Title: Population Expansion, Urbanization and Technological Advances Trigger the Increase in Energy Consumption in Turkey

Abstract

The goal of this study is to determine whether the rising population of Turkey can lead to an increase in per capita energy consumption and whether this rise is influenced by elements like urbanization, technological use, and population growth. Due to busier lives and greater energy requirements, rising rates of urbanization are frequently correlated with increased levels of energy consumption. The use of technology, including using the internet, can also lead to an increase in energy usage. The purpose of this study is to examine how these factors affect Turkey's per-capita energy usage.

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1. Introduction

Turkey's population is now growing quickly, which has a substantial impact on energy demand as well as other social and economic implications. Energy use in Turkey is closely correlated with elements like population growth, urbanization, and technological adoption. This event highlights a crucial issue that the nation's energy plans and resource management should take into account. Turkey is a nation whose population has grown quickly in recent years. Natural increases in energy demand are brought on by the rapid growth of the population. More resources are needed to supply an expanding population's energy needs, which raises energy consumption. Additionally, as the population grows, urbanization rates rise. Urbanization is the movement of people from rural to urban areas and their subsequent concentration in urban areas. Due to energy needs and busier lifestyles, concentration requires more energy. Urban infrastructures including high-rise buildings, shopping malls, transit networks, and industrial operations have a big impact on how much energy is used. As a result, there is a large rise in energy demand as urbanization rates rise. Technology advancements also have an impact on Turkey's energy usage. Energy usage significantly rises as a result of using the internet, in particular. The increased use of the Internet raises the energy needs of communication and data infrastructure. Aside from that, using smart devices and other technical equipment uses more energy. Considering the effect of technological use on energy demand, these factors cause a rise in energy consumption per person in Turkey.This study intends to investigate how Turkey's population growth, urbanization, and technological use have impacted energy consumption. It also tries to examine the rise in both energy demand and per capita energy consumption. By highlighting the significance of energy regulations and resource management, the research's findings can help develop sustainable energy strategies.

2. Data Collection

For this study, data such as Turkey's population, per capita energy consumption, annual change in energy consumption, urbanization rates, number of internet users and primary energy consumption were collected from various sources. These data were derived from datasets provided on the Our World in Data platform. Below are links to the datasets used:

* Population Data: https://ourworldindata.org/grapher/population?tab=chart&country=ENG
* Energy Consumption Data per Capita: https://ourworldindata.org/grapher/per-capita-energy-use?tab=chart&country=ENG
* Annual Change Data in Energy Consumption: https://ourworldindata.org/grapher/change-energy-consumption?country=OWID\_WRL~ENG
* Number of Internet Users Data: https://ourworldindata.org/grapher/number-of-internet-users?tab=chart&country=ENG
* Urbanization Rates Data: https://ourworldindata.org/grapher/urbanization-last-500-years?tab=chart&country=ENG
* Urban Population Share Data Until 2050: https://ourworldindata.org/grapher/urban-population-share-2050?tab=chart&country=ENG
* Primary Energy Consumption Data: https://ourworldindata.org/grapher/primary-energy-cons?tab=chart&country=ENG
* Share of Renewable Energy Sources in Primary Energy Consumption Data: https://ourworldindata.org/grapher/primary-energy-renewables?tab=chart&country=ENG
* Electricity Demand Data: https://ourworldindata.org/grapher/electricity-demand?tab=chart&country=ENG

All of these data sets were obtained in.csv format, and the Python computer language's modules were used to handle them for data analysis. The data is read, cleaned, standardized, and analysed as part of these operations. To verify the authenticity and dependability of the data, we approached the data sources cautiously throughout the data collection process and carried out several checks. Additionally, we confirmed that every dataset was appropriate for our analytic procedure and capable of supporting our hypothesis. Our study's basis is the data collection technique, which also aids in addressing our research issues. To guarantee the correctness and dependability of the analysis, the entire procedure has been carried out with great care.

3. Data Cleaning and Standardization

The raw datasets we acquire need to be cleaned and normalized before we can begin the data analysis. For the analysis to be accurate and useful, this stage is essential. A general analysis of the data was done as a first stage, and any incorrect, missing, or superfluous information was looked for. This step is crucial to ensure that the analysis is carried out properly and to comprehend the overall structure and quality of the data. When there were gaps in the data, we either eliminated the gaps altogether when appropriate or filled them in with the median, mode, or mean of the relevant fields. As a result, we carefully examined our dataset to find and correct any incorrect or aberrant values. To guarantee a uniform format and scale across variables in our datasets, we also undertook a standardization process. Different datasets may be combined and compared more easily thanks to this procedure, which also improved and deepened the analysis. In this project, the data cleansing and standardization procedure was strictly followed. This procedure made sure that the outcomes of our analysis were trustworthy and legitimate.

4. Hypotheses and Research Questions

It is predicted that the expansion in Turkey's population will lead to an increase in energy consumption per capita. This expansion and increase should not only be limited to population growth, but should also consider the impact of technological use and urbanization on energy consumption. Increasing rates of urbanization are often linked to busier lifestyles and energy needs leading to higher energy consumption. On the other hand, the use of technology triggers the increase in energy consumption.

1. What effect do population growth, urbanization, and technological use have on Turkey's per-capita energy consumption?
2. How does the increase in urbanization rates affect energy consumption due to busier lifestyles and energy needs?
3. How does technology use impact Turkey's per-capita energy consumption?
4. How could the management of resources, sustainable energy methods, and energy policies in Turkey impact the relationship between population increase and energy consumption?

In order to comprehend how Turkey's population growth, urbanization, technological advancement, and energy consumption are related, these research questions will be addressed. This will help to shape energy policy and resource management.

5. Methodology

The four fundamental elements of this study's approach are data collecting, data standardization and cleaning, hypothesis testing, and data analysis.

The study's data collection phase is when it all begins. Currently, we obtained the information for our study from a reputable source called "ourworldindata.org" This website serves as a platform for visitors all over the world to view statistics and data. Data on the per capita energy consumption and population growth in Turkey were downloaded in CSV format from the aforementioned website.

To prepare the downloaded raw data for analysis, it must be cleaned and normalized. Errors, gaps, and redundant data are found throughout the data cleaning process and either fixed or eliminated. The overall distribution of the data set and the kind of the data dictate whether missing data should be filled in or removed. A balance between the data sets is achieved during the standardization process. To make data analyzeable, various scales are transformed into a single scale.

Hypothesis testing is part of the data analysis process and forms one of the main focuses of this study. Statistical tests such as correlation and regression analyzes will be used to test this hypothesis. These analyzes will help us evaluate the relationship between energy consumption. This study is built on data analysis. In order to test the hypothesis and respond to the research questions, the gathered and cleaned data are evaluated. The process of data analysis will involve a number of statistical and analytical approaches. These methods consist of exploratory data analysis, time series analysis, regression analysis, and correlation analysis.

Both qualitative (category-based or text-based) and quantitative (numerical) data are analyzed as part of the data analysis process. In this procedure, analysis results are represented graphically to highlight clear trends, patterns, or relationships utilizing charts, graphs, and tables.

In summary, this methodology provides a methodical means of evaluating our hypothesis and addressing our research issues. With the aid of this research, we can investigate any connections that might exist between Turkey's population growth, urbanization, technological development, and per-capita energy consumption and comprehend the potential effects that these connections can have on Turkey's future energy policies and plans.

6. Data Analysis

In this study, the obtained and cleaned data were analyzed using a variety of statistical and analytical techniques. To verify our theory and respond to the study questions, the data were analyzed. Examples of data analysis techniques and outcomes are provided below:

Exploratory Data Analysis: To find patterns, trends, and variability in the data set, exploratory data analysis was utilized. For instance, correlation analysis and scatter plots were used to visualize the relationship between population and energy consumption statistics.

Regression Analysis: Regression analysis was performed to estimate the impact of independent variables on per capita energy consumption, including the population and technological advancement. The creation of regression models yielded statistically significant coefficients. For instance, linear regression analysis was done to determine how population increase and per capita energy use related to one another.

Tables and graphs: The analysis results were presented graphically using tables and graphs. For instance, to illustrate the connection between energy use and urbanization rates, line graphs and tables were developed.

The obtained data was understood, linkages were found, and our hypothesis was tested using these data analysis techniques. The analysis's findings confirm that our hypothesis is true and that urbanization, technological advancement, and population growth all significantly affect Turkey's per-person energy consumption.

7. Results and Discussion

Our analysis' findings verify and reinforce our theory that Turkey's population increase and technology advancements significantly affect energy usage per person. Our hypothesis was supported by rigorous data analysis, including regression analysis and graphical representations, which revealed distinct patterns and linkages. First, consider the connection between population expansion and energy use per person. These two variables have a favorable connection, according to our analysis. The amount of energy used per person likewise rises as the population does. This demonstrates how Turkey's growing population is a factor in the nation's rising energy needs. This association is further supported by regression analysis, which demonstrates a statistically significant positive correlation between per capita energy use and population growth.

Next, we examined at how technology advancements, particularly internet use, have affected energy consumption. According to our data, there is a significant positive correlation between internet usage and per-person energy consumption. The need for energy rises along with the use of the Internet. This is due to the fact that it may be connected to the data centers, communications networks, and energy-intensive equipment required to provide widespread internet connectivity. Regression analysis supports the strong influence of technology advancements on energy consumption per capita, which supports this claim. Our findings conclusively demonstrate that Turkey's population expansion and technical advancements lead to a rise in per capita energy consumption. The findings offer insightful information to support the development of strategies by energy stakeholders and policy makers that support addressing rising energy demands while taking sustainability and environmental protection principles into account. It should be indicated that there are some restrictions on our analysis. The dataset employed in this study may have limitations, and other variables that were not taken into account in our analysis may also have an impact on energy usage. In order to help us better understand the relationship between population increase, technological advancements, and energy consumption in Turkey, future studies may examine additional factors and conduct more thorough analyses.

8. Recommendations

To reduce Turkey's energy usage, it is critical to improve energy efficiency. This could entail actions like encouraging the use of energy-efficient appliances, creating energy-efficient structures, and improving the productivity of industrial processes. Increasing energy efficiency incentives and policies can aid in reducing energy demand. To diversify its energy supply and build a sustainable energy future, Turkey must invest in renewable energy sources. It is important to employ more renewable energy sources, such as solar, wind, hydroelectric, and biomass, while reducing our reliance on fossil fuels. With the use of smart grids, energy consumption may be managed, optimized, and tracked. Turkey can better regulate energy demand and ensure efficient use of energy resources by implementing smart grids. This can raise customer knowledge and give them more power over their energy use. The public should be made aware of energy use and encouraged to adopt energy-saving behaviour through education and awareness initiatives. Spreading energy-saving behaviors and reducing energy demand can both be accomplished through increasing society's awareness of energy efficiency. Turkey needs to invest in the study and development of technologies for sustainable, renewable, and energy-efficient energy. Finding and implementing creative ideas can advance the utilization of sustainable energy sources and the management of energy demand.Turkey can gain knowledge about best practices in energy management through working with other nations and promoting international experience sharing. Collaboration with foreign organizations can provide access to funds and technical assistance. These suggestions can assist Turkey in striking a balance between energy use, population growth, technical advancements, and sustainability. To satisfy the energy needs of future generations, it is crucial to shape energy policies and resource management around the idea of sustainability.

9. Conclusion

This study examines a theory that claims Turkey's per capita energy consumption will rise as a result of population expansion and technological advancements. The findings offer crucial direction for policymakers and energy stakeholders as they establish plans to meet rising energy consumption while advancing the values of sustainability and environmental protection.

10. References

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