HIGH-LEVEL POLITICAL FORUM ON SUSTAINABLE DEVELOPMENT

POLICY BRIEF #13

INTERLINKAGES BETWEEN ENERGY AND JOBS

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In collaboration with:

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This document is a part of a series of Policy Briefs being developed to support SDG7 review at the UN High-Level Political Forum to be held in July 2018. The objective is to inform intergovernmental discussions by providing substantive inputs on SDG7 and its interlinkages with other SDGs prepared through inclusive multi-stakeholder consultation processes. The development of these Policy Briefs is coordinated under the auspices of the Ad Hoc Informal Multi-stakeholder Technical Group of Advisors on SDG7.

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KEY MESSAGES

- The number of people employed, directly and indirectly, in the renewable energy sector rose from 5.7 million in 2012 to 8.3 million in 2016, and could expand to 25 million by 2030 with proper policy support (excluding large hydropower). Solar PV has emerged as the single largest employer in the renewable energy sector, followed by liquid biofuels and wind.
- With manufacturing of renewable energy equipment concentrated in a few countries, employment opportunities reside with project development, sales, construction and installations, and operations and maintenance for on- and off-grid projects for most countries.
- Renewable energy creates more jobs than the fossil fuel industry, enabling net employment gains as the energy transition unfolds. Trends in renewable energy jobs have remained positive, in contrast to traditional energy industries, which have been facing employment cuts due to changing dynamics in the energy sector.
- Available data in the energy access context is still limited, but evidence from Bangladesh and East Africa suggests expanding employment as off-grid solutions become more widely available. The combination of energy access and an enabling environment facilitates rural development.

Priority Actions over the Next Four Years

- Providing an enabling environment with stable and predictable policy support for the expansion of renewable energy is essential.
- To avoid skills gaps, coordination between the renewable energy sector and educational/training institutions is essential, including integration of renewables modules into vocational training and technical courses.
- To augment local value creation, governments should adopt policies in support of value chain development, including incubation of new businesses, capacity-building programmes for suppliers, formation of industry clusters, and provision of infrastructure.
- To improve understanding of positive and negative employment impacts, as well as effects on broader socio-economic development, governments should undertake more systematic data collection and quantitative and qualitative analysis.
- To draw on all available talent, governments should develop policies geared toward specific groups. In particular, to overcome the barriers that women confront, gender diversity targets, greater workplace flexibility and sensitivity training are needed, along with mentorship and training programmes.

Priority Actions to 2030

- Close monitoring of labour market dynamics and projections of skills needs are critical for avoiding skills gaps.
- To make full use of relevant skills and expertise in other sectors of the economy (including parts of the fossil fuel industry), governments should develop appropriate retraining programmes.
- Efforts are needed to adopt and update equipment standards and quality control measures to ensure maximum effectiveness of installed renewable energy capacities.
- Just transition strategies can smooth the energy transition for fossil fuel-dependent communities. These include pro-active consultations, retraining programmes, social protection measures, and investments in support of economic diversification.

Policy Brief on the Interlinkages between Energy and Jobs

SDGs 7 and SDG 8 (Decent work and Economic growth) are linked in important ways. Energy is essential to a well-functioning economy, and must be reliable and affordable. Its absence may spell job loss and missed job-creation opportunities. This is also the case in the energy access context, where local enterprises and households often suffer from either a lack of access to modern energy or unreliable and poor-quality energy services.

Beyond security of supply, the transition to a more sustainable energy system has important employment ramifications in its own right, and enhances socio-economic resilience of communities around the world. Unfettered climate change—in the form of extreme weather, rising global temperatures, changes in rainfall patterns, and spreading disease vectors—will increasingly weaken economic activity and undermine livelihoods by disrupting supply chains, destroying productive assets, displacing people, and affecting the health and productivity of workers.

A skilled workforce is indispensable to a successful energy transition. Without well-trained, experienced workers, renewable energy deployment and energy efficiency targets may be missed or the quality of equipment and installations could suffer.

Current status

The majority of investments and analytical attention has gone to grid-connected renewable electricity in urban and industrial contexts. By contrast, available information in the energy access context, especially in rural settings, remains more limited for the time being.

The expansion of installed renewable energy capacity has translated into a growing workforce. According to IRENA's Renewable Energy and Jobs 2017 (IRENA, 2017a), the renewable energy sector worldwide employed 8.3 million people, directly and indirectly, in 2016[1]. Direct employment in large hydropower adds another 1.5 million, for a total of 9.8 million (see Figure 1). This is up from 7.1 million jobs in IRENA's initial assessment (5.7 million without large hydropower). Solar photovoltaic (PV) employment has more than doubled since 2012. Liquid biofuels, large hydropower and wind power are the next-largest employers.

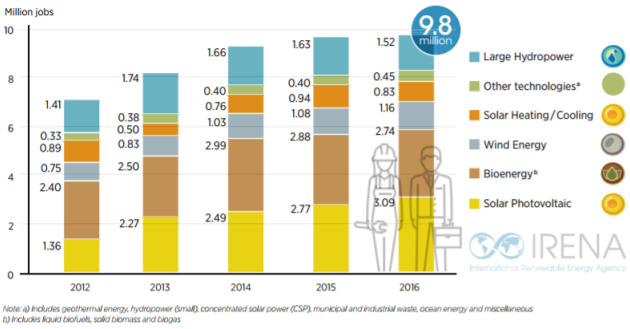

Figure 1: Global Renewable Energy Employment, 2012-2016

Growth in employment has been facilitated by rapidly falling costs especially for wind and solar PV equipment. Feed-in tariffs provided the initial support for the growth of renewables markets. More recently, auctions are facilitating cost-discovery and are bringing about some of the lowest project costs on record. In recent years, these positive developments were somewhat moderated by fluctuating investment levels and by policy changes and uncertainties in some countries, underscoring the continued importance of a stable and favourable regulatory framework.

At present, China, Brazil, the US, India, and member states of the European Union (EU) are leading employers in the renewable energy sector. They are the principal manufacturers of solar panels, wind turbines and other equipment, and are home to the largest deployment markets. Recent years have seen a considerable shift towards East Asian countries, spurred by strong policies there to stimulate domestic installations and to support the emergence of globally competitive manufacturing facilities.

Equipment manufacturing is highly concentrated in a few countries, but with adequate policy support, some production and assembly can be localised. Most countries can expect to create employment principally in other segments of the value chain—in project development, sales and distribution, construction and installation, and operations and maintenance (IRENA and CEM, 2014). This is also the case in the energy access context; most of the solar PV equipment used in decentralised applications is produced in China and a few other countries. Inputs needed for small hydropower and biogas projects, on the other hand, are often supplied domestically.

Rising employment numbers are important, but so is the quality of jobs. The push for continued cost-cutting may affect both staffing levels and wages. Yet wages determine the disposable income available for spending on goods and

[1] The estimate is based on an extensive annual review of available databases, studies and estimates. The jobs numbers include direct and indirect employment along the renewables value chain, but exclude induced jobs. These are generated when employees of the renewable energy sector spend their salaries on goods and services throughout the economy.

services and thus influence the extent of induced employment and socio-economic development

Net Employment Effects

Studies indicate that renewable energy technologies create more jobs than fossil-fuel technologies. For instance, per dollar of expenditure, spending on renewable energy will produce nearly 70% more jobs than spending on fossil fuels (Chen, 2017). Similarly, solar PV could create more than twice the number of jobs per unit of electricity generation compared with coal or natural gas (UKERC, 2014).

To some extent this is owed to the fact that renewable energy technologies are not yet as fully matured as conventional technologies. Labour productivity in the renewable sector can be expected to rise. The ongoing mechanisation of biofuels feedstock harvesting in Brazil is already lowering the requirement for agricultural labourers and is leading to changes in required skills. Production of equipment such as solar PV panels and wind turbines is also subject to increased automation, as are operation and maintenance (O&M) activities.

Still, the energy transition from fossil fuels to renewables will likely be accompanied by net employment gains. In addition to the expansion of renewable energy, jobs will be created through investments in smart grids, modern transmission and distribution networks, storage capacity to help integrate variable renewable energy supplies into the grid, charging infrastructure for electric vehicles, and other measures.

Meanwhile, dynamics within the fossil fuel sector (rising mechanisation, overcapacities and industry consolidation) are increasingly translating into job losses, especially in the coal industry. Renewable energy employment could expand to around 25 million people worldwide by 2030, outpacing job losses in the conventional energy sector by some 6 million workers (IRENA, 2017a). A key challenge for policy-makers will be to ensure that the energy transition is fair, which requires smoothing the adjustment for affected workers and communities.

Another factor affecting employment is energy efficiency. Employment is created in R&D for energy-efficiency technologies, production of materials such as building insulation and of equipment such as more efficient appliances, and finally in the installation and maintenance of such materials and equipment. Energy efficiency allows for money to be spent elsewhere in the economy. On the other hand, greater efficiency could also entail some job loss in extracting, refining and distributing fuels, and in producing electricity, for example.

Skills Requirements of Renewable Energy

Due to the diversity of technologies, the renewable energy sector requires a wide variety of skills and occupations, ranging from construction workers to plumbers and electricians, to technicians and engineers with various specialisations. The bioenergy supply chain also requires people in agricultural occupations for feedstock planting, harvesting and processing. The renewable energy sector spans not only many technical professions, but requires planners and administrators, legal experts and financial specialists. Utility-scale plants require different skill profiles than smaller facilities, especially deployments in an energy access context.

Analysing the occupational patterns and skills needs of a typical 50 megawatt (MW) solar PV project, IRENA's *Leveraging Local Capacity for Solar PV* (IRENA, 2017b) found that a total of 230 000 person days are needed along the value chain (see Figure 2). Operations and maintenance account for 56%, manufacturing for 22%, and construction and installation for 17%. Construction workers (35 500 person days) and factory workers and technicians (32 000 person days) are the most numerous occupations.

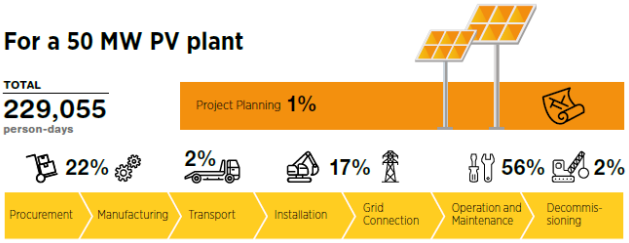

Figure 2: Employment Impacts in the Solar PV Value Chain
Source: IRENA, 2017b.

Similarly, for onshore wind, IRENA (IRENA, 2017c) found that a typical 50 MW project requires a total of 144 000 person days (see Figure 3). Operations and maintenance represent 43% of the total, construction and installation 30%, and manufacturing 17%. Construction workers (26 600 person days) are the single largest occupational contingent, followed by factory workers (close to 12 500 person days).

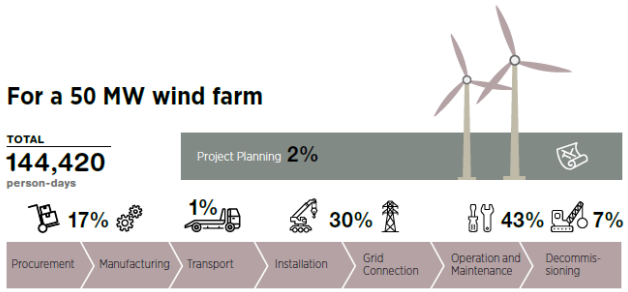

Figure 3: Employment Impacts in the Onshore Wind Power Value Chain. Source: IRENA, 2017c.

For a given project, the duration of different types of jobs along the value chain varies, but a steady pipeline of projects blurs distinctions between limited-duration jobs and permanent ones. Construction and installation typically lasts a few weeks or months. Manufacturing jobs (and related occupations such as in procurement and transportation) depend on the pace and degree of fluctuation in the demand for equipment over time. O&M jobs are quasi permanent in that a given renewable energy power plant can have a lifetime of up to about 20 years.

Employment through Reliable Energy Access

Measuring the employment effects stemming from energy access is difficult due to lack of data, the informality of many of the jobs, and . the complexity of the energy access landscape across a multitude of actors and initiatives, varying technologies and scales of deployment. Electricity access can be provided through grid extension, mini-grids and stand-

alone devices. Boosting access to cooking fuels entails the manufacture and distribution of improved cook stoves, for which very limited employment information is available (IRENA, 2012; ILO, 2017).

In addition to projects intended to improve energy access, there are also large-scale wind, solar and bioenergy facilities located in rural areas but whose output is destined for grid-connected communities . Many of the inputs come from abroad, so that local employment is mostly created in construction. Absent dedicated community development and skill-building efforts, lasting socio-economic benefits may be scarce.

The potential for job creation through decentralised renewable energy solutions for electricity and modern fuels is enormous. Some experience has been gathered on the ground, with regard to small-scale solar (also see Brief #1):

- Bangladesh's rural solar programme, based on a microfinance model, has succeeded in installing more than 4 million solar home systems to date. In the process, more than 100 000 jobs were created. This includes more than 80 000 jobs in installations and in the value chain, and 30 000 jobs in manufacturing and assembly (Barua, 2015). Training and quality control are important dimensions of this programme.
- The spread of the "pay-as-you-go" model in East Africa is creating additional employment, though still at relatively small scale for the time being. Start-up companies like M-KOPA, Off-Grid Electric, Azuri, BBOXX, or Mobisol are the main exponents of a business model that has so far created thousands of jobs in the sale, distribution and installation of decentralised solar panels, but carries the potential for much larger impacts.

As renewables substitute conventional energy such as kerosene, charcoal or firewood, net employment effects, job quality and other benefits must be considered. Charcoal production, transport and trading are labour-intensive, providing livelihoods for millions of people (Openshaw, 2010). Rough estimates available for replacing kerosene lamps with solar lanterns (UNEP, 2014) suggest that the net balance can be positive.

Consumptive and Productive Uses of Energy

Beyond the jobs created by energy access, there are broader employment and development opportunities. Consumptive uses of energy reduce household drudgery such as gathering of fuelwood, freeing up time that may be spent on education and income-generating activities. Access to cleaner energy also permits improvements in education (electricity boosts study hours) and health (reduced exposure to indoor air pollution from traditional biomass), and increases disposable household income (where clean energy sources are cheaper than conventional polluting sources), resulting in economic gains at the local level.

Meanwhile, productive uses of electricity or mechanical power can help small and medium-size enterprises (SMEs) improve their productivity, raise the quality of their goods and services, and increase sales. Agriculture (irrigation, agro-processing, etc.) is a primary beneficiary, but light manufacturing, commercial activities and communications also benefit (ILO, 2017). A review of 50 studies from Africa, Asia and the Americas on impacts of electrification at the household and enterprise level found that, on average, access leads to increases of 7% in school enrolment, 25% in employment (with particular benefits accruing to women), and 30% in incomes (Jimenez, 2017).

Even so, access to energy is generally understood to be a necessary but insufficient condition for economic development. Among the additional enabling factors are availability of finance, knowledge and skills, managerial capacity, access to markets (roads, infrastructure, social networks) and a conducive regulatory environment (Practical Action Consulting, 2012).

Gender as a Central Factor for Success

Employment in the energy sector as a whole is traditionally male-dominated. However, findings from an IRENA survey (IRENA, 2016) suggest that at 35% of the labour force, the share of women in modern renewable energy is higher than in conventional energy. The specifics vary from country to country and from one renewable energy technology to another. In the US, for instance, the share of women in the solar industry rose quickly from a low 19% of the workforce in 2013 to 28% in 2016 (Solar Foundation, 2017).

An online survey with focus on the Middle East and North Africa region (BNEF, CEBC and IRENA, 2017) confirmed findings from other parts of the world that women continue to face challenges due to a range of attitudinal obstacles and structural barriers. These include a lack of background in the STEM (science, technology, engineering and mathematics) fields, but also dated perceptions of gender roles, discrimination in pay and a persistent glass ceiling for managerial positions. Redressing the situation will require a number of initiatives, including offering greater flexibility in the workplace, and greater support for women through mentorship and training. In the energy access context, female entrepreneurs also need better access to finance.

Policy Implications/Recommendations

Improve Data

Available information in both on- and off-grid environments remains uneven, underscoring the importance of more systematic collection of quantitative and qualitative data at sufficiently dis-aggregated levels. The need for better data is particularly strong in the context of rural energy access.

Avoid Skills Gaps

Some skills gaps already exist for technical and engineering positions and could grow as the renewable energy sector continues to expand. Unalleviated, this could hinder a smooth energy transition, contributing to project delays or even cancellations, cost overruns and faulty installations. Improved monitoring of labour market dynamics and projections of likely skills needs are critical tasks. Better coordination between the renewable energy sector and educational institutions is

essential for developing renewable energy curricula, integrating renewables modules into vocational training courses, supporting apprenticeships, and establishing common quality standards.

Retrain Workers and Retain Expertise

Part of the challenge is to find ways to draw on skilled personnel from relevant other industries, and to undertake retraining efforts as necessary (IRENA, 2017d). Ensuring the retention of skilled and experienced workers is also critical, and this requires adequate wages, decent job conditions, and clear opportunities for career advancement.

Mainstream Gender

Governments and the private sector need to work on removing barriers to entry for women's employment in the renewable energy sector and to better include gender perspectives in policy-formulation, education and training measures, access to finance, and various support services. The benefits are dual—creating equal opportunities for women and reducing the risk of a growing skills gap.

Develop Local Supply Chains

To maximise socio-economic benefits, countries seek to localise portions of the value chain (and the associated jobs) by leveraging domestic content (IRENA, 2017a). To be successful, however, such policies need to be part of a broader effort to develop viable domestic supply chains (incubation of new businesses, building up the know-how and capacities of enterprises, providing supporting infrastructure, encouraging industrial clusters, etc.). They also need to be linked to training and skill-building efforts.

Ensure a Just Energy Transition

Generating a smooth energy transition path requires addressing the fear that communities, now reliant on the fossil fuel industry, will lose jobs, incomes, and economic vitality. This creates political resistance to an accelerated transition, but can be addressed through just transition strategies. These include retraining programmes, social protection measures, pro-active consultations with communities, incubation of new businesses, and investments in support of economic diversification.

Augment Investments in Energy

Access to modern energy in developing countries is a necessary input and precursor to fostering economic development, and thus creating livelihoods. Job creation should therefore be an essential consideration of ODA-supported energy programmes and projects, but should be viewed as one benefit, not as the only objective of such investments. Electrification in and of itself is often insufficient for stimulating job creation. This challenge can, however, be overcome through the smart combination of renewable energy investments with additional support efforts to stimulate the productive use of energy.

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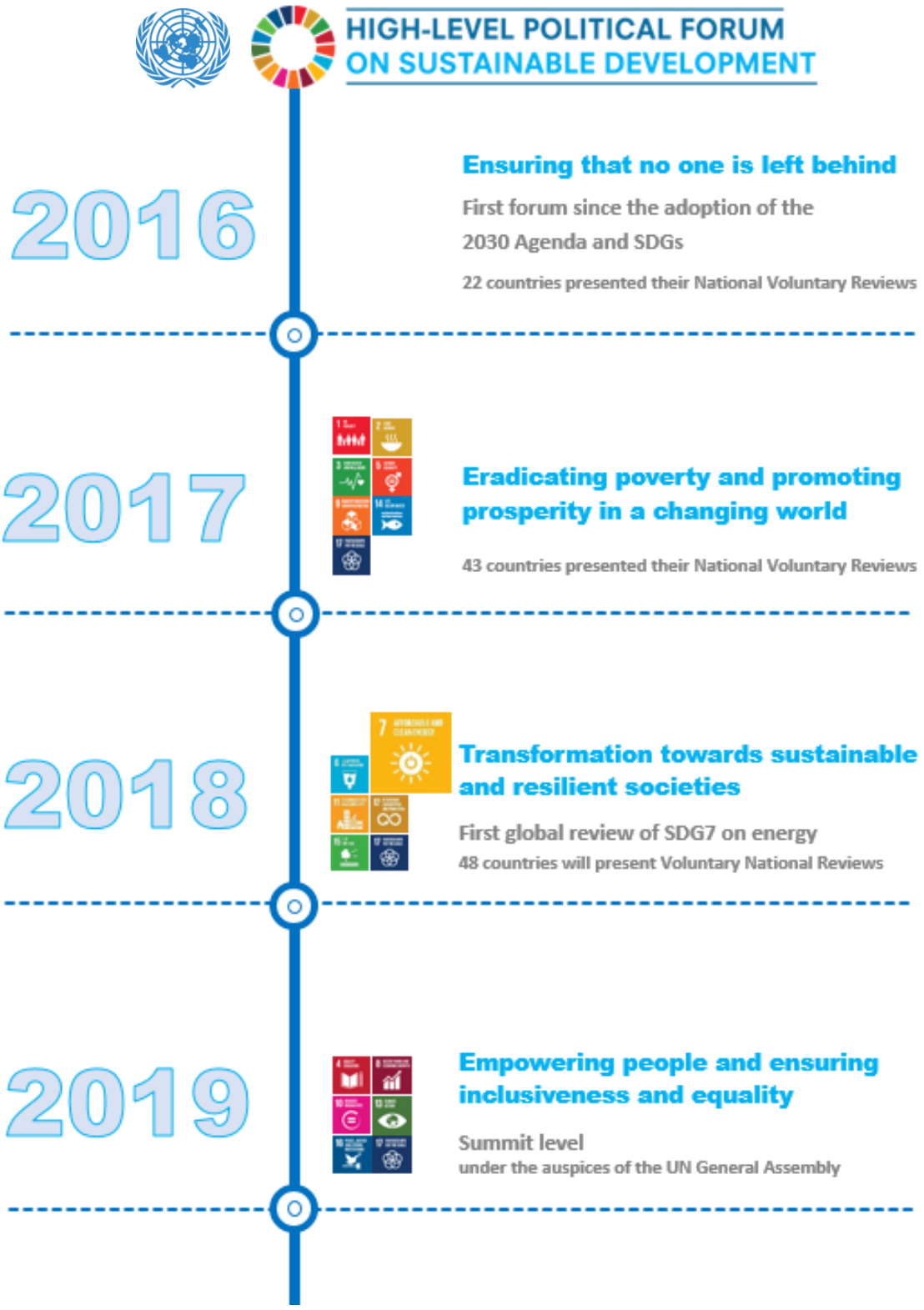

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