Economic Impact of Energy transition

1. Renewable energy and jobs

Overview

Jobs are of great importance in any economy. Employment opportunities are a key consideration in planning for a low-carbon economy. Many governments have prioritised renewable energy development, firstly to reduce emissions and meet international climate goals, but also in pursuit of broader socio-economic benefits. As the energy transition accelerates, job gains and losses can be expected as economic structures evolve. Jobs represent a tangible benefit that gives people a stake in this transformation, and therefore promises to raise its political acceptance.

Renewable energy employment worldwide has continued to grow since IRENA initiated its annual review; the first edition of the Review estimated 7.3 million jobs in 2012. The eleventh edition of IRENA's series, *Renewable energy and jobs: Annual review 2024* produced in collaboration with the International Labour Organization (ILO), estimates at least 16.2 million jobs in renewable energy employment globally.

Annual reviews of employment in renewables

IRENA's 2011 policy brief, *Renewable Energy Jobs: Status, Prospects & Policies*, laid the groundwork for the agency's work on employment. Building on additional standalone explorations of the topic (*Renewable Energy Jobs and Access*, published in 2012, and *Renewable Energy and Jobs*, in 2013), IRENA launched this annual series to provide regular and detailed assessments of renewable energy employment worldwide.

The 2024 edition is the eleventh of the series, and the fourth produced in collaboration with the International Labour Organization.

Each edition in this report series discusses the latest employment trends by renewable energy technology and by country, and includes highlights of important topics such as gender, workforce diversity, decentralised solutions, and others. The series also touches upon how employment generation rides on countries' abilities to build and strengthen domestic supply chains, and some have successfully leveraged local capabilities to that end.

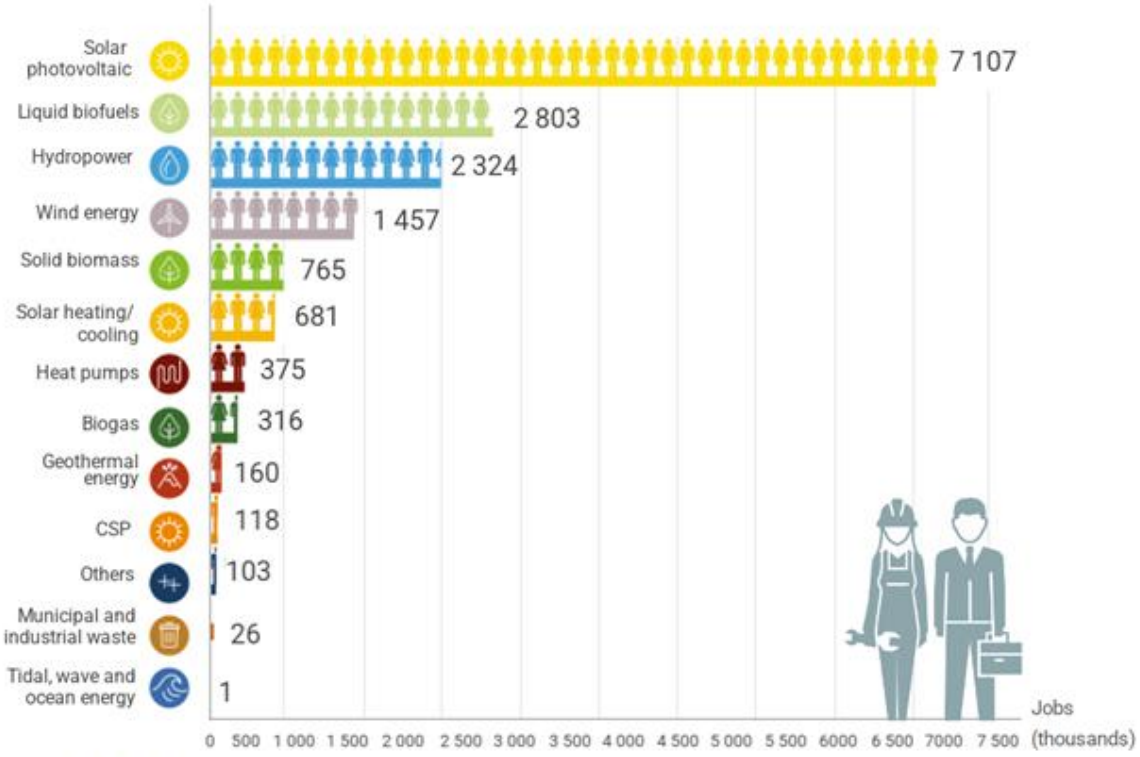


Fig 1.1 **Global renewable energy employment, by technology, 2023**

Key global findings:

- **16.2 million:** global renewable energy jobs in 2023, up from 13.7 million in 2022. China alone has 7.4 million jobs, or 45% of the global total. The European Union (EU) has 1.8 million jobs, Brazil 1.6 million, and the United States and India each slightly more than 1 million

- **7.1 million:** solar photovoltaic (PV) jobs in 2023, representing 44% of the world's total renewable energy workforce. China dominates with 4.6 million jobs, while the EU is a distant second with 720 000 jobs

- **2.3 million:** direct jobs in hydropower in 2023, down 4% from 2022, reflecting a slower pace in new additions

- **2.8 million:** biofuels jobs in 2023. The bulk is in the agricultural supply chain, including seasonal and part-time work. Brazil has the largest number of jobs, 994 000, followed by Indonesia, at 646 700

- **1.5 million:** wind power jobs in 2023. China leads with 745 000 jobs, while second-ranked Europe – still a technology leader – has some 316 300 jobs

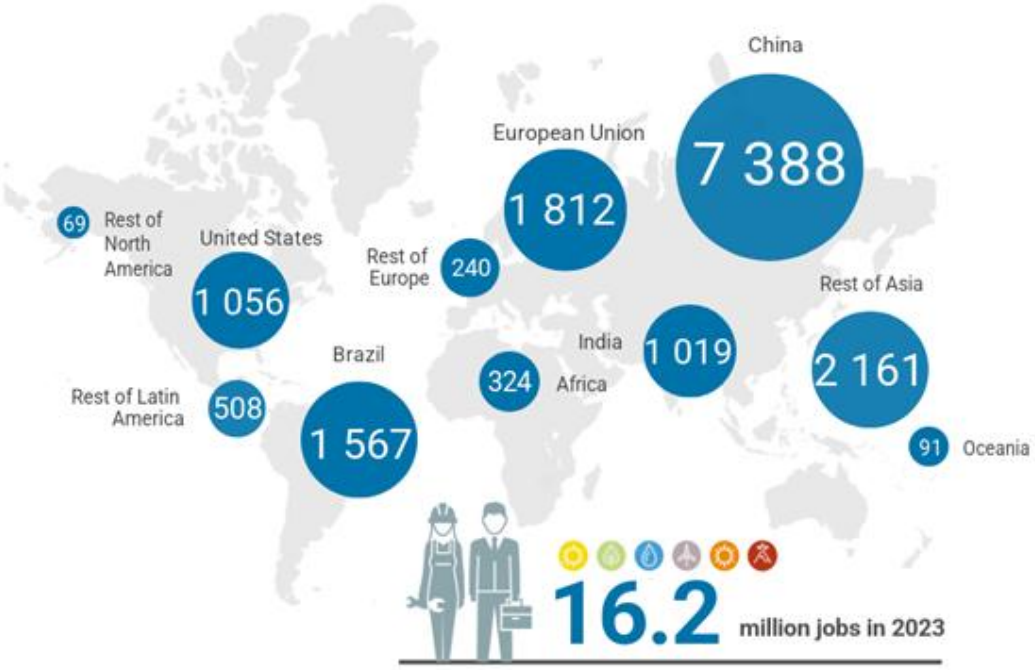


Fig 1.2 Renewable energy employment in countries and regions (thousand jobs)

Key messages to notice:

• **The dominant role of China.** China holds a widening lead in the deployment of renewables and dominates equipment manufacturing. Other countries, such as the United States, India, Brazil and members of the EU, are important installers, and they seek to build or rebuild domestic supply chains to support greater domestic value creation.
• **Skills.** A skilled workforce is essential for a successful energy transition and of particular significance for young people. Education and training do more than make individuals more employable. Skills development and lifelong learning are strategic imperatives for meeting climate objectives and ensuring a just transition.
• **Diversity.** Women could play a pivotal role in the scale-up renewables, especially off-grid technologies. The expansion of these technologies – for example, solar PV systems, which support entrepreneurship, especially in underserved and remote areas – can help women find employment and earn an income. Beyond gender, very little information is available for most countries on indicators of workforce diversity.
• **A people- and planet-centred energy transition.** The global transition to clean energy is shaped by a multitude of public policies and private sector activities that, together with civil society actions, must seek to balance environmental, economic and social sustainability. While markets can be helpful in driving technological change, the global common good is not their primary motivation; indeed, there are trade-offs between the pursuit of profits and the objective of a just and inclusive energy transition that provides widely shared benefits.

Conclusion

Achieving the energy transition in a manner consistent with climate stability requires much faster renewables deployment, in turn creating more jobs. But it also demands **broader, systemic change** – moving beyond the pursuit of endless economic growth incompatible with planetary limits. These changes can only be brought about through the adoption of a comprehensive and holistic policy framework. It must be guided by an understanding that the energy sector is essential to all human activity across the economy, but also that the economy must serve human well-being, and that all societies depend on the integrity of the planet's ecosystems.

2. The Importance of Disseminating Renewable Energy Applications in the Arab Region (Case Study)

Energy resources have been among the most important drivers of economic, political, and social development since their discovery. Most sectors are in dire need of them to manage their affairs and operations. Because energy demand has increased recently due to increased population density and rising industrialization rates, it has become necessary to transition to a more sustainable energy resource that ensures unlimited energy availability and mitigates the problems caused by environmental degradation. Therefore, renewable energy sources are considered among the most important solutions and alternatives in the current era, given their importance to most sectors.

2.1 The Political and Security Impact of the Energy Transition

The political and security importance of the energy transition lies in its efforts to reduce the gap in energy distribution between different regions of the country and achieve energy justice for all. Decentralized energy solutions provide electricity to residents in areas far from the central grid.

A- Security Impact

Many researchers assume that: the wider the gap in energy distribution among the population, the less secure the country becomes. The greater the proportion of poor people unable to access energy resources (expressed by the national energy coverage rate, particularly electricity and gas), the greater the stability within the country.

Based on this assumption, there is no doubt that the multiple benefits of renewable energy can fill critical gaps in electricity and fuel supplies, thereby providing services to fragile communities that lack the infrastructure and resources to meet growing demand. Furthermore, the development of renewable energy sources will achieve a high degree of energy security for the country,

shifting its focus from securing external fossil fuel supplies to managing internal renewable energy supplies. The security importance of the energy transition can be summarized as follows:

- Renewable energy systems are immune to any attack and do not constitute military targets. If such attacks occur, the result will be minimal damage, with the exception of targeting nuclear sites and central fossil fuel centers, which pose a real threat to national security.
- Renewable energy technologies reduce vulnerability to cyberattacks. Off-grid solutions can survive attacks, providing energy during emergencies. Even small grids that are not completely isolated from the main grid can provide backup power in the event of a failure of central power generation facilities.
- The acquisition of renewable energy technology may create political reassessments or may serve as leverage over countries that once played a role in the dependency of these countries, which have become pivotal due to their adoption of renewable energy.

B- Political Implications of the Energy Transition

Renewable energy systems challenge traditional concepts related to energy security, introducing new aspects at various levels related to sustainability, efficiency, independence, and self-sufficiency. Renewable energy applications can provide solutions to energy shortages. The repercussions of a shortage of supplies threaten the stability of the state. Therefore, supporting the idea of working with renewable energy has been a winning card for state institutions to break away from dependence on fossil fuels and reduce the fear of energy shocks. The use of renewable energy creates a balance in the state's ability to adapt and keep pace with current regional and international transformations, and enables the country's active sectors to rise to the level of mutual dependence on the technology of developing and using renewable energy methods and implementing them practically. Energy transition leads to energy independence. When a country takes the first steps toward phasing out its dependence on fossil

fuels, intensifying its efforts to produce sustainable energy domestically, and adopting new policies to promote innovation and scientific research, this will help eliminate foreign imports and the associated pressures related to price fluctuations and the threat of supply chain disruptions. Furthermore, energy transition enhances the country's national security, drives comprehensive economic growth, creates new job opportunities, and alleviates poverty, thus achieving stability at all three levels: political, economic, and social.

2.2. Renewable Energy's Contribution to Achieving the Dimensions of Arab Economic Development

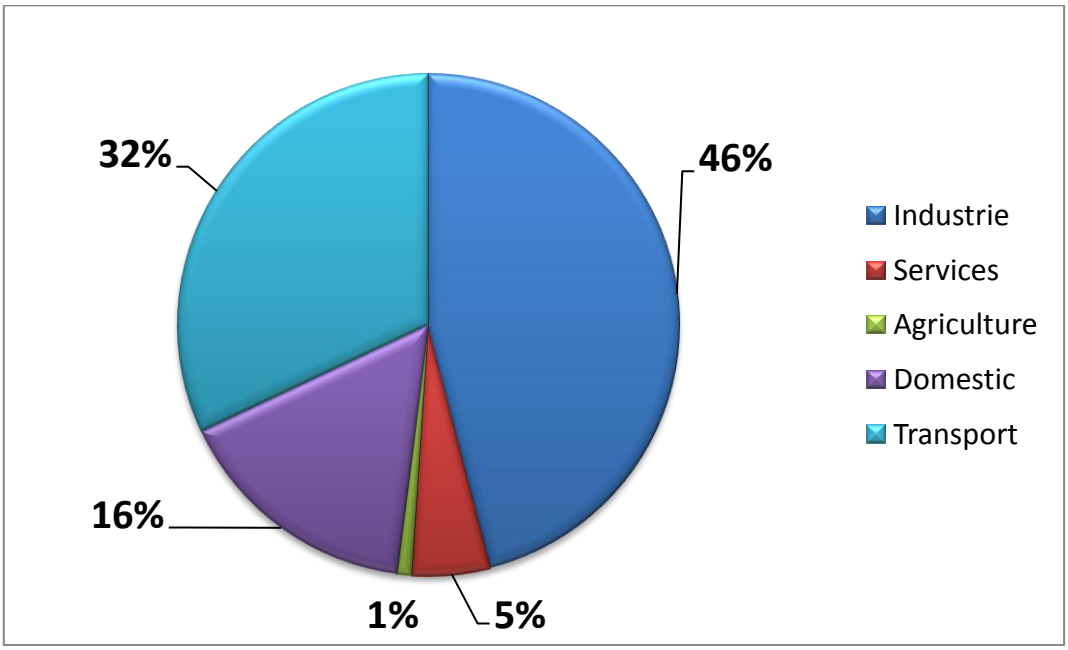
The increasing demand for energy in response to industrialization and urbanization has led to a highly uneven global distribution of primary energy consumption. Per capita energy consumption in industrial market economies is equivalent to three-quarters of the world's primary energy consumption. Economic development depends on the availability of the necessary energy services, whether to raise and improve productivity or to help increase local income. It is not only cities and industrial regions that need energy resources; rural development has also become dependent on renewable energy services, both to raise productivity and to help increase local income by improving the agricultural and farming sectors. Renewable energy sources are of great importance and can be relied upon in many key sectors that consume significant amounts of fossil energy. These sectors include:

a- Industrial Sector

Arab countries are witnessing remarkable growth in the industrial sector, which, in both its extractive and manufacturing components, contributes to the gross domestic product (GDP) and also supports national development plans. Extractive industries include oil, natural gas, and raw materials, while manufacturing industries include iron and steel, chemical and petrochemical

industries, and cement. Most of these industries are energy-intensive, with the industrial sector alone accounting for approximately 36% of total global final energy consumption in 2020. Thus, the industrial sector represents the largest energy-consuming sector in Arab countries, accounting for approximately 46% of total final energy consumption.

Fig. 2.1 : Total Final Energy Consumption in Key Sectors in Arab Countries



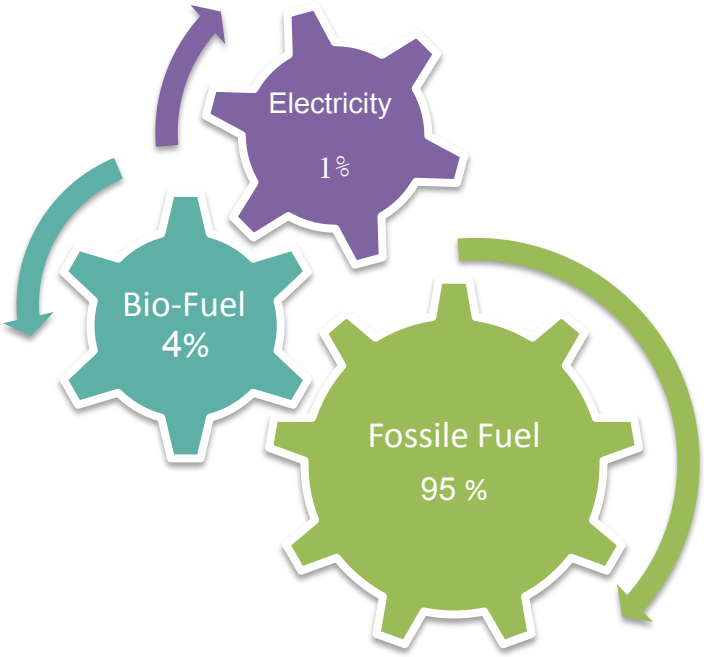
The figure above shows that the industrial sector accounts for the highest percentage of total energy consumption, estimated at 46%, followed by the transportation sector at 32%, and then household and services consumption, estimated at 16% and 15%, respectively. Energy consumption in the agricultural sector reached 1%. This can be explained by the fact that Arab countries are among the regions experiencing growth in local industries, parallel to the high energy consumption in the population sector due to high rates of demographic growth. The high energy consumption in the transportation sector is due to government support for the sector. One of the biggest obstacles facing the world is the penetration of renewable energy into the industrial sector. This sector relies primarily on oil and the materials extracted from it. Even if the industrial sector is electrified, many factories will still need these materials in their

production. Renewable energy currently only meets the world's electricity needs and is far from producing large quantities of biofuel to meet the demand for oil. Therefore, in order to reduce carbon emissions, many factories have turned to relying on renewable energy to generate electricity to run their factories, as an important step towards reducing their dependence on natural gas.

b- The Transport Sector

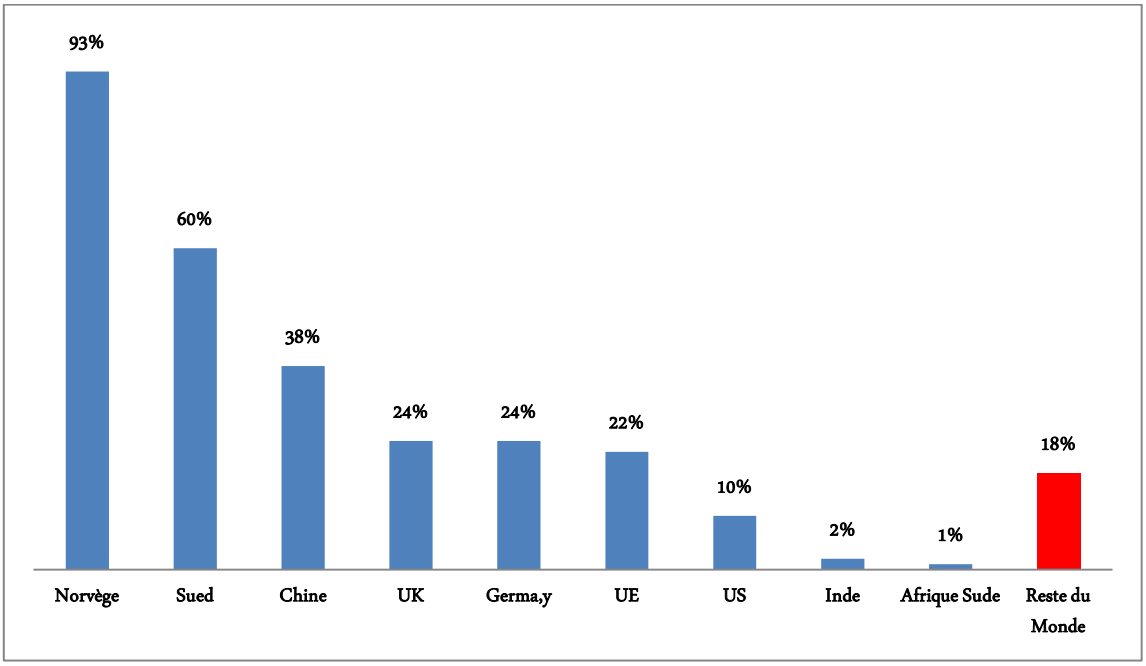
The transport sector is responsible for 30% of carbon dioxide emissions due to its heavy reliance on fossil fuels. International ocean-going shipping is one of the largest sources of emissions, accounting for 70%. This sector is one of the most challenging sectors for the energy transition. The aviation sector also accounts for 2% of total global emissions, a small percentage compared to land transport. Therefore, energy transition policies seek to improve transportation to be more efficient and lower-emission by introducing new types of renewable fuels into the transport sector, such as hydrogen, ammonia, bioethanol, and biodiesel.

Fig. 2.2: Global Energy Consumption in Land Transport



along with the growing global demand for transportation services, demand for biokerosene and biodiesel has increased (reaching 15% in 2021, or about 7 billion liters). The share of renewable energy in the transportation sector has increased to 4.4% in 2021, compared to 3.5% in 2015. One sector experiencing rapid technological advancements in rechargeable batteries is the land transportation sector. According to Energy Finance, 57% of passenger cars will be electric by 2040, relying on lithium-ion batteries. Many companies are also competing to develop hybrid electric vehicles (HEVs) and even hybrid aircraft for short-haul flights, which could radically transform the aviation sector by 2035.

Fig. 2.3: Share of electric vehicles sold in 2021 2023



The figure above shows that developed countries have restructured their transportation sectors in line with global energy transitions. Therefore, we conclude that sustainable transportation is not an aspirational goal for countries, but rather a means to achieve environmental and sustainable development goals.

c- The Building Sector

According to estimates by the International Energy Agency, the building sector has not adequately supported the energy transition. In 2020, buildings (residential, commercial, and public) accounted for approximately 30% of the world's final energy consumption, with electricity generated from natural gas being the primary cause. Energy consumption in buildings is linked to multiple aspects, including cooking, heating/cooling, appliance operation, and lighting. The strategy for transitioning to more modern buildings requires enhancing energy efficiency with efficient household appliances, encouraging the deployment of photovoltaic solar energy applications on rooftops, and installing solar water heaters. As part of the drive to create sustainable cities, 80 countries around the world have implemented building codes. By 2022, approximately 13 countries and 59 cities had imposed restrictions on the use of traditional fuels for heating or cooking in buildings. For example, in 2017, Norway announced a national regulation banning the use of fossil fuels for heating purposes starting in 2020. In the United Kingdom, starting in 2025, low-carbon heating sources will become mandatory in new buildings. This announcement was followed by a ban on the sale of coal used in homes starting May 1, 2023.