Current Educational Research
ISSN: 2393-7637 | 2393-7610
Instituto Nacional de Viticultura

Current Educational Research
DOI: https://doi.org/10.52845/CER/2018/114
Curr. educ. res. 1 (1), 22—28 (2018)
Received 12 July 2018 | **Revised** 23 Aug 2018 | **Accepted** 13 Sep 2018 | **Online Available** 30 Sep 2018

OPEN ACCESS

RESEARCH ARTICLE

Pattern of Energy Use for Lighting in Karnataka: An Analysis based on Census 2011

Praveen Saldanha[1*] | Dr. Premakumara G.S[2]

Abstract

One of the objectives of Millennium development goals is to provide reliable, clean quality energy to all households at affordable prices. The present paper examines the status of Karnataka, in the provision of energy sources for household lighting purposes. Energy is a crucial factor in the process of development. Availability and access to energy are pre-requisites for the functioning of any system, sector, and region which invariably demands for energy security. The present study has made an attempt to analyze, the energy inclusiveness in the process of growth of Karnataka. Census survey data have been used for the study and disparity techniques have been largely used for analysis. Possible pre-testing procedures have been followed to ensure the data validity. Arguments have been made only on the basis of tested results. It has been found from the study that, there is a significant difference between urban and rural regions in access to energy sources. There is a correlation between development and access to energy sources. It has been found from the impact analysis that, regional factors have positive impact on use of modern clean energy sources. Therefore, there is a need of integrated energy strategy for inclusive growth of Karnataka. Otherwise, some regions, some districts and some sections of the people will be left-out in development process, due to lack of access to energy

Key words: Lighting, Energy Availability, Inclusive Growth, Clean Energy and Renewable Energy

1 | INTRODUCTION

One of the objectives of Millennium development goals is to provide reliable, clean quality energy to all households at affordable prices. The Indian plans and development process have assumed that, the growth of the economy will percolate into the margina l sections of the people and groups. But, the assumption of plan has failed to reach the marginal sections of the economy. (1, 2)

The government of India, as remedial measures, has introduced specific programmes for the development of marginal sections of the economy particularly, during the fifth five year plan. These specific programmes have considerably helped some sections of the people to improve their livelihood. However, large sections of the people have been left out of the development process. Accordingly, the government of India in its 11th and 1 th

plan periods, has introduced inclusive growth strategy to include, hitherto excluded people and sections. As a matter of fact, inclusive growth policy will be incomplete without energy component in its inclusive strategy (GOI, 2007). (3, 4)

Therefore, energy is must for inclusive growth as well as for development. Energy is a crucial factor in the process of development. It has been found from the various studies that, there is a significant positive relationship between energy and developent. Avail-

[1] Assistant Professor, Department of Economics, ST. Philomena's College, Bannimantap, Mysuru- 570015.
[2] Assistant Professor, Department of Economics, University of Mysore, UGC Research Awardee, IUC Associate, IIAS Shimla, India .
Address correspondence to: Praveen, Saldanha, Assistant Professor, Department of Economics, ST. Philomena's College, Bannimantap, Mysuru- 570015, *Email: saldanha@gmail.com*

Supplementary information The online version of this article (https://doi.org/10.52845/CER/2018/114) contains supplementary material, which is available to authorized users.

ability and access to energy are pre-requisites for the analyze the availability and use of different energy sources for lighting purposes. The study will examine the status of use of energy for lighting both at urban and rural areas of Karnataka. The study will also analyze the disparities between urban and rural areas, in use of energy sources for lighting. Based on the analysis of the present study, an attempt has also been made to evaluate the eco-efficiency of energy sources for lighting. (5, 6)

2 | REVIEW OF LITERATURE

There are two sets of distinct arguments related to energy and development. The first set of argument is that energy has significant impact on production which will result in the development (Masih, 1996 & Asafu-Adjaye, 2000). It implies that without energy, the other inputs like labour and capital may not be used productively in the production process. However, the contribution of energy to the development varies, based on the availability and efficient use of energy. (7–9) Accordingly, energy has been considered as a factor in the production process and economic development. The other argument is, energy is not at all a factor of production, since the value of energy in total production is very negligible. Therefore, energy may not play a significant role in the development process (Cheng, 1995 & Yu E. J., 1992). However, the widely accepted argument is that, energy is a crucial factor in production process. As a matter of fact, energy is essential for development, and eco-efficient and clean energy is critical for sustainable development. Adequate, reliable and affordable energy is the pre-requisite for development (Premakumara, 2012). Another important dimension argues that there has been significant association between energy efficiency and development (Sascha & Andreas, 2015; Sreenivas, 2014).

Most of the early literatures on causation of economic growth on energy consumption have confirmed the causation by using uni-directional Granger-causality Tests (Yu E. , 1984; Kraft J. K., 1978; Lin, 2003; Soytas, 2003; Mozumdar, 2007). During late 90's, economists like Nachane and others have employed Engel-Granger Models to estimate the causation of electricity and energy on economic growth (Nachane, 1988; Masih, 1996; Asafu-Adjaye, 2000; Thoma, 2004; Hansen, 2002; Yoo, 2005). Meanwhile, the co-integration techniques were also used to estimate long-run relationship between energy consumption and economic growth. Jumbe and Huang have proved bi-directional relationship between energy consumption and economic growth (Jumbe, 2004; Huang 2008). Estimation of multi-dimensional relationship has also proved the role of energy in overall economic development (Tamizan, 2009; Shahbaz, 2012). Recently, Sadorsky has proved the influence of financial development on energy consumption (Sadorsky, 2010). Very recently, ARDL bounds test was used to prove the causation of energy demand on export (hahbaz, 2013). (10, 11)

There is a need for stable energy security in a country, to have sustainable balanced economic development. Since the concept of energy security and inclusive energy policy are more complex, multidimensional, and contextual, most of the previous studies have tried to define the concept of energy security (Bohi & Toman, 1996; Baldwin, 1997). Recent studies have tried to estimate and forecast the energy security (Kamonphorn & Hironobu, 2014; Ito, Zhidong, & Komiyama, 2005). A few studies have also tried to develop the dimensions and indicators to measure the energy security (Lixia & Youngho, 2014). However, there are no unique studies, which specifically analyze the inclusiveness of energy in the development process. To be very specific, there are no intensified studies, which examine the use of energy for lighting, particularly in Karnataka by using Census data. Hence, there is valid justification and rationale for the present study. (12, 13)

3 | METHODOLOGY

The present study has used cross sectional secondary data collected from Census 2011. The data collected at district level for all households, for use of energy for lighting. Electricity, kerosene, and solar have considered for analysis of lighting. Radar is used for presentation of district level data, in order to understand, the availability and use of particular energy source for lighting. Dummy variable regression model is used for difference analysis, to esti-

mate the impact of region, on use of energy sources. All functioning of any system, sector, and region which invariably demands for energy security (Premakumara, 2012. At the same time, availability of clean energy is necessary and sufficient condition for sustainable development (Hancock & Vivoda, 2014. Accordingly, in the present paper, an attempt has been made to necessary steps have followed for data process and normality tests have conducted for variables and parameters.

3.1 | Analysis of Use of Energy for Lighting in Karnataka

Lighting is one of the most essential needs of households. Households use different energy sources for lighting purpose. In this part of analysis, an attempt has been made to evaluate the energy use and its eco-efficiency. Electricity has been considered as modern source of energy for lighting. Kerosene represents the old form of energy source and also the most eco-inefficient form of energy. It is poor people's means for lighting. Solar is the modern as well as eco-efficient form of energy source. With this background, in the present analysis, an attempt has been made to estimate the energy availability and accessibility to urban and rural households and also to estimate the difference between urban and rural energy availability. (6, 14, 15)

3.2 | Use of Electricity for Lighting in Karnataka

In the following section an attempt has made to present relative status of use of electricity in rural and urban Karnataka. In the exhibit 1, the blue line presents district wise use of electricity in Karnataka, red line shows electricity use in urban Karnataka and green line depicts electricity use in rural Karnataka.

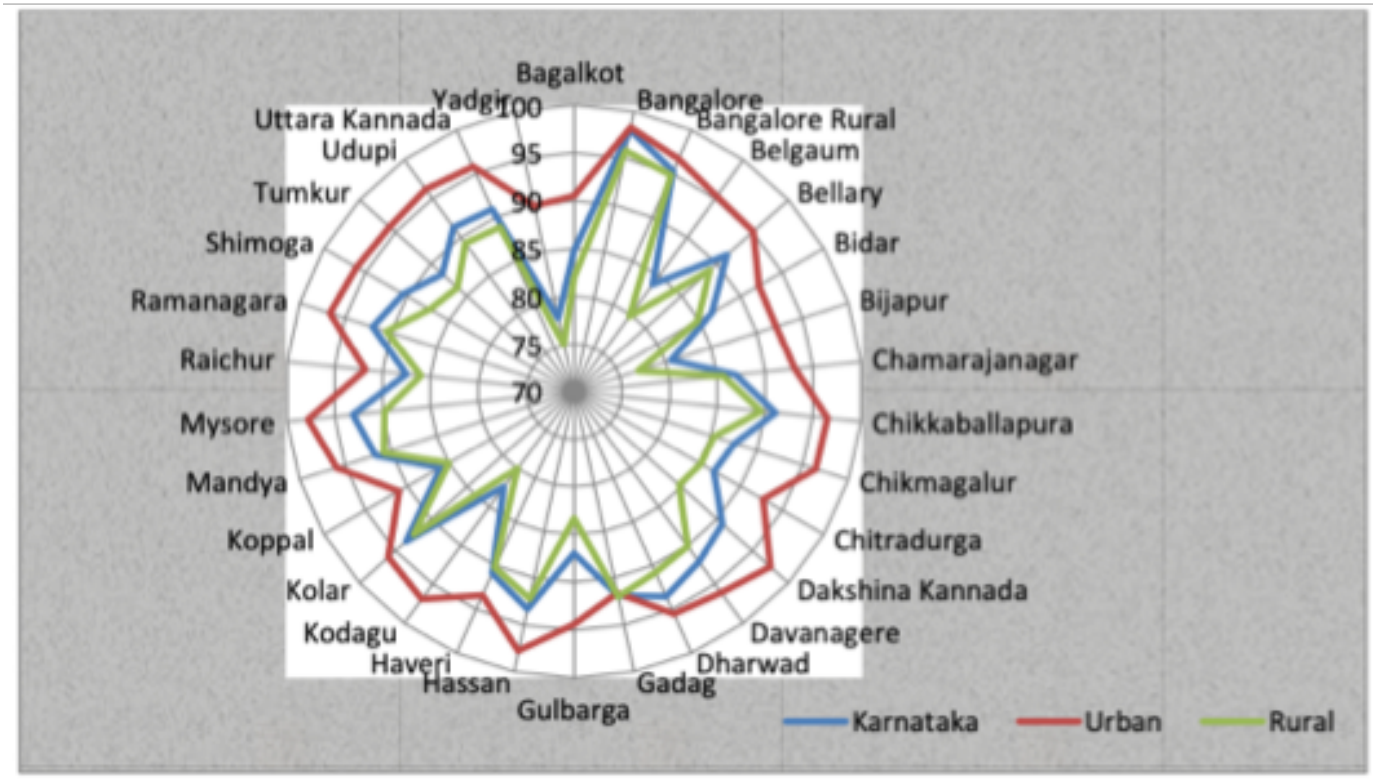

Fig. 1: Status ofElectricity for Lighting in Karnataka

It has been found from the above graph that, in Karnataka, none of the district has crossed 95 per cent in use of electricity for lighting, except Bangalore. The lowest electricity use has been found in Yadgir. In urban Karnataka, the districts like, Yadgir, Bagalkot, Bidar, Bijapur, Chamarajanagar,

Chitradurga, Gadag, Gulbarga, Haveri, Koppal and Raichur have not crossed 95 per cent in use of electricity for lighting. In rural Karnataka, the districts like, Yadgir, Bagalkot, Bijapur, Gulbarga, Kodagu, and Belgaum have not crossed 85 per cent level. Therefore, there has been a wide range of disparities in use of electricity for lighting in Karnataka. It explains the exclusion of most of the places of Karnataka, from the use of modern energy source for basic, essential need of lighting. This has been considered as a first step of modern development process. Accordingly, there is a problem in inclusive growth of Karnataka. With this background, an attempt has been also made to estimate the difference between urban and rural Karnataka, in use of electricity for lighting with the help of dummy variable regression model. (12, 16)

EL= α + β D1 + e

Where;

EL = Electricity for Lighting

α = Intercept (Value of benchmark, in the present context it is the value for rural)

β = Difference between bench mark and D1

D1 = Dummy for urban (1 for dummy and 0 for otherwise)

EL= 87.12+ 7.72 D1

(t): (122.70) (7.69)

Sig: 0.000 0.000

R^2 = 505, F = 59.12, Sig: 0.000

It has been found from the results of dummy variable regression model that the average electricity use for lighting in rural Karnataka is 87.12 per cent, which is acceptable. The difference between urban and rural is 7.72 per cent and is positive and acceptable. Therefore, there is a significant difference between urban and rural Karnataka, in use of electricity for lighting. The use of electricity for lighting is significantly low in rural Karnataka. Accordingly, rural Karnataka has not been efficiently included in development process of Karnataka. It is also evident from the results and analysis that, rural Karnataka is denied from modern source of energy for lighting. (9, 17, 18)

3.3 | Status of Use of Kerosene for Lighting in Karnataka

In the following section, an attempt has made to present the relative status of use of kerosene in rural and urban Karnataka. In figure 2, the blue line presents district wise kerosene use status in Karnataka, red line shows kerosene use status in urban Karnataka and green line depicts kerosene use status in rural Karnataka.

It has been found from the figure 2 that, in Karnataka the highest kerosene users for lighting are found in Yadgir district. The lowest kerosene users for lighting are found in Bangalore. In urban Karnataka, in the districts like, Yadgir, Bagalkot, Bidar, Bijapur, Chamarajanagar, Chitradurga, Gadag, Haveri, Koppal and Raichur, more than 5 per cent of households have used kerosene for lighting purpose. In rural Karnataka, in the districts like, Yadgir, and Bijapur, more than 20 per cent of households have used kerosene for lighting purpose. Therefore, there has been a wide range of disparities, in use of kerosene for lighting in Karnataka. (19, 20)

It explains that the households still dependent on kerosene for lighting. Accordingly, the growth process of Karnataka has failed to, evenly reduce the dependency on kerosene, which is the most eco-inefficient form of energy source. With this background, an attempt has also been made, to estimate the difference between urban and rural Karnataka, in use of kerosene for lighting, with the help of dummy variable regression model.

KL= α + β D1 + e

Where;

KL = Kerosene for Lighting

α = Intercept (Value of benchmark, in the present context it is the value for rural)

β = Difference between bench mark and D1

D1 = Dummy for urban (1 for dummy and 0 for otherwise)

KL= 11.873 - 7.3 D1

(t): (17.843) (-7.757)

Sig: 0.000 0.000

R^2 = 509, F = 60.173, Sig: 0.000

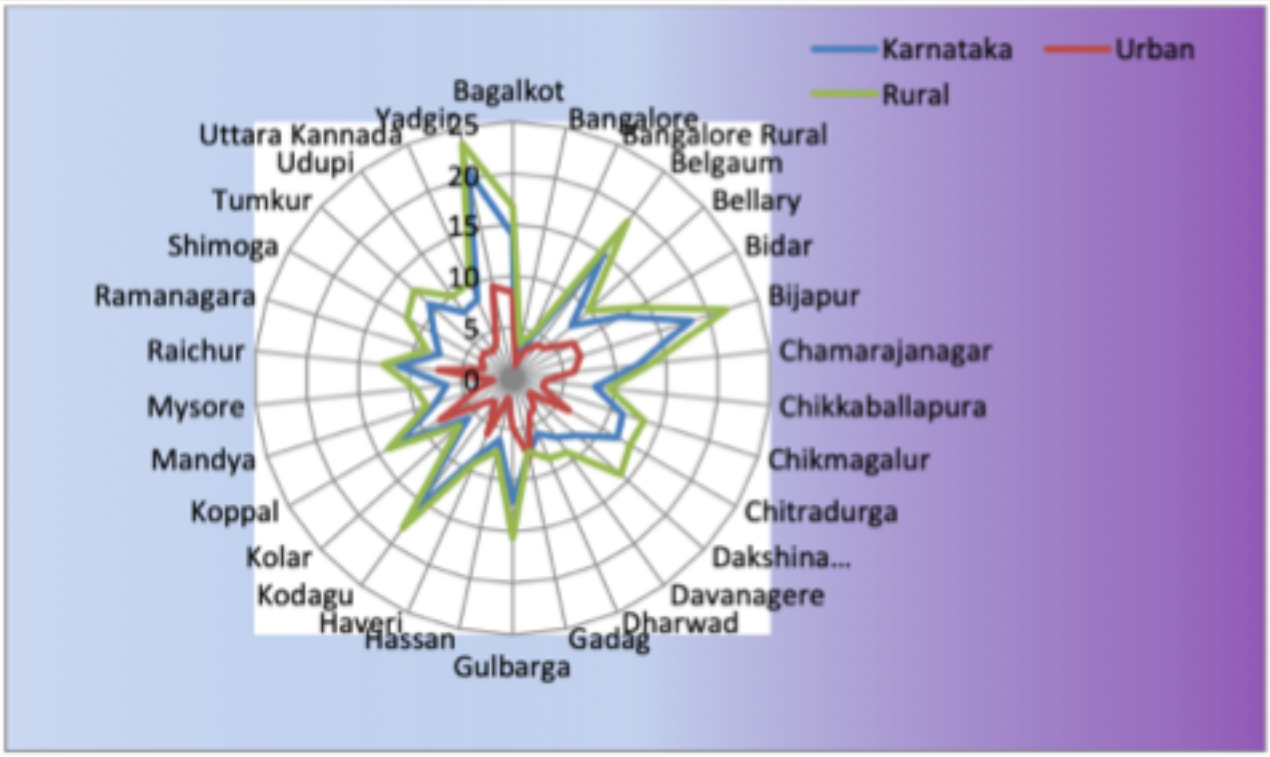

Fig. 2: Use ofKerosene for Lighting in Karnataka

It has been found from the results of dummy variable regression model that the average kerosene use for lighting in rural Karnataka is 11.9 per cent which is acceptable. The difference between urban and rural is -7.3per cent and is negative and acceptable. Therefore, there is a significant difference between urban and rural Karnataka, in use of kerosene for lighting. The use of kerosene for lighting is significantly low in urban Karnataka. Accordingly, rural Karnataka has not been efficiently included in development process of Karnataka. It is also evident from the results and analysis that, rural Karnataka is still using kerosene as a major source of energy for lighting. Accordingly, rural Karnataka is contributing for environmental hazards.

3.4 | Status of Use of Solar for Lighting in Karnataka

In the following section, an attempt has been made to present the relative status of use of solar in rural and urban Karnataka. The blue line presents district wise solar use in Karnataka, red line shows solar use in urban Karnataka and green line depicts solar use in rural Karnataka.

It has been found from the Figure 3 that, in Karnataka, the highest solar users are found in Kodagu district. In urban Karnataka, the highest solar using households are found in Chitradurga district. On other hand, the lowest solar using households are found in Hassan district. In rural Karnataka, the highest solar using households are found in Kodagu and Dakshina Kannada districts. Therefore, there has been a wide range of disparities in use of solar for lighting in Karnataka. It is also identified from the graph that, solar is not a major source of energy for lighting. Accordingly, the growth process of Karnataka has failed, to increase the dependency on solar, which is the most eco-efficient form of energy source for lighting. With this background, an attempt has also been made to estimate the difference between urban and rural Karnataka, in use of solar for lighting, with the help of dummy variable regression model.

$SL = \alpha + \beta\ D1 + e$

Where;

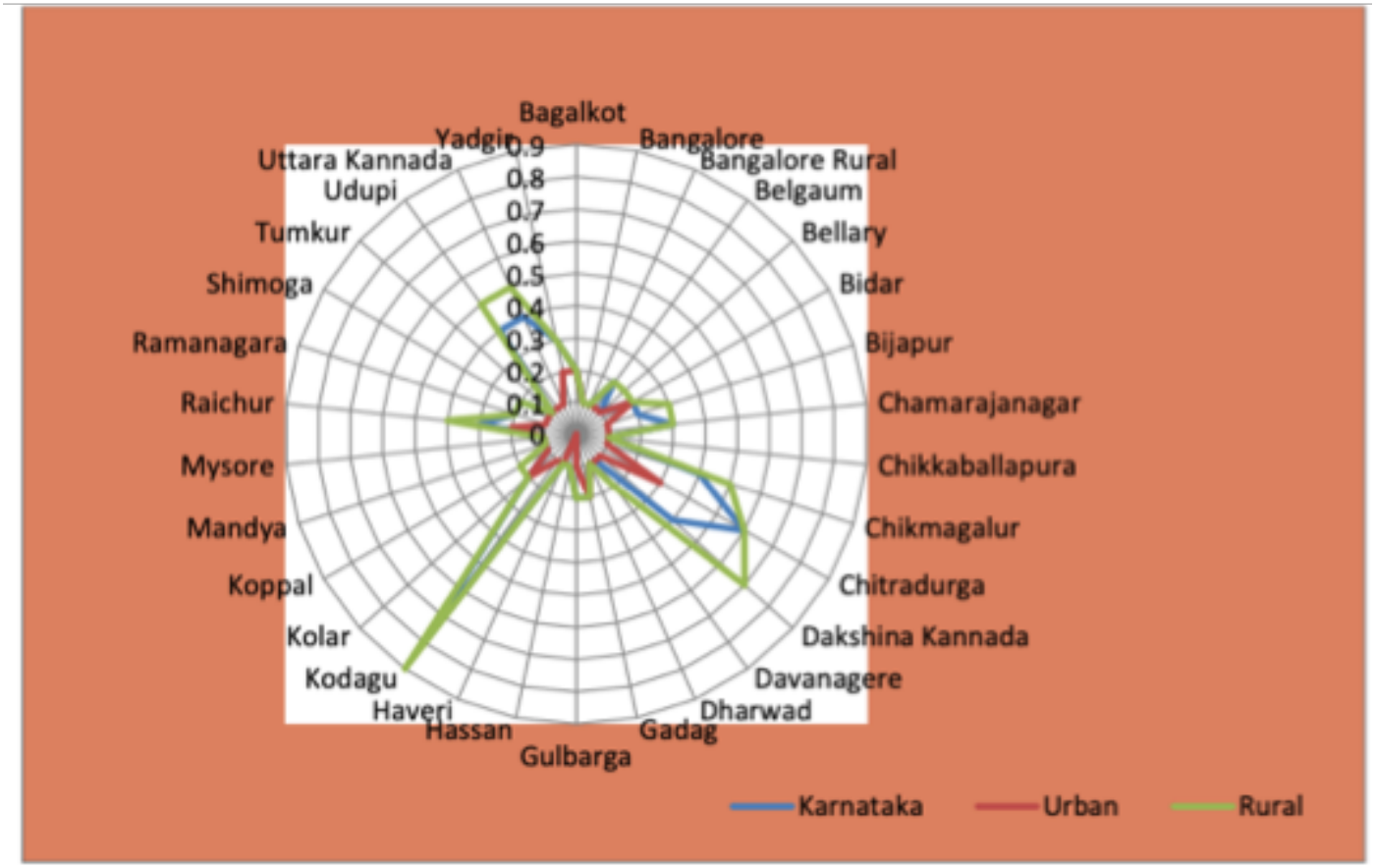

Fig. 3: Use ofSolar for Lighting in Karnataka

SL = Solar for Lighting

α = Intercept (Value of benchmark, in the present context it is the value for rural)

β = Difference between bench mark and D1

D1 = Dummy for urban (1 for dummy and 0 for otherwise)

SL= 0.273 - 0.147 D1

(t): (9.968) (-3.829)

Sig: 0.000 0.000

R^2 = 202, F = 14.650, Sig: 0.000

It has been found from the results of dummy variable regression model that, the average solar use for lighting in rural Karnataka is 0.273 per cent which is acceptable. The difference between urban and rural is -0.147 per cent. It is negative and acceptable. Therefore, there is a significant difference between urban and rural Karnataka, in use of solar for lighting. The use of solar for lighting is significantly low in urban Karnataka. Though, there is a significant difference, altogether, Karnataka has failed to consider solar energy as an eco-efficient tool for its development process. At the same time, rural Karnataka is little ahead in use of solar energy for lighting, due to the acute shortage of electricity and initiations taken by KRDCL and NGOs , to promote solar energy for lighting particularly in rural areas. (21–23)

4 | CONCLUSION

The present study has analyzed the use of energy sources for lighting in both rural and urban areas. It has been found from the analysis that, electricity is the major source for lighting both in urban and rural areas. However, there is a wide range of disparities in availability and use of electricity among the districts in Karnataka. The present study reveals that, the use of electricity for lighting is less in rural areas compared to urban area. Accordingly, rural households are still using kerosene as an alternative for electricity. In both the rural and urban areas, less

than 0.3 per cent of households are using solar for lighting. Therefore, in Karnataka, the use of energy for lighting is not eco-efficient. India is a signatory for Kyoto and Doha agreements on Carbon to reduce it by 18 per cent. The present status of use of energy in Karnataka, for lighting and cooking, will not uphold the Kyoto and Doha agreements, because of its energy eco-inefficiency. Therefore, there is a dire need for government intervention, to restrict the use of kerosene in both urban and rural areas and to promote solar for cooking both in rural and urban areas. As a matter of act, to materialize these strategies, the energy programmes need to be integrated with housing programmes and others. As per the estimations, the installation cost of solar in total cost of house construction is less than 4 per cent, and increasing return to scale operates as size of solar panel increases. Therefore, government may make mandatory of installation of solar with the construction of houses with necessary subsidy schemes and strategies.

REFERENCES

1. Weekly September;3:3953–3959.
2. ;.
3. Bangladesh Energy Policy;35(1):395–402.
4. Kiran KP, Hans VB; 2007.
5. Tamizan AC; 2009.
6. Implications Energy Policy;67:595–604.
7. Shahbaz ML; 2013.
8. Hansen BS. Testing for two-regime threshold cointegration in vector error-correction models. Journal Of Econometrics. 2002;110:293–318.
9. dynamic panel data approach. Ecological Economics;67:41–54.
10. evidence from Malawi Energy Economics;26:61–68.
11. Sascha R, Andreas L; 2015.
12. Bohi D, Toman MA. The Economics of Energy Security. Norwell, Massachusetts: Kluwer Academic Publishers; 1996.
13. industrialization and urbanization in Tunisia. Energy Policy;40:473–479.
14. techniques Energy Economics;18:165–183.
15. Sreenivas A. India's energy policy future: Here be dragons. Elsevier BV; 2014. Available from: https://dx.doi.org/10.1016/j.futures.2013.10.009. doi:10.1016/j.futures.2013.10.009.
16. Ito K, Zhidong L, Komiyama R; 2005.
17. Yu E. The relationship between energy and GNP. Further results. Energy Economics. 1984;6:186–190.
18. Masih AM; 1996.
19. Huang BH; 2008.
20. Cheng B. An investigation of cointegration and causality between energy consumption and economic growth. Journal of Energy Development. 1995;21:73–84.
21. & Mozumdar P; 2007.
22. Asafu-Adjaye J. The relationship between energy consumption, energy prices and economic growth: time series evidence from Asian developing countries. Energy Economics. 2000;22(6):615–625. Available from: https://dx.doi.org/10.1016/s0140-9883(00)00050-5. doi:10.1016/s0140-9883(00)00050-5.
23. Kraft JK. On the relationship between energy and GNP. Energy Development. 1978;3:401–403.

How to cite this article: Saldanha P., G.S D.P. Pattern of Energy Use for Lighting in Karnataka: An Analysis based on Census 2011. Current Educational Research. 2018;22−28. https://doi.org/10.52845/CER/2018/114