Library Progress International
Vol.44 No. 3, Jul-Dec 2024: P. 16516-16525

Print version ISSN 0970 1052
Online version ISSN 2320 317X

Original Article

Available online at www.bpasjournals.com

Renewable Energy for Sustainable Development in India: Current Status and Future Potentials

[1]Dr Anil Kumar, [2]Dr Kavita Sharma, [3]Dr Ashish Srivastava, [4]Dr Deepankar Singh, [5]Prof. (Dr.) Bhupendra Kumar

[1]Department of History, Government Post Graduate College, Jalesar, Etah, U.P. (India) - drgautamanilkumar99@gmail.com
[2]Department of Zoology, Government Post Graduate College, Jalesar, Etah, U.P. (India) drkavitazoology@gmail.com
[3]Department of Commerce, Government Post Graduate College, Jalesar, Etah, U.P. (India) ashishsrivastava.dei@gmail.com
[4]Department of Commerce, Government Post Graduate College, Jalesar, Etah, U.P. (India) deepankarsingh887@gmail.com
[5]Rajalakshmi School of Business, Chennai
bhupendrakumar@rsb.edu.in , https://orcid.org/0000-0002-9609-2311

How to cite this article: Anil Kumar, Kavita Sharma, Ashish Srivastava, Deepankar Singh, Bhupendra Kumar (2024) Renewable Energy for Sustainable Development in India: Current Status and Future Potentials. *Library Progress International,* 44(3), 16516-16525

Abstract: -
The fast industrialization and populace development in India have driven to an uncommon surge in vitality request, inciting a basic examination of feasible vitality sources. The display think about digs into the current status and prospects of renewable vitality in India, investigating its significant part in cultivating economical advancement. The consider envelops an examination of the current renewable vitality scene, government activities, challenges confronted, and potential arrangements. India has made critical strides within the sending of renewable vitality innovations, with a eminent increment in sun oriented and wind vitality capacity. Government-led activities, such as the National Sun based Mission and Wind Vitality Mission, have played a urgent part in advancing clean vitality selection. In spite of these headways, challenges like intermittency, network integration issues, and financial obstructions endure. Long-standing time points of view of renewable vitality in India are promising, driven by innovative progressions, diminishing costs of renewable advances, and a developing accentuation on supportability.
Key-Words: - NDAIAPA, NISE, ISOs, RTOs, WPPs.

Introduction: -

With an increment within the contamination level of the environment and a diminish within the supply of vitality from fossil fuel, the utilize of renewable vitality has turned vital for accomplishing maintainable and healthy nation development. Sun based vitality, one of the most renewable shapes of vitality is an appealing asset since of its for all intents and purposes boundless accessibility, worldwide conveyance, and contamination free frame. Sun oriented vitality has the going before benefits as a common vitality source: noise-free, pollution-free, boundless, etc. Subsequently, Photovoltaic (PV) have turned to be a prevalent and a green vitality among the accessible renewable vitality sources. Governments in different nations have chosen feed-in taxes to handle the setback of the nursery gas emanations and, the establishment of PV boards within the houses of individuals has gotten to be basic. In this setting, forecast of PV control incited as a investigate space. As detailed by the Universal Vitality Office (IEA), the generation of Sun oriented PV has increased by 31% and appeared the biggest outright development over all renewable advances era in 2018. Within the IEA's most recent 5-year estimate between 2019 and 2024, control capacity from renewable sources driven by sun oriented PV(+136 TWh) is set to create by 50%. Be that as it may, the operation of the sun oriented PV system is exasperates by intermittency and instability of irradiance conveying security and steadiness validations.

The following is the installed capacity for Renewables: -

Table: -1 Installed capacity for Renewables

Wind power	46.65 gigawatt
Solar Power	85.47 gigawatt
Biomass/Co-generation	10.35 gigawatt
Small Hydro Power	5 gigawatt
Waste To Energy	0.59 gigawatt
Large Hydro	46.92 gigawatt

Source: Invest India Report-2024

The following list of renewable energy-related activities will be taken into consideration for the trading of carbon credits using bilateral or cooperative approaches under the Article 6.2 mechanism:

1. Renewable energy with storage (only stored component)
2. Solar thermal power
3. Off-shore wind
4. Hydrogen Green
5. Ocean current energy, ocean wave energy, ocean thermal energy, ocean salt gradient energy, and tide energy
6. Transmission of high voltage direct current in conjunction with renewable energy projects
7. Ammonia in Green.

Review of Literature: -

The review of literature brings forth the relevant peer-reviewed research papers and articles, Government reports, reports from different Ministries like Ministry of New and Renewable Energy, Ministry of Power and HRD Ministry on the technological innovations, installation, policy measures of the Centre Government.

1.

2. **Government policy- solar policy:-**

Solar power is the most promising renewable energy technology as it provides onsite electricity. It is environment friendly as it is nonpolluting and also avoids sound pollution unlike wind energy.

The government of India launched the Jawaharlal Nehru National Solar Mission also known as National Solar mission in 2010, with the active participation and support from all States to promote solar energy. The target of the mission was revised in 2015 to install 100 GW from the earlier 20 GW, of solar power by 2022. Implementation oftargets and timely completion was made mandatory from all states. The initiative has been formulated to promote ecologically sustainable growth throughout the nationand to address India's energy security. The mission plays active role in India's contribution to fight against the issues of Climate Change, which has become a big concern across the globe.

3. **Table: -2 Year-wise targets (in MW)**

Category	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	Total
Rooftop solar	200	4,800	5,000	6,000	7,000	8,000	9,000	40,000

Ground mounded solar projects	1800	7,200	10,000	10,000	10,000	9,500	8,500	57,000
Total	2000	12,000	15,000	16,000	17,000	17,500	17,500	97,000

Source: **Kapoor (2015)**

4. Table 3:- Energy Resource Availability in India

Source	Capital cost (Crores/MW)	Emissions (t CO2-eq/ Mwh	Reserves	Longevity
Coal	4-5	1.1	105820MT	70Years
Oil	2-5	0.62	1200 MT	-10
Gas	3-5	0.47	1.5TCM	-20
Hydro	6-20(site and size dependent)	0	148.7GW	NA
Nuclear	8-13	0	70,000 (Tonnes of Uranium-20tonnes of Pu)	40 (Years with Uranium)

Source**: Statistical review report, NHPC, NTPC**

According to the statistical review report, the resource availability of coal is limited and will be depleted in 70 years, with the current rate of development, and oil and gas has approximately 10-20 years and nuclear power with uranium as its source as raw material, may last only for 40 years.

4.1 Objectives of the Study:-

1. With advancement in technology, the energy demand of the world is increasing constantly but the conventional power sources are limited in supply.
2. Uninterrupted energy supply is important for the growth of organisations and also has direct impact on the standard of living and economy of a country.
3. To meet the increased demand of energy, a transition from conventional source of energy to the renewable source is recommended. Renewable energy is the ultimate solution but not very popular.

5. Research design:-

The analysis of the study has been done using PLS SEM. The constructs' validity and dependability were examined, and a cost-benefit analysis was conducted using the State Electricity Board's internal rate of return (IRR), net present value (NPV), and payback period for the various commercial, industrial, and educational building categories with their various power tariffs.

Research Methodology: -

As the country faces a huge energy deficit, In recent years, India has had peak and energy shortfalls. The state's peak demand gap grew from 5% in FY 2005–06 to 19% in FY 2011–12. Peak demand for electricity climbed at a compound annual growth rate (CAGR) of 9% between 2005–06 and 2011–12, while peak supply expanded at a

CAGR of 6%. Over the previous eight years, the peak demand-peak met shortfall increased at a 20% CAGR. (Greencleanguide, 2013).

6. Hypotheses of the study:-

The hypotheses for the current study are divided into three sections.

- Hypotheses for the institutions in Commercial Buildings
- Hypotheses for Industry
- Hypotheses for Educational Institutions.

Here the Renewable Energy means grid connected Solar Photovoltaic. This study has tried to look at the effect of Solar Photovoltaic installations on various parameters affecting business aspects. Specifically the research has taken into account the effect on five variables- Productivity, Performance, Effectiveness Corporate Values and Customer Acceptance for Commercial and Industrial institutions and Performance, Effectiveness and Customer Acceptance for Educational institution. The study has focused on the effect of the five variableson three sustainable benefits that accrue to the institutions who have installed the technology- Environmental, Social and Financial Benefits.

7. Data collection:-

Primary and secondary data

Primary data was procured through a structured questionnaire administered to Commercial, Industrial and Educational institutions. The total number of organisations under study are 191, comprising of 70 Commercial buildings, 59 Industry and 62 Educational Institutions. The secondary data was derived from the peer-reviewed papers, articles, Government reports, reports of different Ministrieslike Ministry of New and Renewable Energy, Ministry of Power and HRD Ministry.

Data Analysis and Interpretation of Commercial Building, Industryand Educational Institution

Demographic characteristics of individual respondents

The Data was collected from 70 Commercial buildings. The following tables demonstrate the type of the organisation, size pertaining to the number of employees working in the organisation and the type of market the company cater to. The availability of power, the frequency of power failures, the use of generator and the number of hours of the use of generators are also recorded.

7.1 Table: -4 Frequency tables on the Types of Organizations in CommercialBuildings

		Frequency	**Per cent**
1	Mall & Shopping centers	2	2.9
2	Office	24	34.3
3	Manufacturing units	20	28.6
4	Retail outlet	8	11.4
5	Hotels/ Restaurants	2	2.9
6	Deparment stores	9	12.8
7	Others (resorts etc)	5	7.1
	Total	70	100.0

Table:-5 Size of the organization in terms of employees

	Frequency	**Per cent**
15 –50	33	47.1
50 – 100	23	32.9
100– 500	12	17.1
500-1000	2	2.9
Total	70	100.0

The sizes of the organizations in terms of the employees are provided in Table -5. Number of employees which ranges from 15 to 100 are found in 80 % of the organization under study and 20% of the organisations have employees ranging from100-1000 numbers

7.2 Measurement model assessment: Convergent validity

7.3 The normal change extricated (AVE) test is exceedingly prompted for evaluating concurrent legitimacy (Naylor et al., 2012). A limit esteem of AVE more prominent than 0.50 is utilized to assess focalized legitimacy (McLure Wasko & Faraj, 2005; Wixom & Watson, 2001). AVE, or normal of squared external loadings of all indicators of a develop, could be a degree of the communality of a certain build as well. In this investigate of businesses with sun powered PV establishment, all exogenous and endogenous idle variable developments had AVE values over the limit esteem of 0.50 (Table 6). Subsequently, all exogenous and endogenous idle variable builds of all estimation models have merged legitimacy.

7.4 Summary of the reflective measurement model

To evaluate the validity and dependability of measurement tools, measurement models were conducted. Table 6 provides a summary of the findings following the use of reflective measurement methods to assess the validity and reliability in the industry.

7.5

7.6

7.7 Table:-6 Results summary for Reflective measurement models

Latent Variable	Elements that the indicator capture	Outer Loadings	Indicator Reliability	Composite Reliability	AVE
PRO	PRO2	0.849	0.720	0.863	0.760
	PRO4	0.893	0.797		
CA	CA1	0.873	0.762	0.908	0.767
	CA2	0.847	0.717		
	CA4	0.906	0.820		
CV	CV1	0.820	0.672	0.887	0.663
	CV2	0.888	0.788		
	CV3	0.749	0.561		
	CV4	0.793	0.628		
EM	EM1	1.000	1.000	1.000	1.000
ENV	ENV2	0.825	0.680	0.816	0.690
	ENV3	0.836	0.698		
FIN	FIN2	0.821	0.674	0.955	0.811
	FIN3	0.880	0.774		
	FIN4	0.980	0.960		
	FIN5	0.952	0.906		
	FIN6	0.862	0.743		

GP	GP2	0.792	0.627	0.802	0.670
	GP4	0.844	0.712		
PER	PER1	0.716	0.512	0.882	0.655
	PER3	0.772	0.595		
	PER4	0.796	0.591		
	PER7	0.937	0.877		
EFF	EFF1	0.762	0.580	0.906	0.661
	EFF2	0.892	0.795		
	EFF4	0.733	0.537		
	EFF6	0.762	0.580		
	EFF7	0.899	0.808		
RM	RM4	0.860	0.739	0.893	0.807
	RM5	0.935	0.874		
SOC	SOC1	0.730	0.532	0.867	0.621
	SOC3	0.762	0.580		
	SOC4	0.867	0.751		
	SOC5	0.786	0.617		

Among the 34 indicators that the measurement models of the present study in Industryhave used, all indicators have outer loadings above the threshold value of 0.70 (Table-6). This indicates that there exists a satisfactory level of indicator reliability.Further, the composite reliability values of all reflective measurement models are higher than 0.8 (Table-6). This is indicative of internal consistency reliability of measures of all constructs. Moreover, all constructs have AVE values that are higher than 0.50 (Table-6), which suggests that there exists convergent validity.

7.8 Measurement model assessment: Discriminant validity

PLS provides a more reliable method of ensuring that a particular model concept is different from other constructs when assessing discriminant validity (McLure Wasko & Faraj, 2005). The square of the correlations between the variables has been compared with the AVE in order to evaluate the discriminant validity (Chin, 1998). It is necessary to calculate the measurement models prior to evaluating the structural model.
While reportingand assessing the results, instructions for PLS-SEM as propounded by Hair et al. (2014) is referred.

7.9 Measurement model assessment: Discriminant validity among latent constructs: Fornell-Larcker criterion.
Discriminant legitimacy may be inspected utilizing the Fornell-Lacker (1981) criteria, which compares the square root of AVE to other idle factors. Hence, discriminant legitimacy may be a degree of a construct's uniqueness. Table-7 appears how the square root of AVE for each idle variable outperforms its affiliation with other inactive factors in Industry.

7.10 Table: -7 Discriminant validity by Fornell-Larcker criterion

	PRO	CA	CV	EM	ENV	FIN	GP	PER	EFF	RM	SOC
PRO	0.872										
CA	0.204	0.876									
CV	0.528	0.249	0.814								
EM	0.213	0.580	0.479	1.000							
ENV	0.707	0.303	0.647	0.212	0.830						
FIN	0.613	0.243	0.586	0.249	0.771	0.901					
GP	0.758	0.397	0.442	0.234	0.771	0.664	0.818				
PER	0.453	0.406	0.649	0.416	0.716	0.717	0.503	0.809			
EFF	0.564	0.688	0.587	0.596	0.701	0.498	0.716	0.569	0.813		
RM	0.367	0.620	0.621	0.400	0.673	0.579	0.536	0.694	0.688	0.898	
SOC	0.784	0.401	0.723	0.370	0.812	0.776	0.738	0.745	0.766	0.675	0.788

The numbers in Table 7 demonstrate that there is discriminant validity among all of the measurement model's components since each latent construct's square root has a stronger correlation with itself than with any of the other latent constructs. Researchers believe that the aforementioned criterion is conservative when evaluating discriminant validity, since it aligns with the Fornell-Lecker criterion (Hair et al., 2014). The degree to which a certain model construct differs from others (Chin, 1998; Hair et al., 2014; Fornell-Lacker, 1981; McLure Wasko & Faraj, 2005). The diagonal values in Table 7 represent the square root value of the AVE of the build in this research of Industry with Solar PV installation, and they are greater when compared both vertically and horizontally with other constructs values.

7.11 Measurement model assessment: Discriminant validity among latent constructs: Cross loading method

Cross-loadings of indicators, which are considered to be liberal in assessing discriminant validity, constitute another method of assessing discriminant validity. The outer loadings of indicators are expected to be higher than their cross-loadings onother constructs. The below-mentioned cross-loading table demonstrates the presence of discriminant validity in the constructs of Industry in this study.

7.12 Table:-8 Discriminant validity by cross loading method

	PRO	CA	CV	EM	ENV	FIN	GP	PER	EFF	RM	SOC
PRO2	0.849	0.114	0.332	0.054	0.532	0.451	0.754	0.217	0.414	0.145	0.542
PRO4	0.893	0.233	0.571	0.298	0.691	0.607	0.583	0.548	0.559	0.469	0.806
CA1	0.009	0.873	0.123	0.543	0.151	0.078	0.191	0.313	0.527	0.500	0.248
CA2	0.257	0.847	0.241	0.403	0.292	0.226	0.357	0.347	0.562	0.570	0.344
CA4	0.283	0.906	0.287	0.569	0.349	0.324	0.486	0.402	0.711	0.562	0.453
CV1	0.498	0.367	0.820	0.604	0.624	0.580	0.523	0.579	0.736	0.568	0.741
CV2	0.524	0.280	0.888	0.432	0.623	0.529	0.530	0.638	0.693	0.544	0.691
CV3	0.365	0.018	0.749	0.091	0.467	0.390	0.213	0.486	0.156	0.483	0.478
CV4	0.287	0.091	0.793	0.397	0.336	0.373	0.076	0.365	0.210	0.398	0.375
EM1	0.213	0.580	0.479	1.000	0.212	0.249	0.234	0.416	0.596	0.400	0.370
ENV2	0.620	0.114	0.387	0.114	0.825	0.627	0.639	0.595	0.502	0.456	0.710
ENV3	0.555	0.386	0.684	0.236	0.836	0.653	0.641	0.595	0.661	0.660	0.803
FIN2	0.697	0.418	0.697	0.433	0.796	0.821	0.737	0.702	0.747	0.753	0.861
FIN3	0.460	0.259	0.539	0.244	0.618	0.880	0.503	0.590	0.420	0.513	0.649
FIN4	0.552	0.270	0.498	0.242	0.729	0.980	0.641	0.684	0.461	0.562	0.732
FIN5	0.548	0.193	0.478	0.163	0.703	0.952	0.615	0.653	0.389	0.452	0.678

FIN6	0.450	0.128	0.378	0.031	0.575	0.862	0.429	0.561	0.123	0.243	0.509
GP2	0.644	0.193	0.305	0.092	0.692	0.625	0.792	0.445	0.508	0.404	0.599
GP4	0.601	0.443	0.413	0.279	0.580	0.474	0.844	0.385	0.656	0.470	0.610
PER1	0.294	0.131	0.466	0.482	0.321	0.400	0.195	0.716	0.164	0.373	0.364
PER3	0.509	0.298	0.519	0.400	0.467	0.446	0.486	0.772	0.443	0.419	0.548
PER4	0.222	0.380	0.515	0.200	0.683	0.672	0.325	0.796	0.514	0.656	0.677
PER7	0.466	0.417	0.596	0.367	0.718	0.704	0.563	0.937	0.597	0.693	0.724
EFF1	0.218	0.715	0.290	0.628	0.246	0.254	0.456	0.273	0.762	0.359	0.356
EFF2	0.472	0.648	0.475	0.453	0.724	0.460	0.586	0.571	0.892	0.655	0.758
EFF4	0.433	0.405	0.458	0.482	0.462	0.227	0.551	0.382	0.733	0.542	0.446
EFF6	0.524	0.461	0.536	0.336	0.623	0.466	0.704	0.371	0.762	0.486	0.646
EFF7	0.563	0.604	0.567	0.585	0.658	0.526	0.590	0.619	0.899	0.678	0.773
RM4	0.235	0.385	0.506	0.259	0.471	0.403	0.331	0.537	0.504	0.860	0.457
RM5	0.399	0.684	0.600	0.433	0.705	0.607	0.591	0.691	0.704	0.935	0.718
SOC1	0.406	0.641	0.526	0.430	0.737	0.592	0.603	0.667	0.745	0.760	0.730
SOC3	0.760	0.153	0.474	0.319	0.730	0.471	0.583	0.452	0.601	0.389	0.762
SOC4	0.610	0.364	0.616	0.222	0.765	0.620	0.558	0.577	0.599	0.518	0.867
SOC5	0.680	0.120	0.659	0.197	0.639	0.759	0.578	0.652	0.472	0.468	0.786

The cross loading is examined such that outer loadings on the associated construct should be greater than all of its loadings on other constructs. As shown in the Table-8, above the loadings on the associated construct is higher than all of its loadings on other constructs which establishes discriminant validity of constructs in the studyof Industry with Solar PV installations.

7.13 Measurement model assessment: Discriminant validity among latent constructs: Heterotrait-Monotrait Ratio (HTMT)

A different way to evaluate the discriminant validity in PLS-SEM is to use the correlations' heterotrait-to-monotrait ratio (HTMT). Furthermore, Nunnally (1978) and Netemeyer et al. (2003) proposed that the correlation between the constructs be computed using the HTMT approach. HTMT uses two methods to evaluate discriminant validity. As both a statistical test and a criteria in the first place. The specified threshold value is used as a criteria to compare the HTMT readings. Discriminant validity is proven if the HTMT value is less than the threshold value. There is debate over the HTMT's predetermined threshold value. Few writers (Gold et al., 2001; Teo et al., 2008) suggested that the cutoff value be at least 0.90. However, some argue that the threshold value ought to be the same equal to or below 0.90 (Gold et al., 2001; Teo et al., 2008). But others propose that the threshold value should be equal to or below 0.85 (Clark & Watson 1995; Kline, 2011). But in this research endeavour notations, HTMT.90 is taken into consideration than HTMT.85. Second, the HTMT can serve as the basis of a statisticaldiscriminant validity test.

7.14 Table:-9 Discriminant validity by Heterotrait-Monotrait ratio (HTMT) method

	PRO	**CA**	**CV**	**EM**	**ENV**	**FIN**	**GP**	**PER**	**EFF**	**RM**	**SOC**
PRO											
CA	0.314										
CV	0.667	0.290									
EM	0.244	0.626	0.513								
ENV	0.343	0.460	0.827	0.284							
FIN	0.742	0.313	0.639	0.255	0.357						
GP	0.301	0.585	0.629	0.318	0.468	0.851					
PER	0.615	0.451	0.766	0.491	0.322	0.770	0.751				

EFF	0.698	0.808	0.649	0.656	0.864	0.510	0.260	0.611		
RM	0.464	0.737	0.760	0.438	0.563	0.640	0.817	0.816	0.799	
SOC	0.342	0.492	0.863	0.417	0.380	0.882	0.162	0.881	0.885	0.839	

Discriminant validity of HTMT ratio of correlations substantiates, with the available empirical evidence provided by this research endeavour, the mutual distinguishability among different constructs of the study. The discriminant validity is estimated when the value of the HTMT is equal or below than the predefined threshold value. In case, if the HTMT values are above the predefined threshold value then there is no discriminant validity. As shown in the table-9, the HTMT values are below than predefined threshold values establishing discriminant validity among the constructs ofthe industry with the incorporation of Solar PV.

Conclusion: -

References:-

1. Chr.Von Zabeltitz (1994) Effective use of renewable energies for greenhouse heating. Renewable Energy 5:479-485.
2. Charles Rajesh Kumar. J, Vinod Kumar.D, M.A. Majid (2019) Wind energy programme in India: emerging energy alternatives for sustainable growth. Energy & Environment 30(7):1135-1189.
3. National electricity plan (2016), Volume 1, Generation, Central Electricity Authority (CEA),Ministry of Power, GOI ..
4. Canadian environmental sustainability indicators (2017), Global greenhouse gas emissions.
5. Kumar B. (2022). The continuous investment in artificial intelligence and its impact on ensuring customer satisfaction. Korea review of international studies, Volume 15, Special Issue 03
6. Pappas D (2017) Energy and Industrial Growth in India: The Next Emissions Superpower? Energy procedia 105:3656–3662
7. Aggarwal P (2017) 2 °C target, India's climate action plan and urban transport sector. Travel Behavior and Society 6:110–116
8. Kumar B. (2022). Application of blockchain technology as a support tool in economic & financial development. Manager- The British Journal of Administrative Management, ISSN:1746-1278
9. Blondeel M, Van de Graaf T (2018) Toward a global coal mining moratorium? A comparative analysis of coal mining policies in the USA, China, India and Australia. Climatic Change 150(1-2):89–101
10. Kumar S (2016) CO2 emission reduction potential assessment using renewable energy in India. Energy 97:273–282
11. Charles Rajesh Kumar. J, Mary Arunsi. B, Jenova. R, M.A.Majid (2019) Sustainable waste management through waste to energy technologies in India—opportunities and environmental impacts .International journal of renewable energy research 9(1): 309-342.
12. Kumar B. (2021). Determinants of internet financial reporting: in the case of Ethiopian insurance and banking sector companies. Innovations , Journal article
13. Kumar B. (2019). The effect of remittance on economic growth of eastern African countries. International Journal of Social Science & Management Studies Vol. - 6, No. – 1 Page-13-26
14. National Institution for Transforming India(2015), Government of India, Report of the Expert group on 175 GW RE by 2022, 31 Dec 2016.
15. Sholapurkar RB, Mahajan YS (2015) Review of wind energy development and policy in India. Energy Technology & Policy 2:122–132
16. India Energy scenarios 2047 (2015), ISGF for planning commission. 01 Jan 2017].
17. Harrison T, Kostka G (2014) Balancing priorities, aligning interests: developing mitigation capacity in China and India. Comparative Political Studies 47:450-480
18. Akash KumarShukl (2017) Renewable energy resources in South Asian countries: challenges, policy and recommendations.Resource-Efficient Technologies 3: 342-346.
19. Schmid G (2012) The development of renewable energy power in India: which policies have been effective? Energy Policy 45:317–326

20. Kumar B.(2020). Determinants of dividend payout ratio: empirical evidence from Ethiopian private banks. Palarch's Journal of Archaeology of Egypt/Egyptology
21. Vikas Khare, SavitaNema,PrashantBareda (2013) Status of solar wind renewable energy in India, Renewable and Sustainable Energy Reviews. 27: 1-10
22. Singh R (2015) India's renewable energy targets: How to overcome a $200 billion funding gap. Renewable Energy Focus. 16(4):60–61
23. T.Blenkinsopp, S.RColes ,K.Kirwan (2013) Renewable energy for rural communities in Maharashtra, India, Energy Policy.60:192-199
24. Kandp TC, Garg HP (1998) Renewable energy education for technicians/mechanics. Renewable Energy. (14(1–4):393–400
25. Subhes C,Bhattacharyya , Shaping a sustainable energy future for India: management challenges, Energy Policy .38(8):4173-4185
26. Swaran Singh, BoparaiK.C.Secretary, India and renewable energy: a future challenge, Renewable Energy.15(1–4): 16-21.
27. Rehman S, Hussain Z (2017) Renewable energy governance in India: challenges and prospects for achieving the 2022 energy goals Journal of Resources, Energy and Development. 14(1):
28. K Kaygusuz, S. BilgenEnergy related environmental policies in Turkey Energy Sources Part B, 3 (2008), pp. 396-410.
29. Y Chang, J Lee, H. Yoon Alternative projection of the world energy consumption-in comparison with the 2010 international energy outlook Energy Policy, 50 (2010), pp. 154-160.
30. Wang W (2014) M Zhang. P. Li Exploring temporal and spatial evolution of global energy production and consumption Renew Sustain Energy Rev 30:943–949
31. BP Energy Outlook country and regional insights-India (2018)
32. EIA Energy outlook 2019 with projections to 2050 (2019)
33. International energy outlook 2018 (IEO2018), EIA Energy outlook 2018(2018).