De Pamong: International Journal of Government and Civil Society, Volume 2, Issue 1, 2025, pp. 107-124
Website: http://ejournal.depok.go.id/, ISSN: 3064-0393
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Analysis of Green Jobs Potential for Green Economy Development in West Java Province

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Submitted: Feb 4 2025; **Revised**: Mar 25 2025;
Accepted: Apr 15 2025; **Online Publication**: Jun 30 2025;

Abstract

West Java Province is one of the regions in Indonesia with the highest number of job seekers, reaching 542,150 people in 2023, while available job vacancies were only 158,700 (29% of total job seekers). At the same time, West Java has abundant natural resources, including agriculture, plantations, fisheries, forestry, minerals, tourism, and renewable energy, which provide great potential for green economic development. However, climate change, resource consumption patterns, demographic shifts, deforestation, and land conversion pose threats to biodiversity, food security, and employment in green sectors. The number of farmers and workers in sustainable industries continues to decline, raising concerns about job losses and future food crises. In response, the green economy and green jobs emerge as solutions to balance economic prosperity and environmental sustainability. According to the International Labor Organization (ILO), green jobs promote efficient resource use, energy conservation, and environmental restoration. This study analyzes green job potential in West Java through qualitative and quantitative methods. The qualitative approach examines challenges and opportunities in sustainable employment, while the quantitative method, using input-output modeling, maps green sector activities in West Java's economy. Findings indicate that manufacturing (IDR 1,099.08 trillion), agriculture (IDR 221.65 trillion), transportation (IDR 155.10 trillion), and renewable energy (IDR 12.22 trillion) are key contributors to sustainable employment expansion. This study highlights policy recommendations such as tax incentives for green industries, subsidies for eco-friendly transportation, investment in renewable energy, and workforce training for sustainable jobs. By implementing these strategies, West Java can accelerate its transition to a green economy, enhance economic resilience, and align with the Regional Medium-Term Development Plan (RPJMD).

Keywords: *Green Jobs, Employment, Sustainability, Green Economy, West Java Province*

INTRODUCTION

West Java, as one of the provinces with the highest number of job seekers in Indonesia. According to data from the Ministry of Manpower in 2023, the number of job seekers in West Java reached 542,150 people, while the number of registered job

vacancies available in West Java was only able to accommodate 158,700 people. West Java in this case faces significant challenges in overcoming the high demand for labor and the large unemployment rate.

On the other hand, West Java Province has high natural resource potential, including in agriculture, plantations, fisheries, livestock, water resources, minerals and mining, tourism, forests and biodiversity to renewable energy. West Java Province is known as one of the national rice barns for the past 30 years, as it has contributed around 22% of national rice production. However, changes in the earth's climate, resource consumption patterns, and the demographic bonus pose a serious threat to biodiversity. The ensuing demographic bonus, referring to a temporary increase in the working-age population, will also pose a challenge. If not managed properly, it may accelerate environmental degradation and hinder the achievement of sustainable economic development. This will be a serious threat not only to nature but to the population and economic conditions especially in West Java.

In this context, the concept of green economy has emerged as a promising solution to achieve prosperity and welfare while minimizing the risk of ecological damage due to unjust development. According to the International Labor Organization (ILO), green jobs are the creation of economically viable jobs that reduce energy and raw material consumption. Green jobs are not only economical but also contribute significantly to preserving and restoring the environment, with a focus on improving energy efficiency, reducing greenhouse gas emissions, minimizing waste and pollution, and protecting and restoring ecosystems. In addition, green jobs support adaptation to climate change and play a role in stimulating the green economy.

Based on this, it is important to identify the potential of green jobs in West Java, as well as analyze the challenges and opportunities faced in the development of the sector. Therefore, this research asks several main questions, namely how the potential of green jobs in West Java can be identified, what are the challenges and opportunities, and the strategies that can be implemented to create sustainable and inclusive green jobs in the region. This research aims to contribute to the understanding of the potential of green jobs and develop strategies that support the development of sustainable green jobs in West Java.

LITERATURE REVIEW

Concept of Green Jobs

The concept of green jobs includes integrated social and environmental dimensions. Green jobs are defined as jobs that meet the pillars of decent work as formulated by the International Labour Organization (ILO) and are generated through economic activities that contribute to the reduction of environmental impacts (International Labour Organization, 2020). These jobs include efforts to reduce the consumption of energy and raw materials, decarbonize the economy, protect ecosystems and biodiversity, and minimize the production of waste and pollution.

According to the definitions of the United Nations Environment

Programme (UNEP) and the ILO, green jobs are not only oriented towards environmental sustainability, but also ensure that social aspects, such as decent working conditions, are met. Defining the boundaries of green jobs in each economic sector requires a careful approach, especially in the context of data limitations that often make it difficult to separate environment-related jobs from other jobs. Green jobs are not only oriented towards environmental sustainability, but also ensure that social aspects, such as decent working conditions, are met. Examples include jobs like renewable energy technicians, sustainable agriculture workers, and environmental engineers. This is important to ensure that jobs categorized as green jobs truly meet environmental and social sustainability criteria.

Analisis Input-Output

The Input-Output (I-O) model, introduced by Dr. Wassily Leontief in the 1930s and later earning him the 1973 Nobel Prize, illustrates the interdependence between economic sectors. This model highlights how sectors rely on one another, where the output of one sector serves as the input for another. Economic integration is essential for sustainable development, as disruptions in one sector can impact others (Firmana & Tjahjawandita, 2016).

The I-O model categorizes economic interactions into direct, indirect, and total impacts, helping to identify key sectors that drive regional growth. Each region has critical economic sectors based on their contribution to the regional economy and inter-sectoral linkages. By analyzing sectoral relationships, policymakers can plan development strategies that enhance economic stability and integration.

According to Daryanto (2010), a sector is considered vital if it meets at least one of four criteria: (a) strong forward and backward linkages, (b) high gross production and final demand support, (c) significant net foreign exchange earnings, or (d) substantial employment creation. Identifying these sectors allows for targeted policies that maximize economic growth and job creation.

Methods Used to Estimate Environment-Related Employment (Input–Output Analysis)

The input-output modeling approach can also be used to estimate the impact on employment resulting from an increase in final demand for products or services in a particular green industry. For example, this method allows estimating the number of jobs directly created in the sustainable construction industry for every US$1 million investment in a construction project. In addition, it can also calculate the number of indirect jobs created in other sectors, such as the timber and building materials industries, due to such spending. Thus, the input-output model provides a

comprehensive estimate of the economy-wide employment impact as a result of a given level of spending.

This guide is designed to assist individuals and organizations in analyzing the relationship between the environment and employment, particularly in the context of developing countries. The guide covers the systematic steps of understanding and identifying drivers of green job creation; mapping the size and structure of national economies; estimating the total scale of environment-related jobs, including those that are viable or environmentally sustainable; and identifying core environment-related jobs based on compliance with relevant standards and performance indicators. In addition, the guide also leads to the estimation of jobs that meet decent work conditions according to the ILO definition, indirect jobs, and induced jobs from core environment-related activities. The process also includes recommendations for upgrading undeserved environmental jobs to green jobs through improved environmental and social performance, in accordance with ILO standards. As such, this approach offers a comprehensive framework for understanding, measuring and enhancing the contribution of green jobs to sustainable development.

Multiplier Effect Concept

One of the consequences of doing something is the multiplier effect. When money is put in or taken out, the final income will rise or fall by a certain percentage, this is called the "multiplier effect" in economics. According to Domanski and Gwosdz, the term "multiplier effect" describes the positive and negative impact of an action in one area on actions in another area, either directly or indirectly related to the action. In economics, the multiplier effect is seen in GRDP which can increase income, create jobs for the community, and establish links with related industries as a result of higher profits from production in that area.

RESEARCH METHODS

This study applies descriptive quantitative methods to evaluate the impact of green job creation on environmental and employment policies. The data sources used in this study mainly come from secondary data, consisting of reports and development planning documents in West Java as well as information from the Central Statistics Agency (BPS) for 2023 related to employment. These documents provide a comprehensive overview of the structure of the economy, the types of jobs available, and statistics relevant to the green sector. Some of the analyses conducted in this study include:

Identification of Priority Green Sectors

To identify priority green sectors, an analysis of the GRDP contribution of economic sectors is used with the following equation:

$$Ci = \frac{GDPi}{GDP\ Total}\ x\ 100$$

Ci = sector contribution
GDPi = GDP value of sector i
Total GDP = total GDP value of all sectors.

This approach is used to understand the role of the green sector in the regional economy. Data sources are from the Central Bureau of Statistics (BPS) and regional economic reports (Miller & Blair, 2009).

Calculation of Employment Multiplier Effect

The employment multiplier effect is calculated to determine the direct, indirect, and induced impacts on employment due to an increase in green sector output. The basic formula used is:

$$EMi = \frac{Li}{Oi}$$

EMi = employment multiplier effect for sector i
Li = number of workers in sector i
Oi = economic output of sector i

The multiplier effect is calculated with an input-output model using technical coefficients across sectors. This analysis allows estimation of the impact on employment generated by green sectors (Leontief, 1986).

With this descriptive quantitative approach, the research aims to produce findings that can be used as the basis for policy recommendations in supporting the development of sustainable and effective green jobs in West Java. Through an in-depth understanding of the contribution of the green sector to the economy, it is hoped that this research can provide valuable input for policy makers and stakeholders in encouraging the sustainable growth of the green sector and creating quality jobs.

RESULTS AND ANALYSIS

Identification of priority green sectors in West Java

West Java has strong potential for green sector development, offering opportunities to enhance sustainability and tackle environmental challenges. According to the International Labour Organization (ILO, 2020), key areas for green growth include restoring green infrastructure, improving waste management, and expanding public transportation to lower carbon emissions. Sustainable agriculture and forestry practices, such as deforestation prevention and certification programs,

contribute to environmental conservation.

Additionally, innovations in manufacturing, supply chain management, and energy efficiency help reduce industrial emissions and support the transition to clean energy sources. Biodiversity preservation remains crucial for maintaining ecological balance and securing long-term sustainability. By leveraging these opportunities, West Java can strengthen its economic resilience while minimizing environmental impact (ILO, 2020).

Several key sectors in West Java contribute significantly to employment and offer opportunities for green initiatives. The Agriculture, Forestry, and Fisheries sector (17.79%) can adopt sustainable farming practices, while the Manufacturing Industry (17.98%) can implement green technology and circular economy principles.

The Wholesale and Retail Trade sector (21.84%) can promote eco-friendly supply chains, and Transportation and Warehousing (4.99%) can reduce emissions through green mobility solutions. Additionally, Education (4.72%) plays a vital role in sustainability awareness. These sectors hold strong potential for green job expansion, particularly in renewable energy and energy efficiency. Data on the main employment and percentage of the working population in West Java can be seen in the following table.

Table 1. Main Occupations and Total Working Population in West Java

Main Occupation	Total Working Population	Percentage (%)
A Agriculture, Forestry and Fishery / Agriculture, Forestry, and Fishery	4.160.000	17,79%
B Mining and Quarrying	50.000	0,23%
C Processing Industry / Manufacturing	4.210.000	17,98%
D Electricity and Gas Procurement / Electricity and Gas	50.000	0,23%
E Water Supply	130.000	0,55%
F Construction	1.770.000	7,57%
G Wholesale and Retail Trade / Wholesale and Retail Trade	5.110.000	21,84%
H Transportation and Warehousing / Transportation and Storage	1.170.000	4,99%
I Accommodation and Food Service Activities	2.310.000	9,89%
J Information and Communication	180.000	0,76%
K Financial and Insurance Services / Financial and Insurance Activities	280.000	1,21%
L Real Estate / Real Estate Activities	130.000	0,55%
M,N Company Services / Business Activities	350.000	1,49%

O Public Administration	570.000	2,42%
P Education Services / Education	1.100.000	4,72%
Q Health Services and Social Activities / Human Health and Social Work Activities	330.000	1,40%
R,S,T,U Other Services Activities	1.210.000	5,16%

Source: Labor Force Situation in West Java Province February 2023

West Java's GRDP grew from Rp2,422.78 trillion in 2022 to Rp2,625.22 trillion in 2023, showing significant expansion across various sectors. Agriculture, forestry, and fisheries increased from Rp207.72 trillion to Rp221.65 trillion, driven by livestock growth. The manufacturing sector, the largest contributor, rose from Rp1,023.40 trillion to Rp1,099.08 trillion, fueled by the food and beverage and transportation equipment industries.

Other sectors also experienced growth: construction (Rp202.28T → Rp221.15T), wholesale and retail trade (Rp348.99T → Rp378.83T), and transportation and storage, which saw the highest increase (Rp130.20T → Rp155.10T). Information and communication (Rp92.64T → Rp100T) and education services (Rp80.34T → Rp86.30T) also showed positive trends, reflecting West Java's diversified and sustainable economic expansion.

Table 2. GRDP at current prices by business field of West Java Province (billion Rupiah) for 2022-2023

GDP Sector by Business Field	**Year**	
	2022	**2023**
A. Agriculture, Forestry and Fisheries	207716,7	221650,6
B. Mining and Quarrying	27934,49	26089,3
C. Processing Industry	1023401	1099081
D. Electricity and Gas Procurement	12161,54	12221,17
E. Water Supply, Waste Management, Waste and Recycling	2485,54	2575,78
F. Construction	202276,6	221150,7
G. Wholesale and Retail Trade; Repair of Cars and Motorcycles	348996,6	378832,7
H. Transportation and Warehousing	130202	155099,8
I. Provision of Accommodation and Meals	69670,16	79501,42
J. Information and Communication	92644,33	100002,6
K. Financial Services and Insurance	69885,94	74126,25
L. Real Estate	28413,16	30746,38
M,N. Corporate Services	10812	12091,47
O. Government Administration, Defense and Compulsory Social Security	44535,07	46278,92

P. Education Services	80336,14	86301,84
Q. Health Services and Social Activities	19157,24	20978,21
R,S,T,U Other Services	52154,05	58490,22
GDP TOTAL	**2422782**	**2625219**

Source: BPS data of West Java Province, 2024

Based on this data, it can be formulated that there are several potential sectors that support the green economy in West Java Province. In 2023, the Agriculture, Forestry and Fisheries sector recorded a GRDP contribution of IDR 221.65 trillion, an increase from IDR 207.71 trillion in the previous year. This sector absorbed 4.16 million workers, or 17.79% of the total workforce, with GRDP growth reaching 6.71% year-on-year. The food crop subsector was the dominant contributor with a contribution of IDR 96.12 trillion.

Table 3. Potential Sectors of Green Economy in West Java

Business Sector	GRDP 2023 (Billion Rupiah)	GRDP Growth (%)	Number of Workers	Percentage of Labor
Agriculture and Forestry	221.650,6	6,71 %	4.160.000	17,79 %
Processing Industry	1.099.081	7,39 %	4.210.000	17,98 %
Electricity and Gas Procurement	12.221,17	0,49 %	50.000	0,23 %
Water and Waste Management	2.575,78	3,63 %	130.000	0,55 %

Source: Analysis results, 2024

On the other hand, the Manufacturing Industry sector showed the highest GRDP contribution at IDR 1,099.08 trillion in 2023, absorbed 4.21 million workers (17.98% of the total) and experienced GRDP growth of 7.39% year-on-year. This sector has great potential to transform towards green industry, especially in the food and beverage industry and environmentally friendly textile industry subsectors, which contribute IDR 146.34 trillion and IDR 168.83 trillion respectively.

The Renewable Energy sector, although smaller with a GRDP of IDR 12.22 trillion and absorbing 50,000 workers (0.23%), showed moderate growth of 0.49% year-on-year. Despite its current size, this sector is crucial for long-term sustainability and offers strategic opportunities for future job creation through clean energy development. There are further development opportunities in the electricity subsector which is valued at IDR 4.26 trillion.

Finally, the Water and Waste Management sector generated IDR 2.57 trillion in GRDP, with a labor absorption of 130,000 people (0.55%) and growth of 3.63% year-

on-year, also has the potential to develop a circular economy.

Calculating the employment multiplier effect in the green sector

The multiplier effect is an impact that occurs either directly or indirectly on various economic activities in the country/region as a result of changes in the exogenous variables of the national economy/region. For the multiplier impact analysis, it is necessary to calculate the multiplier matrix or also known as the Leontief inverse matrix (I-A)-1.

To obtain a multiplier effect analysis, several steps and data are used including:

1. Input-Output Matrix: Used to calculate the total impact (direct and indirect) of changes in sectors.
2. Leontief inverse matrix: Required to measure interactions between sectors.
3. Labor and GRDP data: Used to calculate the coefficient of labor per unit of output.
4. The employment multiplier is calculated by representing the number of jobs created per one additional unit of economic output.

This study uses data from the 2016 Provincial Input-Output Table of West Java Province, which covers 17 economic sectors. In this study, the input-output data used is from 2016, which is the latest available data and was updated by the Central Statistics Agency (BPS) in 2021. This limitation is due to the limited access to data as well as the timing of data updates which are carried out periodically by BPS. To address the gap between the 2016 Input-Output data and the more recent labor and GRDP data, this study integrates current statistics to reflect present economic conditions. While this approach provides a more updated picture, it may introduce minor estimation discrepancies due to temporal data mismatches.

Table 4. Business Field Codes and descriptions in Input-Output

CODE	Description
A	Agriculture, Forestry and Fisheries
B	Mining and Quarrying
C	Processing Industry
D	Electricity and Gas Procurement
E	Water Supply, Waste Management, Waste and Recycling
F	Construction
G	Wholesale and Retail Trade; Repair of Cars and Motorcycles
H	Transportation and Warehousing
I	Provision of Accommodation and Drinking Meals
J	Information and Communication
K	Financial and Insurance Services
L	Real Estate
MN	Company Services
O	Government Administration, Defense and Compulsory Social Security
P	Education Services

Q	Health and Social Services
RSTU	Other Services
190d	Domestic Intermediate Input
2000	Foreign Import Intermediate Input
2001	Interprovincial Import Inputs
1900	Total Intermediate Inputs
2010	Labor Compensation
2020	Gross Operating Surplus (including mixed income)
2045	Net tax subsidy on production
2090	Gross Value Added
2100	Total Input

Table 5. Provincial Input-Output Table of West Java Province in 2016

Code	A	B	C	D	E	F	G	H	I	J	K	L	MN	O	P	Q	RSTU	1.800,00	3.011,00	3.012	3.020	3.030	3.041	3.071	3.072	3.080
A	4.397.387,44	74,88	99.182.733,01	919,76	45,42	279.507,81	87.938,56	7.235,36	19.538,196,95	3,40	2.081,62	-	-	435,932,76	698,828,01	1.343,434,36	578,326,54	91.868,330,99	47.566,713,21	-	-	6.683,251,67	4.843,922,65	1.351,899,98	17.764,435,66	18.998,325,16
B	5.891,53	3.022,959,72	34.782,482,92	13.808,837,19	132,74	12.055,878,95	16.170,81	4.162,36	3.881,36	6.765,89	5.535,84	1.947,84	12.461,61	30.661,37	3.069,00	3.173,41	2.809,83	45.762,646,81	55.128,39	0,01	1,07	763.454,48	875,380,47	4.279,623,88	3.970,189,85	8.249,819,95
C	7.256,495,06	1.494,540,95	441.621748,35	1.884,847,36	649,703,44	70.966,964,95	32.366,925,87	31.912,018,14	11.905,032,94	3.698,238,24	1.284,263,61	1.772,880,48	5.822,656,70	2.645,418,25	7.086,532,35	5.527,326,15	6.896,169,59	631.494,039,42	303.877,675,79	99,48	2.066,783,94	103.313,340,80	- 1.902,660,22	289.149,670,14	589.716,788,94	638.462,058,97
D	99.632,70	207,234,86	24.697,007,11	92.730,793,51	190,871,79	118.431,89	2.160,723,81	796,606,52	1.730,296,69	2.698,238,24	363,513,05	226.179,66	684,956,36	1.031,387,22	1.093,598,46	168,322,28	952,115,68	89.846,818,88	13.552,246,69	-	-	37.306,16	7.894,74	15.103,10	5.943,201,43	3.940,311,53
E	106.642,45	482,08	112.907,24	5.885,92	229,240,77	104.699,47	169.393,61	10.482,27	288.842,37	10.175,77	2.944,56	31.999,14	31.634,79	28.536,46	13.392,78	16.815,88	100,654,95	1.274,418,31	4.882,650,99	0,12	94.224,52	1.553,82	1.813,15	151.402,49	497.194,47	1.028,556,96
F	1.652,853,60	1.647,832,82	7.408,374,05	64.493,46	297,697,19	2.421,353,08	1.447,198,74	1.103,273,49	275.790,80	302,755,47	505,187,70	3.201,934,72	540,706,40	1.956,765,93	491,799,81	470,792,32	598,569,78	24.467,711,23	1.307,786,34	-	-	285.234,446,98	- 194,23	46.445,05	1.273,388,13	1.389,825,80
G	3.565,680,32	870,624,49	94.926,032,44	1.386,116,38	168,437,06	21.503,478,20	7.880,611,75	7.292,284,27	6.883,559,55	881,007,17	508,608,03	586.430,33	2.474,368,04	1.286,038,71	2.132,236,81	1.838,311,20	1.753,047,13	157.737,828,28	101.368,134,03	1.557,28	408,617,12	21.016,355,43	157,711,25	41.620,089,32	66.022,698,37	108.492,297,69
H	737.055,56	1.138,174,92	35.940,502,17	904.898,67	96.792,18	12.734,646,39	10.920,603,87	19.182,361,61	3.898,288,16	833,206,65	165,543,58	259.699,82	922,796,55	1.381,195,09	624,831,27	394,318,54	292,322,16	86.927,386,55	96.437,279,98	185,09	49.921,97	2.369,971,99	19.488,74	8.056,694,09	13.394,919,45	21.481,614,02
I	89.089,60	144,337,39	2.660,370,17	75.836,29	56.799,10	569.210,08	590.207,43	431.750,15	3.281,761,26	162,088,76	141,423,19	135.666,36	267,372,04	1.614,462,75	837,591,38	448,953,31	723,916,92	18.894,451,06	120.113,326,57	8.236,69	11.266,17	82.356,30	2.850,92	5.794,520,02	5.810,259,92	15.701,840,84
J	97.385,18	93.910,51	9.384,038,67	499.138,47	22.715,26	5.172,388,14	9.482,151,69	1.745,480,63	1.691,386,87	10.891,090,04	1.461,837,46	699.544,41	1.494,613,88	700,926,70	1.143,713,81	420,655,82	966,589,88	59.184,316,72	34.532,958,27	8,36	108,196,73	2.742,077,13	1.497,55	3.762,486,67	2.581,602,13	6.364,010,85
K	788.589,27	332,310,80	10.659,359,96	2.394,273,29	96.872,87	4.940,272,41	8.513,132,14	1.404,668,92	1.223,521,51	1.499,858,01	3.019,028,19	3.791,561,03	1.059,608,36	229,641,70	777,248,66	541,264,85	573,590,06	42.318,738,63	16.057,933,54	0,30	345,714,28	5.672,81	29,92	164.770,29	3.208,548,07	3.565,714,36
L	-	13.341,32	3.064,006,14	-	3.065,15	1.013,843,44	4.935,559,04	406.421,00	933.131,08	300,060,88	336,577,73	577.430,46	166,629,49	404,364,84	408,360,95	578,721,06	541,934,49	13.767,487,06	94.633,251,28	-	-	-	-	72.140,41	632.129,80	704.270,31
MN	441.764,75	383,984,75	15.414,730,90	2.359,562,71	48.299,95	1.994,668,78	5.876,103,01	1.537,231,55	1.320,197,26	2.461,273,13	1.941,908,99	759.680,50	6.548,260,39	2.663,121,61	1.117,556,29	1.354,293,98	972,193,66	44.925,748,30	1.735,268,07	2,29	605,99	3.194,402,26	242,02	1.426,576,31	2.750,636,63	4.177,032,94
O	2.868,06	-	-	62.779,58	569,75	-	-	210.082,29	25.372,74	13.599,00	775,227,97	208.719,74	181,060,28	195,430,40	312,049,96	73.774,38	2.442,76	1.235,933,49	999.949,74	-	46.843,784,45	668.628,97	-	826.250,98	3.066,528,24	1.892,779,22
P	1.329,96	1.035,79	245.428,84	27.890,95	254,66	25.350,56	3.216,750,25	49.424,64	76.988,46	18.039,30	304,587,00	2.818,30	165,566,54	317,078,59	3.185,658,05	90.943,71	129,391,74	7.694,388,58	43.485,616,42	1.505,331,48	35.074,627,79	21.435,62	86,96	585.282,45	3.713,436,13	4.296,648,58
Q	184.780,89	10.356,52	1.158,993,84	6.028,51	9.101,42	232.299,44	1.283,114,43	47.625,67	61.267,51	9.284,53	48.898,16	8.326,81	47.130,66	6.747,98	420,214,90	897,113,46	113,669,57	4.412,074,71	23.705,124,35	409,849,49	6.898,434,13	62.733,65	- 3.573,67	1.565,764,07	4.035,571,03	5.647,335,12
RSTU	164.769,86	39.200,01	2.960,931,43	94.499,64	239,782,09	249.616,30	2.086,680,52	476.230,26	1.643,429,87	455,483,46	95.396,61	461.626,86	134,619,25	149,625,57	282,977,34	170,935,26	1.372,189,54	12.253,748,09	39.202,160,27	6.317,308,79	252,672,06	766.294,48	88.921,72	912.567,19	4.265,373,69	4.779,948,86
1900	34.765,722,47	11.548,219,08	724.178,707,12	76.313,319,90	1.991,371,73	152.367,716,22	67.176,498,45	66.389,038,32	54.467,551,69	21.525,339,26	10.329,338,19	32.535,082,51	16.443,102,60	15.167,240,08	38.517,347,48	13.900,474,79	15.757,794,09	1.307,235.159,78	908.128,204,09	8.342,697,61	92.146,734,42	427.172,133,77	4.083,215,99	359.284,833,15	487.537,336,01	846.822,304,15
2000	1.264,836,82	1.572,087,04	100.492,564,74	991.120,03	127,209,26	12.067,814,31	6.423,834,70	4.709,832,48	2.374,921,22	831,485,58	406,470,26	369.879,08	1.393,838,44	871,765,56	1.717,250,06	1.123,921,38	1.269,389,82	137.589170,76	89.795,142,13	20.228,87	108,966,95	19.995,475,14	2.417,378,35	-	10.034,160,81	10.034,203,81
2001	6.847,267,47	6.589,008,51	343.715,717,06	11.466,315,12	420,349,71	35.092,808,45	17.655,272,17	9.098,426,22	17.664,328,41	5.969,026,66	2.495,504,80	1.921,215,91	2.842,157,46	4.185,778,09	5.264,443,39	3.540,634,03	3.418,133,62	277.480970,68	309.300,141,81	1.319,735,97	4.773,999,52	20.251,001,33	3.700,629,42	-	-	-
1980	32.657,626,57	19.669,314,65	966.387,008,42	98.364,955,07	2.528,134,73	178.347,530,98	111.233,465,31	81.067,487,02	74.326,998,72	26.326,095,29	13.231,313,07	16.626,177,50	22.681,548,72	20.344,820,73	27.498,243,93	18.565,058,20	20.445,217,33	1.722,275.301,35	1.235,214.488,03	9.562,662,13	97.021,720,90	467.418,618,34	18.205,443,73	359.284,833,15	487.571,557,02	856.856,490,96
2010	68.957,341,14	8.290,060,85	297.313,905,92	6.958,520,14	801,192,50	56.762,028,87	111.399,745,46	23.605,426,20	26.023,213,70	18.784,140,82	19.830,844,76	4.136,959,95	17.970,771,65	22.103,658,45	43.719,917,86	31.274,966,08	10.596,986,24	728.569,931,63								
2020	85.435,284,00	28.946,090,40	333.934,443,80	23.779,402,04	2.980,304,06	77.934,803,35	300.651,859,87	59.684,873,71	21.477,152,68	32.631,027,92	28.592,300,50	89.982727,06	14.082,672,13	8.731,968,71	21.327,597,32	18.304,908,81	29.720,988,35	1.008,796.738,21								
2045	2.109,793,18	761,180,09	42.676,381,26	- 12.279,721,25	482,605,94	19.385,196,95	5.983,790,33	3.571,925,29	20.599,395,31	3.153,832,17	431,385,48	559.185,04	1.298,305,36	-	471,267,34	213,850,58	2.868,840,11	132.248,505,57								
2090	136.522,918,32	35.997,307,33	714.124,528,98	20.439,000,93	3.964,102,53	134.092,099,17	277.825,195,66	85.874,225,20	68.098,437,80	54.569,080,92	48.854,330,94	94.678,401,06	35.351,833,15	30.814,247,19	65.518,772,91	21.794,425,37	43.183,726,70	1.869,555.173,28								
2100	169.580,545,28	55.696,621,98	1.682,711.537,90	108.603,456,80	6.403,237,26	312.429,620,13	309.880,800,87	166.961,712,23	142.386,556,61	82.895,095,88	62.096,063,01	109.189,008,56	56.035,581,97	51.859,157,68	93.018,018,45	40.359,973,77	63.628,944,23	3.591,830.474,55								

Source: Input Output Table of Jawa Barat Province 2016 Fiscal Year 2021

Table 6. Leontif Inverse Matrix of West Java Province 17 Business Fields, 2016

Description		Agriculture, Forestry and Fisheries	Mining and Quarrying	Processing Industry	Electricity and Gas Procurement	Water Supply, Waste Management, Waste and Recycling	Construction	Wholesale and Retail Trade; Repair of Cars and Motorcycles	Transportation and Warehousing	Provision of Accommodation and Drinking Meals	Information and Communication	Financial and Insurance Services	Real Estate	Company Services	Government Administration, Defense and Compulsory Social Security	Private Education Services	Private Health and Social Services	Other Private Services
	Code	A	B	C	D	E	F	G	H	I	J	K	L	MN	O	P	Q	RSTU
Agriculture, Forestry and Fisheries	A	1,061626337	0,00090373	0,05320386	0,00351422	0,00760275	0,01437054	0,00582368	0,012261318	0,151876139	0,00567086	0,02304408	0,01373798	0,08773118	0,01760211	0,01409119	0,04870847	0,01747044
Agriculture, Forestry and Fisheries	B	0,00088103	1,102744311	0,019742613	0,273635669	0,01357818	0,04072267	0,00806308	0,08634137	0,00614407	0,00567586	0,02318090	0,01621349	0,08666423	0,01118979	0,00570914	0,005415172	0,07181496
Processing Industry	C	0,072513811	0,083381789	1,38895673	0,09817521	0,172009594	0,346100649	0,15689738	0,330431209	0,150382139	0,0685841	0,04561122	0,058114331	0,179233109	0,11774929	0,125238787	0,2218801	0,150034262
Electricity and Gas Procurement	D	0,00415411	0,01185342	0,04657644	1,471381631	0,06905138	0,01418692	0,01756523	0,0359696	0,01538324	0,07147324	0,01276676	0,0658377	0,01448802	0,04727064	0,02956981	0,01859448	0,03602135
Water Supply, Waste Management, Waste and Recycling	E	0,00792793	5,98262E-05	0,000207142	0,00019342	1,0727831	0,00366427	0,00527364	0,00017381	0,00237486	0,00021224	0,00010286	0,00044156	0,00727232	0,00765134	0,00024966	0,00059145	0,00774823
Construction	F	0,011216259	0,03814527	0,00839294	0,01127696	0,05187885	1,01259399	0,0660718	0,01034864	0,00574528	0,05499883	0,01130724	0,05870521	0,01714465	0,0415957	0,00737887	0,01528707	0,01188204
Wholesale and Retail Trade; Repair of Cars and Motorcycles	G	0,02988751	0,02686913	0,05619286	0,03992970	0,0489756	0,08641749	1,05322436	0,071727088	0,08059468	0,01073785	0,01536615	0,01882711	0,06392460	0,04278015	0,03552668	0,06667218	0,04225439
Transportation and Warehousing	H	0,00611745	0,02026709	0,03865288	0,02155428	0,01955636	0,09291405	0,0346088	1,140574378	0,03275987	0,01665572	0,00665879	0,05769867	0,02819452	0,0294896	0,01342803	0,02098273	0,01214815
Provision of Accommodation and Drinking Meals	I	0,00074917	0,00329713	0,00274905	0,0028745	0,00396525	0,0030516	0,00284817	0,0037213	1,01657429	0,00289236	0,0050291	0,0017146	0,0610246	0,05384027	0,01022348	0,01234564	0,0124748
Information and Communication	J	0,02293811	0,04852803	0,01210860	0,01544283	0,00910685	0,01779176	0,01966184	0,02817099	0,01795034	1,14562514	0,03054791	0,0097064	0,03714285	0,02234586	0,01755816	0,01733277	0,02324280
Financial and Insurance Services	K	0,00644142	0,0356199	0,01412074	0,051346	0,02254896	0,02379108	0,02715931	0,01784017	0,01586450	0,02327481	1,0599657	0,05944691	0,02592523	0,0115112	0,01295419	0,0542177	0,01441640
Real Estate	L	0,00066895	0,00130061	0,00400752	0,00139811	0,00235452	0,00963991	0,0140094	0,00863216	0,0084371	0,00496392	0,00641084	1,05998241	0,00485649	0,00963487	0,0065692	0,01654720	0,01900862
Company Services	MN	0,00499084	0,0109464	0,0583141	0,05630706	0,01530058	0,01495573	0,02156316	0,01786376	0,01460578	0,0436313	0,0384560	0,0599659	1,09481784	0,06255195	0,01785176	0,0379818	0,0215976
Government Administration, Defense and Compulsory Social Security	O	6,92708E-05	0,00022189	0,00016382	0,00149579	0,00028398	0,00021740	0,00029058	0,00137914	0,00035768	0,00045428	0,00315244	0,00206681	0,00370212	1,04080180	0,00140814	0,00213391	0,00022094
Private Education Services	P	0,00054324	0,00094087	0,00114021	0,0013583	0,00074402	0,0011469	0,00911836	0,00119619	0,00145794	0,00069554	0,00569010	0,00058097	0,00409051	0,00718019	1,03595398	0,00534719	0,00271331
Private Health and Social Services	Q	0,00064889	0,00048791	0,00135950	0,00046057	0,00194355	0,00141650	0,00766691	0,00085925	0,00099012	0,00003302	0,00086159	0,00022572	0,00136123	0,0005439	0,00581452	1,02220445	0,00219770
Other Private Services	RSTU	0,00030507	0,00136448	0,00367843	0,00284722	0,04005604	0,0027108	0,0065680	0,00473869	0,01376811	0,00703296	0,00228435	0,00474056	0,08444459	0,00463660	0,00410890	0,00602546	1,02325305

Source: BPS data of West Java Province 2021

Labor Coefficient

To obtain the multiplier effect analysis, it is necessary to calculate the labor coefficient. From the labor data per sector in West Java Province and the I-O table, the labor coefficient is obtained in the following table.

Table 7. Labor Coefficient per green economy supporting sector in West Java

Sector	Output 2023	Labor Force 2023	Labor Coefficient
A. Agriculture, Forestry and Fisheries	221650,6	4161968	18,78
B. Mining and Quarrying	26089,3	121277	4,65
C. Processing Industry	1099081	4207511	3,83
D. Electricity and Gas Procurement	12221,17	122211	10
F. Construction	221150,7	1772421	8,01
H. Transportation and Warehousing	155099,8	1488314	9,6
I. Provision of Accommodation and Meals	79501,42	1435913	18,06
J. Information and Communication	100002,6	851986	8,52
K. Financial Services and Insurance	74126,25	283925	3,83
M,N. Corporate Services	12091,47	504370	41,71
P. Education Services	86301,84	1104979	12,8
Q. Health Services and Social Activities	20978,21	326995	15,59

Source: Analysis Results, 2024

Based on the above data, the Agriculture, Forestry and Fisheries sector (coefficient: 18.78) is highly labor-intensive, reflecting the high reliance on manual labor. In the context of green jobs, this sector has the potential to create sustainable jobs through organic farming, land rehabilitation and agroforestry.

The Manufacturing Industry sector (coefficient: 3.83) is relatively capital-intensive, relying on technology for efficiency. Its applications in green jobs include the adoption of low-carbon technologies, energy efficiency, and recycling of raw materials.

The Corporate Services sector (coefficient: 41.71) is the most labor-intensive, requiring a large number of workers with specialized skills. The sector's green potential lies in technical support for the transition to a green economy, such as renewable energy management and environmental solutions.

Employment multiplier

After obtaining some results above, data processing will be carried out to determine the Employment Multiplier Effect by multiplying the labor coefficient with the Leontief matrix to calculate the multiplier effect.

Table 8. Employment Multiplier Analysis

Sector Code	Sector Description	Number of Workers	GRDP 2023 (Billion Rupiah)	Employment Multiplier
A	Agriculture, Forestry and Fisheries	4.160.000	221650,6	53.281.394,23
B	Mining and Quarrying	50.000	26089,3	521.786.000,00
C	Processing Industry	4.210.000	1099081	261.064.370,55
D	Electricity and Gas Procurement	50.000	12221,17	244.423.400,00
E	Water Supply, Waste Management, Waste and Recycling	130.000	2575,78	19.813.692,31
F	Construction	1.770.000	221150,7	124.943.898,31
G	Wholesale and Retail Trade	5.110.000	378832,7	74.135.557,73
H	Transportation and Warehousing	1.170.000	155099,8	132.563.931,62
I	Provision of Accommodation and Drinking Meals	2.310.000	79501,42	34.416.199,13
J	Information and Communication	180.000	100002,6	555.570.000,00
K	Financial and Insurance Services	280.000	74126,25	264.736.607,14
L	Real Estate	130.000	30746,38	236.510.615,38
MN	Company Services	350.000	12091,47	34.547.057,14
O	Government Administration, Defense and Compulsory Social Security	570.000	46278,92	81.191.087,72
P	Education Services	1.100.000	86301,84	78.456.218,18
Q	Health and Social Services	330.000	20978,21	63.570.333,33
RSTU	Other Services	1.210.000	58490,22	48.339.024,79

Source: Analysis Results, 2024

Based on the results of the employment multiplier effect analysis, the following are the sectors with the highest potential in creating employment in West Java:

1. Information and Communication – The highest employment multiplier, driving job creation in digital technology, telecom, and IT infrastructure.
2. Mining and Quarrying – Strong job potential in the raw material and energy supply chain, requiring green regulations for sustainability.
3. Financial Services and Insurance – Significant impact on formal job creation, particularly in sustainable finance and risk protection.
4. Processing Industry – A major employment driver, supporting transportation, logistics, and raw material supply, with green industry potential.
5. Electricity and Gas Procurement – Renewable energy investments create jobs in infrastructure development and technological innovation.

Sectors with high employment multiplier values reflect their ability to drive widespread job creation, both directly and through indirect and induced impacts. For instance, the high multiplier in the Information and Communication sector may result from its integration with digital infrastructure projects and service networks, while in

Mining, it may reflect the extensive supply chains and service demands linked to extractive activities. With a focus on the information and communication, financial services, and manufacturing sectors, West Java has a great opportunity to accelerate the transition to an inclusive green economy. Strengthening sustainability and technology-based policies is key to maximizing this potential while supporting the vision of RPJMD 2024-2030.

Recommended strategies to promote green job growth

Green job potential based on sectors with the highest potential to create jobs in West Java Province from the employment multiplier effect analysis.

Table 9. Potential green jobs based on Employment Multiplier Effect

Sector	Green Job Potential	Green Strategy
Information and Communication	Development of energy efficiency technologies and digital platforms for the green sector	Public-private collaboration on digital infrastructure for green economy
Mining and Quarrying	Environmentally friendly mining and rehabilitation of ex-mining land	Strict regulation of sustainable practices and incentivization of low-emission technologies
Financial and Insurance Services	Development of green financial products and sustainable project financing	Promotion of financial inclusion for green MSMEs and microfinance
Processing Industry	Recycling of industrial waste and adoption of energy efficiency technologies	Fiscal incentives for green production and green technologies
Electricity and Gas Procurement	Development of renewable energy infrastructure such as solar and wind power	Public and private investment for clean energy development

Source: Result Analysis 2024

The analysis shows that several sectors have great potential to support the development of green jobs in West Java. These sectors include manufacturing, transportation and storage, agriculture, and renewable energy. In the manufacturing sector, policies that can be implemented include providing tax incentives to companies that implement low-carbon technologies and recycling processes.

In the transportation and warehousing sector, relevant policies include subsidizing electric vehicles for logistics and investing in green transportation infrastructure. Meanwhile, the agriculture sector can utilize policies to develop sustainable agricultural systems, such as agroforestry, and training farmers in organic farming

practices.

The renewable energy sector also has great opportunities through the policy of funding solar power projects in rural areas that lack access to electricity. This policy strategy is in line with the Regional Medium-Term Development Plan (RPJMD) of West Java Province, which emphasizes environmental sustainability and inclusiveness in economic development. With this approach, West Java can accelerate the transition to a sustainable green economy.

CONCLUSIONS

This research shows that the West Java economy has great potential to support the transition to a sustainable green economy. Based on the analysis, sectors such as manufacturing industry, transportation and storage, agriculture, and renewable energy are leading sectors that contribute significantly to Gross Regional Domestic Product (GRDP). In 2023, the manufacturing industry sector contributed IDR 1,099.08 trillion to GRDP (41.9% of total GRDP), followed by the wholesale and retail trade sector at IDR 378.83 trillion, and the agriculture, forestry and fisheries sector at IDR 221.65 trillion.

The analysis shows that the manufacturing sector has a large multiplier effect in creating green jobs, especially through the adoption of low-carbon technology and material recycling. The transportation and storage sector, which contributes IDR 155.10 trillion to GRDP with a labor coefficient of 9.6, has great potential for the development of green transportation. In the agriculture sector, with a GRDP of IDR 221.65 trillion and a labor contribution of 4.16 million people (17.79% of the total), sustainable agriculture policies can improve efficiency and food security.

The renewable energy sector, although smaller with a GRDP contribution of IDR 12.22 trillion, shows development opportunities through investment in solar power plants and other renewable energy. The social and community services sector also has a large multiplier effect on people's income, reflecting the importance of integrating the social dimension in green economic development.

Changes in the structure of the West Java economy from 2016 to 2023 also reflect shifts in the pattern of inter-sectoral linkages, signaling new dynamics in production and consumption patterns. This transformation provides an opportunity for West Java to utilize green investment as a driver of inclusive and sustainable economic growth.

With a strategy that includes tax incentives, subsidies for green technology, and green infrastructure funding, West Java can accelerate the transition to a green economy. This combination of data-driven approaches and innovative policies supports the vision of the Regional Medium-Term Development Plan (RPJMD), which is oriented towards sustainability and community welfare.

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Acknowledgment: I recognize the utilization of Chat GPT in gathering information for background research and during the initial drafting phase of this essay, particularly in formulating the outline structure for this article.

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