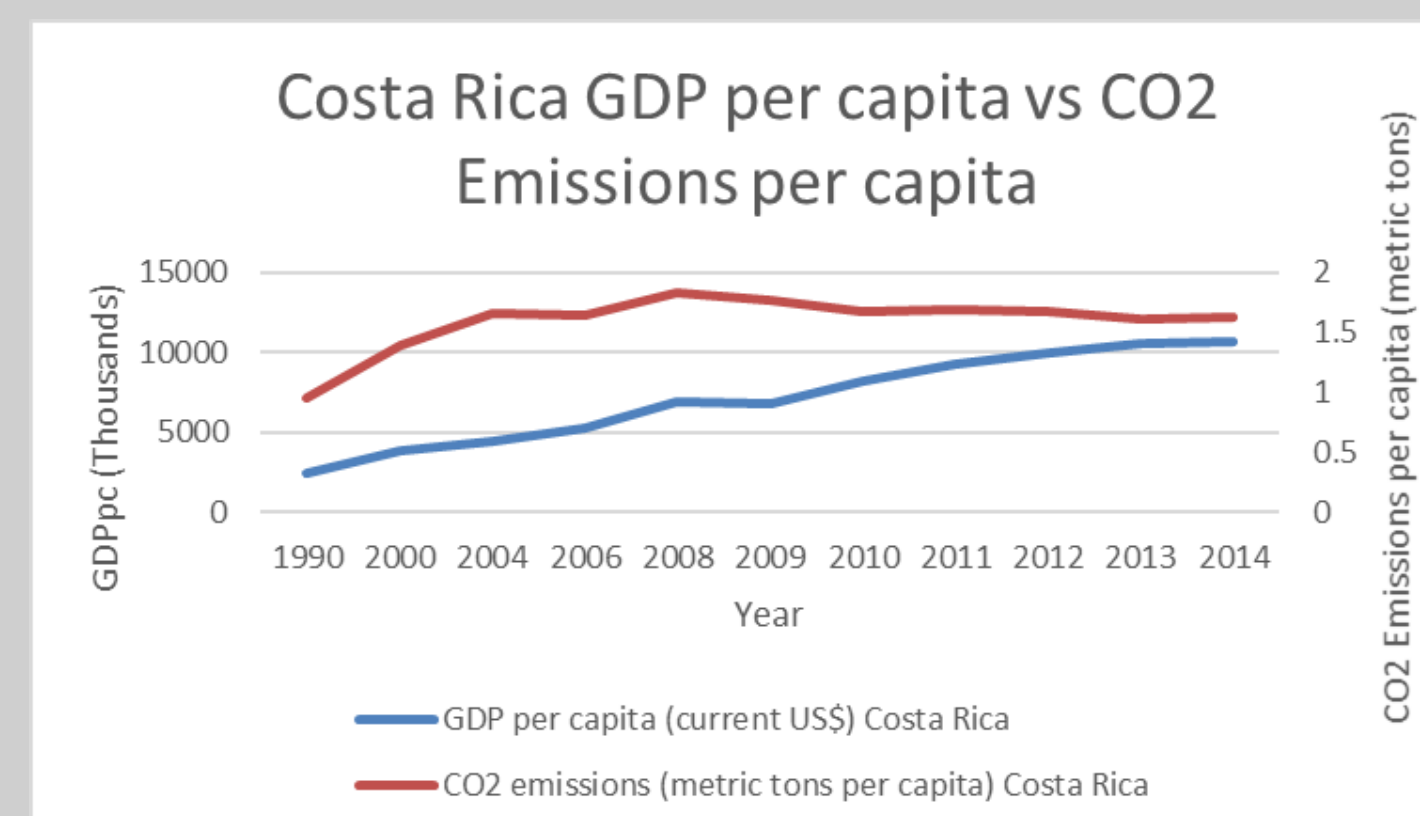
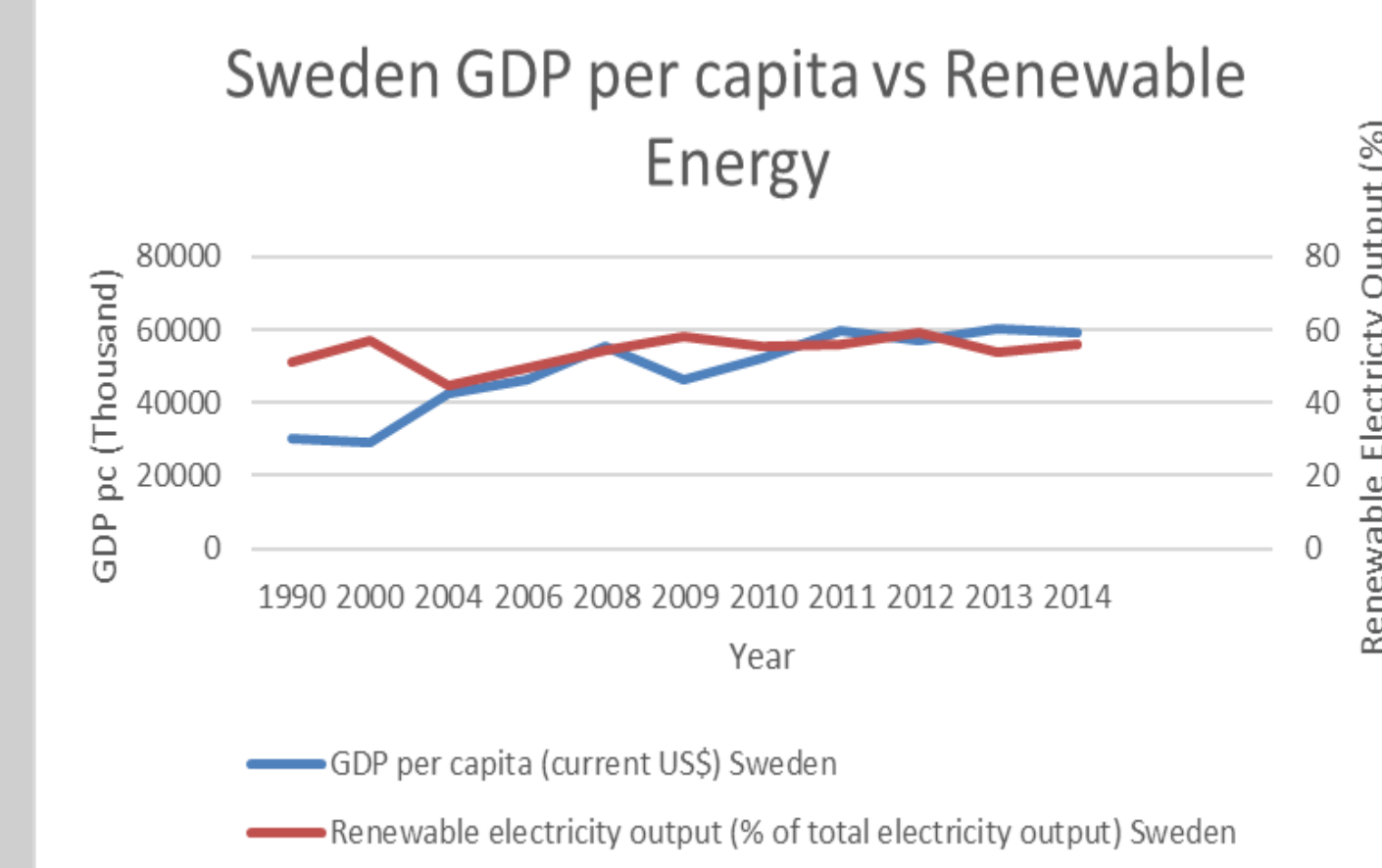
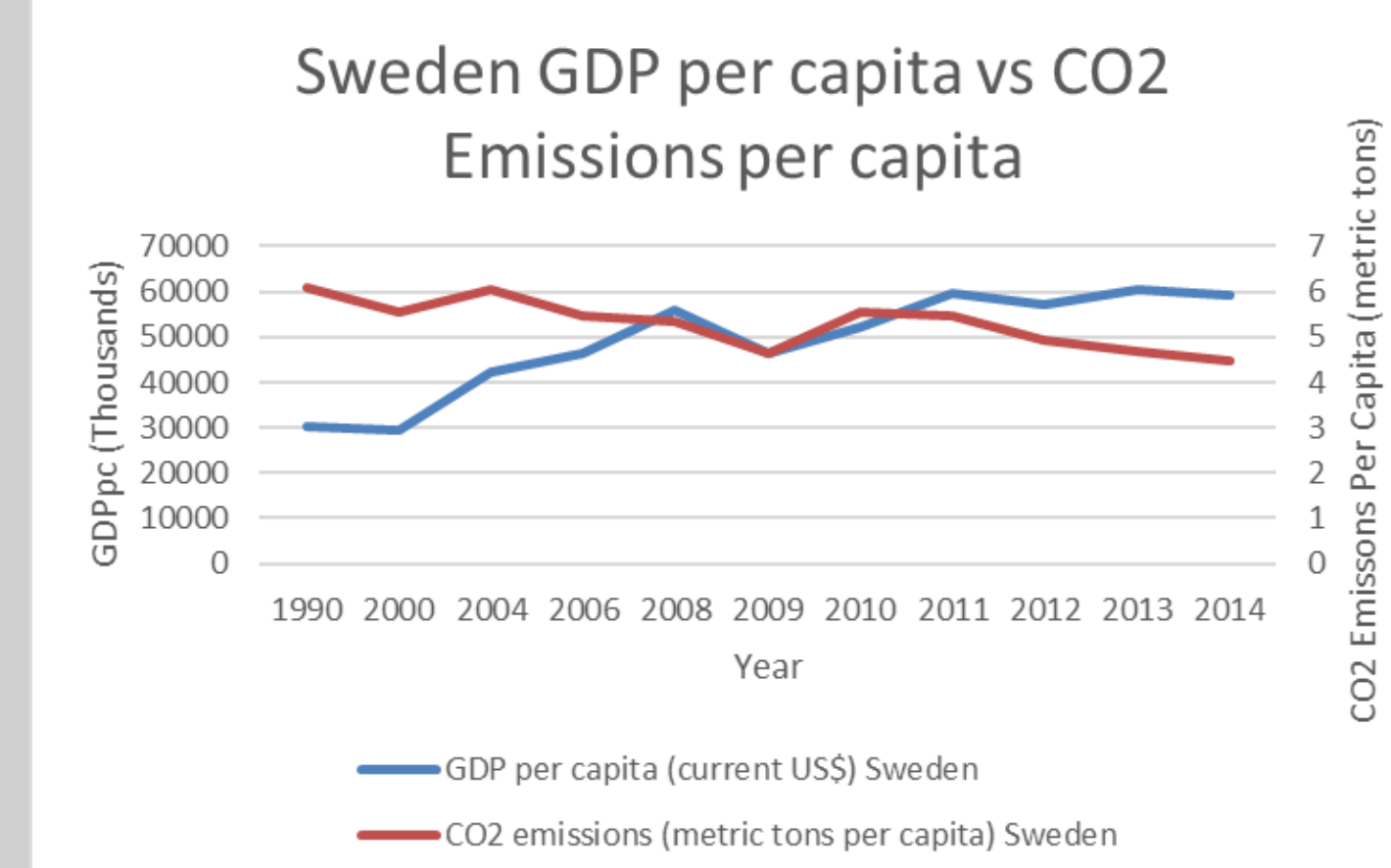
THE WORLD BANK



Results

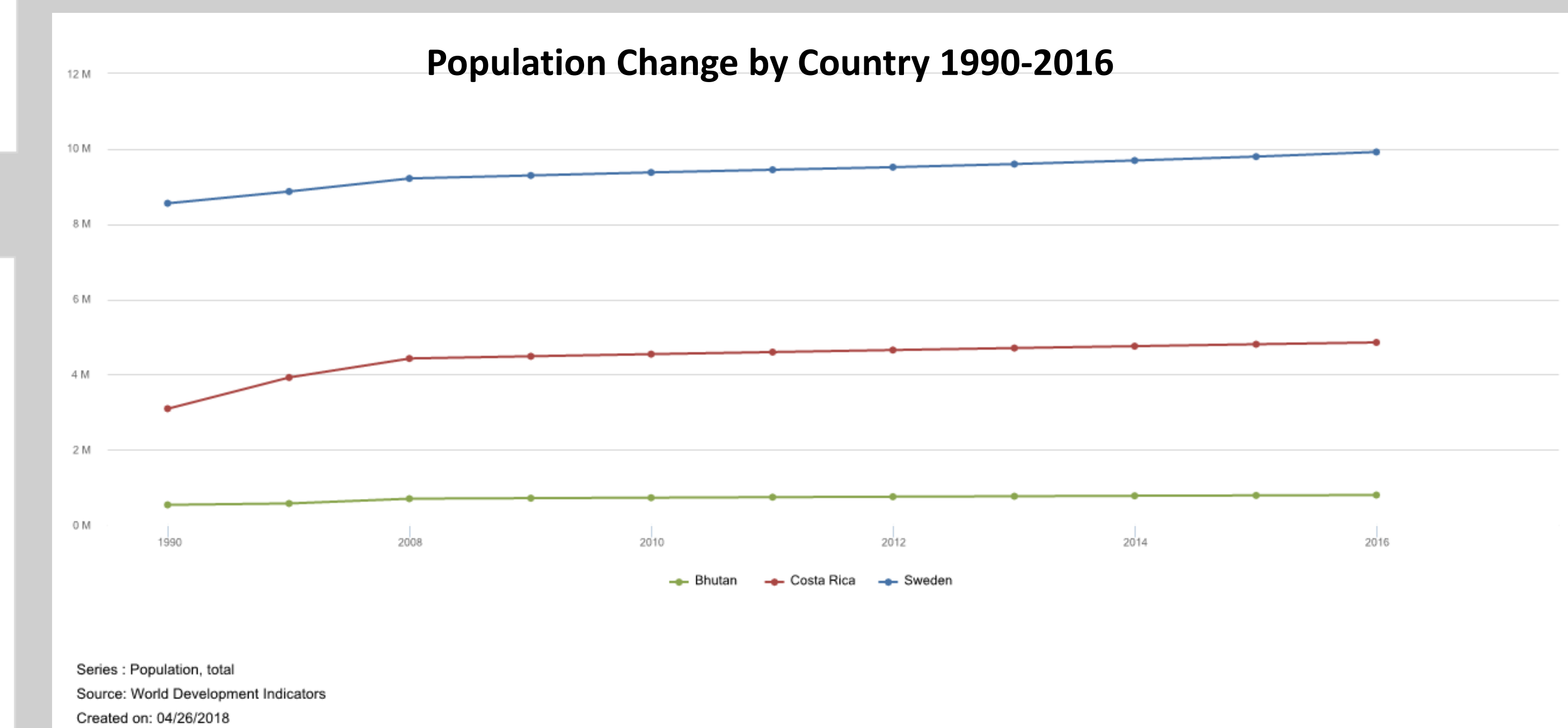
Upon analysis, the following trends were observed:

- Each country’s population increased with Bhutan’s increasing the most (60%)
- CO2 emissions were correlated to which stage each country was in. The core country (Sweden) lowered the overall levels of CO2 emissions while the semi-periphery country (Costa Rica) held levels steady, and the periphery country (Bhutan) increased levels of emissions.
- The above was true even as GDP per capita and renewable energy output either increased or held steady for each country
- Below are the graphs illustrating the correlations between GDP per capita vs CO2 emissions per capita for each country and GDP per capita per capita vs percentage of energy produced by renewable energy for each country



Conclusions

- The countries studied followed the Environmental Kuznets Curve based on their CO2 emissions
- As countries move through different economic stages they may address climate change and the environment differently
- Renewable energy is a viable way for countries in any economic stage to generate clean electricity (especially hydropower)
- Costa Rica exhibits an exception to the Kuznets curve, possibly due to the strict environmental regulations and adoption of renewable energy



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References

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