

THE IMPACT OF RENEWABLE ENERGY ON EMPLOYMENT IN INDONESIA

Maria Elfani*

*London Metropolitan University, Institute for the Study of European Transformations, Tower Building
1st Floor, 166-220 Holloway Road London N7 8DB, UK*

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ABSTRACT

A global demand for energy has forced many countries to search for alternative and renewable energy. An anticipated effect of the development of renewable is an increase in employment as part of new green jobs creation, a major benefit for Indonesia to cope with its high unemployment rate. This paper describes the impact of renewable energy development on the jobs creation in Indonesia. First, we identify current government policies relative to renewable energy. Second, this paper describes the definition of green jobs and what type of jobs might be created due to development of renewable energy. Third, companies in Indonesia currently operating in the renewable energy sector are analyzed for their potential growth. Research is based solely on secondary data analysis. Information publicly available from the government/ministry website was used to examine policies concerning renewable energy. Related journals and articles were used to explore plans for the creation of green jobs, and a database search was conducted to identify companies currently operating in the renewable energy sector. The Kammen et al. (2004) study of Jobs per Megawatt of Capacity identified that the renewable energy installed capacity in 2007 created approximately 14,000 jobs in Indonesia. The potential capacity of renewable energy will create 70,000-190,000 jobs in Indonesia.

Keywords: Renewable energy; Employment; Indonesia

1. INTRODUCTION

Indonesia has launched the Law on Energy Number 30 year 2007 to regulate sources, purpose, management of, and policies regarding energy use in Indonesia. Energy by its definition is an ability to produce heat, light, mechanical, chemical and electromagnetic activity (Law of the Republic of Indonesia, 2007). New energy may come from renewable and nonrenewable sources, with renewable sources characterized as sustainable and ongoing, including geothermal energy, wind, bio-energy, solar energy, water movement and oceans. Nonrenewable sources cannot be sustained and will ultimately run out; they include oil, natural gas, coal and peat.

In the national energy mix as of 2006 (Figure 1), oil was the main source of energy (52%), followed by natural gas at 29%, coal at 15%, hydro power at 3% and geothermal energy at 1%. Assuming "business as usual" until 2025, the composition of the national energy mix (Figure 2) presumes oil to maintain its position as the major energy source at 42%, followed by coal at 35%, natural gas at 21%, hydro power at 1.9%, geothermal energy at 1.1%, and mini/micro hydro power at 0.1%.

* Corresponding author's email: mae0352@my.londonmet.ac.uk, Tel. +44 (0) 7879141656

However, if energy management is optimized, targets for the energy mix as described in Presidential Decree No. 5/2006 will reduce dependency on oil to 20%, and renewable energy sources will account for 17% of the total mix (Figure 3). 2025 target for renewable energy development should substantially impact the creation of jobs. Section 2 provides a brief explanation about the definition and scope of green jobs, and Section 3 identifies possible employment creation across sectors. Section 4 further analyzes new employment predictions and Section 5 summarizes the effects of renewable energy development on employment in Indonesia.

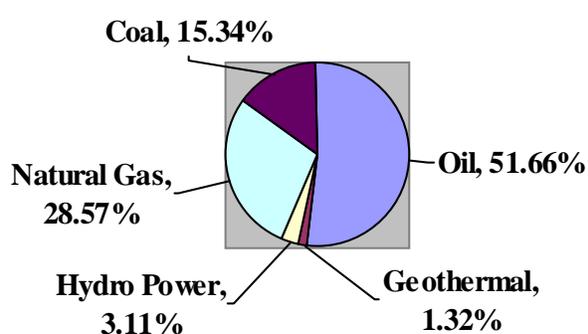


Figure 1 National energy mix of 2006
(Source: Ariati, R., 2009)

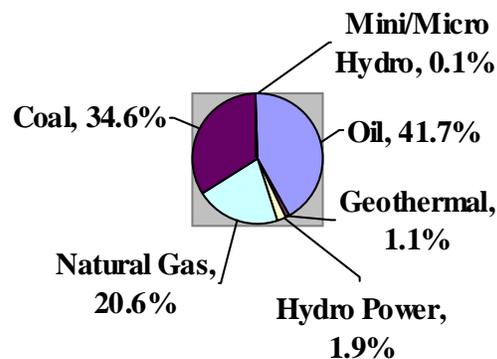


Figure 2 National energy mix of 2025
(BaU)
(Source: Ariati, R., 2009)

2. GREEN JOBS DEFINITION AND SCOPE

The United Nations Environment Programme (UNEP) in its 2008 report defines green jobs as any positions in any fields that contribute significantly to restoring or preserving the environment (UNEP, 2008). Green jobs might occur in agriculture, construction, manufacturing, scientific, technical, administrative, and service-related fields. Activities of green jobs might include minimizing the use of energy, water and material as well as minimizing or avoiding the creation of waste and pollution. Occupations range widely from scientist, academician, engineer, architect, administrator, auditor, marketing professional, retailer, customer service representative, or policy maker to blue-collar workers such as plumbers and electrical wiring specialists.

The green jobs must also be decent jobs, providing fair wages and reasonable working conditions (UNEP, 2008). UNEP noted that employment on sugarcane and palm oil plantation in Indonesia is marked by unfair wages and unsafe working conditions (UNEP, 2008). UNEP cited an International Labour Organization (ILO) (2005) report regarding frequent violations of rights affecting Indonesian plantation workers. Plantation workers tend to have inadequate representation in dialogue and less income security. The International Campaign for Ecological Justice in Indonesia (2004) noted that plantation workers in Indonesia (as well as Indonesian migrant workers on Malaysian plantations) are at risk of working for employers who are known for misconduct in labour practices, including allowing workers to perform their duties under dangerous working conditions because of weak regulations. Worldwatch Institute (2007) reported that female plantation workers tend to earn lower pay than male workers. Moreover, female workers are recruited to spray harmful pesticides without appropriate safety training.

Decent jobs issues in Indonesia therefore should be treated seriously as “green” jobs are created.

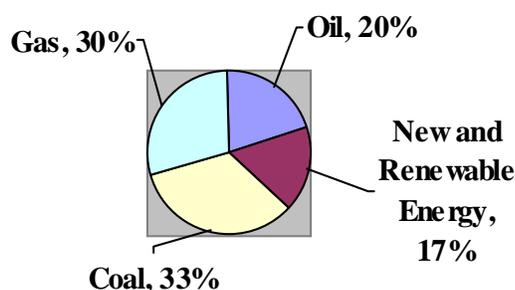


Figure 3 National energy mix 2025 optimizing energy
(Source: Presidential Decree, 2006)

Regarding the effect of green jobs on employment, UNEP explained that green jobs will affect employment in four ways: first some new jobs will be created, such as manufacturing jobs associated with development of hydro power generator. Second, some jobs might substitute or replace existing jobs, such as manufacturing jobs associated with production of a pollution vehicle to jobs aimed at producing green vehicles. Third, some jobs might be eliminated, including those in the packaging industry, and fourth, some jobs are going to stay the same although different work methods maybe employed. For example, plumbers and construction workers will apply environment-friendly methods to their assignments simply by transferring day-to-day skills and methods to be greened.

3. EMPLOYMENT CREATION

3.1. Employment Creation across Sectors

A sustainable and low-carbon economy may have a positive, negative or mixed impact on jobs creation for each sector. It is advisable not to analyze the employment impact from renewable energy per se, but instead from the perspective of the whole “green economy”. Agriculture and forestry, manufacturing, building/construction are sectors that may be positively affected by green jobs creation (Table 1). Mining is the only sector for which a negative jobs effect is anticipated. The other sectors may have mixed effects depending on which number is larger: new jobs created, jobs substituted, or jobs eliminated. Agriculture and forestry, manufacturing and construction together represented 58% of the Indonesian employment rate as of February 2009. If the green economy leads to positive jobs creation for these sectors, the employment rate will grow in the future. Generally, even though a loss of jobs will occur for the mining sector, the impact on overall employment is quite small (1.09%). A significant increase in overall employment is expected.

3.2. Review of Energy Companies in Indonesia

Narrowing this analysis to the number of companies currently operating in renewable energy, presents a difficulty for obtaining a reliable database, as such data cannot easily be accessed. According to the Ministry of Trade, there were only six large-scale companies in 2004 that operated in energy sector (coal and petroleum refineries). These six companies employed approximately 1,000 workers in 2004 (Ministry of Trade, 2004). State-owned companies, however, operated four main companies in the energy sector, not including subsidiaries.

Table 1 Employment effects across sectors: how the green economy affects number of jobs across sectors

	Main Sector	Number of Employment (Feb 2009)	Employment Rate	Jobs Effect	Possibility of Green Jobs
1	Agriculture and Forestry	43,029,493	41.18%	Positive *	Organic method, soil conservation, sustainable forestry
2	Mining	1,139,495	1.09%	Negative	Minimizing non-renewable sources
3	Manufacturing	12,615,440	12.07%	Positive *	Manufacturing a new machine or product (labour intensive)
4	Electricity, Gas, Water	209,441	0.20%	Mixed	Creating an efficient way of use, through renewable energy
5	Buildings/ Construction	4,610,695	4.41%	Positive *	Energy-efficient building (heating, ventilation, lighting)
6	Retail	21,836,768	20.90%	Mixed	Promotion, advertising, new service, shop close to resident
7	Transportation	5,947,673	5.69%	Mixed	Hybrid and fuel efficiency, public mass transport
8	Finance and Corporate services	1,484,598	1.42%	Mixed	Financing, auditing, financial assistants
9	Social Services	13,611,841	13.03%	Mixed	Training, government policy makers, education, research
	Total	104,485,444	100%		

Sources: BPS – Statistic Indonesia, United Nations Environment Programme (2008)

* Positive jobs effect means number of jobs will increase (as part of green jobs creation), negative jobs effect means number of jobs will decrease because some jobs will be eliminated, while mixed effect will increase or decrease number of jobs depending on which number is larger: new jobs created, jobs substituted, or jobs eliminated.

Overall, the total number of large-scale companies operating primarily in renewable energy is currently extremely small. Database searching resulted in the discovery of only one website (<http://indonetwork.co.id/companies/Enerji/0/energi.html>) that loads information about companies currently operating in the energy sector. According to this website, as of August 2010, there were 142 small and medium-sized companies operating in the energy sector. 31 companies (out of these 142) described their operations in the renewable energy sector (searching keyword: “energy terbarukan” resulted in 31 companies). It should be noted that this database is not completely reliable (might contain duplications), but a rough figure of companies operating in renewable energy can be captured.

4. EMPLOYMENT PREDICTION

A sustainable and low-carbon economy that includes the renewable energy factor will create more jobs in manufacturing and construction rather than in services, operation and maintenance. Kammen, Kapadia and Fripp (2004) stated that there will be a shift from jobs in mining and services to jobs in manufacturing, construction and agriculture. Agriculture jobs in Indonesia will increase significantly since more than 5% of Indonesia's energy mix in 2025 is expected to come from bio-fuel and biomass. Green jobs creation through renewable energy will obviously benefit the Indonesian economy since agriculture has a decline trend in employment rates and manufacturing still has a low employment rates (Table 2).

Table 2 Employment rate in agriculture, manufacturing and services sectors

Year	Agriculture* [%]	Manufacturing [%]	Services [%]
1987	57.79	8.80	33.42
1990	55.32	10.88	33.80
1993	50.08	11.95	37.97
1996	43.51	13.50	42.99
1999	43.21	13.78	43.01
2002	44.34	13.90	41.75
2005	44.04	16.92	39.04

(Sources: Hasoloan, 2006; Suryadarma et al., 2007)

*Agriculture sector has a declining trend of employment rate while manufacturing has an increasing trend of employment rate. Services sector has an increasing trend although at the end it started to decline.

A declining trend of employment rate in agriculture will be countered by a green jobs creation in agriculture (Table 2). While a green jobs creation in manufacturing will increase the size of the manufacturing workforce, services employment will face a declining trend as a result of sector-shifting from services to agriculture and manufacturing (green-jobs oriented).

4.1. Jobs per Megawatt of Capacity

One study across Europe and the United States, conducted by Kammen, Kapadia and Fripp (2004), presents a job creation model per megawatt of energy capacity (Table 3). To estimate the number of potential new jobs in Indonesia, the country's renewable energy installed capacity, potential capacity and plans for the installed capacity in the future are described (Table 4).

Applying the job creation model results in an estimated number of green jobs created in Indonesia. Table 5 describes the number of jobs that can be created on installed capacity, potential capacity and plans for the installed capacity in the future. This result is taken after applying jobs creation model (Table 3) into Indonesia's energy capacity (Table 4).

For the Indonesian renewable energy installed capacity in 2007, total jobs created were approximately 14,000, and this number significantly contributes to 0.15% of total unemployment in February 2008 (Table 6). Compared to February 2010 unemployment, installed capacity of renewable energy will contribute 0.27-0.34% of total unemployment. While the potential capacity of renewable energy roughly is anticipated to create 70,000-190,000 jobs, this number contributed 0.8-2.2% of total unemployment in February 2010 (Table 6). By contribute to unemployment means that the number of unemployment is expected to be reduced by the number of green jobs creation.

Table 3 Jobs per megawatt of capacity: how many number of jobs created per megawatt of energy capacity

Energy Sources	Jobs per Megawatt of Capacity		
	Manufacturing, Construction, Installation	Operations and Maintenance	Total
Solar PV	5.76-6.21	1.20-4.80	6.96-11.01
Wind Power	0.43-2.51	0.27	0.70-2.78
Biomass	0.40	0.38-2.44	0.78-2.84
Coal	0.27	0.74	1.01
Natural Gas	0.25	0.70	0.95

(Source: Kammen et al., 2004)

Table 4 Indonesia's renewable energy capacity

Energy Sources	Potential Capacity	Installed Capacity 2007	Installed Capacity in the Future
Solar PV	4.8 kWh/m ² /day	12 MW	0.87 GW by 2024
Wind Power	9.29 GW	2 MW	0.97 GW by 2025
Biomass	49.81 GW	445 MW	-
Coal	-	7400 MW	10,000 MW by 2010
Natural Gas	-	6400 MW	-
Hydro Power	75.67 GW	4200 MW	-
Geothermal	27.00 GW	1042 MW	9,500 MW by 2025
Mini/Micro-hydro	500 MW in 2007	210 MW	2,846 MW by 2025
Nuclear	3.00 GW	-	4.2 GW by 2024

(Sources: Ariati, 2009; Hartoyo, 2007; Schambek & Terras, 2007)

Table 5 Number of estimated green jobs in Indonesia

Energy Sources	Number of Jobs Created		
	Potential Capacity	Installed Capacity 2007	Installed Capacity in the future
Solar PV	-	84-132 jobs	6,055-9,579 jobs by 2024
Wind Power	6,503-25,826 jobs	1-6 jobs	679-2,697 jobs by 2025
Biomass	38,852-141,460 jobs	347-1,264 jobs	-
Coal	-	7,474 jobs	10,100 jobs by 2010
Natural Gas	-	6,080 jobs	-
Total (roughly)	71,114-193,045 jobs	13,986-14,956 jobs	24,178-29,720 jobs

Table 6 Unemployment in Indonesia

Year Month	2008		2009		2010
	February	August	February	August	February
Unemployment (million people)	9.43	9.39	9.26	8.96	8.59

Source: BPS-Statistic Indonesia (2010)

Since the study does not estimate green jobs creation from other renewable energy sources such as hydro-power, geothermal energy, mini/micro-hydro power and nuclear energy, the total number of green jobs created for Indonesia should be greater than available in this analysis, therefore the contribution to reduce unemployment is even more significant.

4.2. Employ-RES (Renewable Energy Sources) Model

A robust model, called the Employ-RES model, developed by the European Commission, predicts the number of jobs to be created from development of renewable energy sources (Figure 4). First, the policies regarding renewable energy sources are examined to identify national renewable energy targets and how to achieve them. Second, an economic analysis by sector estimates the impact on price based on energy demand. Such analysis includes first mover advantage (i.e. technology level advantage), household consumption and energy intensity, and industries and services related to renewable energy development. Third, the effect analysis provides an estimate regarding jobs creation or jobs elimination. For example, investment and increased operations and maintenance in renewable energy will result in creation of jobs, while development of fossil energy sources is expected to result in job losses. Foreign trade (export-import) for energies and technology will have a mixed effect on employment. Finally, the sums of positive and negative effects will result in the estimated number of new jobs created.

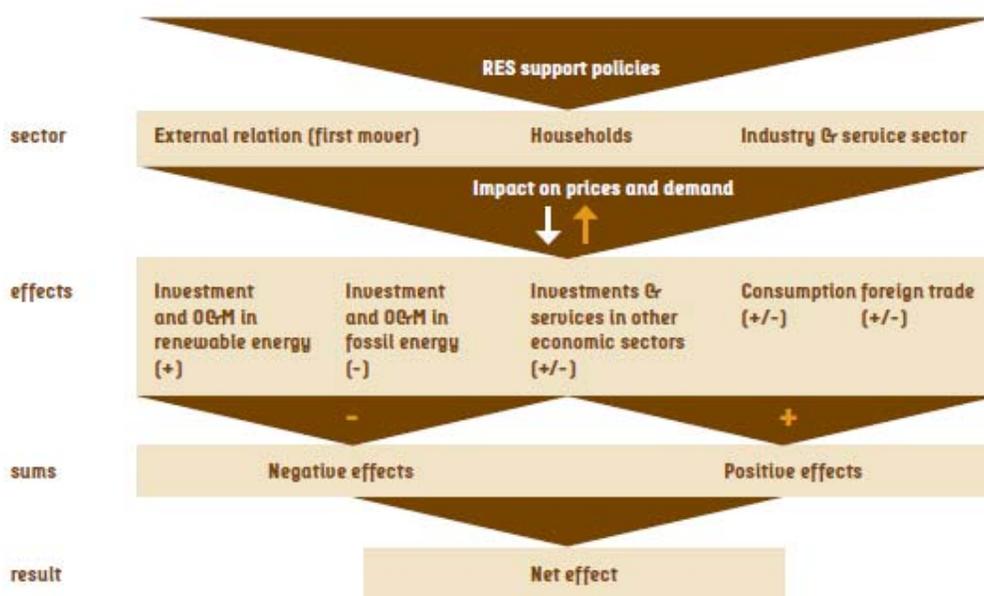


Figure 4 Employ-RES Model
(Source: European Commission, 2009)

5. CONCLUSION

The energy mix for 2025 has set up a target of 17% for renewable energy. This large target will have a positive impact on employment, especially for green jobs creation. Agriculture, forestry, manufacturing and construction sectors are primary industries for the creation of a significant number of green jobs. However, serious consideration must be given to avoid misconduct in labour practices as new green jobs are created in Indonesia. The Jobs per Megawatt of Capacity model (Kammen et al., 2004) predicts that renewable energy development in Indonesia will have a positive effect on employment. Installed capacity of renewable energy in 2007 created approximately 14,000 jobs, while the potential capacity is anticipated to create 70,000-190,000

jobs. For research in the future, the author recommends the Employ-RES comprehensive model for jobs creation in Indonesia. Although the current number of companies operating in renewable energy is small, potential growth is forecast in the future. Government support is needed for financing, advising, and directing industries through the proper regulations and policies.

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