Data Article

Forecasted data of prices for the most common households’ fuels utilized in Nigeria during the period 2010–2024

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A R T I C L E   I N F O

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A B S T R A C T

The most common household fuel utilized in the six geopolitical zones of Nigeria is kerosene, liquified petroleum gas (LPG), firewood, charcoal, and electricity. These energy commodities are contributing to simplify people’s life. They are used in satisfying energy demands such as cooking, heating, and lighting for every single home. The energy prices were collected from 2010 to 2021, and we forecasted from 2022 to 2024. There is data available from 2010–2021 about prices for some of these commodities, but they are scattered, narrow, and in some cases, there is just a general-referred value for the whole nation and only for a single year from the past.

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These situations have limited the development of economic studies which undertake analyses regarding consumers’ behavior. The forecasted fares for kerosene and LPG were calculated under the basis of accessible information but limited by the National Bureau of Statistics of Nigeria. The available electricity tariffs were collected from the Nigerian Electricity Regulatory Commission from the existing eleven private electricity distribution companies (DISCOS). In the case of firewood and charcoal, the costs were estimated departing from the research work of Gujba et al. [1]. In the second part, we specify the way how data was obtained and its treatment for specific time periods. The statistics include the values for each fuel in the different geopolitical regions and for the most popular presentations available to the end customers. The forecasting was developed for past and future years during the under-study period of time. The information presented in the article refers to the research study: Urban and rural household energy transition in Sub-Saharan Africa: Does spatial heterogeneity reveal the direction of the transition? © 2022 The Authors. Published by Elsevier Inc. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/)

Specifications Table

| Subject | Economics and energy. |
|---------|-----------------------|
| Specific subject area | Households’ fuel prices in Nigeria, energy, fuel technology. |
| Type of data | The data is presented in the form of tables. |
| How the data were acquired | The data for kerosene (July-2015 to March-2021) and LPG (January-2016 to March-2021) were obtained from accessible information of the National Bureau of Statistics of Nigeria. The available electricity tariffs (2012 to 2024) were collected from the Nigerian Electricity Regulatory Commission from the current eleven private electricity distribution companies (DISCOS) and was organized in accordance with the different geographical areas of influence in comparison with the nation’s six geopolitical zones. In the case of firewood and charcoal, the prices were estimated departing from the research work of Gujba et al. [1], which present values for the year 2014 for these commodities. The inflation and currency exchange rates for all items were consulted for estimating unknown prices and the data was obtained from the Central Bank of Nigeria. |
| Data format | Elaboration. |
| Description of data collection | The primary data in the databases of the National Bureau of Statistics of Nigeria for kerosene and LPG prices are organized in months for the different States which compose the six different geopolitical regions of the country, and for the various presentations available for end customers (liter, gallon, 5 Kg, and 12.5 Kg) in Nigerian Naira. Electricity tariff prices are organized by year, in Naira per kWh, and for different electricity DISCOS that operates in Nigeria. |
| Data source location | The primary data for kerosene and LPG and prices is accessible information through the electronic site of the National Bureau of Statistics of Nigeria. The available electricity tariffs are available on the website of the Nigerian Electricity Regulatory Commission. In the case of firewood and charcoal, the prices were taken from the research work of Gujba et al. [1,2,3]. The inflation rates for all items are available online at the site of the Central Bank of Nigeria. |

(continued on next page)
Data accessibility

The raw data are presented in the Mendeley data repository and can be accessed at https://data.mendeley.com/datasets/rt55j2tcy3

Related research article

Emodi, N.V., Haruna, E.U., Abdu, N., Morataya, S.D.A., Dioha, M.O. and Abraham-Dukuma, M.C. 2022. Urban and rural household energy transition in Sub-Saharan Africa: Does spatial heterogeneity reveal the direction of the transition? Energy Policy, 168:113118.

Value of the Data

• Provide information about fuels prices that were not collected before and presented in this way and can be used to complete future studies for promoting the use of renewable energy commodities and technologies for households in the different Nigerian energy markets.
• The datasets can be utilized to carry out economic research regarding customers’ behavior in Nigeria, potentially useful to other scholars.
• The data can be utilized to evaluate the results of programs already undertaken by the Government and promote a culture for the energy transition to the use of more friendly fuels with the environment and customers’ health.
• The data matched the behavior of households choosing fuels in urban and rural areas in Nigeria which was noticed in the research work of Drivers of fuel choice in urban and rural households in Nigeria: evidence from panel data.

1. Data Description

The average prices for kerosene, LPG, electricity, firewood, and charcoal in each geopolitical zone of Nigeria, are presented from Tables 1–11. Nigeria has six geopolitical zones which are considered its internal energy markets. The referred fuels are the most popular energy commodities employed for households in satisfying their energy demands. The data is presented for the period of time 2010 to 2024, and the currency considered is the Nigerian Naira. The supplementary material contains the detailed data description (see attachment).
Table 1
Description and summary statistics for kerosene prices in Nigeria.

| Time series                              | Description                                         | Period     | Min.   | Max   | Mean   | Std. Dev. |
|------------------------------------------|-----------------------------------------------------|------------|--------|-------|--------|-----------|
| Kerosene                                 | Kerosene, Nigerian Naira per liter in the North Central region | 2010–2024  | 226.88 | 234.75| 242.15 | 249.15    |
| Kerosene                                 | Kerosene, Nigerian Naira per liter in the North East region | 2010–2024  | 225.10 | 233.42| 241.36 | 249.01    |
| Kerosene                                 | Kerosene, Nigerian Naira per liter in the North West region | 2010–2024  | 227.73 | 235.45| 242.66 | 249.44    |
| Kerosene                                 | Kerosene, Nigerian Naira per liter in the South East region | 2010–2024  | 251.56 | 260.49| 268.94 | 276.99    |
| Kerosene                                 | Kerosene, Nigerian Naira per liter in the South South region | 2010–2024  | 197.07 | 203.08| 208.52 | 213.44    |
| Kerosene                                 | Kerosene, Nigerian Naira per liter in the South West region | 2010–2024  | 231.34 | 240.27| 248.90 | 257.30    |
| Kerosene                                 | Kerosene, Nigerian Naira per gallon in the North Central region | 2010–2024  | 879.31 | 913.85| 947.38 | 980.18    |
| Kerosene                                 | Kerosene, Nigerian Naira per gallon in the North East region | 2010–2024  | 761.40 | 787.08| 811.03 | 833.48    |
| Kerosene                                 | Kerosene, Nigerian Naira per gallon in the North West region | 2010–2024  | 705.67 | 728.27| 749.01 | 768.11    |
| Kerosene                                 | Kerosene, Nigerian Naira per gallon in the South East region | 2010–2024  | 697.41 | 723.45| 748.40 | 772.49    |
| Kerosene                                 | Kerosene, Nigerian Naira per gallon in the South South region | 2010–2024  | 697.41 | 723.45| 748.40 | 772.49    |
| Kerosene                                 | Kerosene, Nigerian Naira per gallon in the South West region | 2010–2024  | 697.41 | 723.45| 748.40 | 772.49    |

Forecasted years: 2010–2014 and 2022–2024.
Table 2
Average prices of kerosene in Nigeria per year during the period 2010 to 2024 in Nigerian Naira per liter.

| Region/Year     | 2010   | 2011   | 2012   | 2013   | 2014   | 2015   | 2016   | 2017   | 2018   | 2019   | 2020   | 2021   | 2022   | 2023   | 2024   |
|-----------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| North Central   | 133.35 | 151.70 | 168.15 | 188.74 | 204.81 | 221.32 | 252.05 | 297.22 | 292.54 | 298.51 | 340.63 | 360.51 | 400.34 | 444.57 | 493.69 |
| North East      | 156.37 | 177.88 | 197.18 | 221.32 | 248.42 | 268.44 | 277.96 | 297.51 | 283.50 | 309.69 | 353.45 | 378.48 | 420.30 | 466.74 | 518.31 |
| North West      | 134.28 | 152.76 | 169.33 | 190.06 | 213.33 | 230.52 | 258.74 | 288.29 | 280.84 | 308.88 | 332.03 | 347.07 | 385.41 | 427.99 | 475.28 |
| South East      | 130.61 | 148.58 | 164.71 | 184.87 | 207.50 | 224.22 | 270.04 | 302.27 | 296.57 | 342.50 | 367.96 | 387.82 | 430.67 | 478.25 | 531.09 |
| South South     | 130.23 | 148.14 | 164.22 | 184.32 | 206.88 | 223.55 | 254.14 | 302.18 | 288.78 | 319.48 | 323.88 | 319.86 | 355.20 | 394.44 | 438.02 |
| South West      | 117.58 | 133.75 | 148.27 | 166.42 | 186.79 | 201.84 | 248.95 | 299.94 | 286.05 | 320.60 | 331.34 | 348.74 | 387.27 | 430.06 | 477.58 |

Forecasted years: 2010–2014 and 2022–2024.
https://nigerianstat.gov.ng/elibrary?queries[search]=#.
Table 3
Average prices of kerosene in Nigeria per year during the period 2010 to 2024 in Nigerian Naira per gallon.

| Region/Year   | 2010  | 2011  | 2012  | 2013  | 2014  | 2015  | 2016  | 2017  | 2018  | 2019  | 2020  | 2021  | 2022  | 2023  | 2024  |
|---------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| North Central | 617.85| 686.11| 686.11| 686.11| 686.11| 840.16| 1092.68| 1054.29| 1173.81| 1234.87| 1301.91| 1301.91| 1301.91| 1301.91| 1301.91|
| North East    | 763.82| 848.21| 848.21| 848.21| 848.21| 962.69| 1168.63| 1060.98| 1276.25| 1234.79| 1166.89| 1166.89| 1166.89| 1166.89| 1166.89|
| North West    | 694.95| 771.73| 771.73| 771.73| 771.73| 883.60| 1125.47| 1100.57| 1256.25| 1280.12| 1310.14| 1310.14| 1310.14| 1310.14| 1310.14|
| South East    | 618.78| 687.15| 687.15| 687.15| 687.15| 816.73| 1031.35| 1034.17| 1204.46| 1185.72| 1223.56| 1223.56| 1223.56| 1223.56| 1223.56|
| South South   | 614.70| 682.62| 682.62| 682.62| 682.62| 840.98| 1092.35| 1128.77| 1159.75| 1144.77| 1061.02| 1061.02| 1061.02| 1061.02| 1061.02|
| South West    | 600.67| 667.04| 667.04| 667.04| 667.04| 838.86| 1105.99| 1054.47| 1176.25| 1176.93| 1191.86| 1191.86| 1191.86| 1191.86| 1191.86|

Forecasted years: 2010–2014 and 2022–2024.
https://nigerianstat.gov.ng/elibrary?queries[search]=#.
Table 4
Description and summary statistics for LPG prices in Nigeria.

| Time series | Description                                      | Period       | Min.          | Max          | Mean          | Std. Dev. |
|-------------|--------------------------------------------------|--------------|---------------|--------------|---------------|-----------|
| LPG         | LPG, Nigerian Naira per 5 Kg in the North Central region | 2010–2024    | 1673.72       | 2196.44      | 2196.44       | 139.09    |
| LPG         | LPG, Nigerian Naira per 5 Kg in the North East region          | 2010–2024    | 1736.93       | 2379.23      | 2379.23       | 154.55    |
| LPG         | LPG, Nigerian Naira per 5Kg in the North West region             | 2010–2024    | 1614.55       | 2111.47      | 2111.47       | 116.14    |
| LPG         | LPG, Nigerian Naira per 5 Kg in the South East region            | 2010–2024    | 1558.69       | 2237.65      | 2237.65       | 197.31    |
| LPG         | LPG, Nigerian Naira per 5 Kg in the South South region          | 2010–2024    | 1661.36       | 2274.87      | 2274.87       | 147.73    |
| LPG         | LPG, Nigerian Naira per 5 Kg in the South West region           | 2010–2024    | 1650.51       | 2093.09      | 2093.09       | 116.15    |
| LPG         | LPG, Nigerian Naira per 12.5 Kg in the North Central region     | 2010–2024    | 3444.96       | 4689.40      | 3974.54       | 285.14    |
| LPG         | LPG, Nigerian Naira per 12.5 Kg in the North East region        | 2010–2024    | 3539.62       | 4597.68      | 3951.68       | 282.33    |
| LPG         | LPG, Nigerian Naira per 12.5 Kg in the North West region        | 2010–2024    | 3266.97       | 4958.93      | 3862.77       | 384.19    |
| LPG         | LPG, Nigerian Naira per 12.5 Kg in the South East region        | 2010–2024    | 3539.65       | 4618.44      | 3979.41       | 304.67    |
| LPG         | LPG, Nigerian Naira per 12.5 Kg in the South South region       | 2010–2024    | 3692.56       | 5002.30      | 4157.67       | 294.69    |
| LPG         | LPG, Nigerian Naira per 12.5 Kg in the South West region        | 2010–2024    | 3412.41       | 4558.31      | 3865.95       | 289.50    |

Forecasted years: 2010–2015 and 2022–2024.
https://nigerianstat.gov.ng/elibrary?queries[search]=lpg%20prices.
Table 5
Average prices of LPG in Nigeria per year during the period 2010 to 2024 in Nigerian Naira per 5 Kg.

| Region/Year | 2010   | 2011   | 2012   | 2013   | 2014   | 2015   | 2016   | 2017   | 2018   | 2019   | 2020   | 2021   | 2022   | 2023   | 2024   |
|-------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| North Central | 1162.37 | 1322.29 | 1465.76 | 1645.19 | 1785.30 | 1929.17 | 1929.17 | 2333.50 | 2064.71 | 1946.26 | 1945.49 | 1944.93 | 2159.82 | 2398.45 | 2663.45 |
| North East | 1126.78 | 1281.81 | 1420.88 | 1594.82 | 1790.06 | 1934.30 | 1934.30 | 2285.28 | 2285.28 | 2303.02 | 2309.28 | 2311.91 | 2567.34 | 2851.00 | 3165.99 |
| North West | 1131.66 | 1287.36 | 1427.03 | 1601.73 | 1797.81 | 1942.68 | 1942.68 | 2010.82 | 2010.82 | 1971.03 | 1904.70 | 1881.65 | 2089.54 | 2320.41 | 2576.78 |
| South East | 1117.72 | 1271.50 | 1409.45 | 1582.00 | 1775.66 | 1918.75 | 1918.75 | 2042.07 | 2042.07 | 1937.79 | 1821.29 | 1958.99 | 2175.43 | 2415.79 | 2682.70 |
| South South | 115.56 | 1269.04 | 1406.73 | 1578.94 | 1772.23 | 1915.04 | 1915.04 | 2090.77 | 2090.77 | 2091.11 | 2011.98 | 2046.49 | 2272.60 | 2523.70 | 2802.53 |
| South West | 1137.04 | 1293.48 | 1433.82 | 1609.35 | 1806.36 | 1951.92 | 1951.92 | 2043.19 | 2043.19 | 1872.20 | 1831.78 | 1930.80 | 2144.13 | 2381.02 | 2644.09 |

Forecasted years: 2010-2015 and 2022-2024.
https://nigerianstat.gov.ng/elibrary?queries[search]=lpg%20prices.
### Table 6
Average prices of LPG in Nigeria per year during the period 2010 to 2024 in Nigerian Naira per 12.5 Kg.

| Region/Year     | 2010  | 2011  | 2012  | 2013  | 2014  | 2015  | 2016  | 2017  | 2018  | 2019  | 2020  | 2021  | 2022  | 2023  | 2024  |
|-----------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| North Central   | 3879.04| 3879.04| 3879.04| 3879.04| 3879.04| 3879.04| 3879.04| 4654.66| 4428.95| 4197.28| 4149.41| 4350.50| 4350.50| 4350.50| 4350.50|
| North East      | 3905.76| 3905.76| 3905.76| 3905.76| 3905.76| 3905.76| 3905.76| 4678.27| 4270.66| 4257.01| 4265.97| 4307.88| 4307.88| 4307.88| 4307.88|
| North West      | 3994.86| 3994.86| 3994.86| 3994.86| 3994.86| 3994.86| 3994.86| 4592.96| 4187.65| 4055.59| 3936.40| 4057.32| 4057.32| 4057.32| 4057.32|
| South East      | 3974.01| 3974.01| 3974.01| 3974.01| 3974.01| 3974.01| 3974.01| 4718.98| 4421.28| 4317.75| 4134.67| 4292.18| 4292.18| 4292.18| 4292.18|
| South South     | 4118.41| 4118.41| 4118.41| 4118.41| 4118.41| 4118.41| 4118.41| 4775.60| 4443.96| 4417.06| 4567.66| 4567.66| 4567.66| 4567.66| 4567.66|
| South West      | 3892.46| 3892.46| 3892.46| 3892.46| 3892.46| 3892.46| 3892.46| 4479.92| 4067.27| 3997.42| 3962.87| 4255.78| 4255.78| 4255.78| 4255.78|

Forecasted years: 2010–2015 and 2022–2024.
https://nigerianstat.gov.ng/elibrary?queries[search]=lpg%20prices.
Table 7
Description and summary statistics for electricity tariffs in Nigeria per DISCO.

| Time series | Description                                         | Period     | Min. | Max  | Mean  | Std. Dev. |
|-------------|------------------------------------------------------|------------|------|------|-------|-----------|
| Electricity | Electricity, Nigerian Naira per kWh in North Abuja DISCO | 2010–2024  | 13.70| 37.05| 26.21 | 7.92      |
| Electricity | Electricity, Nigerian Naira per kWh in Benin DISCO   | 2010–2024  | 12.62| 34.66| 25.14 | 8.33      |
| Electricity | Electricity, Nigerian Naira per kWh in North Port Harcourt DISCO | 2010–2024 | 15.10| 43.62| 30.32 | 10.85     |
| Electricity | Electricity, Nigerian Naira per kWh in the Enugu DISCO | 2010–2024  | 14.23| 38.98| 25.64 | 7.73      |
| Electricity | Electricity, Nigerian Naira per kWh in Eko DISCO     | 2010–2024  | 14.29| 26.90| 21.33 | 3.61      |
| Electricity | Electricity, Nigerian Naira per kWh in Ibadan DISCO   | 2010–2024  | 14.08| 35.26| 26.01 | 7.30      |
| Electricity | Electricity, Nigerian Naira per kWh in Ikeja DISCO    | 2010–2024  | 13.33| 29.05| 21.93 | 4.85      |
| Electricity | Electricity, Nigerian Naira per kWh in Jos DISCO      | 2010–2024  | 14.40| 48.75| 33.43 | 12.61     |
| Electricity | Electricity, Nigerian Naira per kWh in Yola DISCO     | 2010–2024  | 12.34| 42.96| 29.13 | 11.35     |
| Electricity | Electricity, Nigerian Naira per kWh in the Kaduna DISCO | 2010–2024 | 14.17| 39.13| 25.80 | 7.31      |
| Electricity | Electricity, Nigerian Naira per kWh in Kano DISCO     | 2010–2024  | 15.35| 36.10| 25.00 | 6.44      |

Forecasted years: 2010–2011.
https://nerc.gov.ng/index.php/library/documents/Tariff-Charges-and-Market-Rules/.
https://nerc.gov.ng/index.php/component/remository/MYTO-2015/?Itemid=591.
https://nerc.gov.ng/index.php/library/documents/Tariff-Charges-and-Market-Rules/Retail-Tariff-for-respective-DISCOs/.
https://nerc.gov.ng/index.php/component/remository/?Itemid=591.
Table 8
Average prices of electricity in Nigeria per year during the period 2010 to 2024 in Nigerian Naira per kWh.

| Region         | 2010  | 2011  | 2012  | 2013  | 2014  | 2015  | 2016  | 2017  | 2018  | 2019  | 2020  | 2021  | 2022  | 2023  | 2024  | Min   | Max   | Mean  | Std. Dev. |
|----------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|----------|
| North Central  | 13.70 | 15.58 | 17.27 | 17.40 | 18.26 | 24.46 | 36.40 | 37.05 | 36.00 | 30.61 | 29.55 | 29.63 | 29.28 | 29.12 | 28.89 | 13.70 | 37.05 | 26.21 | 7.92      |
| North East     | 13.37 | 15.21 | 16.86 | 17.84 | 18.72 | 24.99 | 34.58 | 39.97 | 41.28 | 42.97 | 43.37 | 41.17 | 40.42 | 41.49 | 36.96 | 13.37 | 43.37 | 31.28 | 11.81     |
| North West     | 14.34 | 16.09 | 17.84 | 19.16 | 20.58 | 23.64 | 31.77 | 34.62 | 37.61 | 31.55 | 26.80 | 26.85 | 26.53 | 26.37 | 26.15 | 14.34 | 37.61 | 25.33 | 6.82      |
| South East     | 14.23 | 16.19 | 17.94 | 18.76 | 19.68 | 24.13 | 36.01 | 38.89 | 38.98 | 38.87 | 26.47 | 26.50 | 26.17 | 26.02 | 25.81 | 14.23 | 38.98 | 25.64 | 7.73      |
| South South    | 13.86 | 15.77 | 17.48 | 17.76 | 18.44 | 22.09 | 34.90 | 38.01 | 39.04 | 38.98 | 38.75 | 36.64 | 28.28 | 28.10 | 27.87 | 13.86 | 39.04 | 27.73 | 9.53      |
| South West     | 13.90 | 15.81 | 17.53 | 17.94 | 18.46 | 20.83 | 29.19 | 29.42 | 27.98 | 27.63 | 26.19 | 25.64 | 25.39 | 25.29 | 25.13 | 13.90 | 29.42 | 23.09 | 5.17      |

Forecasted years: 2010–2011.
https://nerc.gov.ng/index.php/library/documents/Tariff-Charges–and–Market-Rules/.
https://nerc.gov.ng/index.php/component/remository/MYTO-2015/?Itemid=591.
https://nerc.gov.ng/index.php/library/documents/Tariff-Charges–and–Market-Rules/Retail-Tariff-for-respective-DISCOs/.
https://nerc.gov.ng/index.php/component/remository/?Itemid=591.
Table 9
Description and summary statistics for firewood and charcoal prices in Nigeria.

| Time series | Description | Period     | Min.  | Max.  | Mean | Std. Dev. |
|-------------|-------------|------------|-------|-------|------|-----------|
| Firewood    | Firewood, Nigerian Naira per Kg. in the North Central region | 2010–2024 | 3.23  | 12.37 | 7.55 | 3.37      |
| Firewood    | Firewood, Nigerian Naira per Kg. in the North East region    | 2010–2024 | 5.37  | 12.38 | 8.55 | 2.54      |
| Firewood    | Firewood, Nigerian Naira per Kg. in the North West region    | 2010–2024 | 5.37  | 12.38 | 8.55 | 2.54      |
| Firewood    | Firewood, Nigerian Naira per Kg. in the South East region    | 2010–2024 | 5.36  | 12.37 | 8.54 | 2.53      |
| Firewood    | Firewood, Nigerian Naira per Kg. in the South West region    | 2010–2024 | 5.36  | 12.37 | 8.54 | 2.53      |
| Charcoal    | Firewood, Nigerian Naira per Kg. in the North Central region | 2010–2024 | 8.30  | 9.40  | 9.27 | 0.36      |
| Charcoal    | Firewood, Nigerian Naira per Kg. in the North East region    | 2010–2024 | 8.30  | 9.41  | 9.27 | 0.36      |
| Charcoal    | Firewood, Nigerian Naira per Kg. in the North West region    | 2010–2024 | 8.30  | 9.41  | 9.27 | 0.36      |
| Charcoal    | Charcoal, Nigerian Naira per Kg. in the South East region    | 2010–2024 | 8.30  | 9.40  | 9.26 | 0.36      |
| Charcoal    | Charcoal, Nigerian Naira per Kg. in the South South region   | 2010–2024 | 8.20  | 9.28  | 9.15 | 0.36      |
| Charcoal    | Charcoal, Nigerian Naira per Kg. in the South West region    | 2010–2024 | 8.30  | 9.40  | 9.27 | 0.36      |

Forecasted years: 2010–2013 and 2015–2024.
https://doi:10.3390/resources4020412.
https://apps.who.int/iris/bitstream/handle/10665/43569/9789241594806_eng.pdf;sequence=1.
https://openknowledge.worldbank.org/handle/10986/21878.
Table 10
Average prices of firewood in Nigeria per year during the period 2010 to 2024 in Nigerian Naira per Kg.

| Region      | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 |
|-------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| North Central | 3.23 | 3.68 | 4.08 | 4.57 | 4.96 | 5.35 | 5.85 | 6.76 | 7.88 | 8.84 | 9.84 | 11.14 | 12.37 | 12.37 | 12.37 |
| North East   | 5.57 | 6.34 | 7.03 | 7.89 | 8.56 | 5.37 | 5.85 | 6.76 | 7.88 | 8.84 | 9.85 | 11.15 | 12.38 | 12.38 | 12.38 |
| North West   | 5.57 | 6.34 | 7.03 | 7.89 | 8.56 | 5.37 | 5.85 | 6.76 | 7.88 | 8.84 | 9.85 | 11.15 | 12.38 | 12.38 | 12.38 |
| South East   | 5.57 | 6.34 | 7.02 | 7.88 | 8.56 | 5.36 | 5.85 | 6.76 | 7.88 | 8.84 | 9.84 | 11.14 | 12.37 | 12.37 | 12.37 |
| South South  | 5.50 | 6.26 | 6.94 | 7.79 | 8.45 | 5.30 | 5.77 | 6.68 | 7.78 | 8.73 | 9.72 | 11.00 | 12.22 | 12.22 | 12.22 |
| South West   | 5.57 | 6.34 | 7.03 | 7.88 | 8.56 | 5.36 | 5.85 | 6.76 | 7.88 | 8.84 | 9.84 | 11.14 | 12.37 | 12.37 | 12.37 |

Forecasted years: 2010–2024.
https://doi:10.3390/resources4020412.
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Table 11
Average prices of charcoal in Nigeria per year during the period 2010 to 2024 in Nigerian Naira per Kg.

| Region      | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 |
|-------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| North Central | 8.30 | 8.47 | 9.40 | 9.40 | 9.40 | 9.40 | 9.40 | 9.40 | 9.40 | 9.40 | 9.40 | 9.40 | 9.40 | 9.40 | 9.40 |
| North East   | 8.30 | 8.47 | 9.41 | 9.41 | 9.41 | 9.41 | 9.41 | 9.41 | 9.41 | 9.41 | 9.41 | 9.41 | 9.41 | 9.41 | 9.41 |
| North West   | 8.30 | 8.47 | 9.41 | 9.41 | 9.41 | 9.41 | 9.41 | 9.41 | 9.41 | 9.41 | 9.41 | 9.41 | 9.41 | 9.41 | 9.41 |
| South East   | 8.30 | 8.47 | 9.40 | 9.40 | 9.40 | 9.40 | 9.40 | 9.40 | 9.40 | 9.40 | 9.40 | 9.40 | 9.40 | 9.40 | 9.40 |
| South South  | 8.20 | 8.36 | 9.28 | 9.28 | 9.28 | 9.28 | 9.28 | 9.28 | 9.28 | 9.28 | 9.28 | 9.28 | 9.28 | 9.28 | 9.28 |
| South West   | 8.30 | 8.47 | 9.40 | 9.40 | 9.40 | 9.40 | 9.40 | 9.40 | 9.40 | 9.40 | 9.40 | 9.40 | 9.40 | 9.40 | 9.40 |

Forecasted years: 2010–2024.
https://doi:10.3390/resources4020412.
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2. Experimental Design, Materials and Methods

The forecasted data for kerosene was calculated under the basis of accessible information from the National Bureau of Statistics of Nigeria from the period of July–2015 to March–2021, while for LPG for the period January–2016 to March–2021 [4,5]. In both cases, for the previous years was discounted the annual average inflation rate to set the fares, while for the future periods of time was added the average inflation rate from 2010 to 2021. The inflation rates for Nigeria for the period 2003 to 2021 are available on the website of the Central Bank of Nigeria [6]. The estimated prices for kerosene were for the period 2010–2014 and 2022–2024, while for LPG were from 2010–2014 and 2022–2024.

The average prices of electricity per kWh for each electricity DISCO and for the different geopolitical zones in Nigeria are shown in Tables 7 and 8. The data for electricity tariffs was obtained from the Nigerian Electricity Regulatory Commission [7,8]. It can be found for each electricity DISCO that operates in the country. However, it was required to be organized according to the six different energy markets identified politically in this study. The forecasted data for the years 2010 to 2021 was calculated on the basis of accessible information for the period 2012 to 2024. For these two previous years were discounted the annual average inflation rate to set the fares. The forecasted prices were for the period 2010–2011.

In order to estimate the prices for firewood and charcoal, the consulted fares settled in Gujba et al. [1], where they are presented in dollars of the United States per ton. However, that study is limited to set the costs of both items only for the year 2014. We started by converting these measures and values into Nigerian Naira per Kg, using the available currency exchange rates offered by the Central Bank of Nigeria [9]. The estimated prices for charcoal were for the period 2010–2024.
In order to set the price behavior for each State of Nigeria, kerosene was selected as a comparative commodity because is the next substitute for the households’ fuels (Hutton et al., 2006). This was possible thanks to the information provided by the National Bureau of Statistics of Nigeria. From these fares, were obtained the average prices per gallon of kerosene for each State during the period July-2016 to March-2021. Then, it was possible to establish the price by State from the most expensive to the cheapest one during the analyzed period of time.

To obtain the price growth factor between States, the average inflation (Fig. 1) rate for 2014 was consulted from the available data of the Central Bank of Nigeria. We consulted the indicated prices for firewood and charcoal in Table 12 based on the research work by Gujba et al. [1]. On one hand, the prices referred to in this study gave us the averages prices for the year 2014, which are assumed to be the lowest tariffs possible. While on the other hand, through applying the inflation rate, the highest value was obtained and was assigned to the most expensive price of kerosene in the corresponding State.

The intermediate prices were obtained by subtracting the prices between the most expensive State and the next cheapest State. Then, these values were divided by the cheapest State price that was subtracted, and all of this was divided into a value of 100 in order to normalize the values, which is the range of the parameter within which the prices are framed [3,10]. The determination of the factor is given through modifying formulas such as the inflation or the one for percentage of annual differences over consecutive years [11], which is given in a simple way by:

\[ I = \frac{\text{Later CPI} - \text{Earlier CPI}}{\text{Earlier CPI}} \times 100 \text{ or } I_{qc}^{t} = \frac{X_{ac}^{t} - X_{bc}^{t}}{X_{bc}^{t}} \times 100 \]

(1)

We have that \( X_{bc}^{t} \) is the highest price of a given good in a determined geographical area \((a)\) in the year \( t \), while \( X_{bc}^{t-1} \) is the following highest price for the same good in a different geographical area \((b)\) in the year \( t \). In the standard formulas, everything is multiplied by 100. However, as it was expressed before, the equation needs to be divided at the end into this amount in order to normalize the outcomes of the factor which are going to range a set of values between 0 and 1. Our criteria allowed us to obtain a spatial index [12–14], which according to the theory are helpful tools for compiling and compare prices of the same product in different regions or countries [15]. Our normalized equation is given by:

\[ I_{qc}^{t} = \frac{X_{ac}^{t} - X_{bc}^{t}}{X_{bc}^{t}} \times 100 \]

(2)

This decision contributed to keeping framed the prices for each State, for both firewood and charcoal, within a range that did not exceed the price established in Gujba et al. [1] and the obtained value from applying the costs of inflation to the most expensive State for kerosene.
Table 12
Factors for firewood and charcoal prices in Nigeria 2014.

| State            | Average Prices per State in Nigeria July 2015-March 2021 kerosene NIN per Gallon | Factor | Price NIN KG Firewood 2014 | State            | Average Prices per State in Nigeria July 2015-March 2021 kerosene NIN per Gallon | Factor | Price NIN KG Charcoal 2014 |
|------------------|-----------------------------------------------------------------------------------|--------|-----------------------------|------------------|-----------------------------------------------------------------------------------|--------|---------------------------|
| Borno-NE         | 1,198.05                                                                          | 1.0000 | 11.92                       | Borno-NE         | 1,198.05                                                                          | 1.0000 | 9.41                      |
| Kebbi-NW         | 1,162.23                                                                          | 0.0002 | 11.92                       | Kebbi-NW         | 1,162.23                                                                          | 0.0002 | 9.41                      |
| Gombe-NE         | 1,139.41                                                                          | 0.0000 | 11.92                       | Gombe-NE         | 1,139.41                                                                          | 0.0000 | 9.41                      |
| Jigawa-NW        | 1,138.31                                                                          | 0.0000 | 11.92                       | Jigawa-NW        | 1,138.31                                                                          | 0.0000 | 9.41                      |
| Ekiti            | 1,134.53                                                                          | 0.0000 | 11.92                       | Ekiti            | 1,134.53                                                                          | 0.0000 | 9.41                      |
| Adamawa-NE       | 1,130.05                                                                          | 0.0001 | 11.91                       | Adamawa-NE       | 1,130.05                                                                          | 0.0001 | 9.41                      |
| Kano-NW          | 1,116.88                                                                          | 0.0001 | 11.91                       | Kano-NW          | 1,116.88                                                                          | 0.0001 | 9.41                      |
| Katsina-NW       | 1,104.18                                                                          | 0.0000 | 11.91                       | Katsina-NW       | 1,104.18                                                                          | 0.0000 | 9.41                      |
| Yobe-NE          | 1,103.86                                                                          | 0.0000 | 11.91                       | Yobe-NE          | 1,103.86                                                                          | 0.0000 | 9.41                      |
| Taraba-NE        | 1,101.59                                                                          | 0.0001 | 11.91                       | Taraba-NE        | 1,101.59                                                                          | 0.0001 | 9.41                      |
| Sokoto-NW        | 1,087.80                                                                          | 0.0000 | 11.91                       | Sokoto-NW        | 1,087.80                                                                          | 0.0000 | 9.41                      |
| Nasarawa-NC      | 1,083.94                                                                          | 0.0000 | 11.91                       | Nasarawa-NC      | 1,083.94                                                                          | 0.0000 | 9.41                      |
| Plateau-NC       | 1,079.59                                                                          | 0.0000 | 11.91                       | Plateau-NC       | 1,079.59                                                                          | 0.0000 | 9.40                      |
| Kaduna-NW        | 1,074.35                                                                          | 0.0000 | 11.91                       | Kaduna-NW        | 1,074.35                                                                          | 0.0000 | 9.40                      |
| Benue-NC         | 1,071.83                                                                          | 0.0000 | 11.91                       | Benue-NC         | 1,071.83                                                                          | 0.0000 | 9.40                      |
| Niger-NC         | 1,071.81                                                                          | 0.0001 | 11.91                       | Niger-NC         | 1,071.81                                                                          | 0.0001 | 9.40                      |
| Cross River-SS   | 1,058.75                                                                          | 0.0000 | 11.91                       | Cross River-SS   | 1,058.75                                                                          | 0.0000 | 9.40                      |
| Zamfara-NW       | 1,058.15                                                                          | 0.0000 | 11.91                       | Zamfara-NW       | 1,058.15                                                                          | 0.0000 | 9.40                      |
| Enugu-SE         | 1,055.66                                                                          | 0.0000 | 11.91                       | Enugu-SE         | 1,055.66                                                                          | 0.0000 | 9.40                      |
| Edo-SS           | 1,052.92                                                                          | 0.0001 | 11.91                       | Edo-SS           | 1,052.92                                                                          | 0.0001 | 9.40                      |
| Lagos            | 1,046.50                                                                          | 0.0001 | 11.91                       | Lagos            | 1,046.50                                                                          | 0.0001 | 9.40                      |
| Ondo             | 1,039.36                                                                          | 0.0000 | 11.91                       | Ondo             | 1,039.36                                                                          | 0.0000 | 9.40                      |
| Bayelsa-SS       | 1,034.89                                                                          | 0.0000 | 11.91                       | Bayelsa-SS       | 1,034.89                                                                          | 0.0000 | 9.40                      |
| Kogi-NC          | 1,033.87                                                                          | 0.0000 | 11.90                       | Kogi-NC          | 1,033.87                                                                          | 0.0000 | 9.40                      |
| Abia-SE          | 1,031.37                                                                          | 0.0000 | 11.90                       | Abia-SE          | 1,031.37                                                                          | 0.0000 | 9.40                      |
| Kwarar-NC        | 1,029.88                                                                          | 0.0000 | 11.90                       | Kwarar-NC        | 1,029.88                                                                          | 0.0000 | 9.40                      |
| Imo-SE           | 1,027.37                                                                          | 0.0000 | 11.90                       | Imo-SE           | 1,027.37                                                                          | 0.0000 | 9.40                      |
| Ebonyi-SE        | 1,027.20                                                                          | 0.0000 | 11.90                       | Ebonyi-SE        | 1,027.20                                                                          | 0.0000 | 9.40                      |
| Ogun             | 1,026.60                                                                          | 0.0000 | 11.90                       | Ogun             | 1,026.60                                                                          | 0.0000 | 9.40                      |
| Bauchi-NE        | 1,025.31                                                                          | 0.0001 | 11.90                       | Bauchi-NE        | 1,025.31                                                                          | 0.0001 | 9.40                      |
| Abuja-NC         | 1,011.77                                                                          | 0.0000 | 11.90                       | Abuja-NC         | 1,011.77                                                                          | 0.0000 | 9.40                      |
| Anambra-SE       | 1,007.87                                                                          | 0.0000 | 11.90                       | Anambra-SE       | 1,007.87                                                                          | 0.0000 | 9.40                      |
| Oyo              | 1,006.09                                                                          | 0.0001 | 11.90                       | Oyo              | 1,006.09                                                                          | 0.0001 | 9.40                      |
| Akwa Ibom-SS     | 997.09                                                                             | 0.0001 | 11.90                       | Akwa Ibom-SS     | 997.09                                                                             | 0.0001 | 9.40                      |
| Osun             | 991.07                                                                             | 0.0000 | 11.90                       | Osun             | 991.07                                                                             | 0.0000 | 9.40                      |
| River-SS         | 988.85                                                                             | 0.0001 | 11.90                       | River-SS         | 988.85                                                                             | 0.0001 | 9.40                      |
| Delta-SS         | 974.85                                                                             | 0.0000 | 11.03                       | Delta-SS         | 974.85                                                                             | 0.0000 | 9.40                      |
| Base price 2014  | 974.85                                                                             |        |                             | Base price 2014  | 974.85                                                                             |        |                           |

Ethics Statements

None to declare.
Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data Availability

Raw Data (Reference data) (Mendeley Data).

CRediT Author Statement

Nnaemeka Vincent Emodi: Conceptualization, Investigation, Methodology, Visualization, Writing – original draft, Supervision; Emmanuel Umoren Haruna: Writing – review & editing; Nizam Abdu: Writing – review & editing; Sergio David Aldana Morataya: Conceptualization, Investigation, Data curation, Methodology, Writing – original draft; Michael O. Dioha: Writing – review & editing; Magnus C. Abraham-Dukuma: Writing – review & editing.

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Supplementary Materials

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