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GREEN JOBS IN INDIA: PATHWAYS TO A SUSTAINABLE FUTURE

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ABSTRACT

The paper aims to study the increasing concern of nations including India, in ensuring environmental sustainability. Globally concerns are being shown as to how nations can focus on adopting various eco-friendly practices like green employment or providing green jobs in labour markets. This sustainable practice would help in ensuring environmentally sustainable work culture focusing on creation of green jobs along with all round social development of the nations. The study also aims to identify various factors that can help in building green employment, identify future prospects and generate new green jobs. The main objective of the paper is to guide different stakeholders like the policymakers, educators, and industry stakeholders in taking measures that will aid in fast expansion of green employment opportunities and help the nations to attain sustainable and green future.

Keywords: Green employment, Green Environment, Green Jobs, Sustainable workforce, Sustainability

INTRODUCTION TO THE TOPIC

The concept of green employment or provision of green jobs refers to provision of various employment opportunities that contribute to preserving or restoring environmental quality. These jobs are generally found in sectors where main aim is to reduce carbon emissions while work practises are being carried on, minimising waste and pollution levels, conserve natural resources, and promote sustainable practices. The concept of green jobs is an effective answer to various problems like environmental degradation and reducing economic development thereby emphasizing the need to shift to a more sustainable and low-carbon economy.

The key aspect of green jobs includes Environmental Sustainability wherein the Green jobs aim at focusing on the activities that promote environmental sustainability and mitigate the negative impacts of human activities on ecosystems. It mainly focuses on renewable energy production, energy efficiency improvements, waste management and recycling, sustainable agriculture, conservation, and environmental restoration. Also Economic Development can be ensured through Green jobs while minimizing harm to the environment caused by various business practices.

Nations tend to invest in green practices and measures by incorporating sound practices in different industries and technologies. This can further contribute to generation of new employment opportunities, enhance innovation in business practices and enhance competitiveness in the global markets. Also importance should be laid on maintaining Social Equity. The concept of green jobs encompasses social equity considerations and aims to ensure that the benefits of environmental sustainability are equitably distributed across society. It involves providing training and employment opportunities for backward areas, disadvantaged groups, ensuring fair wages and good working conditions working conditions

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while addressing to environmental justice concerns in area facing challenges of air, water and land pollution and environmental degradation.

The Transitioning Workforce often requires retraining and upskilling to meet the demands of emerging green industries. This may involve providing education and training programs in fields such as renewable energy technology, green building design, eco-tourism, and sustainable agriculture along with policy support of the government. The governments play a crucial role in fostering the growth of green jobs through supportive policies and regulations. This can include incentives for renewable energy development, subsidies for green businesses, carbon pricing mechanisms, environmental standards, and green procurement policies.

Various frameworks and methodologies should be developed to measure the impact of green jobs on both the economy and the environment so that job creation, greenhouse gas emissions reduction, energy savings, resource efficiency, and biodiversity conservation can be stressed upon. Thus, the concept of green jobs represents a holistic approach to sustainable development, recognizing the interdependence of economic prosperity, environmental stewardship, and social equity. Nations can attain timely transition to a green economy through their measures like green employment opportunities, green practices, etc to safeguard the planet for future generations.

FACTORS CONTRIBUTING TO INDIA'S GREEN JOB REVOLUTION

India's economic growth and environmental challenges provide a complex backdrop for the emergence and significance of green. Below listed are the factors that intersect:

1**. Economic Growth:** India has experienced rapid economic growth over the past few decades, emerging as one of the world's largest and fastest-growing economies. This growth has been driven by various sectors, including manufacturing, services, and agriculture. However, this growth has also brought about environmental consequences, such as pollution, deforestation, and resource depletion.

2. **Environmental Challenges:** India faces a range of environmental challenges, including air and water pollution, deforestation, soil degradation, and biodiversity loss. These challenges pose significant risks to public health, ecosystem stability, and long-term sustainable development. Addressing these challenges requires concerted efforts to reduce pollution, conserve natural resources, and transition to more sustainable practices.

3**. Climate Change**: India is particularly vulnerable to the impacts of climate change, including extreme weather events, rising sea levels, and changes in precipitation patterns. These impacts can have severe consequences for agriculture, water resources, infrastructure, and human well-being. Mitigating and adapting to climate change are therefore critical priorities for India's sustainable development agenda.

4. **Policy Initiatives:** Recognizing the need to balance economic growth with environmental sustainability, the Indian government has implemented various policy initiatives to promote green growth and address environmental challenges. These initiatives include renewable energy targets, pollution control measures, afforestation programs, and sustainable urban development initiatives.

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5. **Green Jobs Potential:** India's transition to a more sustainable and low-carbon economy has the potential to create a wide range of green jobs across multiple sectors. For example, the renewable energy sector, including solar, wind, and hydroelectric power, offers significant opportunities for job creation in manufacturing, installation, operation, and maintenance. Similarly, initiatives in waste management, water conservation, sustainable agriculture, and eco-tourism can generate employment while addressing environmental challenges.

6. **Skills Development:** However, realizing the full potential of green jobs requires investments in skills development, education, and training to equip the workforce with the necessary knowledge and expertise. This includes training programs for technicians, engineers, scientists, and entrepreneurs in areas such as renewable energy technologies, green building design, waste management, and sustainable agriculture practices.

7. **Inclusive Growth**: It's essential to ensure that the benefits of green job creation are equitably distributed across society, particularly among marginalized and vulnerable groups. This requires targeted interventions to promote access to green employment opportunities, address socio-economic disparities, and empower communities to participate in the transition to a green economy. Thus, India's economic growth and environmental challenges provide both opportunities and imperatives for the development of green jobs. By harnessing these opportunities and addressing environmental challenges through targeted policies and investments, India can promote sustainable development, create employment opportunities, and build a resilient and prosperous future for its citizens.

METHOD

This study relies on different secondary data sources to have a comprehensive understanding of the concept of green jobs, particularly from the Indian context. It also aims to study the various initiatives undertaken by the employment councils to ensure higher sustainability particularly through green employment initiatives.

In the study, the research methodology is review of secondary sources primarily with the objective of exploring the landscape of green employment and sustainability in Indian context. It aims to identify how skill enhancement methods can be applied in green jobs and contribute to the advancement of environmental sustainability. In this paper aim is to shed light on the types of green jobs and their role in fostering a sustainable and environmentally conscious workforce in India including how different stakeholders like the government, policymakers and industry stakeholders can also contribute towards making India a more greener economy.

LITERATURE REVIEW

Rai (2021) conducted a micro analysis of 47 companies. Their study emphasised the potential for focusing on 'green skills' acquired by employees through non-formal and informal means. The research was undertaken by the Skill Council for Green Jobs (SCGJ), under the National Skill Development Corporation (NSDC) within the Ministry of Skill Development and Entrepreneurship (MSDE) wherein it made a liaison between the Government of India and various industry sectors to implement skills development programs that would align with industry requirements and standards, mapping them to the National Skill Qualification Framework (NSQF) levels.

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Nandan, V. (2021) conducted a survey to address to the political resistance in Jharkhand towards the transition towards renewable energy unlike usage of coal where it aimed to discern the characteristics that render alternative jobs more appealing than coal-related employment. A significant "coal penalty" was imposed on respondents exhibited a 36.2 percentage point decrease [95% CI: 33.1–39.5] in the likelihood of choosing coal jobs compared to other alternatives. Furthermore, respondents demonstrated a strong preference for high-paying jobs, with distance being a less influential factor in job selection. These results suggested that, at the margins, coal jobs face unpopularity, underscoring the potential effectiveness of policies such as job training programs and relocation assistance. These initiatives could empower workers to transition to higher-skilled, higher-paid livelihoods, ultimately contributing to a smoother renewable energy transition.

Mahapatra & Ravichandran, R. (2020) investigated senior secondary government school students in Indore regarding the teaching and learning of green skills. The research focused on senior secondary government schools where vocational courses under the National Skills Qualifications Framework have been implemented. Data was collected from a sample of 80 students who had opted for vocational courses, using a self-developed Likert-type scale. Different tests were applied to the questionnaire and aim was to understand the distribution pattern of the data, considering students as the sole respondents. The results indicated a consistent distribution in both teaching and learning of green skills. However, there were diverse responses, with low mean and high standard deviation, particularly concerning students' knowledge of the concept of green skills, despite the majority incorporating green practices taught in their vocational courses.

Sharma, A., & Banerjee, R. (2020) presented an analytical framework designed to assess the geographical distribution of labor impacts resulting from transitions to clean energy. The study suggested that the Indian government's goal of achieving 100 GW solar capacity by 2025 will primarily generate jobs in the western and southern regions, with 60% concentrated in Maharashtra, Rajasthan, Gujarat, Tamil Nadu, Andhra Pradesh, and Karnataka. However, if the addition of solar capacity coincides with the retirement of thermal capacity, the net employment impact is expected to be negative, concentrating job losses in the coal-mining states of eastern India.

Dutta, S. (2016) identified in his study that the current production and consumption system in India is inadequate for achieving genuine and lasting development. Thus there is a need to embracing a multidimensional Green concept across all the sectors like employment, trade, agriculture, domestic industries, etc. Consequently, this shift will lead to fiscal reforms, vigilant monitoring of evolving international trade relations and patterns, better skill development, more expenditure on R&D and high level of public awareness. This paper offers a descriptive analysis including comparisons with other nations to find out India's current green status. The paper also highlights critical gaps and challenges which are faced by India along with the potential solutions to overcome these challenges.

Fernandez, M. V. (2020) in their paper focused on the distinct perspective of disabled students as an innovative area of study. The research endeavors to scrutinize the entrepreneurial intentions of disabled individuals in higher education, drawing comparisons with their non-disabled counterparts, while taking into account pivotal factors emphasized in

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prior studies. Notably, no significant differences were observed in the entrepreneurial intentions of disabled students when compared to those without disabilities. It highlighted the importance of cultivating inclusive entrepreneurial environments within higher education institutions.

Azad, R., & Chakraborty, S. (2018) proposed a green energy policy that suggested higher employment potential alongwith contributing to greater overall economic growth supplemented by increased fiscal expenditure. They suggested that an annual investment of 1million US dollars in the Indian economy through their green energy program would lead to generation of around 200 jobs as compared to those of 82 jobs as create in a fossil fuel program. Thus, their study analyzes the composition of employment (men/ women), throwing some light on the type and quality of jobs created by investments in India's green energy sector. The green energy program demonstrated the progressiveness in the employment composition, gender, region, caste, and skill being used optimally. In the years to come India will be benefitted by being a green energy economy. While the expansion of the green energy program would lead to increase in overall employment yet the challenge would remain regarding how to improve job quality, ensure higher earnings, and availing additional employment benefits such as health insurance, pensions, etc.

LANDSCAPE OF GREEN JOBS IN INDIA

Green jobs span various sectors and industries, and they can be found in both traditional and emerging fields. India's push for green jobs would help it in achieving a sound and sustainable path to attain future growth targets and implement climate action goals timely. India's aim for renewable energy includes 500 GW of non-fossil fuel capacity by 2030 and ensuring there are net-zero emissions by year 2070. India is investing heavily in solar, wind and various other renewable energy sources to meet its future targets. Indian companies have also made commitments towards achieving net-zero emissions in the coming decades. The automotive, construction, and textile sectors areas are focusing more on green transition. This focus on making Indian economy a green economy is producing more green jobs. India has the potential to create around 30 million jobs in green economy by 2047.

Solar energy sector is projected to equip around 3.26 million jobs by year 2050 and wind energy is expected to create 0.18 million green jobs by year 2030. Other sectors which are expected to create green jobs are bioenergy and green hydrogen sectors which are expected to create 0.27 million and 0.6 million green jobs by year 2030 respectively.

India already has over 1 million renewable energy jobs, including: 453K in hydropower, 319K in solar PV, 52K in wind along with growing roles in biofuels, biogas, and storage. Most demanding green jobs in India include:

Technical & Engineering :

1. Wind Turbine Engineers
2. Solar PV Engineers,
3. Hydro -electricity Engineers
4. Energy -Storage Experts

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5. Battery Energy Storage System specialists
6. Operations &Management Managers
7. Quality/Cost control Engineers
8. Environmental engineers focused on waste reduction

Project Delivery & Management

1. Project Engineers
2. Business Development Managers
3. Land Acquisition specialists
4. Sustainable project architects
5. Green- building consultants
6. Environmental- impact assessment professionals

Consulting & Analysis

1. Energy Analysts
2. Financial Reporting
3. Risk Management
4. Energy auditors
5. Waste management specialists
6. Recycling waste coordinators
7. Composting facility experts
8. Compliance measures specialists ensuring adherence to new environmental regulations

Other jobs

1. Renewable Energy Consultants
2. Sustainability Managers
3. Carbon Accountants
4. Bioenergy Engineers
5. Geothermal Energy Engineers
6. Energy-efficient building designers
7. Energy conservation program managers

Entry-Level jobs & Internships

1. EPC internships
2. Distributed Energy & Climate internships

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3. Construction workers specializing in eco-friendly building practices

Electric Vehicle (EV) Jobs:

1. Electric vehicle manufacturing jobs
2. EV charging infrastructure developers
3. Battery technology researchers
4. EV maintenance and repair technicians

Biodiversity Conservation Jobs:

1. Wildlife conservationists
2. Ecologists and environmental biologists
3. Park rangers and naturalists
4. Conservation educators

Education and Research Jobs:

1. Environmental scientists
2. Researchers in Environmental science
3. Sustainable development educators
4. Environmental policy analysts
5. Green technology researchers

CASE STUDY ON GREEN JOBS IN INDIA

One case study in Indian context where significant green jobs initiatives is ensured is that of Tata Power ltd.. Tata Power is India's largest integrated power company and a subsidiary of the Tata Group, one of India's oldest and largest conglomerates. The company has ensured various green initiatives in their routine practices. These have been listed below:

1. Renewable Energy Projects: Tata Power has been actively investing in renewable energy projects, including wind, solar, hydro, and more recently, even exploring opportunities in solar rooftop installations. They aim to increase their renewable energy capacity and reduce their carbon footprint.

2. Job Creation in Renewable Energy Sector: By investing in renewable energy projects, Tata Power contributes to the creation of green jobs in India. These jobs include roles in project development, engineering, construction, operations, maintenance, and support services across the renewable energy value chain.

3. Skill Development Programs: Tata Power has implemented skill development programs focused on renewable energy technologies. These programs aim to train and upskill individuals to meet the growing demand for skilled workers in the renewable energy sector. By doing so, they not only contribute to job creation but also address the skills gap in the industry.

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4. Corporate Social Responsibility (CSR) Initiatives: Tata Power's CSR initiatives often include projects related to environmental sustainability and renewable energy. These initiatives may involve community engagement, awareness campaigns, and infrastructure development aimed at promoting green practices and creating employment opportunities in environmentally friendly sectors.

5. Innovation and Research: Tata Power invests in research and innovation to develop and deploy advanced technologies for clean energy production and environmental conservation. These efforts contribute to the growth of the green economy and create opportunities for research and development professionals in India.

Tata Power's initiatives serve as a measure as to how Indian companies can contribute to sustainable development, job creation, and environmental conservation through their green initiatives.

ROLE OF NATIONAL SKILL DEVELOPMENT CORPORATION

National Skill Development Corporation (NSDC) plays a crucial role in enhancing the skill ecosystem of India by promoting skill-based training which meets the needs of industry and also is needed by most of the sectors. It was established under the Ministry of Skill Development and Entrepreneurship on 31st July 2008 and works through a public-private partnership model to support the creation of vocational training institutions, develop various curriculum standards, and ensure quality through Sector Skill Councils (SSCs). It actively contributes to provide skills to today's youth in different sectors like renewable energy sector, electronics, and construction by funding various training partners, providing certifications, and offering digital learning platforms like eSkillIndia,etc. National Skill Development Corporation also collaborates with global partners to align skills being provided in India with that matching the international standards and requirements. Thus NSDC ensures provision of employment opportunities both in India and abroad. NSDC ensures bridging the skill gap, empowering the youth of today with requisite skills and ensure growth of Indian economy. NSDC has created number of Sector Skill Councils (SSCs), including ones relevant to green energy ,Power Sector Skill Council (PSSC), Electronics Sector Skill Council (ESSCI),Construction Sector Skill Council, etc. These SSCs define the job roles, develop National Occupational Standards (NOS), and ensure quality of training to workforce. It also supports training in solar PV installation, wind turbine maintenance, energy auditing, etc. leading to sustainable future practices.

SKILL COUNCIL FOR GREEN JOBS

The Skill Council for Green Jobs (SCGJ) in India plays an important role in promoting sustainable development by building a skilled workforce for India's growing green economy. It was established under the National Skill Development Corporation (NSDC) on October 1, 2015and is responsible for identifying the skill gaps in different sectors like renewable energy, waste management, water conservation and green construction. It helps NSDC in framing industry-relevant training programs, laying down standards and adopting various certification systems to ensure that the workforce is equipped with the necessary competencies needed to work efficiently in an environmentally sustainable job environment. By collaborating with industry experts, SCGJ ensures the alignment of skill development

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initiatives after collaborations with industry and academia and different government sector initiatives like the National Solar Mission and other clean energy goals. SCGJ helps in creating employment opportunities for the youth of today along with supporting India's commitment to climate change mitigation and achieving sustainable growth in the near future by providing green jobs.

CONCLUSION

Green jobs are essential for India's growing economy as they offer a sustainable pathway to economic growth while addressing the different environmental challenges. With rising concerns over climate change, pollution and natural resource depletion it is essential to meet green environment targets through creation of green jobs. Green jobs tend to promote the use of clean energy, efficient resource management and eco-friendly technologies thereby reducing the technological impact on green environment. They also open up new avenues for employment opportunities especially for the youth of today. As our country progresses towards its sustainability targets under various initiatives like the National Action Plan on Climate Change and net-zero commitments, green jobs will definitely add to its strength and play a key role in ensuring both environmental sustainability and economic resilience. Green jobs are integral to India's economic growth. There are many factors as discussed in the paper which tend to affect green jobs and have to be kept in mind while taking green initiatives along with minimizing any challenges that may pose difficulties for taking green initiatives.

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