IRENA
International Renewable Energy Agency

Renewable Energy and Jobs
Annual Review 2022

In collaboration with

ILO International Labour Organization

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ABOUT IRENA

The International Renewable Energy Agency (IRENA) is an intergovernmental organisation that supports countries in their transition to a sustainable energy future and serves as the principal platform for international co-operation, a centre of excellence, and a repository of policy, technology, resource and financial knowledge on renewable energy. IRENA promotes the widespread adoption and sustainable use of all forms of renewable energy, including bioenergy, geothermal, hydropower, ocean, solar and wind energy, in the pursuit of sustainable development, energy access, energy security and low-carbon economic growth and prosperity.

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ABOUT ILO

The only tripartite U.N. agency, since 1919 the ILO brings together governments, employers and workers of 187 Member States, to set labour standards, develop policies and devise programmes promoting decent work for all women and men.

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IRENA HEADQUARTERS

Masdar City, P.O. Box 236

Abu Dhabi, United Arab Emirates

www.irena.org

FOREWORD

With the extreme weather events witnessed across the globe in recent years, the heavy costs of climate change are becoming increasingly visible to all, strengthening the already compelling case for our transition to a low-carbon future powered by renewable energy.

As with the global economy, the renewable energy sector faces lingering supply chain disruptions from the COVID-19 crisis and volatile energy prices stemming from trade disputes and geopolitical rivalries.

Our responses to these immediate and long-term challenges bring to the fore the role of workforce development. This remains an essential component of the energy transition that should be addressed in the context of a broad policy framework comprising industrial policies, education and skills training, labour market policies, enterprise development, diversity and inclusion strategies, regional revitalisation and social protection measures, based on social dialogue.

Francesco La Camera

Director-General

International Renewable Energy Agency

Guy Ryder

Director-General

International Labour Organization

This ninth edition of IRENA's *Renewable energy and jobs: Annual review* shows that the number of people either directly or indirectly employed in the renewable energy sector has continued to grow, from 12 million in 2020 to 12.7 million in 2021. Solar photovoltaics, with a third of these jobs, remains the most dynamic renewable industry.

Close to two thirds of all renewable energy jobs are based in Asia, with China alone accounting for 42% of the global total. This reflects the region's strengths in installation markets and equipment manufacturing. To secure jobs and other socioeconomic benefits worldwide, more countries across the globe need to pursue policies to boost their domestic capabilities.

As the number of jobs in the renewable energy sector continues to rise, it is essential to ensure that these posts provide decent livelihoods in terms of wages, occupational health and safety and workplace conditions, job security and other rights at work.

A successful and just energy transition must reflect the needs and interests of communities and regions, offer social protection for those most affected, and ensure that poor households and the most vulnerable members of societies are not priced out of the energy market by measures intended to reflect the environmental costs of fossil fuels. Such a perspective can ensure that the move from old to new energy systems is just, both in terms of jobs and other pressing social and economic needs in societies around the world.

Encouraging advances have been made in workforce gender equity – with women accounting for one-third of all renewable energy jobs. Additional progress is essential. As the transition gathers pace our focus must remain on fostering workforce diversity in ways that offer equal opportunities across the board, not only in terms of gender but for youth, minorities and marginalised groups.

This report shines a spotlight on the extended renewables value chain. On the upstream side, growing scrutiny of industry practices in the mining and processing of commodities critical to renewable energy is required. This includes environmental and labour standards as well as impacts on local communities, local content, value added and domestic manufacturing. Meanwhile, at the other end of the value chain, measures are needed to handle decommissioned equipment and materials with greater care and responsibility.

As the transition gains momentum, the multiple benefits of pursuing renewable energy are becoming increasingly clear – ranging from greater climate stability to new economic opportunities and jobs. If we are to lock in these benefits for the long term, we must act with urgency to significantly ramp up the pace of our transition to a sustainable energy future.

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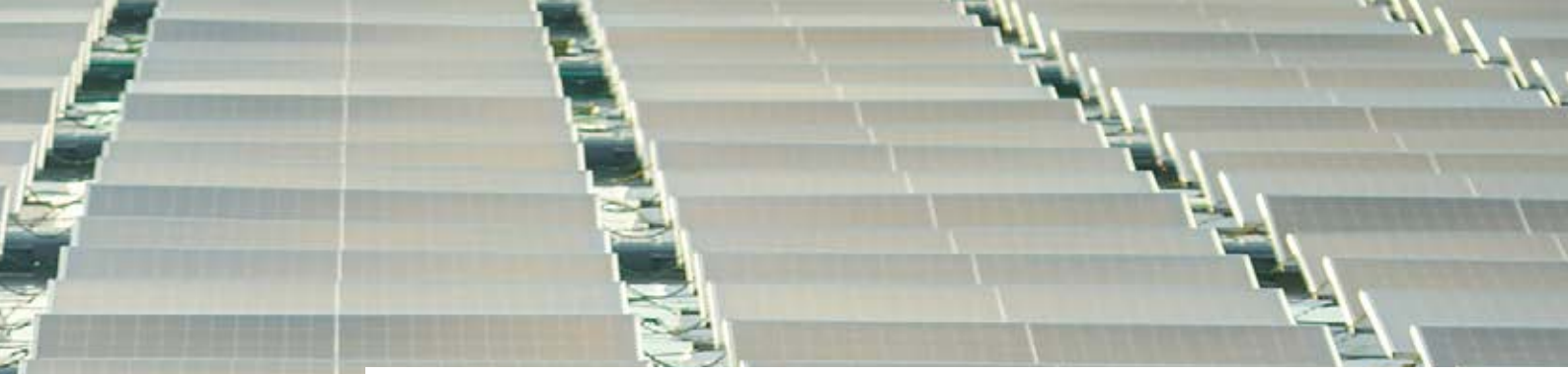

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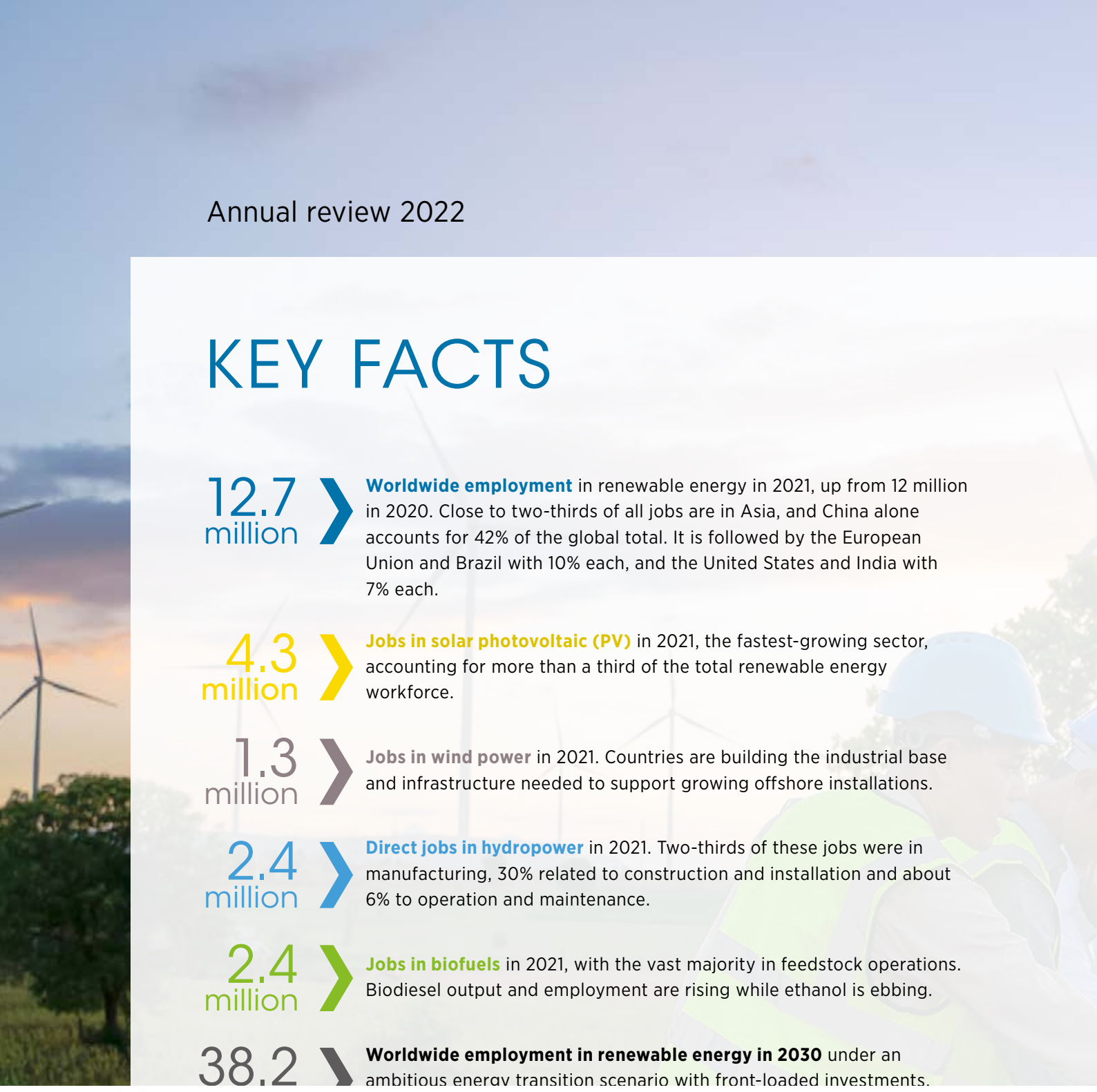
Abbreviations

ASM	artisanal and small-scale mining
CdTe	cadmium telluride
CSP	concentrated solar power
DRE	decentralised renewable energy
EOL	end-of-life
EU	European Union
EU-27	27 Member States of the European Union
GW	gigawatt
IEA	International Energy Agency
ILO	International Labour Organization
IREC	Interstate Renewable Energy Council
MW	megawatt
O&M	operations and maintenance
PV	photovoltaic
R&D	research and development
SGRE	Siemens Gamesa Renewable Energy
USDA-FAS	US Department of Agriculture Foreign Agricultural Service
US DOE	US Department of Energy



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KEY FACTS

12.7 million — **Worldwide employment** in renewable energy in 2021, up from 12 million in 2020. Close to two-thirds of all jobs are in Asia, and China alone accounts for 42% of the global total. It is followed by the European Union and Brazil with 10% each, and the United States and India with 7% each.

4.3 million — **Jobs in solar photovoltaic (PV)** in 2021, the fastest-growing sector, accounting for more than a third of the total renewable energy workforce.

1.3 million — **Jobs in wind power** in 2021. Countries are building the industrial base and infrastructure needed to support growing offshore installations.

2.4 million — **Direct jobs in hydropower** in 2021. Two-thirds of these jobs were in manufacturing, 30% related to construction and installation and about 6% to operation and maintenance.

2.4 million — **Jobs in biofuels** in 2021, with the vast majority in feedstock operations. Biodiesel output and employment are rising while ethanol is ebbing.

38.2 — **Worldwide employment in renewable energy in 2030** under an ambitious energy transition scenario with front-loaded investments.