



# Green Road to Kunming

## Planning Environmentally Sustainable Infrastructure

WORKSHOP SERIES 2022 28 April / 19 May / 23 June / 21 July



**Greening the  
Energy Sector**

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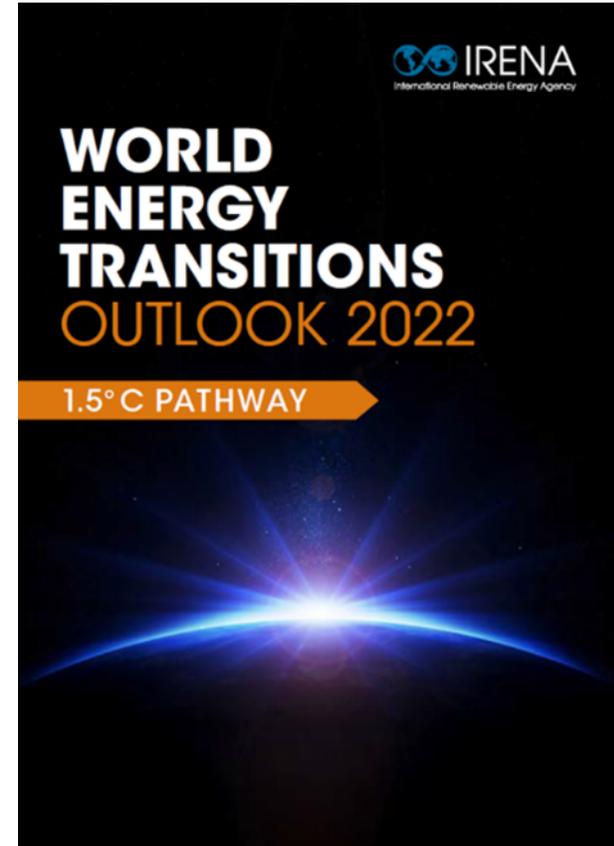
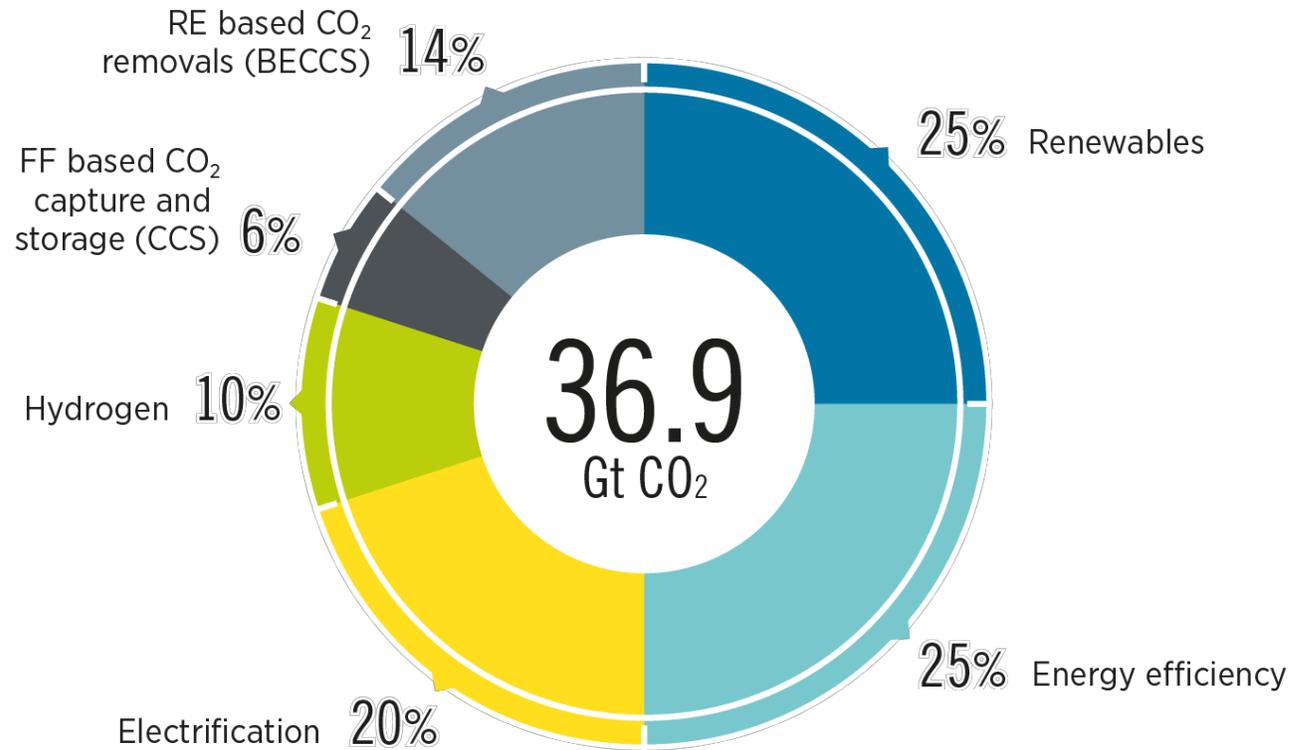
# The energy transition and renewables: the 1.5°C challenge

Dr. Ute Collier



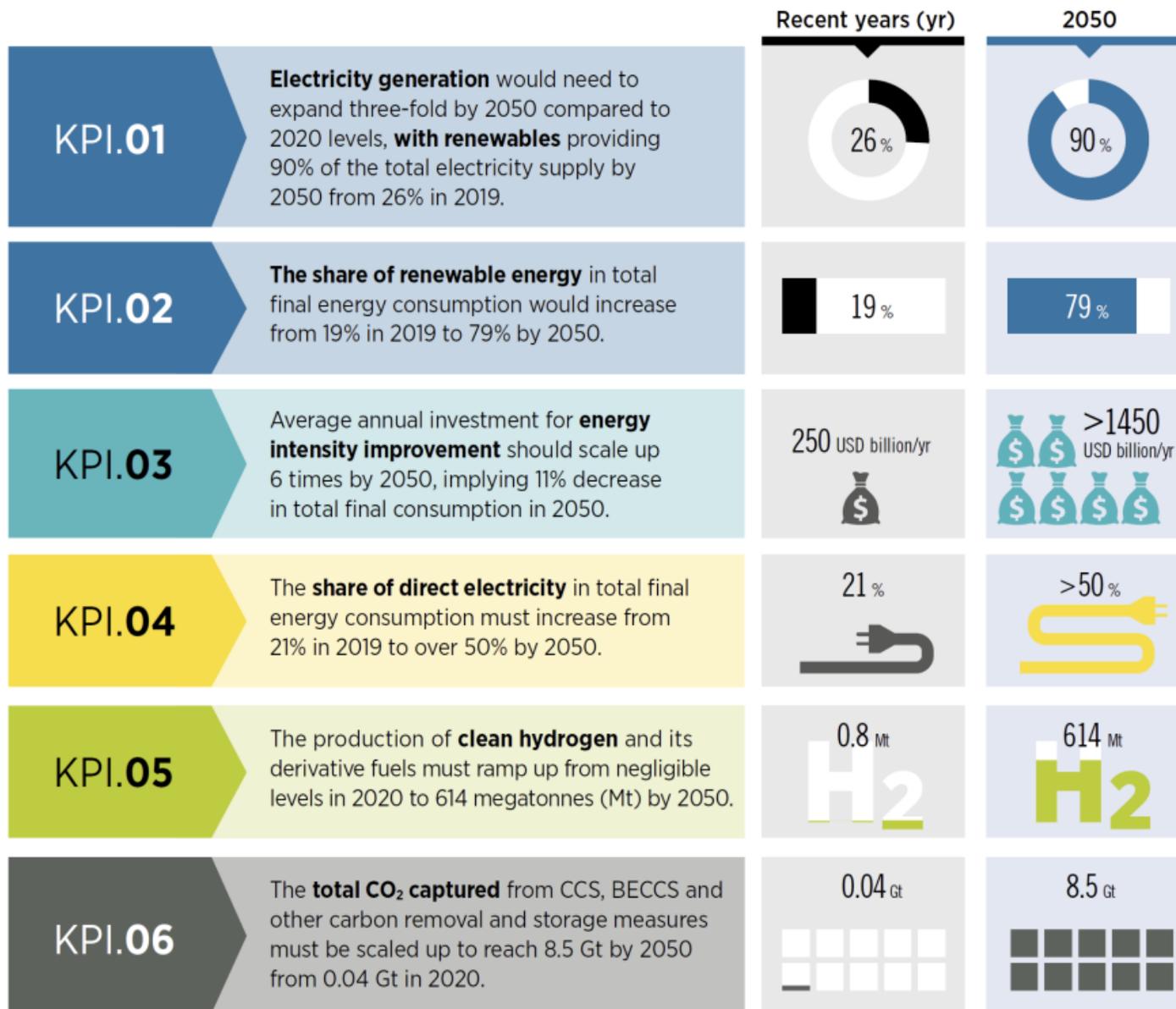
# Renewables, efficiency and electrification dominate the energy transition

## Reducing emissions by 2050 through six technological avenues

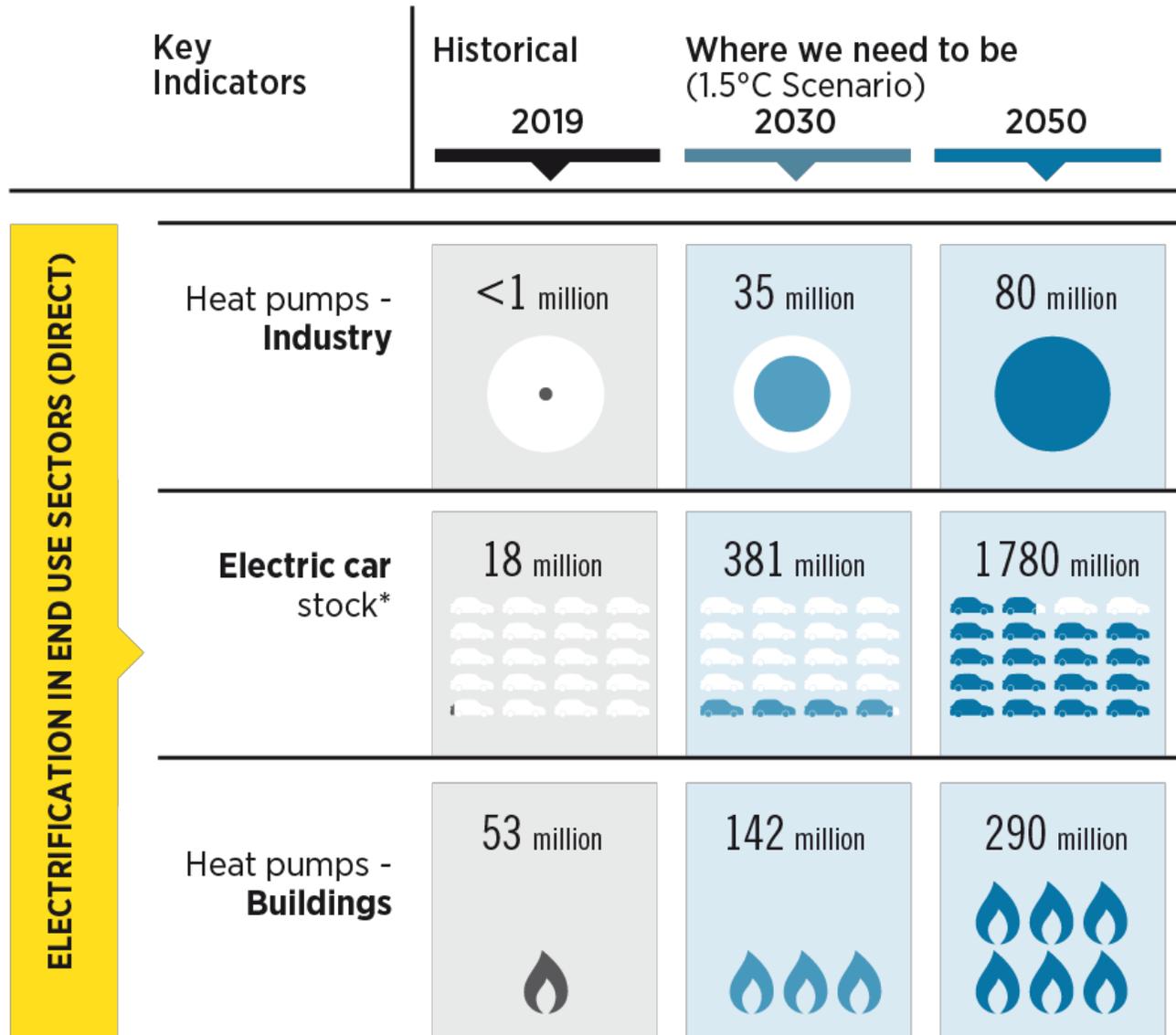


90% of all decarbonisation in 2050 will involve renewable energy through direct supply, electrification, bioenergy with CCS and green hydrogen, with efficiency as an enabler.

# A massive scale-up is needed across all 6 technological avenues

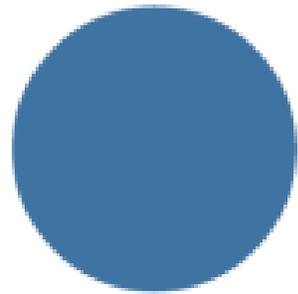


# Electricity becomes the main energy carrier in future energy systems



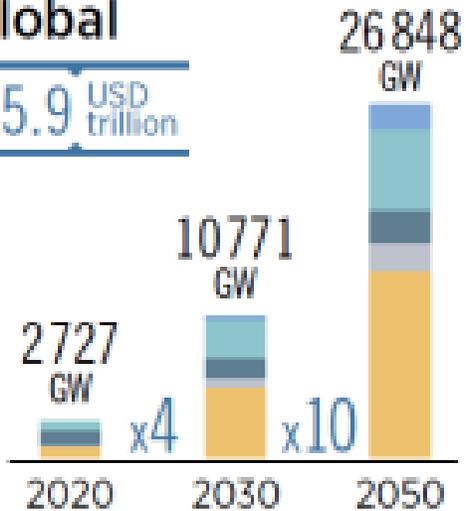
- **Global electricity demand** in end-use sectors needs to increase **1.3 times** to reach **around 31 000 TWh** by 2030.
- The share of electrification in end-use sectors like **industry, buildings, transport** to reach **28%, 56%, and 9%** in 2030, respectively.

# Renewables could decarbonise 90% of the power sector by 2050



## Global

25.9 USD trillion

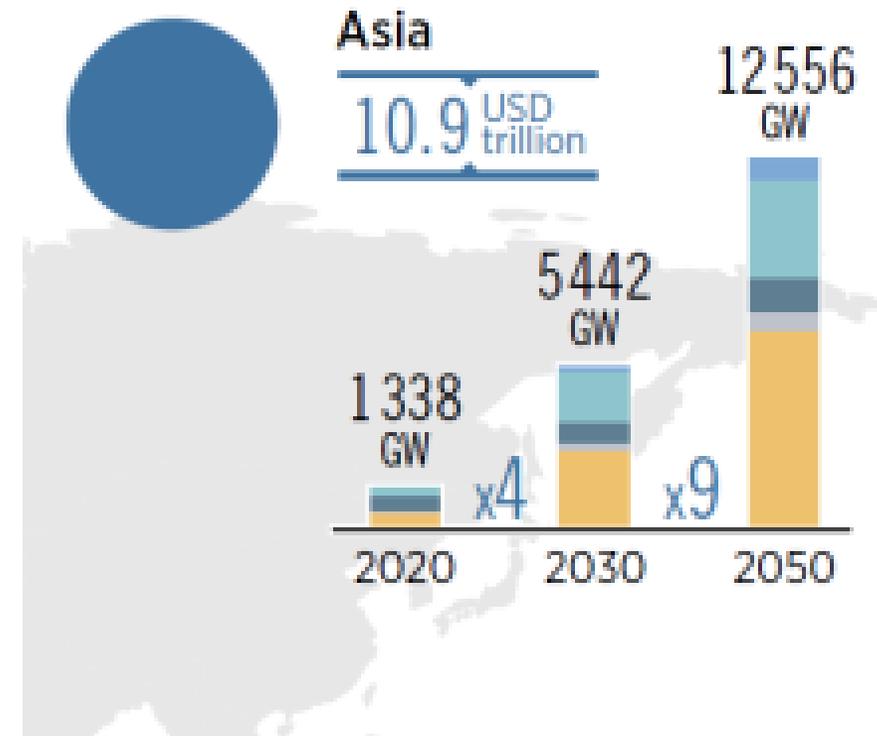


- Offshore Wind
- Onshore Wind
- Hydro
- Others
- Solar PV

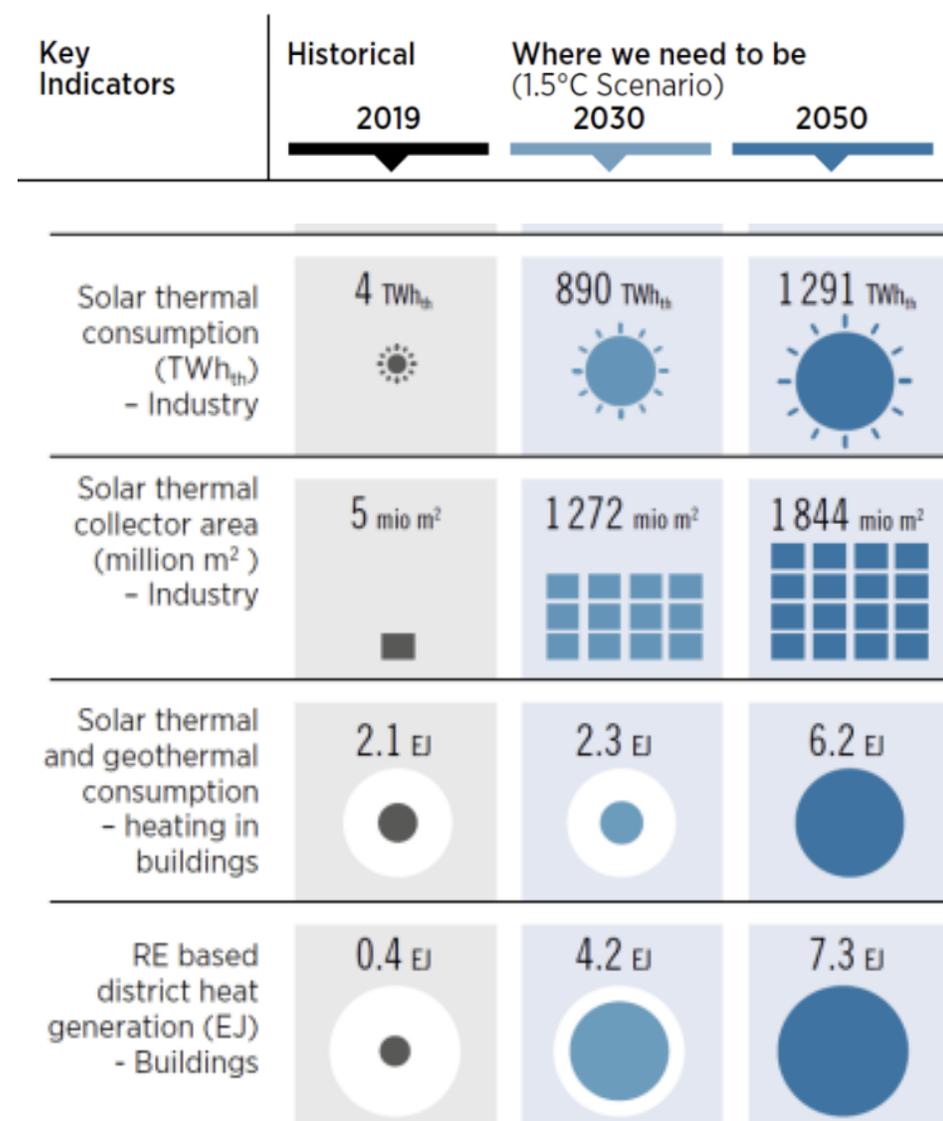
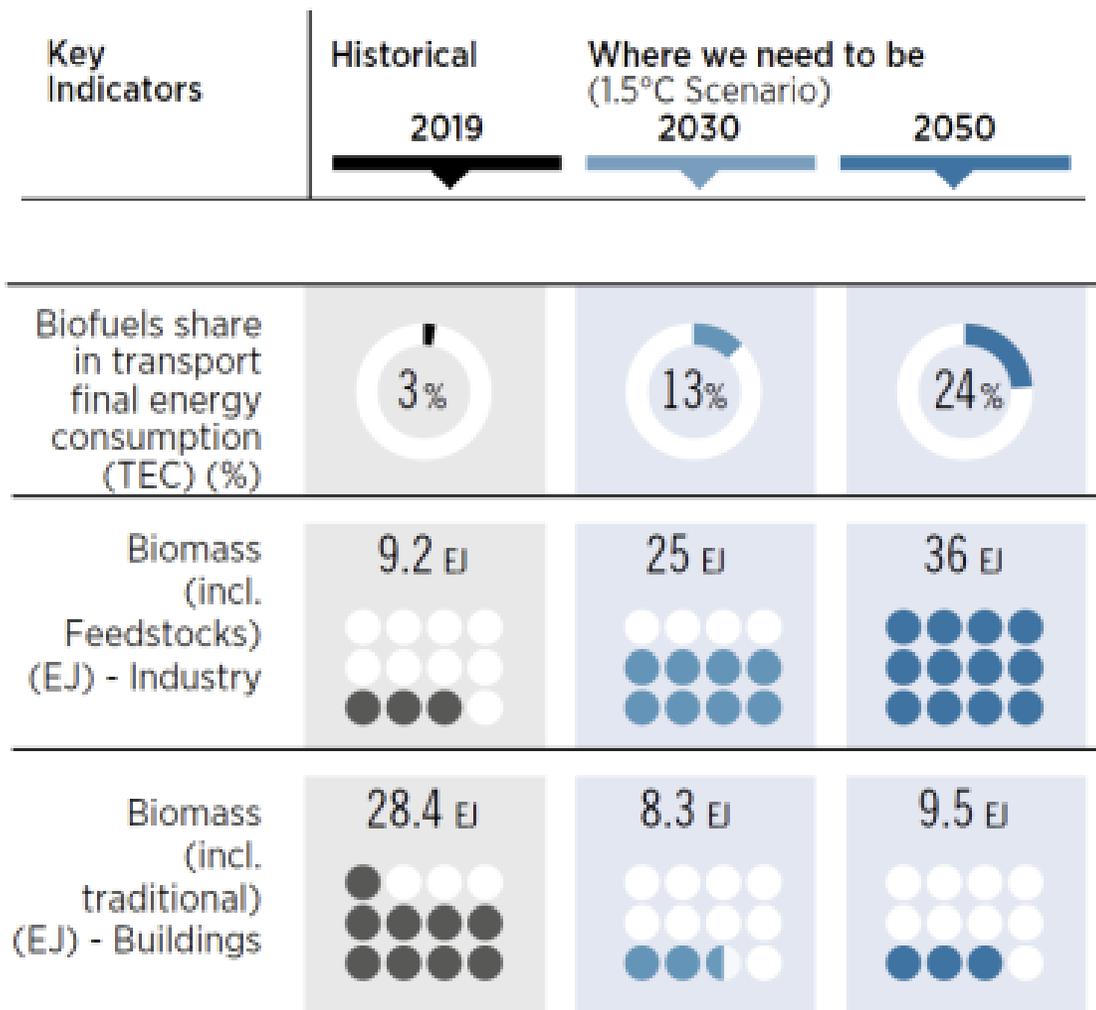


## Asia

10.9 USD trillion



# Direct renewables use also needs a major increase

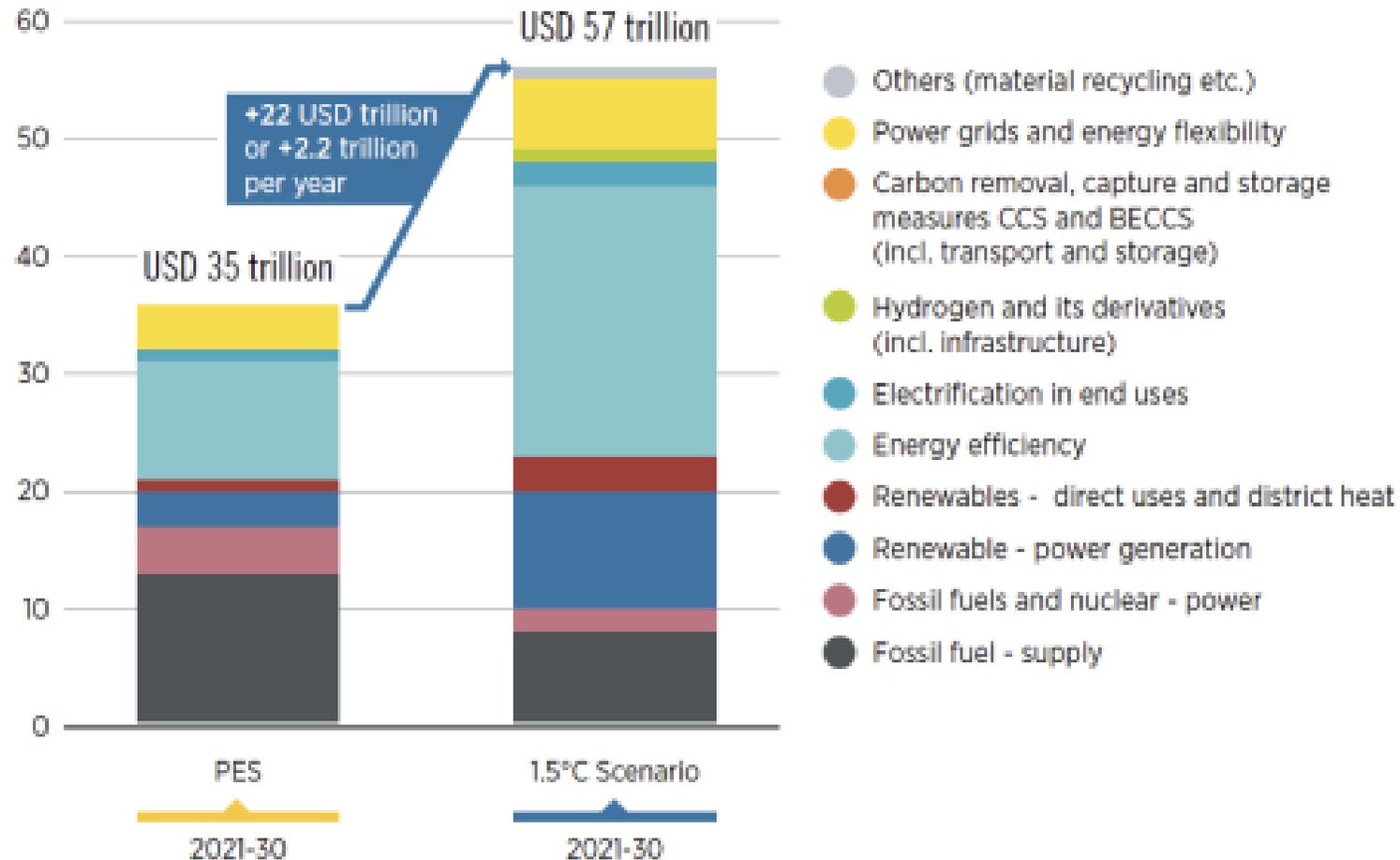




# A major increase in energy sector investment is needed

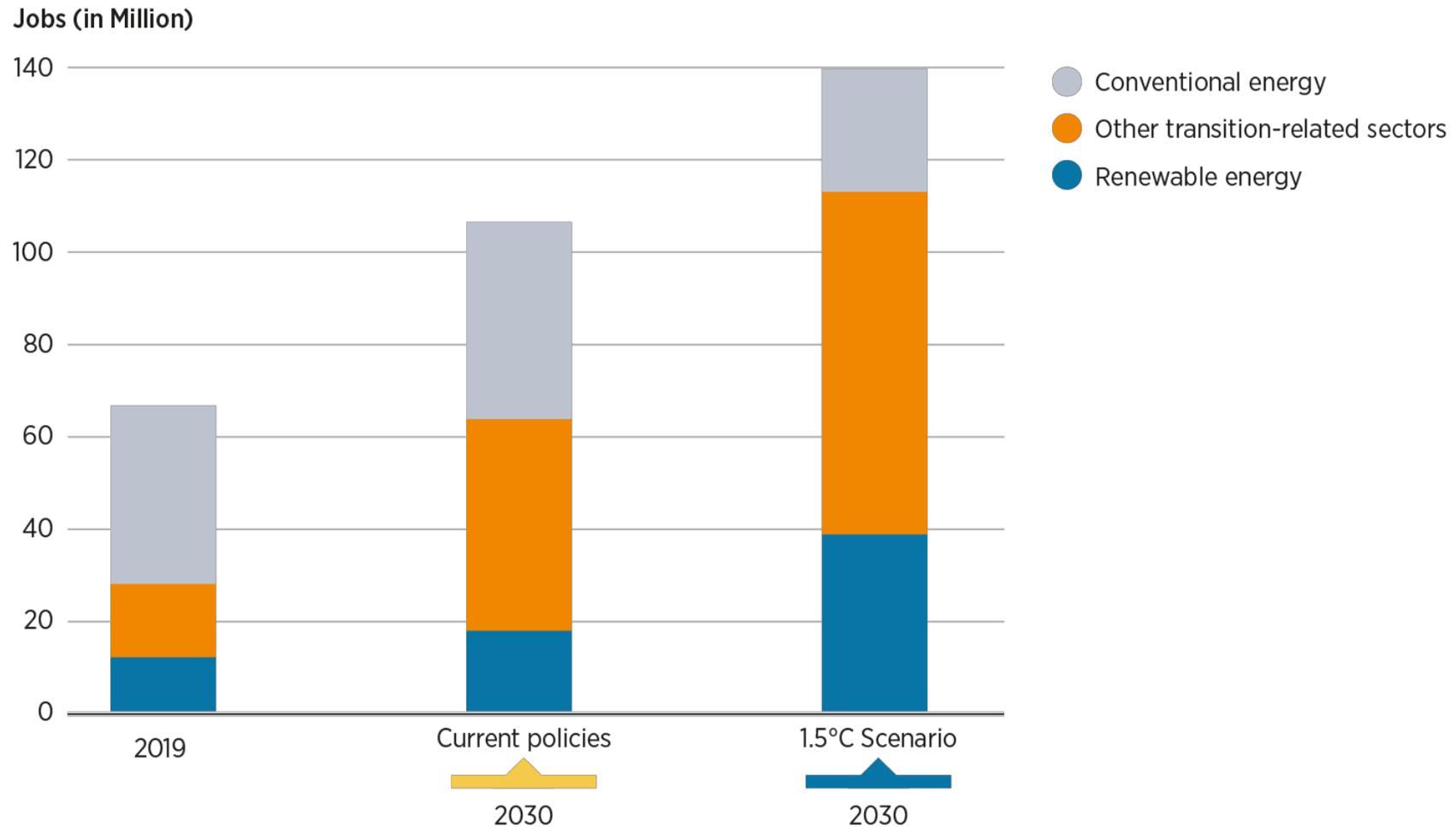
**FIGURE 2.8** Total investment by technological avenue: PES and 1.5°C Scenario, 2021-2030

Cumulative energy sector investments, 2021-30 (USD trillion)

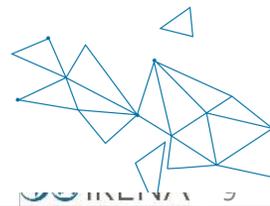




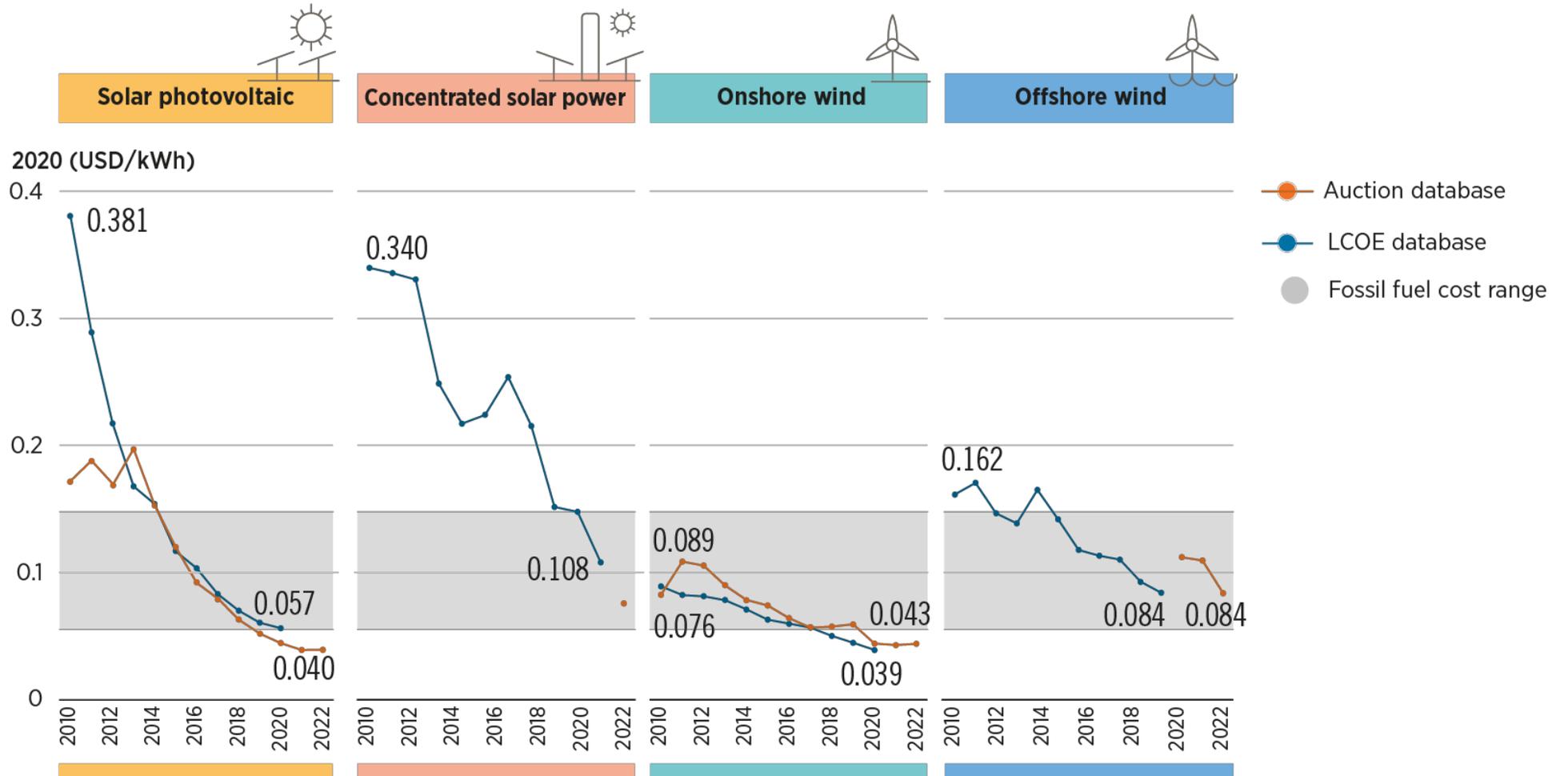
# The energy transition can bring major socio-economic benefits



An additional 85 million energy-transition related jobs could be created by 2030, as well as other benefits if the right policies are implemented to ensure a just and inclusive energy transition.



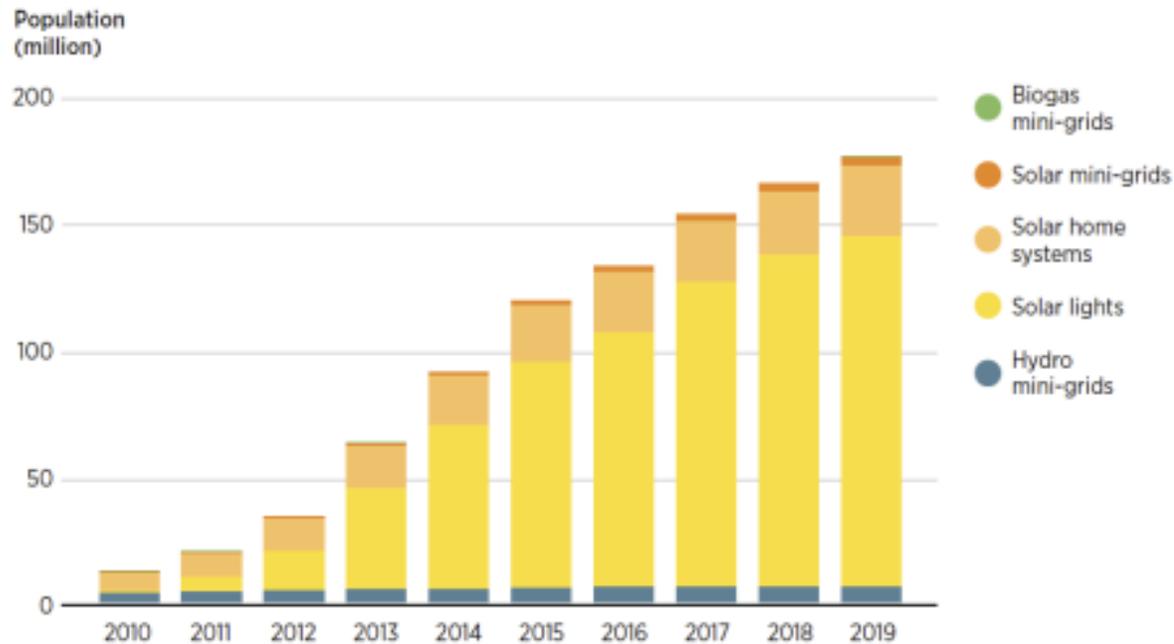
# Renewables-based electricity is already the cheapest power option in most regions



The global weighted average levelised cost of electricity from utility-scale solar photovoltaic (PV) projects fell by 85% between 2010 and 2020, concentrating solar power (CSP) by 68%; on-shore wind by 56%, and off-shore wind by 48%.

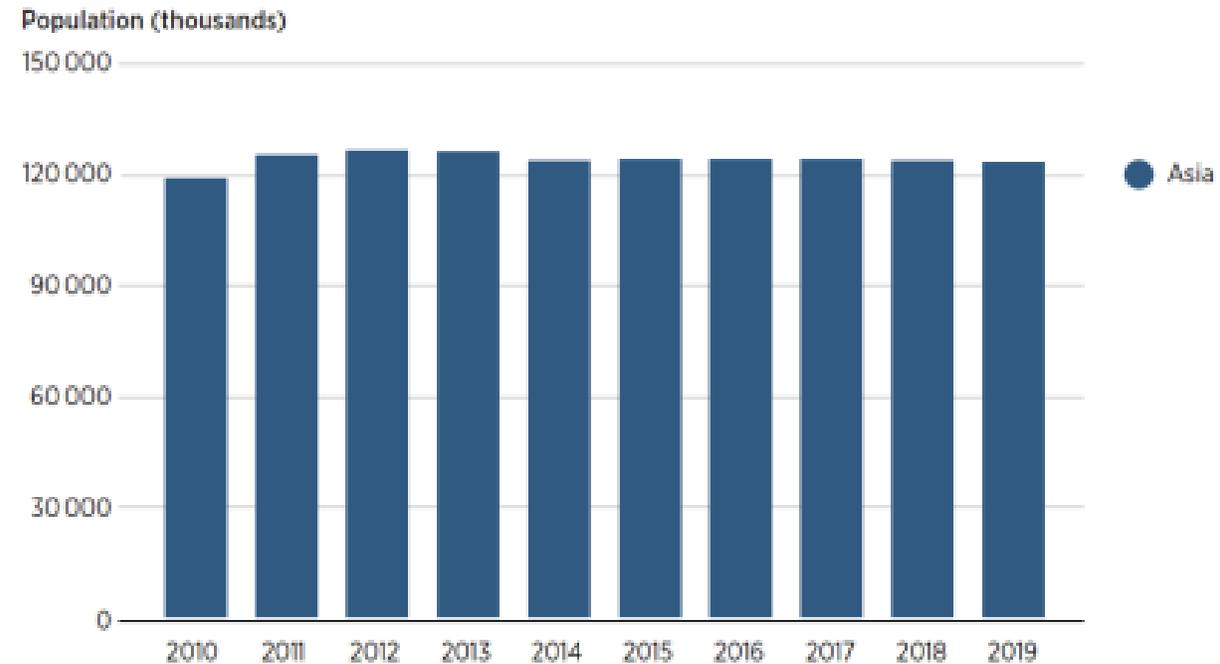
# Renewables can be the cheapest, easiest and quickest option for providing energy access

**FIGURE 4.2** Population served by decentralised renewable energy solutions globally, 2010–2019 (million)

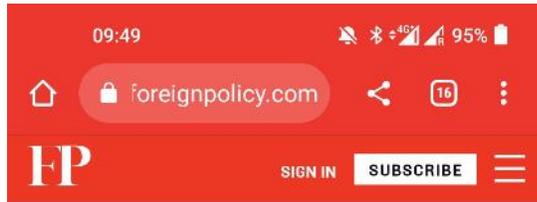


Source: IRENA, 2021d.

**FIGURE 4.4** Number of people using biogas for cooking, by region, 2010–2019



# How 'green' is a renewables-based energy transition?



## ARGUMENT

An expert's point of view on a current event.

# The Limits of Clean Energy

If the world isn't careful, renewable energy could become as destructive as fossil fuels.

By [Jason Hickel](#)

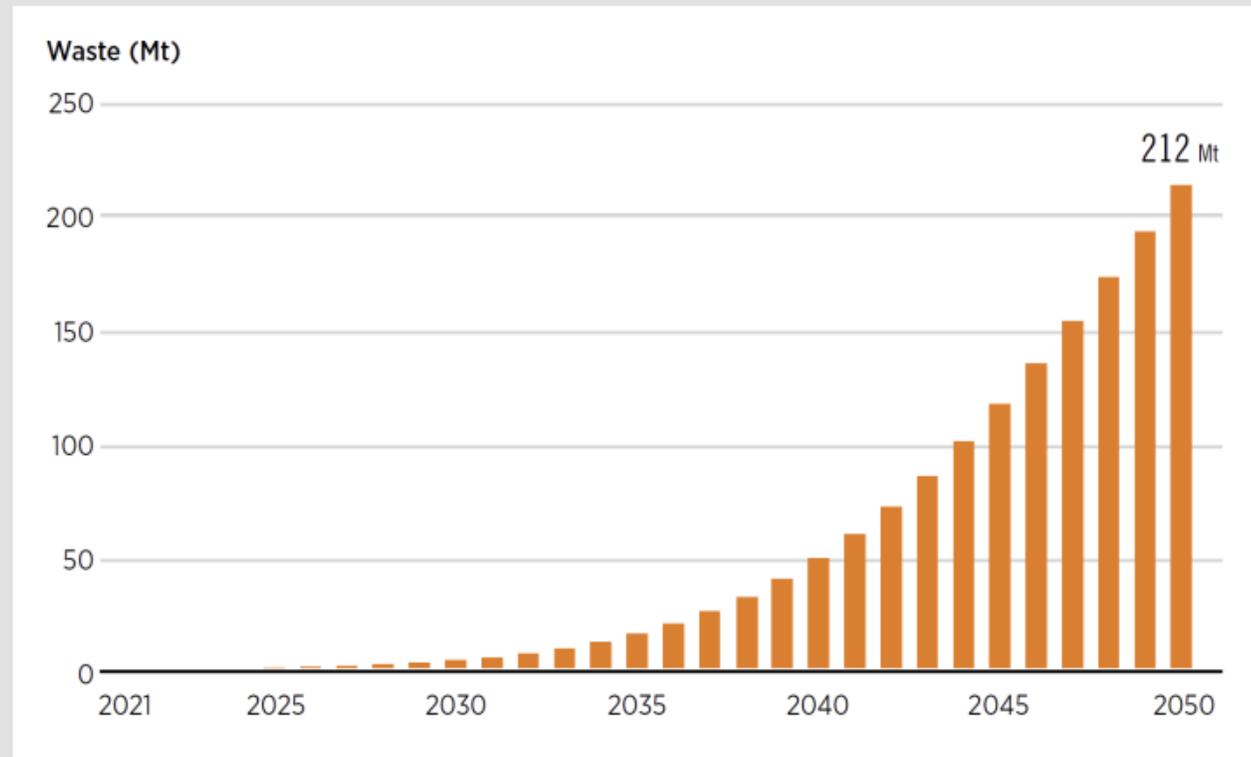


Strong winds blow sand at a wind farm in the Coachella Valley on May 6, 2019 in Palm Springs, California. MARIO TAMA/GETTY IMAGES

Youth Climate Activists Are



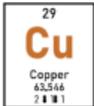
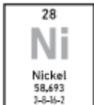
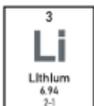
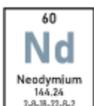
**FIGURE 7.14** Projected cumulative waste from solar photovoltaic projects under IRENA's 1.5°C Scenario through 2050



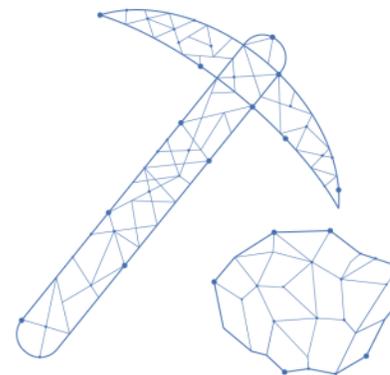
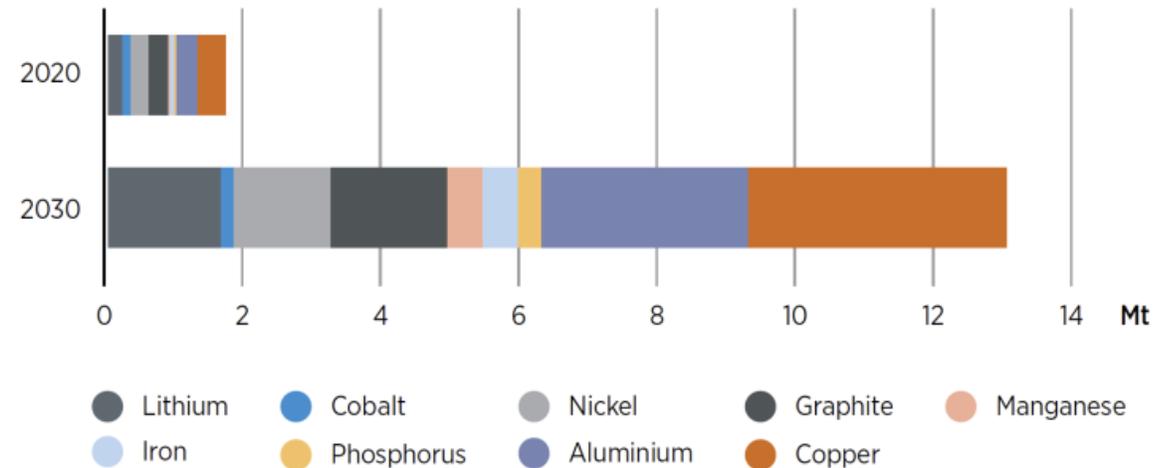
Source: IRENA (forthcoming-e).

# Huge projected increase in critical materials

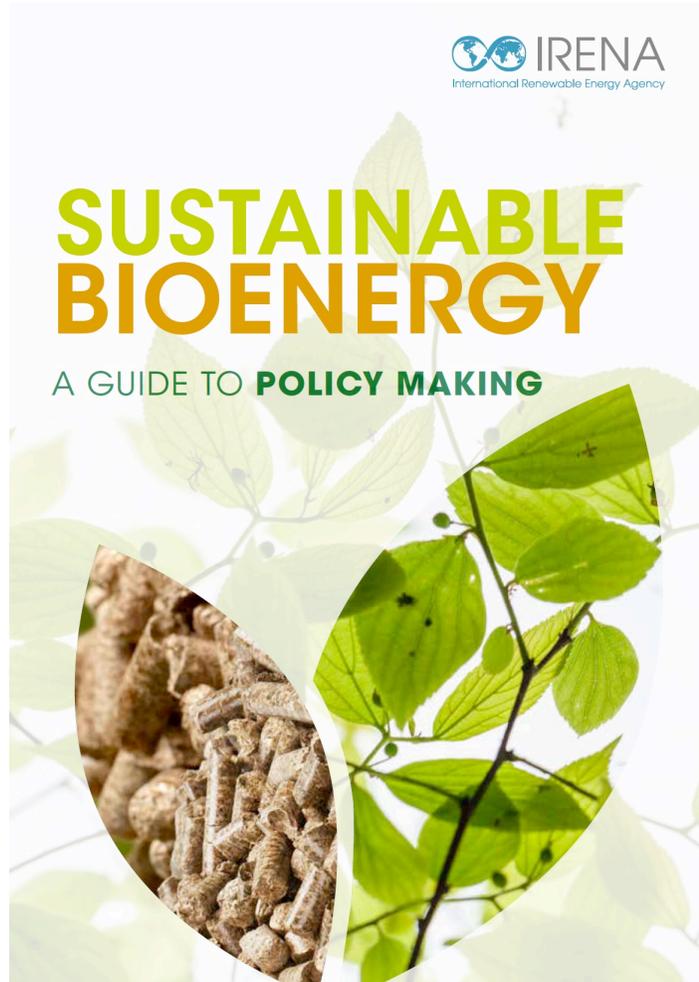
**TABLE 7.1** Actual (2021) and projected (2050) demand for copper, nickel, lithium and neodymium under IRENA's 1.5°C Scenario

Material	Demand in 2021 (Mt/year)	Demand in 2050 (Mt/year)	Source
 Copper	 30 Mt/yr	 50-70 Mt/yr	Elshkaki <i>et al.</i> (2016); ICGS (2021); INSG (2021)
 Nickel	 2.77 Mt/yr	 5-8 Mt/yr	Elshkaki <i>et al.</i> (2017)
 Lithium	 0.3 Mt/yr	 2-4 Mt/yr	Moore and Bullard (2021)
 Neodymium	 0.03 Mt/yr	 0.2-0.5 Mt/yr	Barrera (2021); Joint Research Cent (2020, 2021); Deetman <i>et al.</i> (2021)

**FIGURE 7.8** Actual (2020) and projected (2030) demand for battery materials



Environmental and structural challenges related to mining activities must be addressed



## IRENA work streams addressing environmental impacts:

- Bioenergy
- End-of-life of solar PV and batteries/circular economy
- Clean cooking
- Adaptation & the role of renewables



At COP 26, IRENA became a founding member of the Coalition Linking Energy And Nature for action (CLEANaction) - a partnership to protect nature during the energy transition

“Nature is our most abundant source of energy. To meet the goals of the Paris Agreement by 2050, around two thirds of our energy will come from technologies that harness the renewable power of the sun, the wind, the earth, and the water. The pursuit of a net zero global economy is fundamentally the quest for a future that harmonizes the needs of people and planet.” - **Francesco La Camera, Director-General of IRENA.**

**Thank you**

