# Green Jobs in India:
## Present and Future Prospects

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Dr. Shashi Bala

V.V. Giri National Labour Institute

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# Contents

# Preface

The study on "Green Jobs in India-Present and Future Prospects" encompasses the different aspects of green economy, green skills and green workforce as well as the various industries that green jobs currently caters to and are predicted to displace in the near future. The 2010–2021 timeframe chosen for this study may change based on the data availability for the various areas of study.

It can be seen that there are innumerable factors that affect green jobs and its growth more of which is to be witnessed in the coming years. First and foremost is the inevitable urge to reduce $CO_2$ emissions resulting in the development of a more sustainable environment. This study looks at developments in green job creation (employment), social quality (equity), accessibility of work to women as well. It aims at helping its reader to gain a comprehensive view of the definition of green jobs, sectors where green jobs exist and can be generated in the near future. The report lay emphasis on the relative positioning of India in terms of green jobs and recovery of the economy post COVID-19 pandemic. The major concern of employment generation is also highlighted in this report as to how low carbon emission and clean energy could help India in increasing jobs along with meeting its net zero target.

The report analyses both negative and positive outlook focusing on the different initiatives and schemes related to green jobs in India. Considering them the policy formulation and evaluation in the present study intends to contribute regulation efficacy at the national level, taking into account the existing scenario of green jobs. This could enable in assisting the policymakers in comprehending the implications of green jobs and its sectors for framing affirmative impact on the stakeholders.

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# Chapter 1: Introduction

## 1.1 Overview

The concept of a "green economy" is built on "green jobs," which are projected to improve environmental quality. In terms of employment skill requirements, wage levels, and working circumstances, green jobs are highly diverse (OECD, 2012). This definition gives us an idea of the complexity and challenges associated with evolution of green jobs which have been discussed in detailed in the further chapters.

Along with our understanding of how humans engage with nature, the idea of what defines a "green activity" has changed. A green job is, in the simplest words, any position or form of employment that actively promotes a more sustainable environment.

The company or organisation may be involved in a more conventional industry or one that is more environmentally friendly, such as solar energy, while making considerable and earnest efforts to reduce its carbon footprint (not just green wash).The transition to sustainable practises of consumption and production is aided by green jobs. Training in new and redefined skills is required to get the workforce ready for a green economy. Through incentives or regulatory requirements, firms are driven to adopt green growth strategies and transition to green manufacturing systems. These employment are projected to improve environmental quality while reducing energy use.

### Terminologies one needs to be familiar with

**Green economy** [is] one that greatly reduces environmental risks and ecological scarcities while enhancing human well-being and social equality. (UNEP 2011).

**Green Values** is the overall benefit that customers receive from utilizing green goods and services. The financial, environmental, social, informational, and practical advantages that consumers might receive from a green product or service are collectively referred to as green value.

**Decent work** is defined by the ILO as "being productive work for women and men in conditions of freedom, equity, security and human dignity".

**Gender Mainstreaming** In order to ensure that both men and women gain equally and that inequality is not perpetuated, gender mainstreaming is a strategy for incorporating both men's and women's concerns and experiences into all aspects of policy and programme formulation, implementation, monitoring, and evaluation.

## 1.2 Literature Review

### 1.2.1 Green Jobs

According to Kumar V, Mandal, K, Kumar, N, Banerjee, T. (2010), the field of green jobs is still in its infancy stage, and there isn't much literature on the subject other from a few reports. As a result, it was deduced that the definition of "green jobs" refers to a job that is "green and good." According to a recent report on green jobs, all of the currently available positions in the globe is divided into four quadrants:

green and decent, decent but not green, and green but not decent. But it's not good, and it's not green either. The "green economy" as a development model can only be sustained if all jobs are converted to "green and respectable" jobs.

Sulich & Sołoducho-Pelc, (2022) goal of the study is to look into Environmental Goods and Services sector (EGSS) in 28 European Union countries from 2009 to 2019. The results shows which Sustainable Development Goals can assist Circular Economy (CE) while also enhancing a number of Green Jobs. Given the rising level of environmental consciousness among customers and other public entities, the provision of green products and services ought to be included in CE business models.

The establishment of green Jobs is linked to a new approach to corporate management, with the goal of preventing environmental deterioration and lowering unemployment, McMahon et al. (2021). It can be said that green jobs are critical for environmental and labour market protection, as they combine sustainability principles, Paes et al. (2019).

### 1.2.2 Social Security

Agricultural workers are frequently barred from social protection systems, particularly contributory schemes, due to legislative, project planning, financial, administrative, institutional, participation, and information hurdles. Sato, (2021) examined the availability of social insurance schemes for agricultural workers in the Near East and North Africa (NENA) region, which include a variety of insurance types such as old age, disability and survivors', sickness and maternity, work injury and unemployment, as well as family and child allowances. The author also examined the agricultural insurance plans, which are important in shielding agricultural farmers from the catastrophic effects of covariate risks. His findings revealed that the substantial portion of society are discovered to be left behind, exposed to risks and vulnerable to growing vulnerabilities. Many families lack access to social protection due to the public and formal commercial sectors' limited potential to generate acceptable work prospects.

At the family and local economy level, Tirivayi, (2016) discovered possible synergies between social protection and agriculture. In Sub-Saharan Africa, there are connections between social protection and agriculture that can be utilised and enhanced to construct resilient and sustainable rural livelihoods. The "Comprehensive Africa Agriculture Development Programme (CAADP)" framework, which promotes synergies between social protection and agriculture in order to eliminate hunger and ameliorate extreme poverty and hunger through agricultural-driven development.

Wang et al., (2013) addressed that in the absence of comprehensive government-provided social security, the agricultural sector and stable agricultural land holdings are significant means of protecting rural people and rural–urban migrants from dangers and difficulties. Given the country's enormous rural population and massive rural–urban mobility, reliable land access for both rural and migrant communities have helped China's economy escape vulnerability and sustain social stability.

## 1.3 Objectives of the Research Study

To study the sectors where green jobs are existing.
To study the areas where Green Jobs can replace the existing jobs.
To examine the green jobs potential in India by 2025, 2030, 2047 and 2070.

## 1.4 Research Methodology and Framework

This report contributes to the phase 1 of the research on green jobs where emphasis has been laid on secondary data. It is set up in a way such that it carefully examines the goals before assisting in the recommendation of policies. The development of the SDGs and MDGs, agricultural methods, and CO2 emission levels are only a few of the variables that affect the availability of green jobs. Additionally, four states *viz.* Rajasthan, Gujarat, Tamil Nadu and Karnataka have been chosen where the government has started a number of green job projects and is actively implementing new ones.

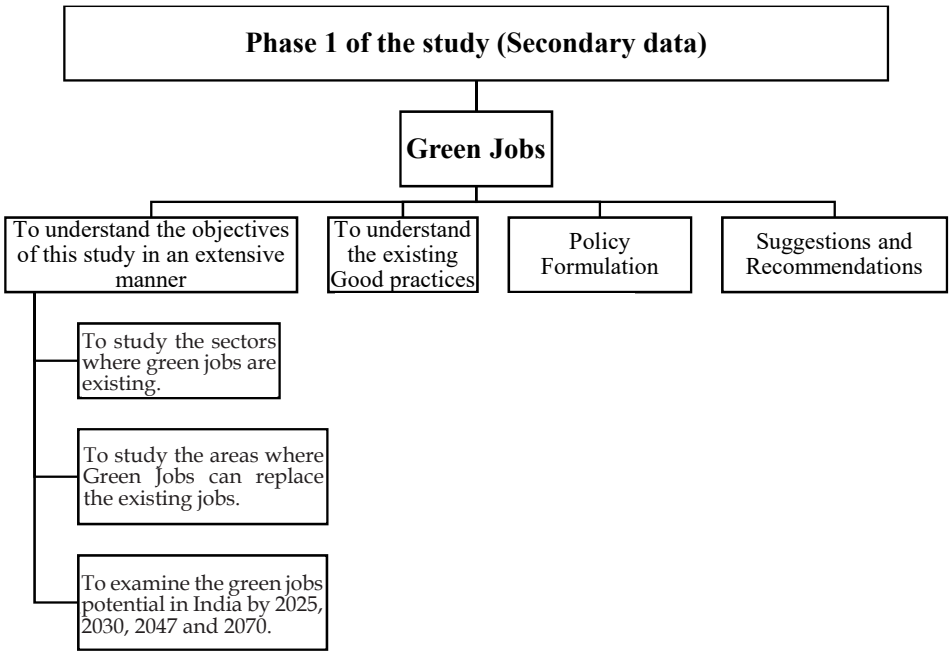



*Figure.1 Research Framework for Green Jobs*

### 1.4.1 Selection of the Sectors and Area

According to the statistics times, India's most important industry is the services sector. In 2020–21, the services sector's gross value added (GVA) is projected to be 96.54 lakh crore Indian Rupees (INR), at current exchange rates.

Of India's total GVA of 179.15 lakh crore Indian rupees, the services sector represents 53.89% of that total. In context to the tertiary sector GVA is highest for financial, real estate & professional service contributing to 22.05%. Industry sector output accounts for 25.92% of GVA, which is Rs. 46.44 lakh crore. It can be seen that for the secondary sector GVA of 2020-21 is highest for manufacturing by 14.43%. GVA of 2020-21 for the primary sector is highest for the agriculture which is 20.19% and allied sector (StatisticsTimes, 2021).

### 1.4.2 Data Sources

The exploratory nature of this work will be supported by theoretical underpinnings. The information was primarily gathered from secondary sources, such as annual reports from the Ministry of Environment, Forests & Climate Change (MoEF&CC), the International Labor Organization, the IPCC's sixth assessment report, key findings of various other related events focusing on environment and sustainability. Adding to this, numerous journal databases have been referred to collect topic-related research papers, and various newspaper articles.

## 1.5 Limitations of the study

As far as the limitations are concerned the study covers different facets of green jobs which is relatively at an initial stage and emphasises majorly on secondary data sources

# Chapter 2: India and 'Green Jobs'

## 2.1 Introduction

The shift from Brown economy to Green Economy is an outcome of myriad factors such as climatic conditions, air pollution and environmental degradation. This transition focuses majorly on environmental protection, habitat conservation and zeroing out emissions.

Green jobs are a kind of employment that directly benefits the environment and promotes general environmental development. Energy efficiency, resource conservation, and jobs utilizing renewable energy are all included in this category. Green jobs aim at lessening the detrimental effects of economic sectors on the environment and advancing the transition to a low-carbon economy. A decarbonization or low-carbon economy is based on a rather straightforward concept. It concerns preserving a sustainable economy, one that doesn't result in significant emissions of greenhouse gases, particularly carbon dioxide.

**Table 2.1: Environmental Performance Score for India**

| Countries | Environmental Performance Score | Rank (out of 180 countries) | GDP Rank |
|---|---|---|---|
| United Kingdom | 81.3 | 4 | 5 |
| Germany | 77.2 | 10 | 4 |
| Japan | 75.1 | 12 | 3 |
| United States | 69.3 | 24 | 1 |
| China | 37.3 | 120 | 2 |
| **India** | **27.6** | **169** | **6** |

***Source: Wendling, Z. A., Emerson, J. W., de Sherbinin, A., Esty, D. C., et al. (2020). 2020 Environmental Performance Index. New Haven, CT: Yale Center for Environmental Law & Policy. Indicators are weighed on a 0–100 scale, from worst to best performance.***

According to 32 performance indicators in the following 11 issue categories the 2020 Environmental Performance Index (EPI) assigns rankings to 180 nations. As far as India's environmental performance score is concerned it is relatively low which is 27.6 and has a rank of 169 out of a posible180 countries.

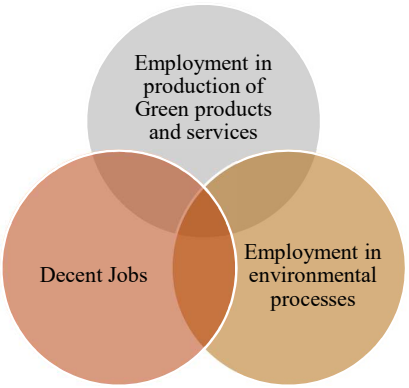
## 2.2 Meaning and Definition

Green jobs are described as "jobs that contribute to conserve or restore the environment," whether they are found in established green industries like manufacturing and construction or in more recent green industries like renewable energy and energy efficiency". India was one of the first nations in the Asia-Pacific region to work with the ILO on the Green Jobs Initiative (an ILO-UNEP-IOE-ITUC global partnership launched in 2007). This collaboration was made possible by

[1] Issue categories air quality, sanitation and drinking water, heavy metals, waste management, biodiversity and habitat, ecosystem services, fisheries, climate change, pollution emissions, agriculture, and water resources

the Multi-Stakeholder Taskforce on Climate Change and Green Jobs, which was presided over by the Ministry of Labor and Employment (ILO, n.d).

Despite the fact that the topic of green jobs is of concern to the government, academia, and business community, different research has varying definitions for the term. We will be covering the two definitions in the section below, the first one is given by International Labour Organization (ILO) and the second one by Bureau of Labour Statistics (BLS).




For the ILO, green jobs are all those jobs that fall in the dashed area.

The term "green jobs" refers to "**decent jobs that help to the preservation or restoration of the environment**," whether they are found in established green industries like manufacturing and construction or in more recent green industries like renewable energy and energy efficiency.

***Figure 2.1 Dashed area representing green jobs which is an intersection of three parameters***
***Source https://www.ilo.org/global/topics/green-jobs/news/WCMS_220248/lang--en/index.htm***

As per the Bureau of Labour Statistics Green Jobs can be defined as

**i.** Employment opportunities in companies that manufacture products or offer services that protect the environment or preserve natural resources;

**ii.** Jobs where employees' responsibilities include making the production process more sustainable or improving the environmental friendliness of their establishment's industrial processes.

Keeping in mind the aforementioned definitions we further consider the key findings of COP26 to get a closer look of the targets pertaining to Co2 emission and renewable energy.

During COP 26 held at Glasgow, Scotland from Sunday, October 31st to Saturday, November 13th, 2021 there were different goals decided for the nation to achieve. Mentioning the targets set for India included aim at accomplishing a net zero economy by 2070, an increase in the renewable energies, reduce the nation's carbon intensity, and reduce emissions by 1 billion tonnes by 2030. It is expected to meet nearly 50% of the energy needs by the different renewable sources. Further, by 2030, it is estimated that the country's non-fossil energy capacity might increase to 500 GW (IETA, 2021).

## 2.3 Skill Council for Green Jobs (SCGJ)

The Union government established the Skill Council for Green Jobs on October 1, 2015. It was designed to be a non-profit, autonomous, industry-led project that was in line with the National

Skill Development Missions. The council, which is supported by the Confederation of Indian Industry (CII) and the Ministry of New and Renewable Energy (MNRE), aims to assist manufacturers and other service providers in India's "green business" sector in implementing collaborative, industry-led skills that will advance the nation toward fully realizing the potential and significance of "green jobs". The Skill Council for Green Jobs claims that raising people's awareness of and providing them with training in green jobs skills will ensure that greenhouse gas emissions are reduced, waste and pollution are reduced, ecosystems are protected and restored (Skill Council of Green Jobs, n.d). The growth of green jobs today is taking place in both developed and developing nations.

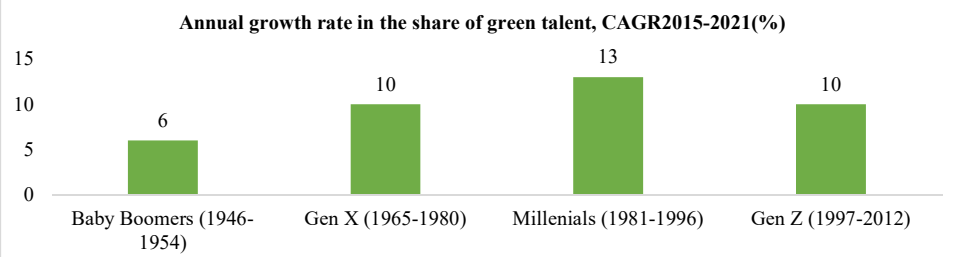



*Figure 2.2: Annual growth rate in the share of global green talent from 2015-2021*
*Source https://economicgraph.linkedin.com/*

The empirical data between 2015 and 2021 shows that millennials will dominate the world in terms of green talent growth, with a compound annual growth rate of 13%. While this gives a chance for younger generations to positively influence the greening of the economy. It can be deduced that young people today will help create and maintain solar panels, wind turbines, low emission cars, and other green economy technology (Global Green Skills Report, 2022).

## 2.4 Parameters affecting the overall Green Jobs scenario in India

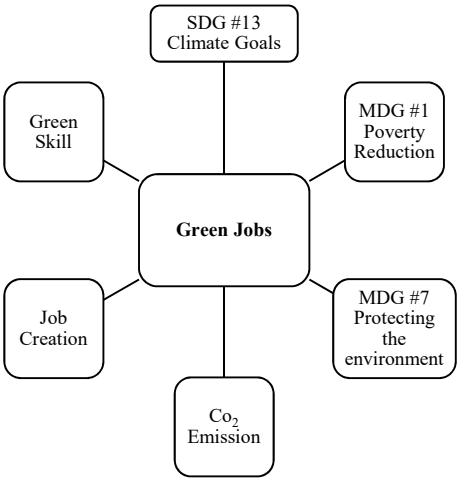



*Figure 2.3: Parameters affecting Green Job Scenario in India*

There are numerous factors which affect green jobs and its overall mechanism. To highlight the parameters affecting Green Jobs would include its interrelationship

with Sustainable Development Goals related to Climatic condition, Millennium Development Goals of Protecting the environment and Poverty reduction. The amount of Co2 emission on the environment also plays a critical role in adding to environmental degradation, hence controlling it will help increase sustainability. Adding to it, there are sectors which have been discussed in detail in Chapters 3 and 4, which can be seen moving towards adopting operations that are environment friendly and require an individual to acquire green skills thereby resulting in job creation.

### 2.4.1 Sustainable Development Goal #13 Climate Goals

The effects of climate change are felt by all countries on all continents. It is harming people's lives and upsetting national economies. The sea level is rising, weather patterns are shifting, and extreme weather events are happening more frequently.

From a rank of 117 in 2020 and 120 in 2021 India's SDG preparedness rank has moved down to 121 out of 163 countries as per the 2022 Global Index of SDGs. The different indicators of climate goals comprise of **i)** CO2 emissions from cement manufacturing and the use of fossil fuels CO2 emissions **ii)** imports contain CO2 emissions **iii)** emissions associated with the export of fossil fuels. In accordance to the dashboards.sdgindex.org (2022), the climatic goals for India have been achieved (dashboards.sdgindex.org, 2022).

However, it has been found that children under the age of five bear about 90% of the burden of sickness associated with climate change, despite the fact that they are the least to blame for the environment's changing conditions. Each year, air pollution-related causes claim the lives of more than 500,000 kids under the age of five. The developing minds and lungs of even more will sustain long-term harm. A new generation of kids will be raised in a world that is significantly more unsafe and uncertain due to environmental degradation and climate change today (UNICEF, 2022).

### 2.4.2 Millennium Development Goal #1 Poverty Reduction and #7 Protecting the environment

The rate of worldwide poverty decreased between 2015 and 2018, from 10.1% in 2015 to 8.6% in 2018, continuing the long-term trend of decline. However, the COVID-19 epidemic caused the worldwide poverty rate to spike from 8.3% in 2019 to 9.2% in 2020, reversing progress by around three years.

**Global Hunger Index (GHI)**

India is ranked 107$^{th}$ out of the 121 nations having enough data to compute the 2022 Global Hunger Index rankings. India has a serious level of hunger with a score of 29.1.

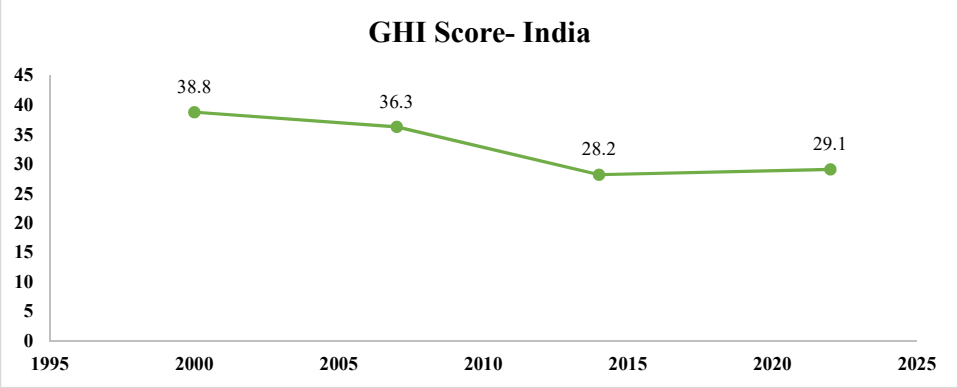



*Figure 2.4: Global Hunger Index Score for India*
*Source: https://www.globalhungerindex.org/india.html*

For the year 2000 the Global Hunger Index was 38.8 which decreased to 36.3 in 2007. In a span of 7 years GHI saw a dip of 8.1 and was reduced to 28.2 in 2014. However, in 2022 there was a relative increase in the GHI index by 0.9 thus the GHI Score of India is 29.1 at present.

**Table No 2.2 Trend Indicator Values for India**

| Year | Proportion of undernourished in the population (%) | Prevalence of wasting in children under five years (%) | Prevalence of stunting in children under five years (%) | Under-Five mortality rate (%) |
|---|---|---|---|---|
| 2000 | 18.4 | 17.1 | 54.2 | 9.2 |
| 2007 | 17.5 | 20 | 47.8 | 6.8 |
| 2014 | 14.8 | 15.1 | 38.7 | 4.6 |
| 2022 | 16.3 | 19.3 | 35.5 | 3.3 |

*Source https://www.globalhungerindex.org/india.html*

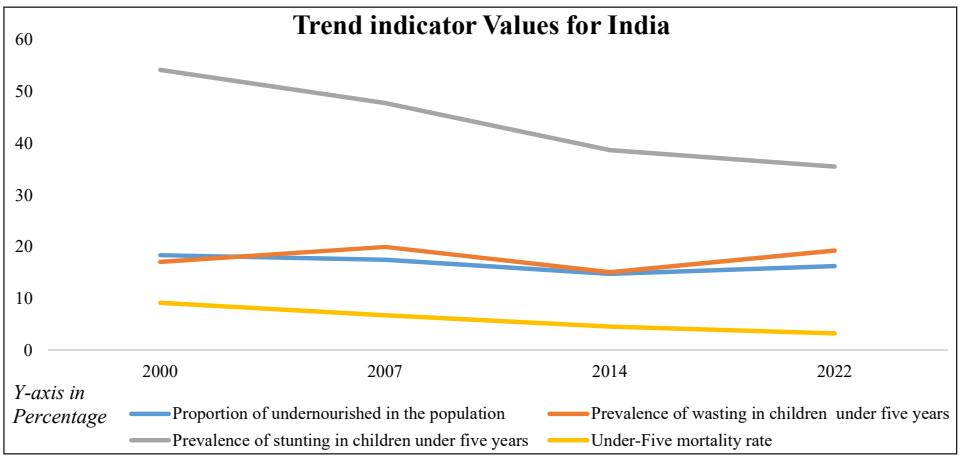



*Figure 2.5: Trend Indicator Values for India*
*Source: https://www.globalhungerindex.org/india.html*

The trend indicator values for India encompasses **i)** four parameters Proportion of undernourished in the population, **ii)** Prevalence of wasting in children under five years, **iii)** Prevalence of stunting in children under five years and **iv)** Under-Five mortality rate. For the year 2022, proportion of undernourished in the population is at 16.3%, prevalence of wasting in children under five years 19.3%, prevalence of stunting in children under five years is at 35.5% and under-five mortality rate is 3.3%. All the values are relatively lower in comparison to the previous years. Thus, it can be said that India has showcased development yet it has a long way to go.

### 2.4.3 $CO_2$ Emissions kt

NASA claims that increasing atmospheric carbon dioxide concentrations will both benefit and harm crops. Increased carbon dioxide levels can "improve water-use efficiency in crops" and "mitigate yield losses due to climate change," but they can also lead to nitrogen and carbon imbalances that reduce the number of essential elements like iron, zinc, and protein that crops need to grow (Global Green Skills Report, 2022).

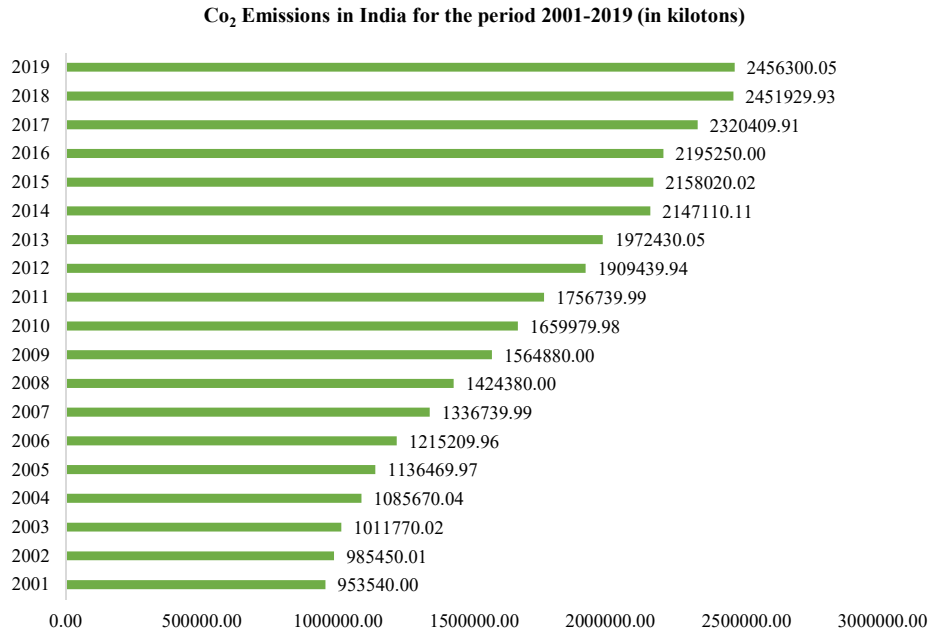



*Figure 2.6: $Co_2$ Emissions in India for the period 2001-2019 (in kilotons)*
*Source: https://data.worldbank.org/indicator/EN.ATM.CO2E.KT?locations=IN*

As per the annual data from World Bank for the period 2001-2019, it can be seen that there has been an increase in the $Co_2$ emission for India from 2001(953540.00 kilotons) to 2019(2456300.05 kilotons), which is an issue of grave concern and needs immediate attention.

## Greenhouse gas emissions by Sector, India

As far as India is concerned it is the third largest emitter of GHG after China and the United States. It has been found that over 96% of India's current GHG emissions come from only five industries: energy, agriculture, industry, transportation, and

buildings and infrastructure. To transform each of these sectors as part of India's net zero transition, an ambitious multi-decade effort will be required (World Economic Forum, 2021).

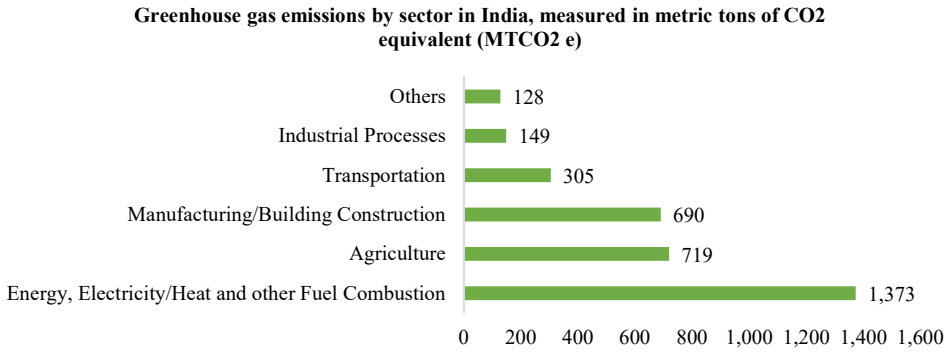



*Figure 2.7: Greenhouse gas emissions by sector in India, measured in metric tons of $CO_2$ equivalent ($MTCO_2$ e)*

*Source: World Resources Institute CAIT Climate Data Explorer*

The sectorial emission of GHG gives a snapshot for India where it is clearly evident that maximum emission is contributed by energy, electricity/heat and other fuel combustion accounting for 1,373 MTCO2e whereas the least by the industrial processes contributing to149 MTCO2e and other sectors releasing GHG nearly 128 MTCO2e.

### 2.4.4 Job Creation

To highlight one of the most recent initiatives of Delhi Government wherein it has been identified that there is a lack of Electric Vehicles skilled mechanics. To bridge this gap Delhi Skill and Entrepreneurship University (DSEU) aims at offering an integrated course to students pursuing diploma in automobile engineering. This will act as an enabler in creating Green Jobs within the capital and help it become a training hub for EV workforce. For this initiative a MoU has been signed between DSEU, World Resources India (WRI) and Hero Electric Vehicles Ltd. This will further help generate 100 trained students in both basic and advanced EV mechanics (Times of India, 2022).

### 2.4.5 Green Skills

Green skills can be defined as the abilities that help to modify procedures, offerings, and goods to comply with environmental laws and regulations resulting from climate change. They comprise of knowledge, attitudes, and values required to live in, grow, and support a sustainable and resource-efficient society (GSDP,n.d).

The core conclusions of the IPCC's sixth Assessment Report, which emphasize on certain sobering future realities, should be understood after a study of all potential implications on the growth of green jobs. The important findings from the IPCC's sixth assessment report, which focuses on India and its many states, are summarized here.

As per the research conducted, India has been identified as one of the vulnerable hotspots, with multiple areas and significant cities at extremely high risk of climate

calamities like flooding, sea level rise, and heat waves. It has been highlighted that Mumbai might face certain serious risk of flooding and sea level rise. Further heat waves are a big threat for Ahmedabad.

The heat and humidity are getting close to becoming dangerously high in a number of cities, including Chennai, Bhubaneshwar, Patna, and Lucknow. Another dangerous aspect worth noticing is the extreme and slow-onset disasters that have harmed infrastructure, including water, sanitation, and electricity systems. This has led to financial losses, service interruptions, and relatively negative effects on people's well-being. With a predicted spike in population by 2050, expected to double vis-à-vis 2022, urban India is more at risk than other locations (IPCC, 2021).

## Case Study #1 Zambia Green Jobs Program

### Introduction

The Government of Zambia and a number of UN organisations, including the International Labor Organization (ILO), the United Nations Environment Programme (UNEP), the Food and Agriculture Organization (FAO), the United Nations Conference on Trade and Development (UNCTAD), and the International Trade Center, have partnered to create the Zambia Green Jobs Program (ITC). The ILO is in charge of overseeing the program's implementation, and the Finnish Ministry of Foreign Affairs provides funding for it.

The Zambia Green Jobs Programme (2013–2017)'s three major goals make up the Zambia Green Jobs initiative, which is a comprehensive intervention. Each assist in achieving the desired outcome.

i) The first major pillar, known as the "meta-level," aims to alter people's perspectives and attitudes in order to foster a greater appreciation of green building.

ii) The promotion of a supportive business climate that permits sustainable private sector development is the goal of the second key pillar (meso-level).

iii) Creating sustainable micro, little, and medium-sized enterprises (MSMEs) that provide respectable green jobs is the third and final pillar.

### Conclusion

This case study has painted a clear picture of how the Zambia Green Jobs Programme sought to balance the needs of the business environment, or more generally, the development of the private sector, with those of environmental sustainability. Although the program's design began with the creation of jobs and the growth of the private sector in mind, it was able to constantly incorporate the sustainability component by framing the programme in terms of "Green Jobs" throughout.

***Source:*** *https://www.enterprise-development.org/wp-content/uploads/DCED-GGWG-Case-study-Zambia.pdf*

# Chapter 3: Green Job and its sector

## 3.1 Introduction

In a recent news article, Prime Minister Narendra Modi urged businesses, individuals, and state governments to concentrate on "green growth" and "green jobs" in order to achieve the goal of net zero carbon emissions by 2070 (Livemint,2022). Until now, sectoral assessments have highlighted the significance of social interaction as the cornerstone of any transition to a greener economy. Stakeholder participation has proven to be crucial for ensuring that worker concerns are appropriately expressed, especially in industries where a brief loss in employment is anticipated.

Production, consumption, and employment trends are all changing significantly, and it is anticipated that this trend will continue over the coming years. The transition to a greener economy is already underway, though at varied stages of maturity depending on the countries and sectors involved. It is possible and already happening to reduce GHG emissions and other environmental effects, improve living standards, create green jobs, and eradicate poverty while boosting the competitiveness of businesses and economic sectors in industries like renewable energy or construction in various nations around the world.

## 3.2 Labour Market Outlook during Pandemic

In 2020, social cohesion was undermined by widespread dissatisfaction and political polarization, and an ongoing recession is endangering the livelihoods of people at the lower end of the income scale. Economic globalization is also slowing. As the COVID-19 health epidemic affects economies and labour markets, millions of employees have gone through transformations that have fundamentally changed their lives at work and outside of it, their wellbeing, and their productivity. One of the distinguishing characteristics of these shifts is their asymmetrical nature, which has a higher and faster impact on people who are already disadvantaged (World Economic Forum ,2020).

## 3.3 Prominent sectors for Green Jobs

Many areas need to be strongly supported for the transition to a green economy. In this study we aim at understanding the present condition with respect to i) Renewable energy ii) Recycling and waste management and iii) Sustainable agriculture and forestry.

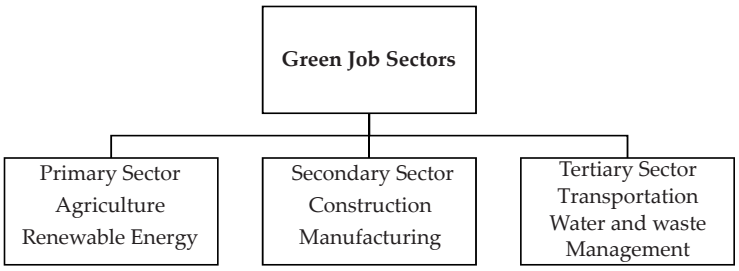



*Figure 3.1 Green Job and its sectors*
*Source: https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2021/Oct/IRENA_RE_Jobs_2021.pdf*

It can be said that, "green jobs" are positions in the agricultural, manufacturing, research and development, administrative, and service sectors that make a significant contribution to maintaining or improving environmental quality. This includes work that specifically, but not exclusively, contributes to the preservation of ecosystems and biodiversity, the use of high-efficiency strategies to reduce energy, material, and water consumption, the decarbonization of the economy, and the reduction or avoidance of the production of all waste and pollution. Subsidies, carbon markets, tax reform, regulatory instruments and targets, feed-in tariffs, eco-labeling, R&D investment, and overseas aid are just a few examples of the forward-thinking government policies that will be essential.

### 3.3.1 Renewable Energy

Despite the COVID-19 aftereffects and the escalating energy crisis, there were 12.7 million (1.27 crore) renewable energy jobs worldwide in 2021, an increase of 700,000 new jobs in a single year (ILO, 2022).

An interesting fact to be noticed here is that in 1982, India became the first nation in the world to create a ministry specifically for renewable energy. A goal of 20 GW of solar capacity by 2022, which was criticized as being overly optimistic when it was set in 2010, was achieved four years early. India currently plans to install 227 GW of renewable energy by 2022, surpassing Latin America's entire installed renewable energy capacity. (greeneconomytracker.org, 2022).

With installed non-fossil energy capacity totaling 157.32 GW, or 40.1% of installed electricity capacity, India has achieved its Nationally Determined Contributions objective. According to the DPIIT's Foreign Direct Investment (FDI) data unit, India's "Non-Conventional Energy" sector attracted FDI worth US$ 797.21 million between 2020 and 21 (PIB, 2021).

**Table 3.1: State-wise installed capacity of Renewable Power as on 30.09.2022**

| P&C Division | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| State-wise installed capacity of Renewable Power as on 30.09.2022. | | | | | | | | |
| S. No. | STATES / UTs | Small Hydro Power | Wind Power | Bio-Power | | | | |
| | | | | BM Power/ Bag asse Cogen. | BM Cogen. (Non-Bagasse) | Waste to Energy | Waste to Energy (Off-grid) | Bio Power Total |
| | | (MW) | (MW) | (MW) | (MW) | (MW) | (MW) | (MW) |
| 1 | Rajasthan | 24 | 4577 | 119 | 2.00 | | 4 | 125 |
| 2 | Gujarat | 89 | 9799 | 65.30 | 12.00 | 7.50 | 26 | 111 |
| 3 | Tamil Nadu | 123 | 9874 | 969.10 | 44 | 6.40 | 24 | 1042.70 |
| 4 | Karnataka | 1281 | 5268 | 1867.10 | 20.20 | 1.00 | 14 | 1902 |

*Source: https://mnre.gov.in/img/documents/uploads/file_s-1665464058867.pdf*

**Table 3.2: State-wise installed capacity of Renewable Power as on 30.09.2022**

| P&C Division | | | | | | | |
|---|---|---|---|---|---|---|---|
| State-wise installed capacity of Renewable Power as on 30.09.2022. | | | | | | | |
| S. No. | STATES / UTs | Solar Power | | | | | Total Capacity |
| | | Ground Mounted Solar | Rooftop | Solar Component in Hybrid | Off Grid Solar | Solar Power Total | |
| | | (MW) | (MW) | (MW) | (MW) | (MW) | (MW) |
| 1 | Rajasthan | 12590 | 835.00 | 1380.40 | 478 | 15284 | 20009 |
| 2 | Gujarat | 6045 | 1957 | 0.00 | 43 | 8046 | 18044 |
| 3 | Tamil Nadu | 5805 | 368.50 | 0.00 | 60 | 6233 | 17273 |
| 4 | Karnataka | 7447 | 382 | 0.00 | 30 | 7859 | 16310 |

*Source: https://mnre.gov.in/img/documents/uploads/file_s-1665464058867.pdf*

### 3.3.2 Recycling and Waste Management

The waste value chain, from waste collection to sorting and recycling, has the potential to increase decent work and green business development. Sustainable waste management is an opportunity to promote social inclusion, as well as upgrade the quality of existing jobs.

### 3.3.3 Sustainable Agriculture and Forestry

Currently, India emits roughly 3.5 billion tonnes of carbon equivalent GHG emissions annually, including about 1 billion tonnes of emissions from agriculture. India should therefore choose between a low carbon track that maintains emissions at 3 to 4 billion tonnes annually and an ambitious net zero pathway that aims to achieve net zero emissions by the middle of the century. India has some latitude and can choose to achieve net zero emissions by 2050 or 2060. To achieve net zero by 2047, *the hundredth year of Independence* would be a very inspiring aim.

Further more, Mckinsey published a report titled "Decarbonising India: Charting a pathway for sustainable growth" that provides an in-depth analysis of the opportunities and mechanisms to decarbonize the five sectors *viz.* power, steel, transportation, cement, and agriculture that account for about 70% of India's overall emissions. The report further suggests various measures to move towards decarbonizing such as establish a comprehensive medium-term (5, 15, or 25-year) decarbonization plan with sector-specific priorities and regulatory frameworks that will act as a steady hand and demand signals for businesses, allowing them to invest with confidence.

# Chapter 4: Areas where Green Jobs can replace the existing jobs

## 4.1 Introduction

This chapter attempts to give its reader a better understanding of the industries with the potential to generate green jobs. It will concentrate on the various government initiatives that support India's net zero target, clean energy, and sustainability goals.

## 4.2 An overview of the sectors where green jobs exist

### 4.2.1 Energy

According to the International Renewable Energy Agency (IRENA), the industry presently employs more than 10 million people worldwide. The green jobs with the highest salaries are those requiring advanced degrees in renewable energy, such senior engineers in thermos solar plants.

**Green Energy Corridors (GEC)**

**Launched: 2015-2016**

**Phases:** The project is divided into two phases i.e. Phase 1 and Phase 2

**Aim(s):**

1. It tries to synchronize the grid's traditional power plants and electricity generated from renewable resources like wind and solar.
2. By 2030, it hopes to reach the goal of 450 GW of installed RE capacity. The GEC's goal is to upgrade the grid in participating states and evacuate about 20,000 MW of large-scale renewable energy.

The Green Energy Corridor (GEC) initiatives have been started to make it easier for renewable power to be evacuated and to reshape the grid for future needs. By lowering carbon footprint, it would support environmentally sustainable growth and help ensure India's long-term energy security. Large amounts of direct and indirect employment opportunities, for both skilled and unskilled workers, will be made possible by it (MNRE, 2022).

### 4.2.2 Agriculture

The global market for organic agriculture is still expanding, often by double digits, according to the Research Institute of Organic Agriculture (FiBL). Sales of organic food rose 6.4% in 2017 in the United States, the largest market in the world, to reach 43,700 million euros. Europe grew by 10.5% at this time, totaling 37,300 million euros.

### 4.2.3 Transport

In the European Union (EU), this industry is to blame for more than 30% of the CO2 emissions, with road transport accounting for 72% of those emissions. Numerous nations have already taken steps to significantly cut transportation emissions.

By 2050, the EU will reduce these by 60% compared to 1990 levels, resulting in the creation of jobs in the electric vehicle, public transportation, and electrified railway freight haulage industries.

## 4.3 Construction and Manufacturing

Construction and manufacturing are the top industries for hiring green talent. A growing concern with environmental issues at factories and construction sites is indicated by popular vocations and skills. Environment, health, and safety (EHS) is one of the top green talents that people in India have highlighted, and safety manager was the second fastest growing green profession in India between 2016 and 2021. Businesses all around the economy are starting to support environmental aims. Corporate social responsibility and sustainability were among the most popular green talents identified by individuals, while sustainability manager was the green profession with the highest growth between 2016 and 2021. Corporate positions like regulatory affairs consultant, which is India's fastest growing greening career, are also becoming more and more in demand for individuals with green talents.

# Chapter 5: Green jobs and future scenario in 2025, 2030 and 2047

## 5.1 Introduction

The ILO estimates that the green economy might generate 24 million (2.4 crore) jobs globally by 2030, making green skills crucial to the transition to a green economy. According to data from LinkedIn's jobs platform, the ratio of US oil and gas occupations to renewable energy/environment jobs was 5:1 in 2015 but would decrease to 2:1 by 2020. The number of green jobs is growing across a broad spectrum of industries, including banking, fashion technology, and transportation in addition to more unforeseen ones like renewable energy.

As per the social networking site LinkedIn which is also a platform where employee and employers meet urges action on reskilling and up skilling because it warns that demand for green talent is outpacing supply. Over the past five years, green job ads have increased by 8% annually, but the proportion of green talent has only increased by about 6% annually. To sum up the World Economic Forum estimates that skills shortages will remain significant in the years leading up to 2025 as in-demand skills across jobs evolve in its Future of Jobs Report 2020. According to the Forum, the most in-demand talents will be those related to critical thinking, problem-solving, and self-management, including resilience (Linked in Economic Graph 2022).

A paradigm shift towards a greener economy can be attributed to number of initiatives being implemented across the nation. According to the third objective of this study which focuses exclusively on the future Green Jobs scenario, thus we highlight the initiatives to be considered in the coming years within a span of 5-20 years.

### 2025

For instance, the Ethanol Blended Petrol (EBP) initiative, introduced by Prime Minister Narendra Modi in 2018, aimed to mix 20% ethanol into gasoline by 2030; however, while some will be ready in 2023, the total goal has now been pushed back to 2025. Additionally, initiatives like Faster Adoption and Manufacturing of Electric Vehicles - Phase II (FAME II), the production linked incentive (PLI) programme for manufacturing of advanced cell chemistry (ACC) batteries, and investments in non-fossil fuel-based energy capacity are also positive developments.

### 2047

According to a recent NITI Aayog assessment, the use of green hydrogen will reduce CO2 emissions by 3.6 giga tonnes between 2020 and 2050 and result in energy savings of between $246 billion and $358 billion within the same time period (the Hindu business line, 2022).

### 2070

Adoption of green hydrogen will also be revolutionary since it may significantly contribute to India's transition to "net zero" by decarbonizing otherwise challenging industries like iron and steel and heavy transportation.

## 5.2 Good Practices in India related to Green Jobs

1. In order to examine the effects on the labor market and the potential for green jobs, there have been national studies in five sectors (forestry, watershed development, wind energy, metro transport services, and railway transport services) as well as a state study of the wind energy sector in Gujarat.
2. National research study on green job skills.
3. Examining the Mahatma Gandhi National Rural Employment Scheme (MGNREGA) and reviewing good work and green jobs in the Kaimur area of Bihar.
4. National briefings and workshops for interested parties and constituents;
5. A pilot effort for developing green value chains in the Jabalpur dairy industry.
6. Creation of a green business guidebook and introduction of a training programme for the Start and Improve Your Business (SIYB) Program of the International Labor Organization.

In order to comprehend the energy industry and its growth potential, we now talk about the state-level energy generation capacity for the four selected states: Rajasthan, Gujarat, Tamil Nadu and Karnataka. This will also assist in reaching a consensus on which state is performing best in terms of clean energy and how these programmes are assisting in job creation.

## 5.3 State wise Initiatives and potential places for Primary Study-an overview

### 5.3.1 Rajasthan

As a step closer towards a greener economy the integrated energy company Avaada Group has proposed an Rs 40,000 crore investment for a green ammonia manufacturing unit and a renewable energy power plant in Rajasthan, which is an important move for the nation's emerging green hydrogen and ammonia industries.

A Memorandum of Understanding (MoU) has been signed between the Noida-based business and Rajasthan's Department of Industries and Commerce. 3,500 people will be employed directly by the facility when it is built, which is planned for remove the Rajasthani which is planned for the district of Kota district of Kota. Hydrogen is created by electrolyzing water with electricity obtained from renewable energy sources, and this hydrogen is then used to make green ammonia (Businesstoday,2022).

However, industry experts emphasize on a concern that until the eagerly anticipated production-linked incentive (PLI) system for units, electrolysers, fuel cells, etc., is implemented, the cost of producing green hydrogen and green ammonia won't decrease.

### 5.3.2 Gujarat

Plantations enhance the quality of life in many ways. It aids in removing CO2 that contributes to the greenhouse effect (one acre of trees can remove up to 2.6 Tons of CO2) and prevent erosion. Further, plantations assist in cleaning the air by capturing airborne particles, cutting heat, and absorbing pollutants including CO, SO2, and NO2. Trees clean the air through lowering air temperature, respiration, and particulate retention (forests.gujarat.gov.in, n.d).

The State's installed capacity for power generation expanded from 315 MW in 1960–1961 to 28277 MW in 2019–2020. (as on 31.03.20). GSECL has an installed capacity of 7038.57 MW as of June 30, 22. Gujarat State's 2021–2022 per capita electricity usage was 2283.19 units.

### 5.3.3 Tamil Nadu

Tamil Nadu government has started a Green Fellowship programme to actively engage youth in initiatives for climate change adaptation and mitigation actions. The Chief Minister's Green Fellowship Program would be introduced in 38 districts, the government has stated in the Assembly in September 2021. 6 crores have been approved by the government for the scheme. The program's goal is to involve young people in the development and implementation of environmental policies. They will keep track of the results, assess them, convey the effects of the policies, and provide better services (The Hindu, 2022).

### 5.3.4 Karnataka

In the area of renewable energy, Karnataka is actively engaged. Karnataka is about to start making hydrogen fuel. The state has further signed agreements for renewable energy worth 1.3 lakh crore, as stated by the Chief Minister Mr. Basavraj Bommai in a manufacturing show. The government also plans to produce ammonia from the sea, solar and hydrogen fuel, and biofuel (water) (The Hindu, 2022).

# Chapter 6: Gender Inequality and Green Jobs

All green occupations can be carried out by women in the primary, secondary, and tertiary levels of the economy. Contrary to beliefs that the majority of green work is hard labour and that this is a barrier to female involvement, automation has lowered the need for greater physical strength.

## 6.1 Introduction

With better-paying, non-traditional job where women make up less than 25% of the workforce, opportunities available in the green economy might allow women to reclaim their rightful place in the workforce (ILO, 2007).

In the recent Stockholm Conference organized by the International Labor Organization (ILO), United Nations Environment Programme (UNEP) and UNICEF emphasis was laid on achieving its S+50 objectives of transition to a low carbon and circular economy to help address the triple planetary crisis. An emphasis was laid on the necessity for a fair transition and the significance of "good" green jobs while underlining the importance of youth participation in social discussion, particularly for women, girls, and those without access to higher education or vocational training (IISD, 2022).

## 6.2 Case study

It can be said that targeted campaigns need to be organized by unions to encourage the participation of the female workers in the potential green sectors. Another aspect to be taken into consideration is incorporation of new approaches which should be inclusive in nature. The male dominated sectors such as construction which are switching towards a more sustainable mode of operation should increase the recruitment and retention of the female workers.

In order to enhance gender equality in the greening of economies countries that are making progress in addressing gender disparities in the labour force typically have high educational attainment for both men and women, greater political commitment to gender equality, national policies that facilitate women's participation in the workforce, and effective enforcement mechanisms with regard to laws prohibiting gender discrimination in the workplace and ensuring that women have equal access to political and economic participation.

### Case Study #2 Kagad Kach Patra Kashtakari Panchayat (KKPKP)

**Women Waste Collectors Who Are Also Environmentalists**, Pune, India

A union (Garbage Collectors' Union KKPKP) in of Pune pushed a socially and environmentally innovative waste recovery concept that has gained tangible benefits for mostly female waste collectors. With the help of this project, 9500 waste collectors, 90% of whom are women, now have jobs.

The Waste Collectors' Union KKPKP is a member organization for more

than two thirds of these workers. In order to incorporate an ecological component into local garbage management, the union has been collaborating with municipal authorities. In the past, municipal trucks would collect all the trash from the roadside bins and dump it at a landfill. 90% of waste was biodegradable, according to a union survey, and the majority of trucks were gathering trash needlessly and wasting enormous amounts of fuel.

The union encourages families to separate their waste into biodegradable and non-biodegradable categories at the household level. The waste collectors visit homes to collect it, and once they have what may be sold, they sell it. The biodegradable trash is composted at the source, and what cannot be reused is dumped. Such projects allow for empowered unions to create social and environmental advantages as well as financial savings.

*Source: http://www.greeneconomycoalition.org/glimpses/women-waste-collectors-india*

***Read more on***

***https://kkpkp-pune.org/***

# Chapter 7: Suggestions, Recommendations and Conclusions

This chapter focuses on ideas and recommendations that should be taken into account when implementing policies for green jobs in India. It further highlights the importance of incorporating these suggestions which would further help in creating a sustainable economy. The last part of this chapter summarizes on how India's green transition is dependent on leadership, technology, and money. If it were to be effective, it would pave the way for the developing globe.

## 7.1 Suggestions and Recommendations

1. This study initially covers secondary data and considering the research gaps its suggested that primary study be incorporated to gain a more comprehensive view of the topic.
2. After understanding the research gaps it can be said that up skilling will help in meeting objectives of Sustainable Development Goals and reducing the CO2 emission. This can be done with the help green talents which can be defined as those required to modify procedures, offerings, and goods to comply with environmental laws and regulations resulting from climate change. They comprise the skills, knowledge, attitudes, and values required to live in, grow, and support a society that is resource-efficient and sustainable.
3. Social policy must be created in addition to economic and environmental policies. Another noteworthy aspect to be taken into consideration is that important choices must be made on crucial issues, such as investing in the knowledge required for a low-carbon global economy and formulating policies to address the changing nature of employment across various economic sectors.
4. Likewise, from the perspective of social solidarity, it is essential that policies are put in place to ensure that those who are likely to be negatively impacted are protected through income support, retraining opportunities, and relocation assistance, among other things. This is necessary in order to mobilize the political and workplace support for the changes that are needed.
5. India's carbon taxes need to be reorganized. Currently, taxes on gasoline, diesel, aviation fuel, natural gas, and coal are bringing in several trillions of rupees (almost $100 billion) for the combined central and state governments. In addition, high railway coal freight rates are imposed in order to lower passenger fares.
6. In context to the burgeoning green economy, it is critical to ensure that the aspect of gender neutrality is taken into consideration by the unions.

It can be said that this study on Green Jobs offer suggestions on how businesses might implement eco-friendly practices also make a just transition considering the technological disruption and unavoidable business dynamism. These include fostering an enabling business environment by enhancing policy and regulatory frameworks, providing organizations with greater strategy clarity, assisting managers and employees in getting ready for changes to jobs, skills, and wages (both in sectors that need to downsize and those where jobs will be created), and

addressing gender segregation, including skill development, so that women can benefit from the creation of green jobs.

## 7.2 Conclusions

The decarbonization of India by 2070 has the potential to provide up to $15 trillion (1500000 crore) in economic opportunities and up to 50 million (5 crore) net new jobs. With sustained work, it is possible that the first $1 trillion of this opportunity may materialize within this decade. To bring about the next green revolution, the public sector, private sector, financial sector, civil society organisations, and the general public must collaborate (World Economic Forum, 2021).

Encouraging more government initiatives may generate demand for decarbonized goods and services. Further to help MSMEs decarbonize more quickly, the government and business in India may need to implement policies and strengthen their capabilities.

Therefore, emphasis should be laid on alternatives that help achieve the sustainable development goals on climate change and create a carbon free economy.

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## Annexure 1: E-Awareness Programme on Green Jobs – Knowledge Poshan Panchayats

V.V Giri National Labour Institute, NOIDA

Ministry of Labour and Employment, Government of India

*Shram Saptha Poshan Panchayats*

**Awareness Programme on Green Jobs for the Village Sarpanch/Panchayat members**


**Green Jobs will result in achieving the Sustainable Development Goal pertaining to Climatic conditions and the Millennium Development Goal of Zero Hunger.**

## OBJECTIVES:

**To provide awareness on significance of Green Jobs**

Defination

Significance

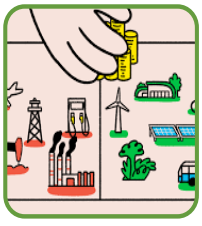
Job opportunities

**To provide familiarity on the schemes pertaining to creating green jobs and in rural areas**

Pradhan Mantri Kisan Urja Suraksha evam Utthaan Mahabhiyan Yojana (PM KUSUM ).

Green Energy Corridors

One Sun One World One Grid (OSOWOG)



**To provide knowledge on upskilling the potentials of rural population in green jobs**

Availability of various short term training and skill development programmes

Case study of DSEU, World Resources India (WRI) and Hero Electric Vehicles Ltd. to prepare Electric Vehicles skilled mechanics

**To discuss the role of rural population in achieving Sustainable Development Goals on Climate Change**

The different field programmes tailored specifically for rural areas to generate money and improve resource utilisation

Framework for Rural policies in reaching the net-zero GHG emission targets via addressing the climate emergency

**Opportunities available on National Career Service (NCS)**

Green Skill Development Programme (http://www.gsdp-envis.gov.in/)

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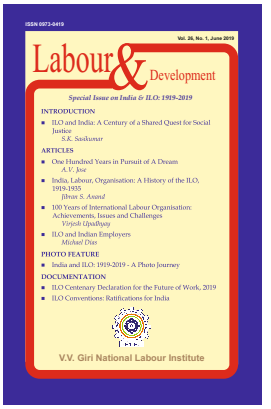


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