

# Consumer's Perception in Adoption of Clean Energy Products in Areas of South Odisha

**Shiv Sankar Das<sup>1\*</sup>, Swagat Ranjan Behera<sup>1</sup>, Debashree Debadatta Behera<sup>2</sup>  
and Sanjib Patnaik<sup>1</sup>**

<sup>1</sup>Zenith School of Management, Bhubaneswar, Odisha, India.

<sup>2</sup>Department of Mechanical Centurion University of Technology and Management, Odisha, India.

## **Authors' contributions**

*This work was carried out in collaboration among all authors. Author SSD designed the study and wrote the first draft of the manuscript, wrote the protocol. Authors SRB and SP managed the literature searches, performed the statistical analysis, analyses of the study. Author DDB managed the Field works. All authors read and approved the final manuscript.*

## **Article Information**

DOI: 10.9734/CJAST/2021/v40i831334

### Editor(s):

(1) Dr. Santiago Silvestre, Universitat Politècnica de Catalunya, Spain.

### Reviewers:

(1) Eftimie Elena, Transilvania University of Brasov, Romania.

(2) Bilal Abdullah Nasir, Northern Technical University, Iraq.

Complete Peer review History: <http://www.sdiarticle4.com/review-history/68168>

**Original Research Article**

**Received 24 February 2021**

**Accepted 29 April 2021**

**Published 04 May 2021**

## **ABSTRACT**

Ending poverty and ensuring sustainability are the defining challenges of the recent times. Clean energy has the answer to both [1]. Clean energy plays a significant role in human development, economic and regional development. Clean energy is that which do not produce any negative externalities. Some of the clean energy includes energy generated from sun, wind, hydro, hydel, etc. This paper discusses on the prevailing market situation and demand prospects of clean energy products (here solar operated lights) in the region of South Odisha. An empirical study was carried out through structured questionnaire to understand the perception of the respondents towards adoption of solar operated lights for their use.

*Keywords: Solar operated lights; clean energy.*

\*Corresponding author: E-mail: [shivsankardas85@gmail.com](mailto:shivsankardas85@gmail.com);

## 1. INTRODUCTION

### 1.1 Clean Energy and Clean Energy Products

Clean energy is that energy which do not produce any negative externalities. "As an example, electricity when used at household level for cooking does not produce noxious gases like that from wood or coal or kerosene. Hence, electricity is a clean energy and wood, coal and kerosene are unclean energy. The production of clean energy may use processes with varying degree of cleanliness. For example, electricity generated from coal follows many unclean processes including coal mining, transportation, coal handling at the power plant, burning of coal, flue gas emission, ash disposal, etc. Whereas electricity generated from solar energy, wind energy, hydro energy, etc. do not have such unclean processes. It is often useful to distinguish end-use energy and its history of transformation for allocations clean/unclean energy. Through energy and product life cycle analysis one can rank them on a cleanliness scale. The energy form and products during its lifespan that generates highest amount of pollutants can be called most unclean and that produces least amount of pollutants can be ranked as most clean" [1].

There are different products which use clean energy for cooking, transforming energy, etc. Clean energy products are "multiple variety of products, that uses clean materials and energy sources, which dramatically reduces the utilisation of natural resources and eliminating emissions and wastes" [2]. Use of clean energy products help in creating new avenues for earning, reduces cost, reduces drudgery and improves health conditions, thus helping in enhancing quality of life in rural areas [2].

Clean energy products are associated with services. Services include installation, repair and maintenance of the clean energy product [3]. For example, installation of a solar based lighting system, training services is provided on how to operate, maintain and repair the product. There are different clean energy products available [4]. These include biomass Cook Stove, Biogas Plant, Biomass Gasifier, Electric Stove, Piped Natural Gas (PNG), Liquefied Petroleum Gas (LPG), Solar Operated Lights, Solar Operated Irrigation Systems, etc [5].

This paper focuses on adoption of clean energy products in general and solar operated lights in particular in the areas of South Odisha.

## 2. METHODOLOGY OF THE STUDY

The basic objective of the study is to promote clean energy products, precisely the solar operated lights in the areas of South Odisha. It will help in increasing the income of rural people and thus enhancing the quality of life. The study was limited to some blocks of Koraput, Malkangiri and Nabarangapur districts of South Odisha.

Both primary and secondary data was collected for this study. Questionnaire along with interview method was carried out to find out the perception of the respondents towards adoption of solar operated lights. Table 1 shows the area of study and number of respondents.

For conducting this study various steps were undertaken. Initially, a non-governmental organisation (NGO) in the local area was chosen and contacted for providing handholding support for conducting this study. Various discussions was held with the officials of the NGO for achieving the same. Discussions were held with the respondents from each block. The list of such respondents was collected from the NGO in a purposive manner. Table 1 shows the number of respondents from each area. Questionnaire was developed in consultation with the officials of the NGO and the researcher. Major variables included source of income, member of cooperative society, access to electricity, consumption of kerosene, activity during evening hours, electricity required during evening hours, awareness level, interest level and price of the product. Table 2 to table 10 shows the interpretation of the data collected.

From Table 2 it was found that 48% respondents depended mainly on agricultural based activities for their income, 12% depended on business activity, 16% depended on wage labour, 16% depended on livestock and forest based activity, 4% depended on job related activity and 4% of them depended on other sources such as tailoring business, carpentry, animal husbandry, etc.

From Table 3 it was found that 41% of the respondents were members of cooperative and 59% were not members of any cooperative.

From Table 4 it was found that 41% of the respondents had access to electricity and 59% of them were not accessed to electricity.

From Table 5 it was found that only 5% of the respondents were consuming 1 litre of kerosene, 26% of them consumed 2 litre, 31% of them consumed 3 litre, 26% of them consumed 4 litre, 8% of them consumed 5 litre and 5% of them consumed 6 litres of kerosene on a monthly basis.

From Table 6 it was found that on 17% of the respondents were carrying out some kind of activity during evening hours and 83% of the respondents were not able to carry out any kind activity during evening hours.

From Table 7 it was found that 3% of respondents required electricity for 4 hours, 24% required for 6 hours, 69% required for 8 hours

and 3% of the respondents required for 10 hours of electricity during evening hours or night time.

From Table 8 it was found that 26% of the respondents were aware about the solar operated lights and 74% of the respondents were unaware about solar operated lights.

From Table 9 it was found that 73% of the respondents were interested to buy solar operated lights and 27% were not interested to buy solar operated lights.

From Table 10 it was found that 17% of the respondents can buy solar operated lights between Rs. 1000/- to 2000/-, 58% can buy solar operated lights between Rs. 2000/- to 3000/-, 18% can buy solar operated lights between Rs.3000/- to 4000/- and 7% can buy solar operated lights between Rs. 4000/- to 5000/- price range.

**Table 1. Area of Study and number of Respondents**

Dist Name	Area of Sample Collection	Number of Respondents
<b>Koraput</b>	Jeypore Block	30
	Kotpada Block	02
	Kundra Block	27
	Baipariguda Block	20
<b>Nabarangapur</b>	Koraput Block	02
	Nabarangapur Block	18
	Pampadahandi Block	8
<b>Malkanagiri</b>	Chatahandi Block	5
	Mathili Block	8

**Table 2. What is your main source of income?**

Age Group	Agriculture	Business	Wage Labor	Livestock and Forestry	Job	Others	Total
21-28	15	6	4	4	1	2	32
29-36	24	8	11	8	4	3	58
37-44	7	0	3	0	0	0	10
45-52	10	0	0	5	0	0	15
53-60	2	0	1	2	0	0	5
<b>Total</b>	<b>58</b>	<b>14</b>	<b>19</b>	<b>19</b>	<b>5</b>	<b>5</b>	<b>120</b>

**Table 3. Are you a member of any cooperative society?**

Age Group	Yes	No	Total
21-28	9	13	22
29-36	18	22	40
37-44	5	13	18
45-52	13	22	35
53-60	4	1	5
<b>Total</b>	<b>49</b>	<b>71</b>	<b>120</b>

**Table 4. Whether electricity is available in your house?**

Age Group	Yes	No	Total
21-28	10	14	24
29-36	15	24	39
37-44	3	14	17
45-52	16	18	34
53-60	5	1	6
<b>Total</b>	<b>49</b>	<b>71</b>	<b>120</b>

**Table 5. Your monthly consumption of kerosene (in Litres)?**

Age Group	1 Litre	2 Litre	3 Litre	4 Litre	5 Litre	6 Litre	Total
21-28	3	2	7	4	2	3	21
29-36	1	15	10	14	2	1	43
37-44	0	3	5	8	3	0	19
45-52	2	8	15	5	2	2	34
53-60	0	3	0	0	0	0	3
<b>Total</b>	<b>6</b>	<b>31</b>	<b>37</b>	<b>31</b>	<b>9</b>	<b>6</b>	<b>120</b>

**Table 6. Are you carrying out/thought of carrying any kind of activity during evening hours that requires light?**

Age Group	Yes	No	Total
21-28	3	18	21
29-36	5	34	39
37-44	5	15	20
45-52	6	28	34
53-60	1	5	6
<b>Total</b>	<b>20</b>	<b>100</b>	<b>120</b>

**Table 7. How many hours of electricity is required during evening hours or night time?**

Age Group	4 Hour	6 Hour	8 Hour	10 Hour	Total
21-28	0	5	13	2	20
29-36	1	9	31	2	43
37-44	0	6	15	0	21
45-52	3	9	21	0	33
53-60	0	0	3	0	3
<b>Total</b>	<b>4</b>	<b>29</b>	<b>83</b>	<b>4</b>	<b>120</b>

**Table 8. Are you aware of solar operated lights?**

Age Group	Yes	No	Total
21-28	5	15	20
29-36	11	27	38
37-44	7	15	22
45-52	6	28	34
53-60	2	4	6
<b>Total</b>	<b>31</b>	<b>89</b>	<b>120</b>

**Table 9. Are you interested in buying solar light?**

Age Group	Yes	No	Total
21-28	14	9	23
29-36	32	9	41
37-44	13	4	17
45-52	24	10	34
53-60	5	0	5
<b>Total</b>	<b>88</b>	<b>32</b>	<b>120</b>

**Table 10. At what price you can buy solar light?**

Age Group	1000 to 2000	2000 to 3000	3000 to 4000	4000 to 5000	Total
21-28	6	8	4	6	24
29-36	5	26	8	0	39
37-44	3	11	5	0	19
45-52	6	22	5	2	35
53-60	0	3	0	0	3
<b>Total</b>	<b>20</b>	<b>70</b>	<b>22</b>	<b>8</b>	<b>120</b>

### 3. RESULTS FROM THE STUDY

From the above study it was found that 48% respondents depended mainly on agricultural based activities in the region. Fifty nine percent of the respondents were not members of any cooperative. Fifty nine percent of the respondents did not have access to electricity, 31% of respondents consumed 3 litre of kerosene on a monthly basis, 83% of the respondents were not able to carry out any kind activity during evening hours, 69% of the respondents informed that they required electricity for 8 hours, 74% of the respondents were unaware about availability of solar operated lights, 73% of the respondents were interested to buy solar operated lights and 58% of the respondents could buy solar operated lights between a price range of Rs. 2000/- to 3000/-.

### 4. RECOMMENDATIONS

Based on the study, this section focuses on the recommendations for adoption of clean energy products in rural areas.

Use of NGO, Cooperative and SHGs as Distribution Channel for Adoption of Clean Energy Products in Rural Areas: Manufacturers find it difficult to access to remote areas to diffuse clean energy products. They become reluctant to build-up a distribution network if they cannot secure a certain amount of sales volume to justify the investment in the first place. For building up the distribution network, the

manufacturers need to diffuse the clean energy products in the rural areas by involving people from NGOs, cooperatives and SHGs present in the local area. Since, NGOs, cooperatives and SHGs focuses on sustainable development by providing avenues for income generation they have a substantial influence in the rural areas covered by them. As a result, the manufacturers need to join hands with NGOs, cooperatives and SHGs for adoption of clean energy products in the rural areas [6]. Manufacturers need to make them their part of distribution channel to achieve the last mile delivery of clean energy products or services in the rural areas. Use of Rural Centric Models for Adoption of Clean Energy Products in Rural Areas: Clean energy products need to be available through various rural centric models. Clean energy products available through haats, village malls, petrol pumps, through associated distribution and rural innovation centres will help in adoption of clean energy products in rural areas. Other possible distribution partners can be post offices, photocopy shops, electrical shops, kirana stores, local tiffin stalls, etc. present in the local area. This will help in adoption of clean energy products in rural areas. Promotional Activities for Adoption of Clean Energy Products in Rural Areas: For promotion of clean energy products in rural areas various promotional activities can be undertaken. Creating awareness programs by conducting live demonstration of the clean energy products in local language, using visual, pictorial advertisements of clean energy product, conducting door-to-door campaign, conducting cycle rally, participating in rural melas, trade fairs, exhibitions, conducting road

shows, performing street plays, campaigning through auto-rickshaws by using loud speakers for communication purpose, conducting puppet shows, showing documentary films, etc. are some of the strategies which can be undertaken for adoption of clean energy products in rural areas [7].

## 5. CONCLUSION

Access to and use of clean energy are essential prerequisites for a good quality of life of an individual [8]. Clean energy products, process and associated technology play an important role for human development. It has the potential to improve health, livelihood and quality of life. For adoption of clean energy products in rural areas, a collaborative approach among facilitating institutions, implementing agencies, financing institutions and other actors needs to be focused. Collaborative approach can be undertaken through technical collaboration, marketing collaboration, financial and consulting collaboration. The consumer's perception towards adoption of clean energy product (here solar operated lights) was found to be high.

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

## REFERENCES

1. Das SS, Behera DD, Mishra SP, Pradhan G. Clean energy access and productive use by bottom of pyramid clients in ethnic & tribal areas of Odisha: An Appraisal. *Current Journal of Applied Science and Technology*. 2020;39(36):38-50.
2. Clean Edge: \$246B Market for Solar, Wind, Biofuels in; 2011 (n.d.). Available: <https://www.greentechmedia.com/articles/read/clean-edge-246b-market-for-solar-wind-biofuels-in-2011>
3. Das SS, Panda H. Smokeless Chulha – A way for enhancing quality of life. *International Journal of Research and Scientific Innovation*. 2017;4:70–78. Available: <https://www.rsisinternational.org/IJRSI/Issue44/70-78.pdf>
4. Energizing India. A Joint Report published by NITI Aayog and IEEJ; 2017. Available: [https://niti.gov.in/writereaddata/files/document\\_publication/EnergyBooklet.pdf](https://niti.gov.in/writereaddata/files/document_publication/EnergyBooklet.pdf).
5. Mavuri S. Impact of Education and Income on Awareness Creation and Buying Decision in case of Solar Products in Visakhapatnam, India. *World Journal of Social Sciences*. 2011;1(1):49- 68.
6. Das SS. "Rural Market and Marketing", *International Journal of Management Technology and Engineering*. ISSN No: 2249-7455 (online). 2018;8(XII).
7. Das SS. "Diffusion of Clean Energy Products: A Conceptual Framework", *Indian Journal of Natural Sciences*. ISSN No: 0976-0997 (online). 2020; 10(59)18251-18268.
8. Painuly J. Barriers to renewable energy penetration; A framework for analysis. *Renewable Energy*. 2001;24(1):73–89.

© 2021 Das et al.; This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Peer-review history:

The peer review history for this paper can be accessed here:  
<http://www.sdiarticle4.com/review-history/68168>