e-ISSN:2582-7219

INTERNATIONAL JOURNAL OF MULTIDISCIPLINARY RESEARCH IN SCIENCE, ENGINEERING AND TECHNOLOGY

Volume 7, Issue 5, May 2024

INTERNATIONAL STANDARD SERIAL NUMBER INDIA

Impact Factor: 7.521

International Journal of Multidisciplinary Research in Science, Engineering and Technology (IJMRSET)

| ISSN: 2582-7219 | www.ijmrset.com | Impact Factor: 7.521| Monthly, Peer Reviewed & Referred Journal|

| Volume 7, Issue 5, May 2024 |

| DOI:10.15680/IJMRSET.2024.0705161 |

Conventional and Non-conventional Energy use in Ahmednagar

Hariom Mishra, Dr. Sukeerti Singh

Scholar, Department of Chemistry, Sunrise University, Alwar, India

Professor, Department of Chemistry, Sunrise University, Alwar, India

ABSTRACT: A strong energy mix of Renewable Energy Sources (RESs) is needed for sustainable development in the electricity sector. India stands as one of the fastest developing countries in terms of RES production. the main objective of this review is to critically scrutinize the Maharashtra state energy landscape to discover the gaps, barriers, and challenges therein and to provide recommendations and suggestions for attaining the RES target by 2022. This work begins with a discussion about the RES trends in various developing countries. Subsequently, it scrutinizes the installed capacity of India, reporting that Maharashtra state holds a considerable stake in the Indian energy mix. A further examination of the state energy mix is carried out by comparing the current and future targets of the state action plan. It is found that the installed capacity of RESs accounts for about 22% of the state energy mix. Moreover, the current installed capacity trend is markedly different from the goals set out in the action plan of the state. Notably, the installed capacity of solar energy is four times less than the target for 2020. Importantly, meeting the targeted RES capacity for 2022 presents a great challenge to the state. Considering this, an analysis of the state's strengths, barriers, and challenges is presented. Moreover, strong suggestions and recommendations are provided to clear the track to reach the desired destination. This can be useful for the government agencies, research community, private investors, policymakers, and stakeholders involved in building a sustainable energy system for the future.

KEYWORDS: Economy, urban area, Growth, population, Energy Resources

I. INTRODUCTION

Every sector of the economy relies on energy. Energy resources are essential for the day-to-day operation of every sector of society, including households, businesses, and the tertiary sector. The demand for energy resources is rising at a high rate due to the rapidity of global growth. However, a new obstacle has emerged in the form of the diminishing availability of fossil fuels, which makes it more difficult to maintain both economic expansion and environmental sustainability. This obstacle prevents the developed and developing worlds from making renewable energy compatible and efficient enough for their economies. A new global energy economy is taking shape, according to Lester R. Brown's 2015 [4] book "The stated, Great "As Transitfossion" lfue, air pollution is becoming worse, and worries about climate change are casting a shadow on the future of fossil fuels. The economy that relied on fossil fuels

is giving way to one that harnesses the power of the sun and the wind. The government is attempting to influence every part of the economy to support renewable energy and fight climate change. Programs supporting the construction of wind farms, hydropower (both large and small), solar electricity, and Renewable Purchase Obligations (RPOs) are all available. Solar power is one example of a decentralised energy source that is readily implementable at the home level. Rooftop solar photovoltaic programs are already in place globally, and some Indian states are actively pushing for their implementation as well. Photovoltaics, whether installed on or off the grid, are a great way to increase the use of renewable energy sources nationwide. The industrial sector can be powered by the current efficiency of renewable energy sources. Reasons for this include the fact that renewable energy technology is still in its early stages of development and that there are many geographical and technical constraints that restrict the use of renewable energy sources. Domestic sector engagement in renewable energy consumption will therefore play a very major role in accomplishing the targets in the future.

According to the World Bank Group (2014) [5], company owners in India rank the unreliability of the electrical supply as the second most significant challenge to the growth of their businesses. Because of these and other factors, urban regions have low economic activity and high unemployment rates (IEA, 2015). As a result, people in urban areas are moving to cities, where they believe the infrastructure is better and the quality of life is higher (IOM, 2015). Utilities have less of a need to invest in distribution systems serving urban areas as people leave villages and the economy becomes

| ISSN: 2582-7219 | www.ijmrset.com | Impact Factor: 7.521| Monthly, Peer Reviewed & Referred Journal|

| Volume 7, Issue 5, May 2024 |

| DOI:10.15680/IJMRSET.2024.0705161 |

more concentrated in cities. Contrarily, the country's economic development may be healthier and more balanced if urban regions are given with a steady electricity supply. There is a one-of-a-kind chance to enhance the preservation of perishable fruits and vegetables via refrigeration if there is a better power supply in urban regions. In fact, in 2012, the Ministry of Food Processing Industry projected that significant agricultural output lost a total of Rs.92000 Crore ($13.8 billion) during harvest and post-harvest processes.

Sustainable development has taken on several meanings: it is the motto of environmental and developmental activists, the language of development planners, the subject of conferences, and the watchword of international assistance organizations. The approval of Agenda 21 and the several Conventions that emerged from the UNCED-1992 has ensured that sustainable development is now an integral aspect of all global climate change policy talks (Sathaye *et al*, 2006) [6]. Is it worth sacrificing short-term gains in employment and GDP to ensure environmental protection in the long run? Economic development and environmental sustainability are frequently seen as two sides of the same coin by policymakers in emerging nations. Concerning long-term economic growth and development, especially in the least developed nations, "there is growing evidence to show that environmental conservation for sustainability of natural resources is not a luxury but a necessity," according to Sathaye *et al*. (2006) [6].

As it relates to the Paris Climate Agreement, India has spoken about its INDCs. Among its primary goals was the increase of non-fossil fuel-based energy capacity to 40% by 2030 and the reduction of GDP's emission intensity by 35% from 2005 levels by 2030. Energy independence is also crucial, and India plans to cut its oil imports by 10% by 2022 to achieve just that. Imports account for over 83% of India's crude oil supply at the moment. While renewable energy holds great promise for economic development in the years to come, the obstacles standing in the way are more formidable than they first appear, as stated in the Energy Statistics Report (2016) prepared by the Central Statistics Office (CSO) of India. Massive solar and wind power projects are now in the planning and construction stages in India. Of the entire installed generating capacity of renewable electricity as of March 2016, wind power accounted for around 63% and solar power for 16%, according to the Energy Statistics Report (2017) by CSO. As a result, India is the center of attention as the country sets lofty climate objectives and advances towards renewable energy.

With a total of over 1.3 billion people, India is home to more than 17% of the global population. With a total size of 328 million hectares, it ranks as the sixth biggest nation in the world. Urban regions are home to more than 75% of India's population. After a period of rapid economic change and expansion in the first half of the previous 25 years, India entered a stabilization phase. There was an effect on the economy from global instability and an unpleasant international economic climate as well.

For primary and secondary energy needs, India relies on its coal and hydropower resources. The nation has small nuclear power plants and little oil and natural gas reserves. The coal deposits are low-quality and include a lot of ash. The main resources are unevenly distributed throughout the several areas. Seventy percent of the world's coal reserves are located in the east, whereas more than 70 percent of the world's hydrocarbon reserves are in the west. A great deal of hydropower potential exists in northeastern India. Ahmednagar, Arunachal Pradesh, and Meghalaya are the latest states to see the construction of hydropower projects. To fully use the hydropower generating potential of rivers like as the Brahmaputra and its tributaries, the Teesta and its tributaries, and many more, further hydropower facilities of this kind may be constructed.

According to India's consumption pattern, the proportion of energy used by non-commercial applications has been steadily decreasing over the last several decades. In India, biomass is often used as an energy source. The use of biomass has dropped from 63% to 24% throughout the last fifty years. The shift in energy consumption habits among city dwellers is thought to be responsible for the drop in its use. Different energy consumption trends are seen in urban and urban families. While 65% of city dwellers made the transition to LPG between 1981 and 2011, only 11.4% of urban families did the same. Urban areas have 92% of homes with electric lights, whilst urban areas have just 55%. While only 36% of urban Indian families had access to electricity in 1994, that number rose to over 56% in 2011. While this is true, around 74.1 million urban homes still lack access to power. Power shortages persist in urban communities throughout the nation, even though the output of energy has grown substantially. The power deficit in India has been between 8 and 10% in recent years, with the greatest impact seen by customers in urban areas. According to the data, about 90% of all communities have access to electricity.

| ISSN: 2582-7219 | www.ijmrset.com | Impact Factor: 7.521| Monthly, Peer Reviewed & Referred Journal|

| Volume 7, Issue 5, May 2024 |

| DOI:10.15680/IJMRSET.2024.0705161 |

II. LITERATURE REVIEW

(According to Mei *et al*., 2018) [1], Affordable, eco-friendly, reliable, and power-efficient alternatives to traditional energy sources are what consumers need. Unlike DG systems, which provide electricity from central stations, this one generates power closer to where the users live. General energy use, improved power quality, and dependability are a few other ways DGs may reduce peak demand prices. Techniques such as solar, wind, and fuel cell driven systems are continuously increasing the need for energy and reviving interest in sustainable and affordable power production. As the world's population and technology continue to rise, traditional fossil fuel power plants are becoming less environmentally friendly. For instance, when demand for electrical energy grows, so do problems like acid deposition, global warming, and urban air pollution. Hence, fuel cells may work in tandem with other renewable energy conversion technologies, such as PV cells and wind turbines, in various networked and autonomous systems.

In grid-connected photovoltaic systems, collected power is either sent back to the grid or used to power AC-connected loads. Battery technology is used in hybrid systems to compensate for variations in generation and demand. Maximum Power Point Tracking (MPPT) is used to determine the duty cycle, as increasing output voltage increases power. Energy sources are utilized to their maximum potential, with the load bus voltage kept constant. The MPPT system uses an FLC to harness solar and wind power. Digitally controlled multiphase switching DC-DC converters with PWM switching are used to manage energy in a DC micro-grid and control load power. The Power Electronic Simulation (PSIM) program is used to model and examine the dynamic behavior of all power sources. The power tracking control method stabilizes PV and load variations by coordinating storage device operation. Optimal power with stable output voltage can be achieved by integrating phase-shifted pulse width modulation (PWM) with dual pulse width modulation (PI) control. A freestanding hybrid PV/FC/battery system uses an FLC to regulate power flow, allowing the PEMFC/battery system to select the optimal operating conditions.

Energy intensive industrial units have a lot of space to grow when it comes to energy efficiency, as stated by a study by Shali (2014) [3]. To make this a reality, there is an immediate need to upgrade and modernise technology, which includes removing old hardware and replacing it with new microprocessors. Both the federal and state governments have allocated funds under the Eighth Plan to encourage energy efficiency measures, and private companies are also receiving aid from lending institutions. Ambaj Sagan (2022) [2] reveals that between 1973 and 1997, India's overall primary energy production from renewable sources and agricultural waste increased by a factor of 2.5. At about 480 kg of oil equivalent, the country's overall primary energy supply per capita has grown by half during this time. A thirty percent drop in total primary energy per unit of GDP on a purchasing power parity basis occurred throughout the same time.

III. URBANIZATION TRENDS

Of the urban expansion that occurred between 1981 and 1991, 60% was attributable to natural rise, 21% to migration, and 18.80% to reclassification of new towns. Nearly 60% of the entire migration movement has been from urban-to-urban areas, according to estimates for the last three decades. Nevertheless, migration has been instrumental in the growth of several major urban centers throughout certain time periods. For instance, in the cities of Mumbai, Delhi, and Hyderabad, migration has been increasing. from 1981 to 1991, although it has been declining as a proportion of city development.

Table 1: Analyzing The Movement Pattern In Large Urban Areas (Millions)

Cities	**Mumbai**		**Calcutta**		**Delhi**	
	1981	1991	1981	1991	1981	1991
Population	8.24	12.57	9.19	10.91	5.73	8.38
Population Increase	2.27	4.33	1.77	1.72	2.08	2.65
Of which Migration	1.55	1.81	0.69	0.61	1.16	1.36
In percent	68.51	41.92	39.01	35.30	55.73	51.53
Cities	Chennai		Bangalore		Hyderabad	
	1981	1991	1981	1991	1981	1991
Population	4.29	5.36	2.92	4.09	2.55	4.28
Population Increase	1.12	1.07	1.26	1.16	0.75	1.73
Of which Migration	0.68	0.57	0.50	0.51	0.25	0.55
In percent	60.50	53.08	40.13	43.78	32.72	31.60

| ISSN: 2582-7219 | www.ijmrset.com | Impact Factor: 7.521| Monthly, Peer Reviewed & Referred Journal|

| Volume 7, Issue 5, May 2024 |

| DOI:10.15680/IJMRSET.2024.0705161 |

The percentage has grown little, nevertheless, in Bangalore's instance. Keep in mind that the widely held belief that migration is a major driver of urbanization is, in fact, partly true. The fundamental changes occurring in the Indian economy are being mirrored by the urbanization trends. The agricultural sector's contribution to GDP pales in comparison to that of industry and services put together.

Comparative growth of urban population (1991-2011)

A population's concentration in a region due to the use of a variety of land uses for purposes other than primary subsistence is known as urbanization. As a whole, urbanization entails not only the proliferation of population centers but also the enlargement of specific urban concentrations. The Ahmednagar district provides a viable case study for urbanization research.

Table 2: District and Maharashtra state Evaluation of the expansion of urban populations in percentage (1991-2011)

	Total/Urban	1991	2001	2011
Ahmednagar District	Total	24.40	19.80	22.42
	Urban	51.80	50.70	22.10
Maharashtra State	Total	25.73	22.73	15.99
	Urban	38.90	34.30	23.67

Decadal changes in urban population

Consequently, the district's urban population increased by a factor of more than four during these decades. The table below shows the percentage change in the district's urban population from 1901 to 2001 for each decade.

Table 3: Decadal changes in Urban population of Ahmednagar district

Year	Urban population	Decadal growth of Urban pop^{n}	Variation in growth Rate of Urban pop^{n}
1971	251500	64185	34.27
1981	351368	99868	39.71
1991	518134	166766	47.46
2001	808789	290655	56.09
2011	912617	103828	12.83

Details from the past fifty years from the Ahmednagar districts illustrate the decadal change of urban population. What follows is a description of the most significant findings from the research area:

In the present research, some investigated outcomes of all selected nineteen urban cities or centers and according to their urban population percentage as described below in details.

| ISSN: 2582-7219 | www.ijmrset.com | Impact Factor: 7.521| Monthly, Peer Reviewed & Referred Journal|

| Volume 7, Issue 5, May 2024 |

| DOI:10.15680/IJMRSET.2024.0705161 |

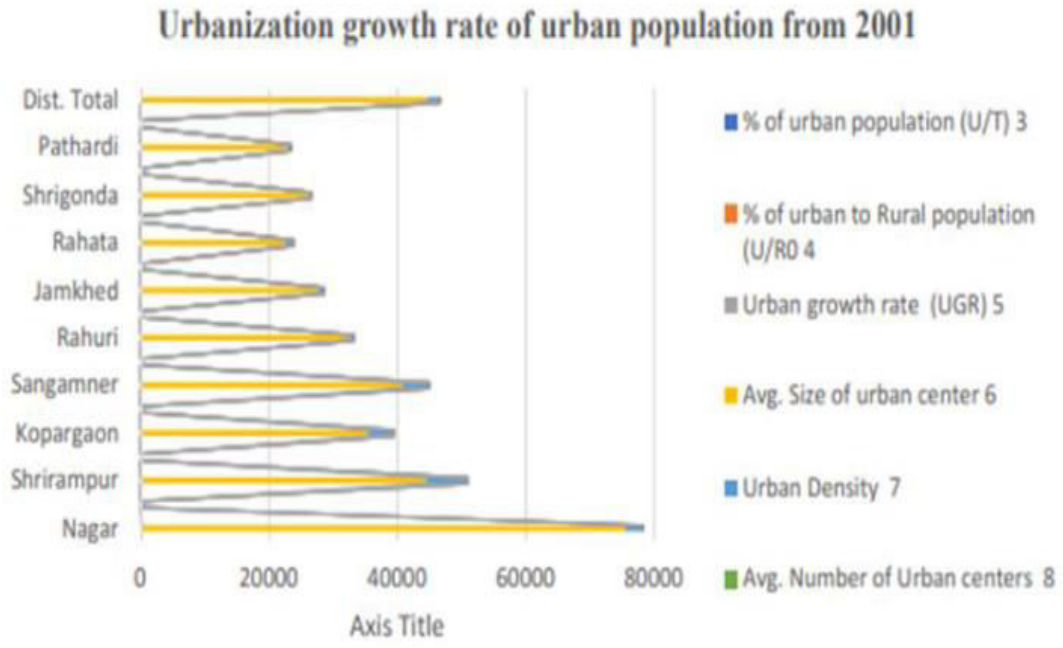

Fig 1: Growth rate of urban population from Ahmednagar, 2001

Utilization of energy resources in Urban Area

For all forms of life on Earth, energy is a necessary component. Food is one of the primary sources of energy for humans. This chapter provides a high-level overview of the energy profile.

Energy and regional development

For human progress, energy is a crucial component. Particularly relevant to regional progress is this factor. One kind of energy is electricity. The other element can't compare to its superior power. One wind is one of the kinetic energy types produced by the effect of the sun's warmth.

Energy and Environment

Environmental economics and ecologists have spent a lot of time thinking about the relationship between energy and the natural world. Anything from a pond to a field to a forest to an ocean or even just an aquarium constitutes a biological system or ecosystem when combined with its unique biotic assemblage of plants, animals, and microorganisms.

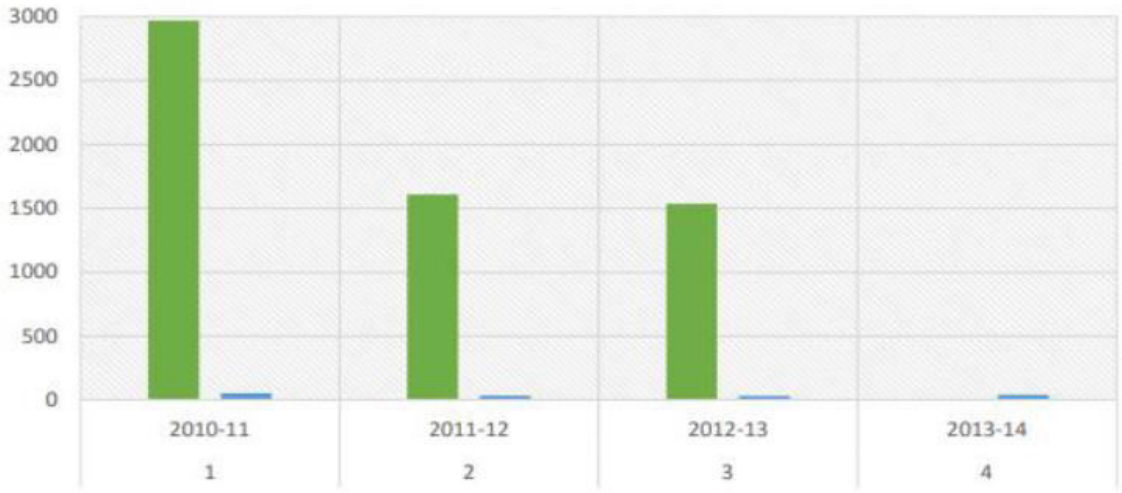

Fig 2 Electricity uses/capita/day in Ahmednagar from last four decades

| ISSN: 2582-7219 | www.ijmrset.com | Impact Factor: 7.521| Monthly, Peer Reviewed & Referred Journal|

| Volume 7, Issue 5, May 2024 |

| DOI:10.15680/IJMRSET.2024.0705161 |

This led to the discovery of a declining power generation order. Lastly, throughout the research period, its effect on load shading in the suburban region was noted. Power generating capacity was enhanced the next year.

IV. ENERGY CONSUMPTION OF HOUSEHOLDS

the residential sector uses 70 percent of the energy. The energy crisis impacting the family sector is a major one among the many truths of energy challenges afflicting emerging nations. The residential sector remains the biggest energy consumer in the majority of emerging nations, as pointed out by Elizabeth Cecelski (1987) [8].

Just to be alive, a household needs very little energy. However, A household's real energy consumption is influenced by several aspects. These include the following: education level, income, family size, occupation, cooker cost, fuel kinds, plinth area of the home in square feet, cooking hours, cooker type, and kitchen location. Houses use a mix of commercial and non-commercial energy sources to meet their whole energy demands. Fuels such as electricity, kerosene, gasoline, diesel, L.P. gas, and others are examples of commercial sources.

Electricity Consumption pattern in the district

Presented below is a three-decade history of the Ahmednagar district's electrical usage trend. Below, you can see their tabular statistics and graphical depiction organized by year. The data used in this research demonstrates the ongoing rise in power consumption.

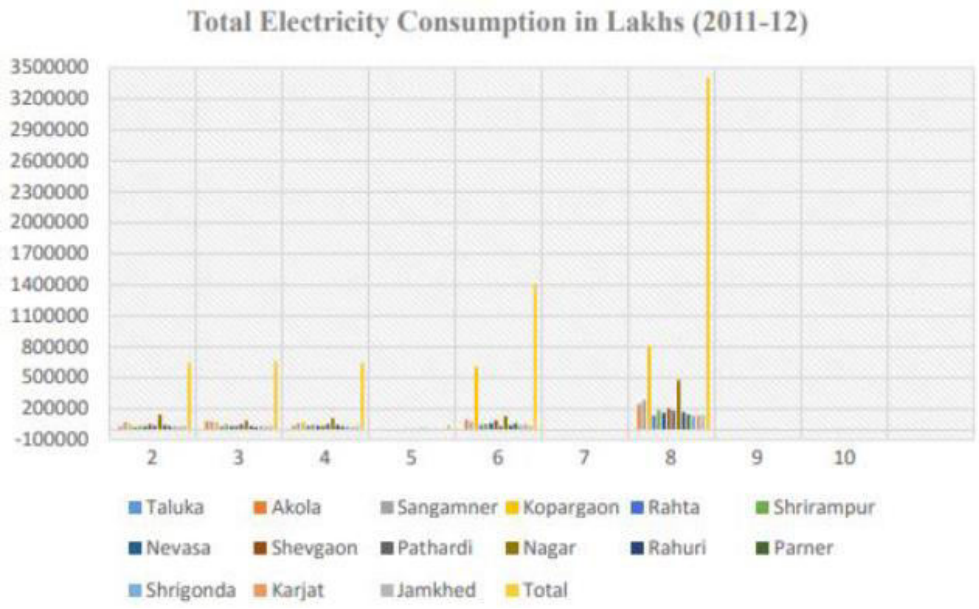

Fig 3: Observed total electricity consummation paten in Ahmednagar

Maximizing the Use of Solar PV on Rooftops

The main survey and data analysis from the field visit are included here. As part of the field visit, we asked people to fill out surveys that represented their homes. A close-ended questionnaire was used to capture the replies. The researcher's personal observations and interpretations are also part of the survey results. The data analysis is an endeavor to examine the consumer's view of the scheme and their desire and motivation to use SPV (Solar Photovoltaic) systems, as well as other pertinent findings.

| ISSN: 2582-7219 | www.ijmrset.com | Impact Factor: 7.521| Monthly, Peer Reviewed & Referred Journal|

| Volume 7, Issue 5, May 2024 |

| DOI:10.15680/IJMRSET.2024.0705161 |

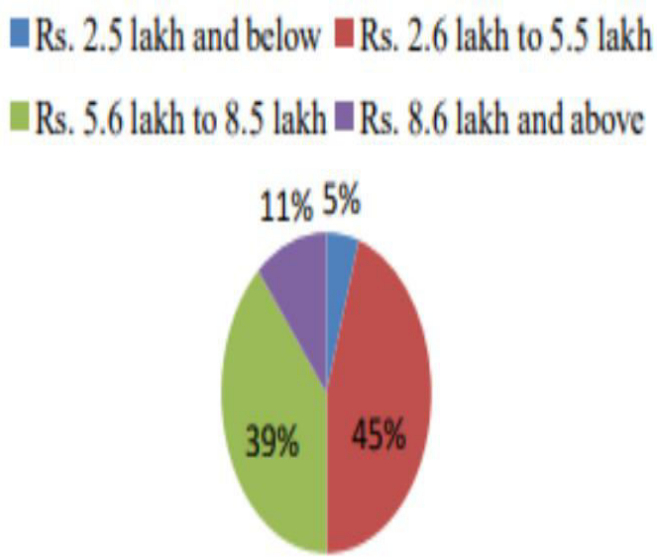

Fig 4: Those Who Responded Had an Annual Household Income

Level of Education

Various studies have attempted to link environmental concern and awareness with greater levels of education. Environmentally friendly actions are more often taken by those with higher levels of education since they are more informed about the costs and benefits (Meyer, 2014) [11].

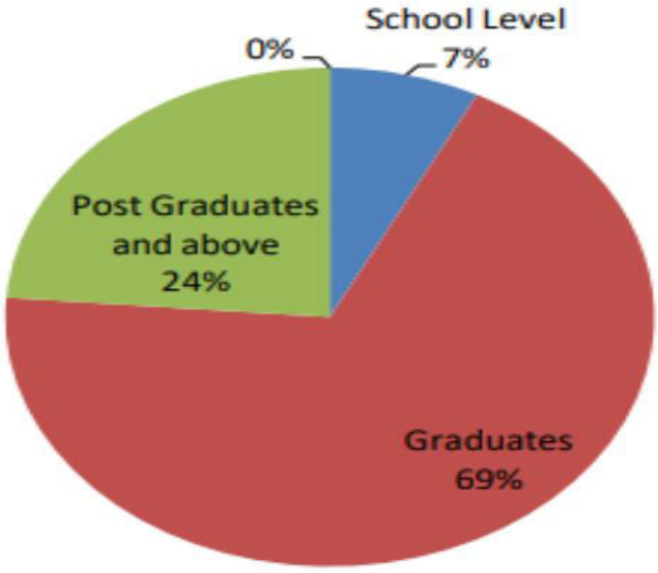

Fig 5: Level of Education attained by the Participants

A large majority of the responders had earned a master's degree or above. Out of all the answers, only 6 claimed to have completed any kind of formal education.

SPV Users and Non-Users a comparative classification

It is also an important and interesting analysis to perform for a researcher where classification of SPV users and non users can be done.

a.) A user's annual family income based on SPV classification

An essential consideration for implementing such systems is the revenue.

| ISSN: 2582-7219 | www.ijmrset.com | Impact Factor: 7.521| Monthly, Peer Reviewed & Referred Journal|

| Volume 7, Issue 5, May 2024 |

| DOI:10.15680/IJMRSET.2024.0705161 |

Table 4: Family Income and SPV System Use on an Annual Basis

Annual income of the household	SPV Users		Total
	No	Yes	
Rupees 2.5 Lakh and below	2	2	4
Rupees 2.6 lath to 5.5 Lath	19	17	36
Rupees 5.6 Latch to 8.5 Lalit	15	16	31
8.6 Lath and above	4	5	9
Total	40	40	80

b.) Segmentation of SPV Users according to Their Level of Education

Though user education has been crucial, it is also necessary to examine the current user landscape to determine which subcategory of SPV usage is most prevalent.

Table 5: Academic Background and SPV System Implementation

Annual income of the household	SPV Users		Total
	No	Yes	
School Level	3	3	6
Graduation (bachelor's degree)	27	28	55
Post Graduate and Above	10	9	19
Total	40	9	19

c.) Occupation-Based SPV User Classification

Table 6: SPV Users Organized by Profession

Occupation	SPV Users		Total
	No	Yes	
Employed in Public Sector	14	9	23
Employed in Private Sector	10	7	17
Self-Employed	11	16	26
Other	5	9	14
Total	40	40	80

V. CONCLUSION

There is an energy crisis in Ahmednagar. The energy consumption of cities is on the rise. The ever-increasing needs of a growing population, more urbanization, and a more developed economy have proven insurmountable despite increases in both energy supply and resource augmentation. The research region offers promising possibilities for non-conventional energy resources. This study has mostly focused on this scope. The findings of this research might be useful for urban developers in evaluating the non-conservational energy advantages of certain initiatives. This chapter draws its secondary or sedentary findings from primary data collected for the investigation. The location selected for the research was the Ahmednagar district in the state of Maharashtra. A total of 375 individuals were selected using a multi-stage random-sampling process. Units chosen at random were interviewed using pre-planned schedules for the goal of gathering data. The data was referred to from 2011-12 to 2015-16. In accordance with previous research, various energy sources were transformed into Energy units known as megajoules (MJ) and gigajoules (GJ).

REFERENCES

1. Mei Q, Xu ZL, Wu WY. A novel multi-port DC-DC converter for hybrid renewable energy distributed generation systems connected to power grid. In: Proceedings of IEEE Conference on Industrial Technology; c2018. p. 1-5.
2. Ambaj S. India's Energy R & D, Land Scope: A Critical Assessment. Economic and Political Weekly. 2022;37(38):3925-3934.
3. Shali PN. Energy saving through modernization and technology upgradation. Yojana. 2014;38(5):5-10.

| ISSN: 2582-7219 | www.ijmrset.com | Impact Factor: 7.521| Monthly, Peer Reviewed & Referred Journal|

| Volume 7, Issue 5, May 2024 |

| DOI:10.15680/IJMRSET.2024.0705161 |

4. Brown RE. An introduction to the New Testament. Yale University Press; c2015.
5. World Bank Group. Doing Business 2015: Going Beyond Efficiency: Comparing Business Regulations for Domestic Firms in 189 Economies: a World Bank Group Flagship Report. World Bank Publications; c2014.
6. Sathaye J, Shukla PR, Ravindranath NH. Climate change, sustainable development and India: Global and national concerns. Current science. 2006. p. 314-325.
7. Veeramalla J, Kumar S. Application of interline power flow controller (IPFC) for damping low frequency oscillations in power systems. In: Proceedings of IEEE Conference on Modern Electric Power Systems (MEPS); c2020. p. 1-6.
8. Cecelski E. Energy and rural women's work: crisis, response and policy alternatives. Int'l Lab. Rev. 1987;126:41.
9. Wang C, Nehrir MH. Power management of a stand-alone wind/photovoltaic/fuel cell energy system. IEEE Trans Energy Convers. 2018;23(3):957-967.
10. Van Hoven C, Eberhard A. Development South Africa – Energy, Environment and the Urban Poor in South Africa. J Urban Stud. 2015;12(2):197-211.
11. Meyer JP. Applied measurement with jMetrik. Routledge; c2014.

INTERNATIONAL STANDARD SERIAL NUMBER INDIA

INTERNATIONAL JOURNAL OF MULTIDISCIPLINARY RESEARCH

IN SCIENCE, ENGINEERING AND TECHNOLOGY

| Mobile No: +91-6381907438 | Whatsapp: +91-6381907438 | ijmrset@gmail.com |

www.ijmrset.com