



INTERNATIONAL RENEWABLE ENERGY AGENCY (IRENA)

**Contribution to the
2015 United Nations Economic and Social
Council (ECOSOC)
Integration Segment**

INTRODUCTION

The socio-economic benefits renewable energy sources can generate strengthen their business case. These benefits are increasingly relevant to stimulate economic growth and create jobs while reducing environmental impacts. The knowledge base on the socio-economic dimension of deployment remains, however, relatively limited and dispersed. In order to bridge this knowledge gap IRENA has been conducting various studies, which provide a broad overview of the status and trends in renewable energy employment as well as an in-depth analysis of its key aspects, including supportive policies, skills and education, energy access and gender. Recommendations for policymakers ensuring job creation in renewable energy deployment is maximized are also provided.

IRENA'S WORK ON RENEWABLE ENERGY AND JOBS



- » The 2011 policy brief *Renewable Energy Jobs: Status, Prospects & Policies* laid the ground for IRENA's work on employment. The analysis focused on job creation in the large-scale renewable electricity and transport biofuel industries.



- » The 2012 *Renewable Energy Jobs & Access* report analysed the role of renewable energy in creating jobs and improving livelihoods in the context of energy access.



- » IRENA developed country and project case studies to demonstrate the potential for job creation in rural areas (2012).



- » The 2013 report *Renewable Energy and Jobs* provides the first comprehensive view of the various dimensions of global employment in the sector. It underlines the importance of an enabling policy framework to realise the full potential for job creation.



- » In January 2014, the first international "Renewable Energy Jobs Conference", held in Abu Dhabi, brought together experts, practitioners, academics and policy makers to discuss employment dynamics in the sector.



- » *Renewable Energy and Jobs - Annual Review 2014* is the first of a series on the global state of employment in renewable energy.

- » In parallel, IRENA has been contributing a sidebar on renewable energy employment to REN21's annual *Global Status Report* since 2012.

RENEWABLE ENERGY AND JOBS - KEY FACTS

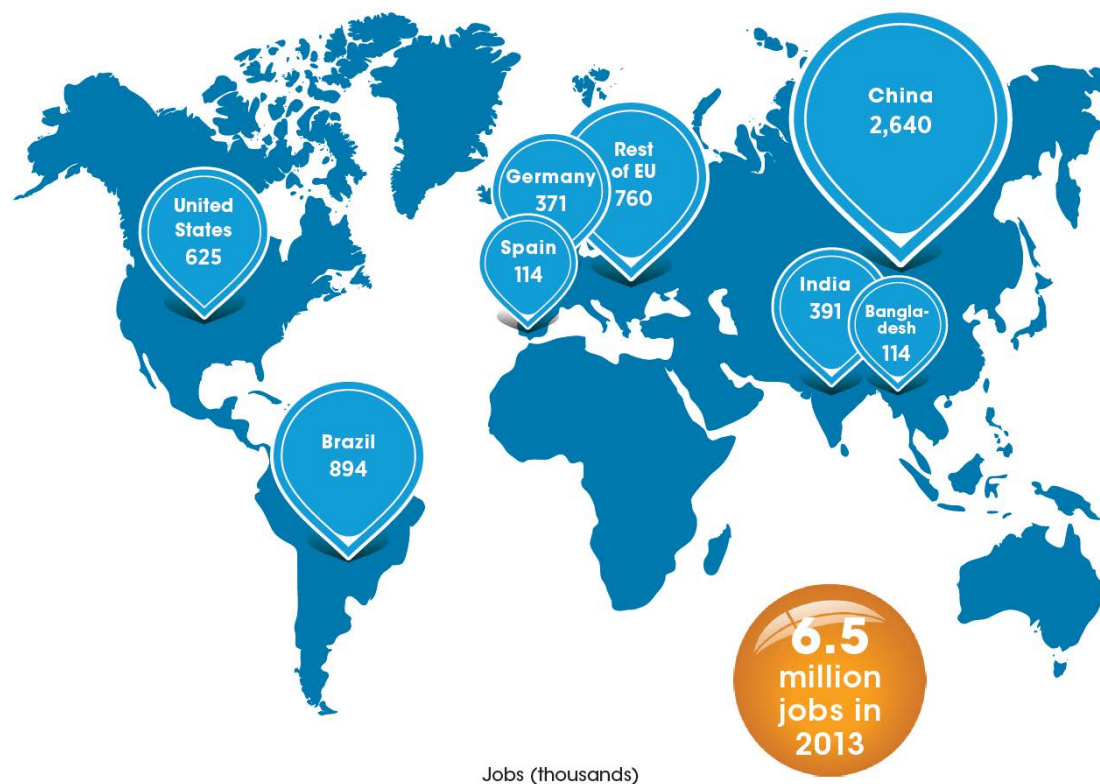
The renewable energy sector has become a significant employer with potential for creating millions more jobs worldwide in the coming years. IRENA estimates that globally 6.5 million people were working directly or indirectly in the renewable energy sector in 2013.

Renewable energy deployment continues to grow globally as a sustainable and increasingly economically viable alternative to conventional sources of energy. Recent trends in renewable energy prices and investment have affected job creation across the value chain. For instance, although declining prices of solar photovoltaic and wind equipment are introducing new challenges for suppliers and affecting manufacturing jobs, they are also driving employment growth in installation and operations and maintenance. From year to year, these dynamics can generate substantial employment swings.

Renewable energy employment is also shaped by regional shifts, industry realignments, growing competition, advances in technologies and manufacturing processes and the impacts of austerity and policy uncertainty. The policy context is critical. While the suitability of different policy tools varies depending on a country's circumstances, steadiness in the policy framework is key. Uncertainties or frequent changes are inimical to job creation. In addition, skill shortages can also act as a major barrier to renewable energy deployment and thus to associated employment.

Employment by Country

In decreasing order, the largest employers were China, Brazil, the United States, India, Germany, Spain and Bangladesh. Regional shifts in employment from developed to emerging countries continued in wind and solar technologies, predominantly in the manufacturing and installation segments of the value chain.



Employment by technology

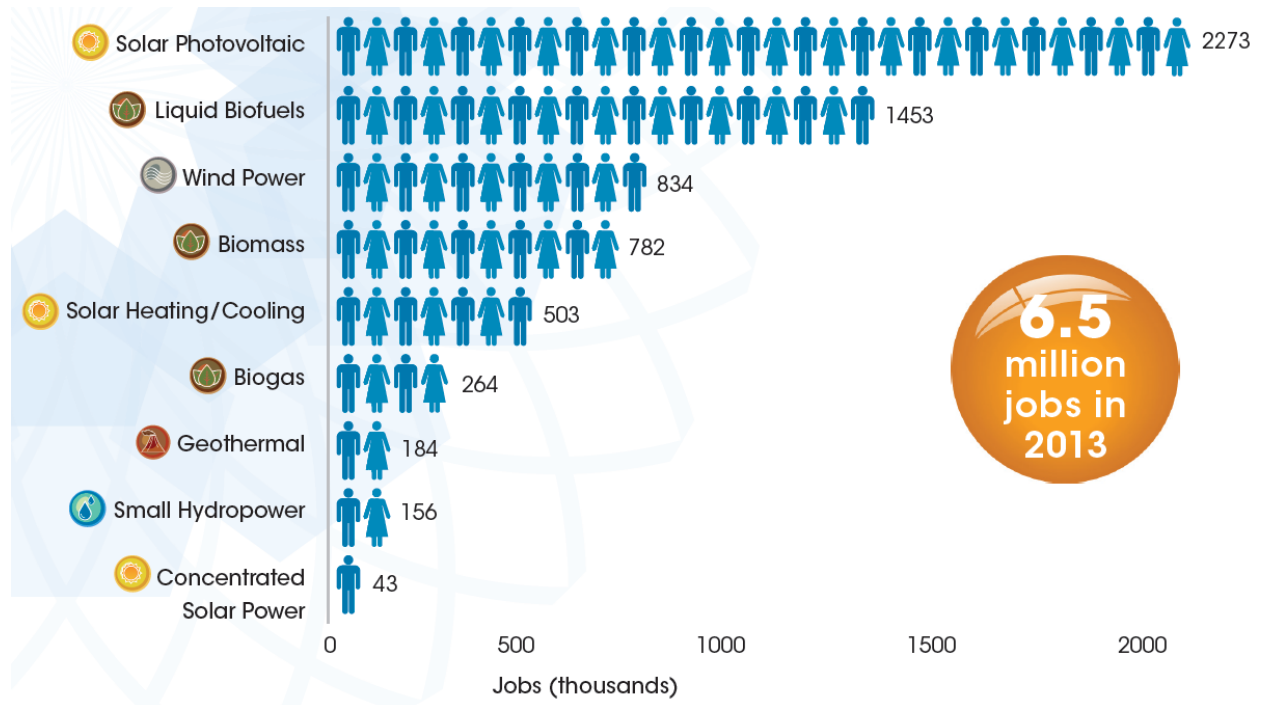
Solar photovoltaic and wind power remain the most dynamic renewable energy technologies.

In 2013, the solar photovoltaic sector accounted for 2.3 million jobs, largely concentrated in China. The trends show an increase in Chinese installation jobs, while manufacturing jobs remain stable as growing demand is absorbing the oversupply of photovoltaic panels.

Liquid biofuels, modern biomass and biogas are large employers (1.4 million, 0.8 million and 0.3 million) and jobs are mainly concentrated in feedstock production.

Wind employment remains relatively stable at 0.8 million jobs. Policy changes in several countries have reduced installation jobs, while those in operations and maintenance have experienced some growth.

Solar heating employed 0.5 million people, around 70% were in China. Data availability for solar heating, small hydro and geothermal is low, hence there is a potential for underestimation of jobs.



RENEWABLE ENERGY AND JOBS - KEY ASPECTS

Interactions between different policy instruments in support of job creation

A broad range of policies influence renewable energy job creation. These include policies governing renewable energy deployment, trade, investment and research and development, as well as regional development and cluster formation. These policies are most effective when they are pursued in conjunction with each other, in concert with broader economic policies such as industrial, labour and fiscal.

Steadiness and predictability in governmental policies are important to ensure stability and continued growth in employment. Although governmental support policies need to adjust to changing market conditions, the experience of recent years demonstrates the need to avoid abrupt policy reversals which may put renewable energy jobs in jeopardy.

Cross-border trade and investment flows are increasingly relevant to the renewable energy sector, with implications for employment. To maximise domestic job creation opportunities, national policies need to be calibrated carefully depending on the strengths and weaknesses of a particular country. Capacities and opportunities vary across countries, depending on respective renewable energy resource endowment, stage of industrial development, and availability of a local skilled workforce.

A free-trade regime for renewable energy technologies makes imported renewable energy equipment generally more affordable than under high import tariffs, thereby facilitating employment in installation, operations and maintenance. Trade liberalisation, however, can make it difficult for domestic manufacturers to compete with cheaper imports, impacting the chances for creating domestic renewable energy manufacturing jobs. Foreign direct investment typically provides greater opportunities than trade links do for joint ventures between foreign and domestic firms, which can set the foundation for a nascent domestic renewable energy industry.

Careful policy consideration is needed with regard to local content requirements. Many governments are adopting local content requirements, tied to deployment policies, in a push to establish local renewable energy industries. It is essential to pay attention to their design and to link them closely to a learning-by-doing process. To ensure the full-fledged development of an infant industry, local content requirements should not only be time-bound, but also accompanied by measures to facilitate the creation of a strong domestic supply chain and a skilled workforce, and to advance research and development programmes.

Industrial clusters, which facilitate information sharing and cross-pollination of ideas, can provide important benefits in the development of renewable energy capabilities. A cluster typically refers to a geographic concentration of interconnected economic and innovative activities in a particular field. Clusters and regional policies involve a variety of economic actors, including government agencies, private businesses and universities. Research and development is typically a crucial component of such efforts, often motivated by the need to overcome economic challenges, such as crises in older industries or lack of economic diversification. Governments can play an important role in setting the broad framework within which clusters can operate successfully, combining industrial, market-creating and business support policies, in order to fully mobilise the inherent potential.

Renewable energy skills, education and training: key enablers

As renewable energy deployment continues to increase across the globe high demand for qualified human resources in the sector is expected to continue, raising the potential for skills gaps and labour shortages. If not addressed in a timely manner, the shortage of skills in the

renewable energy sector could become a major barrier to deployment. Installations performed by inadequately skilled personnel can result in performance issues and lead to a negative public perception of renewable energy technologies, thus further slowing down progress. Although renewable energy companies may be able to draw on experienced workers from other industries, this may not be an efficient solution in the long term.

Successful deployment of renewable energy technologies requires forward-looking renewable energy education and training policies. There is a significant variation in the skills demanded in the renewable energy sector by occupation. Medium and high-skilled occupations, which require a certain level of education and training, are by nature more difficult to fill. In many countries where the industrial capacity is still under development, the majority of renewable energy jobs will be in installing, operating and maintaining renewable energy production facilities, rather than in manufacturing equipment. Therefore, it is essential that strategies for the renewable energy sector account for how skill needs in the future may evolve in the context of rapid technology changes and industry development.

In addition to technology-specific skills, training programmes should also provide core technical and soft skills that increase workers' employment flexibility. In the context of energy access, where the installations tend to be simpler, basic commercial skills, accounting, price design, inventory, quality assurance, etc., as well as marketing and after-sales service skills can be as important as technical skills.

Countries will be successful in the deployment of renewable energy technologies only if effective renewable energy education and training policies are in place. Policy makers have various ways of pro-actively including renewable energy topics in the existing and new educational programmes and institutions. This can be done by fostering the creation of interchangeable job and training specifications, harmonisation of curricula and the development of common quality standards for training programmes and trainers.

Off-grid solutions: catalysing local employment and economic growth

IRENA estimates that reaching the SDG 7.1. of universal access to modern energy services by 2030 could create 4.5 million jobs in the off-grid renewables-based electricity sector alone.

This estimation provides an indication of the overall magnitude of the job creation potential if the other end-use sectors, *i.e.*, heating/cooling and transport, are included. Local employment is more likely to be concentrated in assembly, distribution, installation, operations and maintenance and after-sales services, rather than in manufacturing.

Achieving universal access to modern energy services is a vital pre-requisite to advancing socio-economic development. Decentralised renewable energy, in particular, can play an important role where extending the grid is more expensive or impractical, or the pace of extensions is slow. Off-grid renewable energy solutions are already cost competitive in many circumstances and bring high potential for job creation along the supply chain.

Renewable energy jobs in rural areas vary significantly depending on the specific renewable energy technologies and the deployment approach adopted. The scale of off-grid renewable energy applications, typically much smaller than grid-connected, has implications for how they are distributed, installed and operated. This, in turn, affects the type and number of jobs involved and the types of technical and business skills required. Analysis of selected case studies also suggests that the characteristics and number of jobs depend largely on local variables such as social factors (e.g., family relations, societal structures), market-based factors (e.g., demand fluctuations, deployment model) and policy-based factors (e.g., employer legal obligations).

There is growing evidence that decentralised renewable energy solutions can create value locally in terms of both employment and economic growth. This potential is considerably enhanced when renewable energy projects are well integrated with local commercial activities. Local enterprises play an increasingly important role in extending access through the adoption of innovative business models. In addition, many of the technical and commercial skills required can be developed locally, thereby enhancing the sustainability of local economic activities.

Dedicated off-grid renewable energy policies are key to transforming rural economies. The adoption of an integrated programmatic approach specifically targeting the sector is necessary to achieve universal access to modern energy. As such, the provision of energy access should go beyond meeting basic needs to include energy services for productive uses to enable a range of downstream micro-enterprises for rural economies. A better understanding of the employment effects of different energy access approaches (e.g., number of jobs created by technology, type of employment, wages, skills and training requirements, gender dimension, etc.) can guide policy-making towards achieving the full potential of employment from renewable energy deployment.

Gender dimensions of renewable energy employment

Women's talents and insights remain under-utilised in the renewable energy sector. In both industrialised and developing countries, gender stereotypes are powerful inertial forces which continue to restrict women's participation in, and contribution to, the sector. However, the nature of the gender gap is vastly different in the modern energy context, where the entire population has adequate access to energy, than in rural areas of the developing world, where women and children typically bear the burden of inadequate energy access.

In the modern context, women are still a minority in the renewable energy workforce, particularly among technical staff and management. In industrialised countries, the share of female employees in the sector is estimated at about 20-25%, with most women working in administrative and public relations positions. Among the key constraints are issues related to self-perception, mobility and skills. For example, the low percentage of women who graduate in the so-called STEM (science, technology, engineering, and mathematics) fields directly affects women's participation in the renewable energy sector. Within the industry itself, barriers to women's advancement relate not only to ingrained views and attitudes, but also to the way that workplaces are organised and influence the work/life balance.

In the majority of developing countries, women face day-to-day challenges related to cooking and lighting their households, especially in rural areas. They are often compelled to spend long hours collecting firewood and other materials for fuel, which markedly limits their ability to pursue education or find employment. In terms of employment, female employees are a minority in most rural renewable energy enterprises, particularly in managerial and technical positions. Limited capital and mobility, as well as socio-cultural restrictions, preclude a larger role for women in many modern renewable energy technologies.

Including the gender dimension in the renewable energy equation can help simultaneously address the expected skill shortages in the industry while maximising socio-economic benefits. By removing existing barriers and working towards equal opportunity for the employment of women in the sector, the pool of talent can be substantially increased. In developing countries, renewable energy employment provides an opportunity to address the disparity in poverty between women and men, especially considering that women represent 70% of the world's 1.3 billion people in extreme poverty. The inclusion of gender dimensions in renewable energy strategies and the empowerment of women in energy decisions can multiply renewable energy

co-benefits, particularly those related to access, household consumption and micro-enterprises, where women are primary actors.

RENEWABLE ENERGY AND JOBS - KEY RECOMMENDATIONS

According to IRENA studies, in designing and implementing policies to increase the number of renewable energy jobs, policy makers may consider:

The importance of measuring employment from renewable energy

- Systematic data collection and thorough analysis to estimate employment at the country level is essential to inform policy-making, evaluate the effectiveness of deployment policies and communicate the results to the public at large. Among the various methods available to estimate employment in the renewable energy sector, each country should consider which best suits their needs and resources. To the extent possible, countries should also seek to harmonise methods and data reporting categories.
- The most useful data would distinguish between conventional and renewable energy employment (by technology and use) and direct and indirect employment; disaggregate among the main components of the renewable energy sector (feedstock operations, manufacturing, engineering, construction and installation, and operations and maintenance) and provide occupational details (e.g., wages, gender, etc.).

Interactions between the different policy instruments in support of job creation

- National renewable energy policy choices need to be combined carefully with an eye towards a country's particular strengths and weaknesses. A key requirement is that policies provide a stable, predictable framework that anchors investor confidence and supports job creation in the sector.
- Efforts to maximise socio-economic impacts of renewable energy deployment, and job creation in particular, benefit from a tailored policy mix that entails coordination between deployment and other interacting policies, such as education, trade, regional development, industrial and labour.

Renewable energy skills, education and training: key enablers

- Policy makers can facilitate the inclusion of renewable energy topics in existing and new educational programmes and increase awareness of the career opportunities in renewable energy to attract young people entering the sector as well as experienced workers from other industries with relevant skills.
- Governments can provide financial support for renewable energy education and training at universities or other suitable institutions, and foster international and interdisciplinary collaboration, such as the creation of interchangeable job and training specifications, harmonisation of curricula and development of common quality standards for training programmes and trainers.
- The private sector is well placed to provide relevant technical skills in a timely fashion through on-the-job apprenticeships and training programmes. Public and private sector

actors should, therefore, collaborate in order to benefit from their respective strengths to most effectively meet the needs of the sector.

Off-grid solutions: catalysing local employment and economic growth

- Dedicated off-grid renewable energy policies are key to transforming rural economies. An integrated programmatic approach specifically targeting the sector should be promoted to ensure that timely expansion of energy access can generate economic growth and improve the livelihoods of millions of people.
- There is a need to develop a comprehensive framework to collect, analyse and disseminate the employment impacts of rural energy access initiatives. Data on rural renewable energy employment, both quantitative and qualitative, can be crucial in guiding policy-making towards adopting energy access approaches that maximise socio-economic development in rural areas.

Gender dimensions of renewable energy employment

- Removing barriers to entry for women's employment in the renewable energy sector is a win-win proposition, both to address the existing skills gap in a rapidly expanding renewable energy industry and to create equal opportunities for women.
- In order to maximise renewable energy co-benefits, particularly those related to energy access, household consumption and micro-enterprises, it is essential to include gender perspectives in policies and support services (e.g., training, access to finance), and to provide other incentives to encourage employment of women in renewable energy.