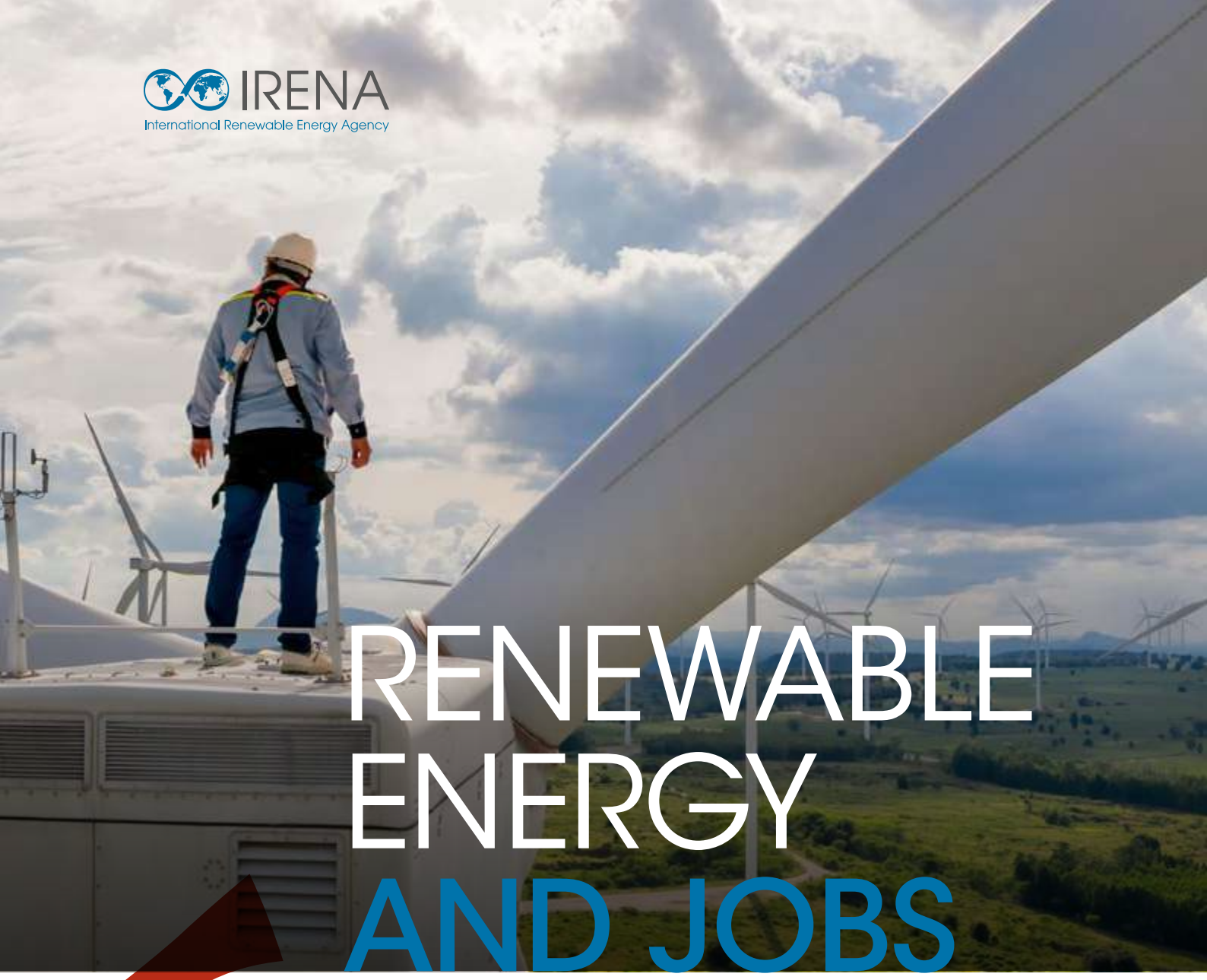


RENEWABLE ENERGY AND JOBS

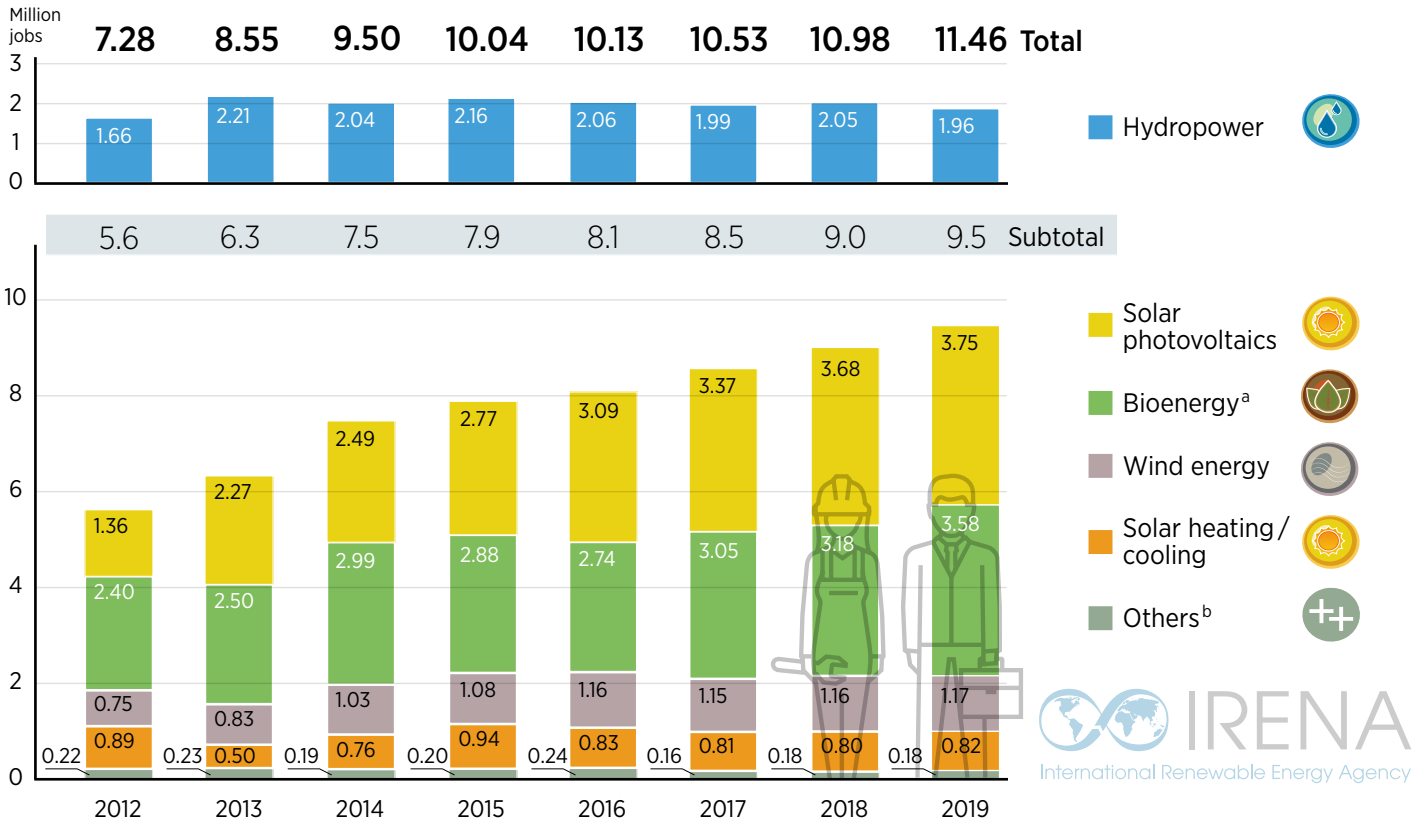
Annual Review 2020

The renewable energy sector employed at least 11.5 million people, directly and indirectly, in 2019.[1] Renewable energy employment has continued to grow worldwide since 2012, when the International Renewable Energy Agency (IRENA) began to assess it on an annual basis. The solar photovoltaic (PV), bioenergy, hydropower and wind power industries have been the biggest employers. The bulk of global jobs relate to modern energy use, but the 2019 estimate includes jobs tied to the use of decentralised solar PV to expand energy access in parts of Sub-Saharan Africa and in South Asia. Figure 1 shows the evolution of IRENA's renewable energy employment estimates since 2012.[2] The majority of these jobs are still held by men. The share of women in the renewable energy workforce is about 32%, compared to 22% in the energy sector overall (IRENA, 2019a).

1 Data are principally for 2018-19, with dates varying by country and technology, including some instances where only earlier information is available. The data for hydropower include direct employment only; the data for other technologies include both direct and indirect employment where possible.

2 IRENA does not revise previous years' job estimates in light of improved or additional information that becomes available following the publication of a particular edition.

FIGURE 1: **GLOBAL RENEWABLE ENERGY EMPLOYMENT BY TECHNOLOGY, 2012-2019**



Source: IRENA jobs database.

Note: Except for hydropower, where a revised methodology led to revisions of job estimates, numbers shown in this figure reflect those reported in past editions of the Annual Review.

a. Includes liquid biofuels, solid biomass and biogas.

b. "Others" includes geothermal energy, concentrated solar power, heat pumps (ground based), municipal and industrial waste, and ocean energy.

This year's edition of the Annual Review series (see Box 1) highlights the latest employment trends by technology, including jobs in decentralised applications of renewable energy for improved energy access. The report then offers insights for selected regions and countries. It also includes a feature highlighting the importance of education and training policies to avoid skills shortages as renewable energy continues to expand. The report concludes with observations on the impacts of the crisis triggered by the outbreak of COVID-19 and a sketch of the way forward to ensure a successful energy transition.

BOX 1. IRENA'S ANNUAL REVIEW OF EMPLOYMENT IN RENEWABLES

This seventh edition of *Renewable Energy and Jobs – Annual Review* provides the latest available estimates of renewable energy employment and continues to refine and improve data and methodologies. Global numbers are based on a wide range of studies. Those studies apply varying methodologies to information of varying detail and quality.

The *Annual Review* series is part of IRENA's effort to assess the socio-economic impacts of the energy transition worldwide. Over the past decade, the agency has published an expanding set of reports analysing opportunities for localising value creation, measuring the socio-economic footprint of the transition and assessing the state of gender equity in renewable energy (see Figure 2). Jobs and livelihoods are vitally important in this context, for individuals and families as much as for communities and entire societies.

This is being highlighted in dramatic fashion by the response to the COVID-19 crisis, with lockdown orders and other restrictions bringing much economic activity to a halt and causing widespread losses of jobs and income.

FIGURE 2. IRENA'S KNOWLEDGE BASE ON RENEWABLE ENERGY EMPLOYMENT... AND MORE

Annual reviews of employment in renewables

Analyses of local capacities

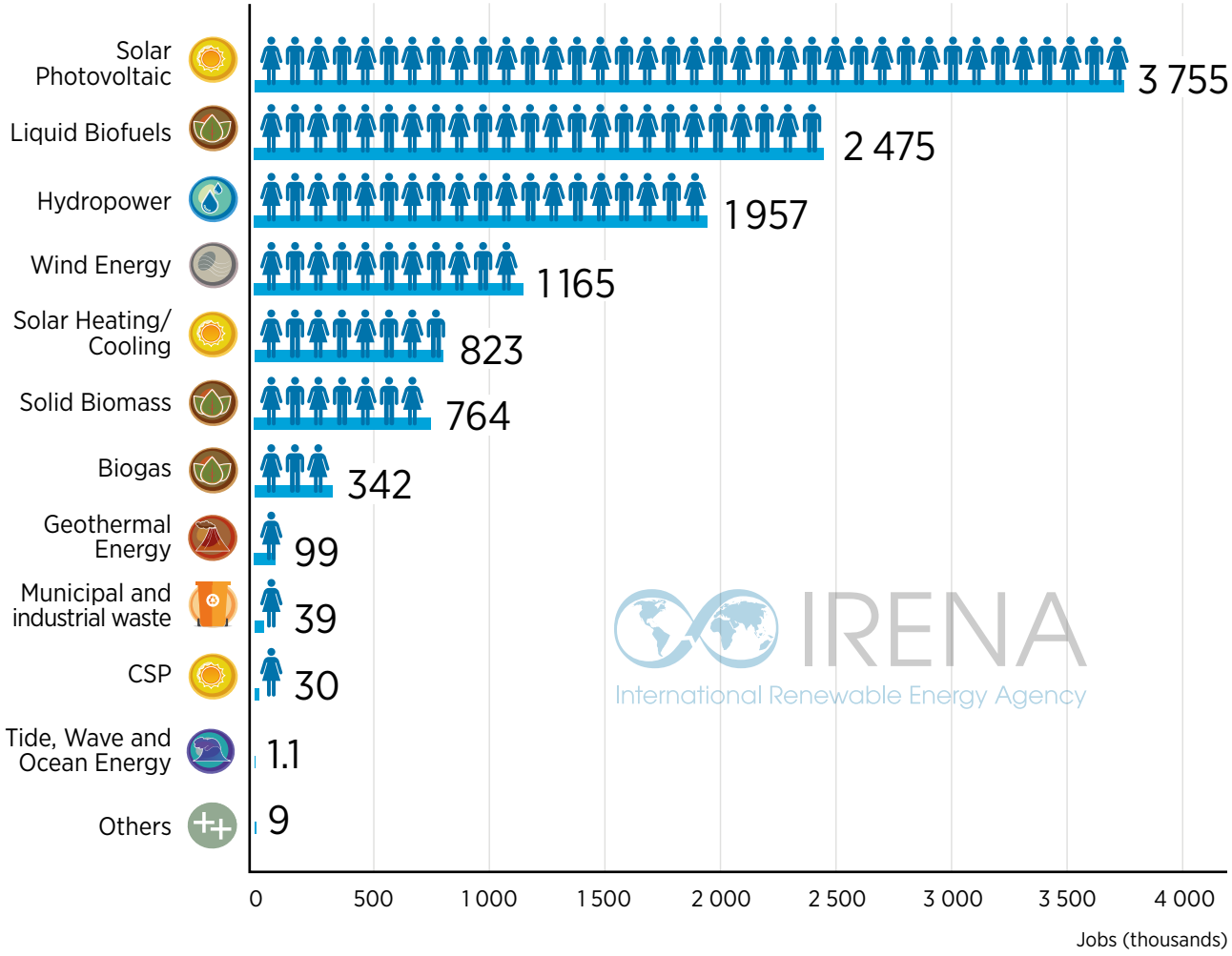
Assessing gender equity in renewable energy

Measuring the socio-economic impact of renewables

RENEWABLE ENERGY EMPLOYMENT BY TECHNOLOGY

This section presents estimates for employment in solar PV, liquid biofuels, wind, solar heating and cooling, and hydropower. Less information is available for other technologies such as biogas, geothermal energy and ground-based heat pumps, concentrated solar power (CSP), waste-to-energy and ocean or wave energy. These other technologies also employ fewer people (see Figure 3).

FIGURE 3: **RENEWABLE ENERGY EMPLOYMENT BY TECHNOLOGY**



Note: Others include jobs not broken down by individual renewable energy technologies.

Source: IRENA jobs database.

SOLAR PHOTOVOLTAIC

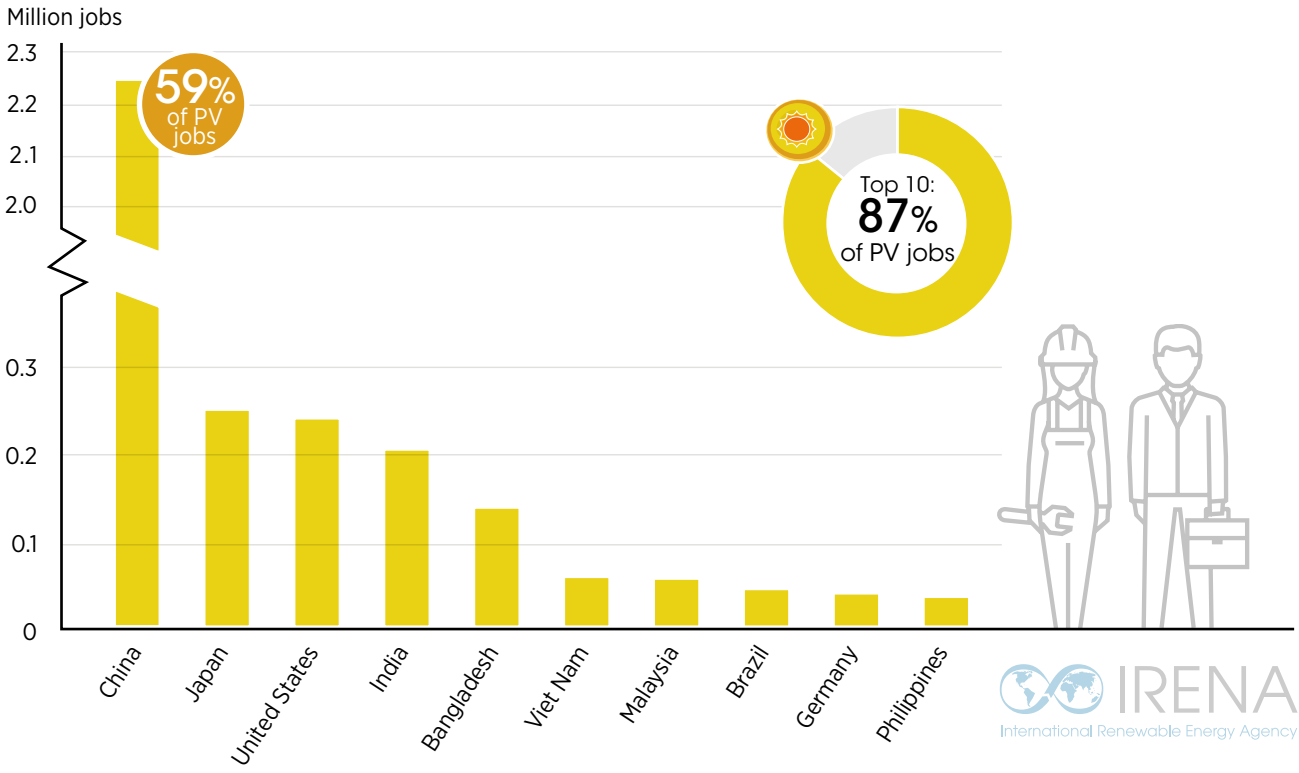
Globally, the solar PV industry installed 97 gigawatts (GW) of capacity during 2019, slightly less than the 100 GW installed in 2018. More than half, some 55 GW, was added in Asian countries (principally China, India, Japan and Viet Nam); Europe installed 19 GW, the United States another 9 GW and Australia close to 6 GW (IRENA, 2020a).

IRENA estimates that global solar PV employment increased by 4% to reach 3.8 million jobs in 2019.[3] Of the leading ten countries shown in Figure 4, seven are Asian. Overall, almost 3.1 million of the solar PV jobs (83% of the global total) were in Asia, followed by North America's 6.5% share, Europe's 4.4% and Africa's 3.7%.

Together, the ten leading countries are home to around 87% of the world's solar PV workforce, which indicates that deployment and manufacturing continue to be concentrated in a handful of countries. The global total includes an estimate of 372 000 off-grid jobs for South Asia and parts of Africa.

China, the leading producer of PV equipment and the world's largest installation market, accounted for more than half of PV employment worldwide, or some 2.2 million jobs (CNREC, 2020). Japan's solar PV industry continues to face difficulties, and capacity additions in 2019 were almost half the volume of the year before. IRENA estimates that jobs fell to 241 000 in 2019. The United States had a similar number of jobs, some 240 000.[4] India's on-grid solar employment is estimated at 109 000 jobs, with another 95 000 off-grid, for a total of 204 000 jobs. Most of the 137 000 solar PV workers in Bangladesh are employed in the installation of solar home systems. PV employment in the European Union rose significantly to 127 300 jobs in 2018, up from 95 600 (EurObserv'ER, 2020).

FIGURE 4: **SOLAR PV EMPLOYMENT: TOP 10 COUNTRIES**



Source: IRENA jobs database.

Note: The figure for India includes an estimated 95 000 jobs in off-grid solar PV. Bangladesh's figure principally represents jobs related to off-grid deployments.

3 The countries for which IRENA's database contains solar PV employment estimates represent 574 GW of cumulative installations in 2019, or 99% of the global total. They represent 98.7% of new installations in 2019.

4 The Solar Foundation (2020) estimates employment in all solar technologies (PV, solar heating and cooling, and CSP) at 250 000 jobs, but provides no breakdown. Most of the activity is in PV; IRENA assumes 240 000 jobs in PV, and 5 000 jobs each in the other solar technologies.