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Analyzing Indian law and policy in the interest of sustainable development: Renewable energy

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Abstract

There are limits to conventional energy, and these conventional sources of energy are exploited at the expense of the environment given the current energy situation where they are nearly entirely dependent. So, a paradigm that would assist the quick transition of energy from conventional to non-conventional is needed for the sake of our next generation. The study tries to analyze Indian legislation and regulations relating to renewable energy that can aid in reaching our sustainable development objectives. This essay has two goals in mind. To start, it is important to recognize the numerous motivations driving the switch to renewable energy sources and to list some of the advantages for global sustainable development. In the second place, a discussion of various current approaches used to estimate, quantify, or project past and future benefits of expanded deployment of renewable energy sources.

Keywords: conventional energy, environment, sustainable development goals, implementation policy, energy security

Introduction

Societies around the world are on the verge of a profound and urgently necessary transformation in the way they produce and use energy. This shift is moving the world away from the consumption of fossil fuels (which cause climate change and other environmental and social challenges) toward cleaner, renewable forms of energy. Millions of people around the world already use renewable energy to generate electricity, heat and cool buildings, cook, and provide mobility ^[1].

The rapid deployment of renewable energy has been driven mainly by a wide range of objectives (drivers), which include advancing economic development, improving energy security, enhancing energy access, and mitigating climate change. Altogether, these drivers might be described as the pursuit of sustainable development, where economic prosperity is advanced around the world while negative impacts are minimized. While such presumed benefits are widely cited as key drivers in political and energy debates, specific, documented evidence of such benefits remains rather limited for reasons including a lack of adequate conceptual frameworks, methodological challenges, and limited access to relevant data.

“By destroying nature, environment, man is committing matricide, having in a way killed Mother earth. Technological excellence, growth of industries economical gains have led to the depletion of natural resources irreversibly. Indifference to the grave consequences, lack of concern, and foresight have contributed in large measures to the alarming position.”

- Justice Arijit Pasayat in T.N Godavarman Thirumalpad v. Union of India

Energy has become an important and one of the basic infrastructures for the economic development of a country. Energy security is, therefore, imperative for the sustained growth of the economy. The oil Crisis of 1973 and concern for the environment due to the excessive use of fossil fuels have led to remarkable global efforts in harnessing alternative energy resources. Renewable energy resources such as sun, wind, biomass, and geothermal heat are environment-friendly and perennial in nature. These resources are also referred to as non-conventional energy resources as, at present, their large-scale use is not common.

Harnessing energy through these resources using efficient technologies is expected to play an important role in serving as clean energy sources for mankind.

“Energy is the golden thread that connects economic growth, increased social equity, and an environment that allows the world to thrive” [2].

Proficient, inexpensive and consistent energy facilities are essential for global prosperity as the growth of the power sector is connected to the overall development, economic stability, and environmental sustainability of a nation. The energy sector is one of the most fundamental components of economic progress as all the economic activities from manufacturing to transportation of goods depend on the availability of adequate energy resources. A World Bank study shows that nations with improper and inefficient energy systems may drop up to 1 to 2 % of the potential to grow every year due to electric power shortages and inefficient utilization of energy resources [3]. It is evident from the fact that more than 80 % of the world’s population exists in developing countries but these countries only consume 40% of the world’s total energy, which shows how energy consumption is directly related to economic stability and the development of a country.

Nature is showing signs of continuous degradation, which affects not only the present generation but the forthcoming ones too. However, the protection of the environment presents a most fundamental challenge to the human desire to industrialize faster, to achieve self-sufficiency in food, and energy, and to provide basic amenities to the entire human race, a herculean task. Environmental degradation is mainly caused either due to excessive use of fossil fuels. The present work is focused on these aspects as well. The lack of availability of resources causes an adverse impact on the environmental health and well-being of our society. Recent years have shown unprecedented growth in the renewable energy scenario, where despite the global financial crisis the sector has managed to hold its own. The resilience of the sector against all odds showcases that renewable energy is indeed the future and will play a major role in providing a clean, secure, and sustainable energy economy. The potential is unquestionably large and the rapidly growing economies are determined to transform the economic crisis into an opportunity for greener growth.

This aspect is due to the side effects of a rat race to achieve faster economic growth and development, thereby, overburdening our system which is poorly planned and has utter disregard for the environment in order to fulfill commercial and vested interests. In a society like India, the rich destroy the environment through expensive lifestyles, unsustainable patterns of living, and exploitation of nature for profit. The environment is not just trees, tigers, endangered species, and ecosystems but it is the foundation on which the entire system of our nation, be it agriculture, industry, or service sector is based. In the mad race of development and overexploitation of resources and environmental degradation, Gandhian teachings remain relevant:

“There is enough in this world for everybody’s need but not for anybody’s greed.”

-M.K. Gandhi

Objectives of the Study

The objectives of the study are:

- To examine the policies of Central and different State governments.
- To examine the impact of renewable energy policies on society.

Research Methodology

The planned study will be a mixed-methods study that will include both qualitative and quantitative data and will be primarily doctrinal. The paper is based on doctrinaire research and uses material from both primary and secondary sources and legal and non-legal sources like authoritative textbooks, book reviews, reports, digests, journals, etc. Legal terms and their significance are addressed in a manner that will also be comprehensible to a non-legally trained readership.

Overview of the National Sustainable Development Strategy Indian

Sustainable development (SD) has become a popular quotation in contemporary development discourse. However, even though its pervasiveness and the massive popularity it has garnered over the years, the concept still seems unclear as many people continue to ask questions about its meaning. Acknowledging the pervasiveness of (World Commission on Environment and Development) WCED’s definition, Cerin (2006) as well as Abubakar (2017) argue that SD is a core concept within global development policy and agenda. It provides a mechanism through which society can interact with the environment while not risking damaging the resource for the future. Thus, it is a development paradigm as well as the concept that calls for improving living standards without jeopardizing the earth’s ecosystems or causing environmental challenges such as deforestation and water and air pollution that can result in problems such as climate change and extinction of species (Benaim & Raftis, 2008; Browning & Rigolon, 2019). Philosophy The notion of 'sustainable development is not new to India. Through the preaching of great saints like Mahavir, Buddha, Ashoka [4], and Gandhi, the concept of sacrifice for others became an integral part of the oriental philosophy. The Sufis and Moulanas (Muslim religious leaders) have also contributed to this Indian (and oriental) philosophy of overcoming greed and desire.

The inherent strength of this philosophy has helped the Indian civilization survive and thrive over five thousand years without invading or colonizing other countries. Though in its long history although being invaded many times, only the British via the introduction of Western science were able to impact the lifestyle and production system of this old civilization. Western science taught key sectors of the Indian population how to exploit and dominate nature; Pre-British India believed in co-existence with nature where agriculture, production system, transportation, and social and religious events were all planned as per the weather cycles. Oriental science respected nature. But modern science has taught us how to mine coal and crude, build bridges and dams, pump out underground water to produce hybrid grains during the off-season, genetically modify plants, etc. Within two hundred years of the application of these forms of new knowledge, a country with five thousand years of sustainable existence (without any record of large-scale famines prior to British rule) is now desperately searching for a viable model of sustainable development to rescue itself from the current environmental (also economic) mess.

Drivers for Renewable Energy Policies

Renewable energy drivers (benefits) have been categorized in a variety of ways. For example, the United Nations Intergovernmental Panel on Climate Change (IPCC) Special

Report on Renewable Energy Sources and Climate Change Mitigation (SRREN) categorized key drivers, opportunities and benefits of renewable energy into environmental (climate change mitigation and reduction of environmental and health impacts), energy access, energy security (e.g., diversity of fuel supply; fuel imports; balance of trade), and social and economic development (e.g., job creation, rural development) ^[5]. This section identifies some key drivers according to the main categories of environmental, economic, and political (social and security) criteria, acknowledging that many drivers can be classified by more than one category.

Environmental Drivers

The extraction, transport, refining and use of fossil and nuclear fuels result in a host of significant environmental impacts, including damage to land from mining; pollution of air and water; consumption of vast amounts of fresh water, particularly for cooling at power plants; loss of biodiversity; risk of nuclear accidents; global climate change; and associated impacts on human health ^[6]. For example, the World Health Organization estimates that outdoor air pollution – due largely to the burning of coal and road transport – killed 3.7 million people worldwide in 2012 ^[7].

Health problems, biodiversity loss, and other environmental challenges will only be exacerbated by climate change. Renewable energy deployment has become an integral part of government strategies around the world to address these many challenges. Examples include Reduce pollution and improve public health. Around the world, governments at all levels have enacted policies to support renewables in order to reduce health impacts associated with energy production and use. In China, for example, the quest for cleaner air and water has become an important driver of renewable energy targets and policies, alongside carbon dioxide (CO₂) emissions reductions, job creation and economic development ^[8]. Concerns about the impacts of traditional use of biomass, and burning of kerosene and other fossil fuels for cooking and heating on indoor air quality, as well as the need to reduce local deforestation, also have driven policies to promote modern renewables.

Reduce fresh water use

Many governments are turning to renewable energy to reduce water consumption associated with energy production. For example, Georgetown, Texas, a US city of more than 50,000 inhabitants, aims to achieve 100% renewables in the electricity sector by 2017, in part to reduce water consumption in the sector; other drivers include opportunities for local economic development and protection against volatile fossil fuel prices ^[9].

Reduce reliance on nuclear power

In the wake of the 2011 Fukushima Daiichi nuclear disaster, several Japanese cities and regions including Hokkaido, Kyoto, and Osaka – have set targets and enacted policies to promote renewables and energy efficiency in order to reduce their reliance on nuclear power. Germany reacted to the disaster in Japan by planning to phase out its own nuclear power facilities, to be replaced over time with renewable energy ^[10].

Mitigate climate change

Climate change mitigation is becoming increasingly the key

environmental driver of renewable energy; in combination with energy efficiency improvements, renewables now represent a key pillar in many governments' efforts to decarbonize their energy sectors.¹⁸ For the 21st Conference of the Parties (COP21) to the UN Framework Convention on Climate Change (UNFCCC), held in Paris in late 2015, 189 countries (representing an estimated 95% of global emissions and 98% of population) submitted Intended Nationally Determined Contributions (INDCs).¹⁹ The vast majority of countries prioritized the energy sector in their plans, with most of these relying primarily on deployment of renewable energy and energy efficiency technologies to achieve their stated emissions reduction targets ^[11].

Prior to COP21, many countries and regions were increasing the deployment of renewables to address climate change. For example, the European Union 2020 target of 20% energy consumption by renewables is intended (alongside an energy efficiency target) to assist Europe in reducing greenhouse gas (GHG) emissions (relative to 1990) by 20% ^[12]. India's National Solar Mission, part of the National Action Plan on Climate Change, launched in 2008, aims to promote ecologically sustainable energy growth, constituting "a major contribution by India to the global effort to meet the challenges of climate change ^[13]."

COP26: Together for our planet ^[14]

The UN Climate Change Conference in Glasgow (COP26) brought together 120 world leaders and over 40,000 registered participants, including 22,274 party delegates, 14,124 observers and 3,886 media representatives. For two weeks, the world was riveted on all facets of climate change — the science, the solutions, the political will to act, and clear indications of action. The outcome of COP26, the [Glasgow Climate Pact](#) is the fruit of intense negotiations among almost 200 countries over the two weeks, strenuous formal and informal work over many months, and constant engagement both in-person and virtually for nearly two years.

"The approved texts are a compromise," said UN Secretary-General António Guterres. "They reflect the interests, the conditions, the contradictions and the state of political will in the world today. They take important steps, but unfortunately the collective political will was not enough to overcome some deep contradictions." Cuts in global greenhouse gas emissions are still far from where they need to be to preserve a liveable climate, and support for the most vulnerable countries affected by the impacts of climate change is still falling far short. But COP26 did produce new "building blocks" to advance the implementation of the Paris Agreement through actions that can get the world on a more sustainable, low carbon pathway forward.

Details of Different Kinds of Renewable Energy ^[15]

The various sources can be explained in details with following:

A. Solar Energy

Solar energy is the most abundant permanent energy resource on earth and it is available for use in its direct (solar radiation) and indirect (wind, biomass, hydro, ocean, etc.) forms. Solar energy, experienced by us as heat and light, can be used through two routes: the thermal route uses the heat for water heating, cooking, Drying, water purification, power generation, and other applications; the photovoltaic route converts the light in solar energy into electricity, which can then be used for a number of purposes such as lighting,

pumping, communications, and power supply in electrified areas. The total annual solar radiation falling on the earth is more than 7500 times the world's total annual primary energy consumption of 450 EJ. The annual solar radiation reaching the earth's surface, approximately 3,400,000 EJ, is an order of magnitude greater than all the estimated (discovered and undiscovered) non-renewable energy resources, including fossil fuels and nuclear. However, 80% of the present worldwide energy use is based on fossil fuels. Equivalent of more than 5000 trillion kWh/yr. Depending on the location, the daily incidence ranges from 4 to 7 kWh/m², with the hours of sunshine ranging from 2300 to 3200 per year. The MNRE, working in conjunction with the Indian Renewable Energy Development Agency (IREDA) to promote the utilization of all forms of solar power as well as to increase the share of renewable energy in the Indian market. This promotion is being Achieved through R&D, demonstration projects, government subsidy programs, and also private sector projects.

B. Wind Energy

Winds are generated by complex mechanisms involving the rotation of the earth, heat energy from the sun, the cooling effects of the oceans, temperature gradients between land and sea and the physical effects of mountains and other obstacles. Wind is a widely distributed energy resource. Total India wind capacity at the end of 2016 was around 32,280MW. Wind energy is being developed in the industrialized world for environmental reasons and it has attractions in the developing world as it can be installed quickly in areas where electricity is urgently needed. In many instances it may be a cost-effective solution if fossil fuel sources are not readily available.

In addition there are many applications for wind energy in remote regions, worldwide, either for supplementing diesel power (which tends to be expensive) or for supplying farms, homes and other installations on an individual basis Wind Energy is mostly convenient energy source which can be harnessed only in coastal areas in India such as Nasik in Maharashtra, Muppandal in Tamil Nadu, etc. As now India is developing and becoming the centre of hub of investments we should install more and more windmill to generate more power so that we could distribute more and more electricity across the different states of India which are not getting enough electricity. So that they can live their livelihood more peacefully. Taking a step ahead which will boost our energy capacity.

C. Biomass Energy

Biomass includes solid biomass (organic, non-fossil material of biological origins), biogas (principally methane and carbon dioxide produced by anaerobic digestion of biomass and combusted to produce heat and/or power), liquid biofuels (bio-based liquid fuel from biomass transformation, mainly used in transportation applications), and municipal waste (wastes produced by the residential, commercial and public services sectors and incinerated in specific installations to produce heat and/or power). The most successful forms of biomass are sugar cane bagasse in agriculture, pulp and paper residues in forestry and manure in livestock residues. It is argued that biomass can directly substitute fossil fuels, as more effective in decreasing atmospheric CO₂ than carbon sequestration in trees.

The Kyoto Protocol encourages further use of biomass energy. Biomass may be used in a number of ways to produce energy. The most common methods are:

- Combustion
- Gasification
- Fermentation
- Anaerobic digestion

India is very rich in biomass India has over 5,940 MW biomass-based power plants comprising 4,946 MW grid-connected and 994 MW off-grid power plants. Out of the total grid-connected capacity, a major share comes from bagasse cogeneration and around 115 MW is from waste-to-energy power plants. Whereas off-grid capacity comprises 652 MW nonbagasse cogeneration, mainly as captive power plants, about 18 MW biomass gasifier systems being used for meeting electricity needs in rural areas, and 164 MW equivalent biomass gasifier systems deployed for thermal applications in industries.

D. Small Hydropower

Hydroelectric power refers to the energy produced from water (rainfall flowing into rivers). Consequently, rainfall can be a good indicator to investors looking for a location to implement or build a new hydroelectric power plant in India. The dominant annual rainfall is located on the north/eastern part of India: Arunachal Pradesh, Assam, Nagaland, Manipur and Mizoram, and also on the west coast between Mumbai and Mahe. In India, small hydro is the most utilized renewable energy source for energy production.

E. Tidal Energy

Oceans cover 70 percent of the earth's surface and represent an enormous amount of energy in the form of wave, tidal, marine current, and thermal gradients. The energy potential of our seas and oceans well exceeds our present energy needs. India has a long coastline with estuaries and gulfs where tides are strong enough to move turbines for electrical power generation. A variety of different technologies are currently under development throughout the world to harness this energy in all its forms including waves (40,000 MW), tides (9000 MW), and thermal gradients (180,000 MW). Deployment is currently limited but the sector has the potential to grow, fuelling economic growth, reduction of carbon footprint, and creating jobs not only along the coasts but also inland along its supply chains. As the Government of India steps up its effort to reach the objectives to contemplate its Renewable Energy and climate change objectives post 2022, it is opportune to explore all possible avenues to stimulate innovation, create economic growth and new jobs as well as to reduce our carbon footprint. MNRE looks over the horizon at a promising new technology and considers the various options available to support its development.

Law and Policy in India

A country's overall economic development depends on the availability of power. According to World Bank, 270 million Indian lives in poverty (WB, 2016). About, 240 million people lack basic electricity services (Singh and Sundria, 2017). The growth of the Indian economy lies in the growth of its agriculture, industry, and service sector mainly (Bosworth et al., 2007). To provide enough support to the GDP growth through the production of goods and services access to electricity is a prerequisite pressing the need of

power generation infrastructure in India, which is perennially facing problems like energy deficit, energy inequity, and threats to energy security. Renewable Energy is looked upon as a sustainable solution to the above (Singh, 2018). Renewable energy is produced using Mother Nature's renewable resources. Solar energy, wind and water currents, tides, biomass, and other renewable energy sources are examples of renewable generation technology. (IEA, 2012). Among the nations that generate renewable energy, India ranks third in the world for Concentrated Solar Thermal Power (CSP) and fourth for Wind Power Capacity (WPC), but fifth overall for installed renewable capacity. Using renewable energy sources improves a nation's energy security and eventually aids in the achievement of carbon emission reduction goals. Unlike other emerging nations, India's power sector has undergone a lot of changes, which were then followed by modifications to the sector's operational environment (Agrawal et al, 2017). It has prompted a commercial strategy, the establishment of independent regulators, sector reorganization, and privatization. (Vishwakarma and Tyagi, 2017). The potential of energy generation from renewable sources in India is around 900 GW (Shah, 2017). The potential stands in the form of energy generation from Wind [102 GW], Small Hydro [20 GW], Bio Energy [25 GW], and Solar Power [750 GW] ^[16].

National Renewable Energy Act 2015, India ^[17]

The Electricity Act of 2003 is amended by the 2014 Electricity Amendment Bill. The amendment's main focuses were Grid Security and Distribution and Supply Segregation. The production of electricity from both conventional and non-conventional sources is covered by the Electricity Act of 2003. In contrast, the 2014 Electricity Amendment Law emphasises renewable energy. A thermal power production business must build a renewable energy generation facility with a capacity of at least 10% of the total thermal generation capacity, according to the bill. Moreover, 5% of the Renewable Purchase Obligation is advised. The Act's main provisions are: (a) supporting the ecosystem; (b) providing a framework for financial and economic activities; (c) providing funding assistance for renewable activities; (d) providing institutional support; and (e) promoting grid-connected or distributed renewable energy.

Institutional Structure:

1. Central Level – The Central Government is fully empowered to take the required actions to promote the deployment and advancement of renewable energy sources in India, as well as to support educational and training initiatives for this purpose.
2. State Level – For assistance in developing a state-level renewable energy policy and plan, the state government must establish a nodal agency at the state level. The extra tasks include creating a green fund to encourage renewable energy through renewable parks, transmission infrastructure, data centres, deployment framework, etc.

Authorities to be constituted under the Act

1. National Renewable Energy Committee [NREC] – This committee must be established by the federal government within three months of the 2015 National Renewable Energy Act being passed into law. Also, in order to maintain transparency, NERC will consult the advisory body regarding the tasks given to it.

- Role: Advisory role to assist interministerial task coordination for the 2015 Act's objectives.
 - Responsibilities include monitoring the National Renewable Energy Policy and Plan's implementation, creating institutional, policy, regulatory, financial, and fiscal frameworks, and coordinating technological missions, skill development, capacity building, technology export, and manufacturing base development.
1. National Renewable Energy Advisory Group [NREA] – The advisory body must be established by the federal government within three months of the 2015 National Renewable Energy Act being passed into law. NERC will also speak with the advisory body regarding the allocated tasks in order to maintain transparency.
 - Function - an advisory role to help with integrated energy resource planning and the proper use of the national renewable energy fund for varied development needs (IERP).
 - Publication of yearly reports on the renewable energy sector and dissemination of relevant data to the general public.
 1. Renewable Energy Corporation of India [RECI] – Within one year of the proposed Act, the central government must establish the corporation under the Companies Act 2013; alternatively, it may designate an existing organization as the Renewable Energy Corporation of India.
 - Function: Create investment hubs across the country for the expansion of renewable energy.
 - Responsibilities: Make purchases for renewable energy on a nationwide scale.

Development of Supportive Ecosystem

- i) National Renewable Energy Policy [NREP] – In consultation with the federal government, the Ministry of New & Renewable Energy will draught and release the National Renewable Energy Policy. Such a renewable energy scheme must adhere to the Electricity Act of 2003's requirements. The policy must include specific information regarding how renewable energy will be used for uses such as irrigation, lighting, heating, cooling, cooking, transportation, and combinations of these. The policy must include 5-year national goals for renewable energy, as well as 10-year goals that are indicative of those goals. Research, development, and demonstration (RD&D) must be envisioned in the policy and must be in accordance with the National Energy Policy, Integrated Energy Resource Planning (IERP), and National Renewable Energy Plan.
- ii) Renewable Energy Resource Assessment [RERA] – RERA is a nodal organisation that the minister of renewable energy designates to evaluate renewable energy resources. This node entity evaluates resources, including non-electric and electric applications for distributed and decentralised electricity generation, using contemporary assessment approaches. For instance, a solar power plant can be used to produce energy, water, fuel, and other things.
- iii) Technical Standards and Testing – State-level monitoring and verification entities can be set up according to the provisions. Moreover, labs can be configured to enable the

testing of machinery connected to renewable energy. For the benefit of the stakeholders, the Ministry would revise and publish technical and safety standards for quality compliance.

iv) Manufacturing and Skill Development – In addition to strengthening the supply chain for the mobility of the vital component, the ministry will promote the export of equipment for renewable energy sources from the nation. The goal of research and development is to provide unique products at a reasonable price. In order to do this: (a) the ministry may establish designated renewable energy manufacturing zones after consulting with the advisory group; (b) state and federal entrepreneurship and skill development institutions will change their curricula to encourage research and development in the renewable energy sector.

Economic & Financial Framework

1. National Renewable Energy fund –The Ministry of New & Renewable Energy must establish a fund called the "National Renewable Energy Fund" in order to carry out the goals of the proposed Act. The management of this fund shall be the responsibility of the Central Government.

2. State Green Fund – The State Green Fund will be established by the State Government. The State Green Fund is raised by an initial corpus from the National Renewable Energy Fund, State Level Green Cess, Grants of the Public and Private Sector, Electricity Duties, and Public Benefit Charges, etc. A State Nodal Agency must be established to oversee and manage the State Green Fund.

Distributed Renewable Energy Applications

The state government must publish a list of the communities where grid extension is not possible in the next five years within six months of this Act's implementation. By generating power from renewable energy sources in the included villages, the State and Central Government can set up a nodal body to help achieve the country's goal of rural electrification.

Grid Connected Renewable Electricity

To produce and supply power utilising renewable energy sources, no licence is necessary. Hence, a mandated, standardised Renewable Purchase Obligation (RPO) trajectory involving the purchase of renewable energy or renewable energy certificates is required on a national level. For this, in addition to creating a nodal body, the Ministry must also finance the power distribution businesses (DISCOM) up until they reach grid parity. This will enable DISCOMs to choose between renewable and conventional electricity on their own.

Findings

India's location on the Tropic of Cancer puts it in a favourable position to harness solar energy. Despite having 300 days of clear, sunny weather each year in the majority of our nation, we still fall short of our true potential. The main cause of this is the absence of appropriate regulations that can serve as a guide for us. The most effective use of unconventional resources propels us towards research on sustainable development. The article is really useful in understanding how our country's implementation policy works. The introduction of appropriate measures for the Renewable Energy Fund and Renewable Purchase Obligation in the Proposed National Renewable Energy Act, 2015 suggests accountability and governance for structural improvements in

the Indian Energy Sector. 100% of foreign direct investment is allowed in renewable energy projects under the automatic route.

By 2022, International Finance Corporation (the investment arm of the World Bank Group) projects the investment of US\$ 448 billion for sustainable and renewable energy plans in India (IFC, 2018). To promote and advance the use of renewable energy sources, IREDA [Indian Renewable Energy Development Agency] was founded. According to studies, renewable energy sources improve the local and global environment, as well as the region's development. According to IRENA, the deployed workforce in the R.E sector may increase from 9.8 million in the year 2016 to 24 million in 2030. The 175 GW of RE by 2022 could create 3 lakhs 30 thousand jobs in wind and solar energy alone. According to Energy World, 2018, there may be 4.5 million jobs in India's renewable energy industry. Also, the construction of renewable energy equipment in locations where grid extension is impractical may give people in rural and urban distant parts of India access to electricity.

These renewable energy sources might also aid India's efforts to electrify its rural areas. The analyses in this research support the growing significance of socioeconomic and sustainable development advantages in discussions of energy policy. This literature analysis also demonstrates the critical need for improved and more thorough conceptual frameworks for analysing, quantifying, and evaluating the socio-economic and (more generally) sustainable development benefits of renewable energy. Hence, more investigation and in-depth analysis are required on a variety of crucial issues if political will is to be maintained for the use of 100% renewable energy.

Social implication

These resources also offer social benefits like improved health, depending on consumer preferences, technological advancements, and employment opportunities, but some fundamental factors should be taken into account for the benefit of people, such as climatic conditions, level of education and living standards, and region whether urban or rural from an agricultural perspective. The fundamental factors for any nation's development are social ones. Renewable energy systems can result in local employment, improved health, employment prospects, and customer choice. The study found that, following the construction of renewable energy projects in remote places, the total emission decrease increases exponentially over time ^[18].

Value

The document provides information about India's diverse policies and legislation and also explains how to find out how they are doing right now. The study makes an effort to describe sustainable development and how renewable energy might help with the latter.

Conclusion

Long-term-oriented actions are necessary to find answers to the environmental issues, such as global warming and climate change that we are currently confronting. A step towards resolving the carbon footprint, the demand and supply gap, and rural electrification is the National Renewable Energy Act, of 2015. Indian renewable energy programs face obstacles including the necessity to adjust RE policies on a community-based basis, the requirement to reward

compliance, and the shift from Perform, Achieve & Trade to an effective Energy Trading System, which necessitates a qualified workforce. In addition to these issues, gender mainstreaming and the availability of skilled labour are other obstacles to the execution of climate action programmes.

The Union Environment Minister said in December 2016 that preparations for the Paris Agreement's implementation beginning in 2017 had begun. Unfortunately, the Union Budget for 2017–18 did not include any significant funding for addressing climate change. According to the pertinent news and announcements, the Environment Ministry appears confident in its ability to spend significant sums of money on planning to put the Paris Agreement, which took effect in 2020, into practise. According to an estimate, poor nations will require about \$100 billion in new investments annually for the next 40 years in order to increase their resilience to the consequences of climate change. Almost a million tonnes of solar PV panel waste are anticipated by 2035, according to Global Data research.

Thus, Recycling must be incorporated into local value chains that are being developed for the renewable energy sector. Energy conservation and greenhouse gas reduction must take precedence over growing energy output. It is urgent to have a perfect Act or Statute for the promotion of sustainable development through renewable energy since, as we can see from the paper, there is no codified Act or Statute for the application of renewable energy in India.

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