Classwork-3: Population Dynamics, Sustainable Energy Use and Quality of Life

This project involves calculating and then understanding the relationship between population dynamics, sustainable energy consumption and quality of life. Use data from the of the US government's Central Intelligence Agency's World Factbook at: https://www.cia.gov/library/publications/the-world-factbook/ for this research project. Each Team is provided with one triplet of countries. Each team is responsible for collecting and analyzing data only for their triplet. They are permitted and encouraged to do additional research after they have done the basic work asked for. All the data can be found under the People and Society and Energy categories at the site for each country.

Countries	Team 1	Team 2	Team 3	Team 4	Team 5
Affluent	USA	Japan	Germany	Australia	Saudi Arabia
Middle Income	Iran	Brazil	Thailand	South Africa	China
Poor	Uganda	Nepal	Philippines	Nigeria	Honduras

1. Start understanding the energy production and consumption patterns for this country. Specifically, look at the current energy mix and then all the quantities related to energy. Some of these are listed in the given blank table for you to fill. You can add more rows to this table as you find other relevant data. From these data find net electricity use, net crude oil use and net CO_2 emissions. From that compute these three quantities on a per capita basis. How would the total electricity consumption change as population increases in 30 to 60 years *if per capita consumption remains the same*? How much would per capita consumption change in 30 to 60 years *if total consumption remains the same.* If time permits repeat a similar analysis for crude oil. Do any other analysis you find important.

2. Start calculating the factors affecting rates of population change for your triplet of countries. Specifically at least tabulate population growth rate, fertility rate per woman, migration rates, birth rates, death rates, contraceptive availability, infant mortality, sex ratio, median age of the population. Add additional criteria as you see fit. Project from simple models from current growth rates how much population will increase to in (i) 30 and (ii) 60 years.

3. Analyze all this data with comparison for different countries in your triplet. Is the country's population and energy consumption trend sustainable over 30 to 60 years? How about sustainability over 7 generations or about 175 years? If they are unsustainable then suggest solutions by studying specifics of each country to make them sustainable for 7 generations. Make other evaluator comments of sustainable energy use that are relevant.

4. Measure the quality of life for your triplet. Do this by at least tabulating life expectancy at birth, GDP, median years in school, infant mortality, literacy. Comment on how these quantities relate to net electricity consumption and net crude oil consumption. Using the above data report each quality of life parameter on a per capita basis per unit electricity consumption. Also perform the same calculation but now on a per capita per unit of net crude oil consumption.

5. Now compare your per capita results in item 5 above **only** with those of other teams. Form three quintuplets of countries with one quintuplet belonging to each category of Affluent, Middle Income and Poor. This will involve comparing data for each member of your triplet of countries with the corresponding data from other teams. So all Affluent countries will belong to one quintuplet. Compare them with each other. Similar comparisons should be performed for Middle Income and Poor country quintuplets. Find why each country in your quintuplet has different per capita per unit energy quality of life parameters. Seek answers for the differences and reasons for similarities.

6. Finally, write comments from a total evaluation of the whole exercise. How is energy consumption connected to quality of life in different countries? What are your general conclusions? What have you learned through this exercise? What new perspective or connections with other ideas from this course or other courses have you generated? Any other comments are also welcome.