Input by the International Renewable Energy Agency (IRENA)
to the 2022 High-level Political Forum on Sustainable Development (HLPF)

"Building back better from the coronavirus disease (COVID-19) while advancing the full implementation of the 2030 Agenda for Sustainable Development".

A. Progress, experience, lessons learned, challenges and impacts of the COVID-19 pandemic on the implementation of SDGs 4, 5, 14, 15 and 17 from the vantage point of your intergovernmental body, bearing in mind the three dimensions of sustainable development and the interlinkages across the SDGs and targets, including policy implications of their synergies and trade-offs.

The COVID-19 pandemic has a devastating impact around the world. Alongside the negative effect on health and well-being, hundreds of millions of people have lost their jobs or seen their livelihoods threatened. Even in the face of the turmoil caused by the pandemic, energy systems based on renewables demonstrated remarkable resilience, showing technical reliability. With falling costs, renewable energy investments have grown steadily over the past 15 years, from USD 70 billion in 2005 to just over USD 300 billion in 2019. In 2020, investments in renewables reached over USD 320 billion.[1]

Several global events in 2021, including the High-Level Dialogue on Energy (HLDE) and COP26 reaffirmed countries' commitments to the energy transition, driven by this trend. The HLDE was the first global gathering on energy under the auspices of the General Assembly since the UN Conference on New and Renewable Sources of Energy held in Nairobi in 1981.[2]

Global Roadmap for Accelerated SDG7, the outcome document of the HLDE, highlights the role of SDG 7 in achieving both the Paris Agreement and the 2030 Sustainable Development Goals, noting that: *"Achieving SDG 7 will catalyse action to combat climate change and attain many other SDGs, including on poverty eradication, gender equality, climate change, food security, health, education, sustainable cities and communities, clean water and sanitation, decent jobs, innovation, transport, and refugees and other situations of displacement."* [3]

In this light, the *World Energy Transitions Outlook 2021* of the International Renewable Energy Agency (IRENA) outlines with its 1.5°C Scenario a pathway for the world to achieve the Paris Agreement goals and halt the pace of climate change by transforming the global energy landscape . IRENA estimates that the global energy transformation would require at least a doubling of annual investments compared to the current levels. USD 24 trillion of planned investments will have to be redirected from fossil fuels to energy transition technologies between now and 2050.

This comes with benefits. By investing in a sustainable future, we can ensure universal access to energy, education services and healthcare facilities while creating stable, productive economic opportunities for millions of people. Under IRENA's 1.5°C Scenario, the renewable energy sector could account for 38 million jobs by 2030 and 43 million by 2050. Investment in the 1.5°C Scenario will yield a cumulative payback of at least USD 61 trillion by 2050. Every

[1] BNEF (2021a), Energy Transition Investment Trends, Bloomberg New Energy Finance, London
[2] https://www.un.org/en/conferences/energy2021/about
[3] https://www.un.org/en/page/global-roadmap

USD 1 spent on the energy transition should yield benefits valued at between USD 2 and USD 5.5 in the form of reduced negative externalities from human health and the environment.

IRENA continues to capture an increasingly comprehensive picture of the socio-economic impacts of the energy transition, demonstrating how steps towards a decarbonised energy future will positively affect economic activity, jobs - outweighing losses in the fossil fuel industries- and welfare, provided a holistic policy framework is in place.

SDG7 and SDG 4: "Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all"

Over 759 million people lived without electricity access in 2019, and 3.5 billion received unreliable supply.[4] Meanwhile access to modern energy services is closely linked to access to essential public services such as health care and education, and improves overall well-being and safety, particularly for women and children.

Energy access is vital for improving **educational delivery in schools.** Lighting enables teaching and learning in the early morning and evenings; electrification allows for the introduction of ICT and digital education into pedagogical methods and curriculum; it also improves student focus by enabling the cooling or heating of the classrooms. Reliable energy access is also linked to improvement in supply of water and sanitation in schools, as well as nutrition where schools also deliver mid-day meals. This importance is reflected in the fact that SDG 4 on Quality Education includes a specific indicator (4.a.1) on the proportion of schools with access to electricity, internet, computers, basic drinking water and handwashing facilities.

Off-grid renewable energy sources are also vital to providing online education in many places.[5] The Covid-19 pandemic has accelerated the transition to digital learning platforms and raised the risk that those without adequate infrastructure access will be left behind. The COVID-9 crisis is already placing utilities and off-grid enterprises in financial duress as the off-grid supply chain is being affected on multiple levels. The cash positions of off-grid companies are extremely tight, with approximately 70% of companies having no more than two months of operating capital available. Shutdowns of ports and flights in many countries will mean that imported batteries, solar panels, inverters, and smart meters will not be as readily available as they had been. Even internally, movement restrictions have slowed servicing of existing customers in rural areas and delivery of projects. Existing energy access programmes and initiatives may also experience delays in implementation because of the pandemic.

SDG7 and SDG 5: "Achieve gender equality and empower all women and girls"

The COVID-19 pandemic has had a significant impact on women all over the world, amplifying or preserving the inequities they confront every day. At home, women have more domestic chores due to the impact of the pandemic. At work, they still represent a small share of the labour force.

With pandemic-related disruptions in economic activity, rural populations in developing countries face an impending income shock. Women are disproportionately affected by economic shutdowns, as they are more likely to be informal workers and entrepreneurs. Vulnerable households whose incomes are strained are less likely to be able to pay for

[4] IEA, IRENA, UNSD, World Bank, WHO. 2021. *Tracking SDG 7: The Energy Progress Report*. World Bank, Washington DC

[5] IRENA (2020), *The post-COVID recovery: An agenda for resilience, development and equality*, International Renewable Energy Agency, Abu Dhabi

electricity or clean cooking services, thus risking expansion of new access and those with access falling back into **energy poverty.**

Recent trends suggest that the world will fall short of the 2030 target for universal access to **clean cooking** by almost 30 percent, reaching only 72 percent of the population. Without urgent action, the environmental, social, and health toll caused by household air pollution is likely to continue, affecting women and children, because they bear a disproportionate share of the burden of gathering fuel and tending polluting stoves.[6]

One of the key elements of a just energy transition is ensuring that the **workforce** includes people from underrepresented and marginalised groups. Population groups of concern in this context are women, minorities, people with disabilities, low-income people, youth and older workers. For many, the challenge is magnified where energy access is lacking. IRENA's surveys have found that women account for **only 32% of the overall renewable energy workforce** and 21% of the wind workforce. When it comes to roles in science, technology, engineering and mathematics (STEM), these figures are even lower: 28% and 14%, respectively. While this demonstrates that women have a much stronger presence in renewable energy than in the energy sector as a whole and in oil and gas, it confirms that they remain underrepresented.[7]

Both IRENA's analyses and the rest of the literature are quite clear about the fact that women face a series of barriers that make them less likely than men to take up a **career in renewable energy**. And when women do join, they confront attitudes, perceptions and structural obstacles that can make it difficult for them to stay in the workforce and to advance in their careers. These barriers are not exclusive or specific to the energy sector, of course; they are found in the economy and society at large. But because women make up such a large share of the talent pool for renewable energy, dedicated measures are needed to ensure equal access to job opportunities and capital for women-led enterprises.

SDG7 and SDG 14: "Conserve and sustainably use the oceans, seas and marine resources for sustainable development"

Oceans contain vast renewable energy potential – theoretically equivalent to more than double the world's current electricity demand.[8] Nascent ocean energy technologies could cut CO_2 emissions from power generation and help to ensure a sustainable, climate-safe energy future. Alongside other offshore renewable energy technologies, ocean energy – including wave, tidal, salinity gradient and ocean thermal energy conversion technologies – forms a crucial component in the world's emerging blue economy.

In addition to decarbonising the power system, offshore renewables have the potential to greatly contribute to the creation of a global blue economy and to the energy transition. This would help countries meet international policy goals. Simultaneously, islands and coastal communities could benefit from climate-safe recovery options amid the COVID-19 pandemic and coastal protection thanks to ocean energy devices.

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[6] IEA, IRENA, UNSD, World Bank, WHO. 2021. *Tracking SDG 7: The Energy Progress Report*. World Bank, Washington DC

[7] IRENA and ILO (2021), Renewable Energy and Jobs – Annual Review 2021, International Renewable Energy Agency, International Labour Organization, Abu Dhabi, Geneva

[8] IRENA (2021), *Offshore renewables: An action agenda for deployment*, International Renewable Energy Agency, Abu Dhabi

Amid the COVID-19 pandemic, **off-shore wind** installation has risen thanks to falling costs. At the end of 2020, the global installed offshore wind capacity was more than 34 GW, up 6 GW from 2019 and an increase of around 11-fold from 2010, when the installed capacity was nearly 3 GW.

By the end of 2020, cumulative global installed **ocean energy capacity** – including tidal and wave energy as well as ocean thermal energy conversion (OTEC) and salinity gradient – was more than 515 MW. More than 98% of this capacity was operational, with 501.5 MW consisting of two large tidal barrage projects. Globally, 31 countries, primarily in the OECD, are pursuing ocean energy projects.

As of the end of August 2020, the cumulative installed **floating solar PV** capacity was around 2.6 GW from 338 active projects in 35 countries globally mainly on freshwater artificial reservoirs. The installed capacity has more than doubled from 1.1 GW in 2018. Due to space constraints on land, Islands could also benefit greatly from this technology. Maldives, Seychelles and Singapore are planning floating solar PV arrays of 5.8 MW, 11 MW and 50 MW, respectively.

Relatively little is known about the **impact of ocean energy technologies on marine life** due to the early stage of technology deployment. Negative impacts could arise in the form of habitat loss, animal-turbine interactions (e.g., collision risk, mainly of marine mammals, fish and birds), noise and electromagnetic fields produced by sea cables, which may have effects on aquatic species.

International shipping enables 80-90% of global trade and comprises about 70% of global shipping energy emissions.[9] If the international shipping sector were a country, it would be the sixth or seventh-largest CO2 emitter, comparable to Germany. Yet, international shipping emissions fall outside national GHG emission accounting frameworks. Urgent action is necessary to accelerate the pace of the global energy transition and the decarbonisation of the global economy. Green hydrogen-based fuels set to be the backbone for the shipping sector's decarbonisation.

The COVID-19 pandemic has heated up the race for leadership in **green hydrogen**, as many countries recognise the importance of hydrogen for addressing the twin challenges of climate change and economic recovery from COVID-19.[10] By early August 2021, governments had allocated at least USD 65 billion in targeted support for clean hydrogen over the next decade, with France, Germany and Japan making the most significant commitments. As of November 2021, global announcements of hydrogen projects by 2030 add up to USD 160 billion of investment, with half of the investments being planned for green hydrogen production using renewable energy sources and electrolysis.

Water stress is a challenge for green hydrogen production. Hydrogen requires significant amounts of (pure) water as a feedstock. As the effects of climate change continue to exacerbate water stress, a growing number of countries may need to consider whether hydrogen production is suitable in the longer term. Investors have set their eyes on the locations with the best solar PV and wind resources to develop green hydrogen projects. The catch is that sunnier locations also tend to be the driest. More than 70% of planned electrolyser

[9] IRENA (2021), *A pathway to decarbonise the shipping sector by 2050,* International Renewable Energy Agency, Abu Dhabi
[10] IRENA (2022), *Geopolitics of the Energy Transformation: The Hydrogen Factor*, International Renewable Energy Agency, Abu Dhabi

projects will be in water-stressed regions, such as Australia, Chile, Oman, Saudi Arabia and Spain. As a result, over 85% of the planned green hydrogen projects may need to source water via **desalination.**

Depending on how it is developed, hydrogen could positively or negatively affect sustainable development outcomes. For example, from a technical perspective, water required for hydrogen use is generally not perceived as a barrier to its deployment. However, climate change is multiplying water risks in locations currently seen as promising hydrogen production sites. A greater understanding of the multidimensional nature of global threats and vulnerabilities will make it possible to foresee and defuse certain risks that may come with the deployment of hydrogen on a major scale.[11]

SDG5 and SDG 15: "Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss"

Sustainable energy can stimulate land restoration and conservation efforts and improve the economic sustainability of projects undertaken. For example, renewables can electrify rural health centers, provide solutions in the agri-food sector and alleviate poverty through integrated rural community development projects. In regions like Africa and particularly the Sahel, additional bioenergy production through land restoration activities can generate further benefits by lightening the burden of energy insecurity while also generating employment and income, thereby reducing poverty.

About 30% of the world's energy is consumed within **agri-food systems**. Energy is also responsible for a third of agri-food systems' emissions of greenhouse gases. Both systems must be transformed to meet current and future demand for food and energy in a fair, environmentally sustainable, and inclusive manner. A joint approach to the energy transition and to the transformation of agri-food systems is crucial to meet the SDGs and the Paris Agreement.[12]

Hydrogen is used to produce all the world's industrial ammonia. Ammonia is the main ingredient in **synthetic fertilisers**, which account for a significant part of the world's crop yields. These hydrogen-based fertilisers now support approximately half the global population. Without hydrogen, agricultural productivity would plummet, jeopardising food security for billions of people.[13]

To produce synthetic fertiliser, hydrogen is generally sourced from natural gas and coal, without carbon capture and storage. The expected boom in **clean hydrogen** could thus contribute to the decarbonisation of the global food supply chain. To the extent that it increases the supply of hydrogen on the market, it could also bolster global food security. These effects could be especially relevant for Sub-Saharan Africa, where fertiliser consumption was less than 20 kilogrammes per hectare (kg/ha) in 2018 – two to three times less than required to meet the needs of the agricultural sector. Inadequate use of fertiliser results in the depletion of soil nutrients, low agricultural productivity and less arable land per capita.

[11] IRENA (2022), *Geopolitics of the Energy Transformation: The Hydrogen Factor*, International Renewable Energy Agency, Abu Dhabi
[12] IRENA and FAO. 2021. *Renewable energy for agri-food systems – Towards the Sustainable Development Goals and the Paris agreement*. Abu Dhabi and Rome
[13] IRENA (2022), *Geopolitics of the Energy Transformation: The Hydrogen Factor*, International Renewable Energy Agency, Abu Dhabi

Biogas-based solutions have long been deployed to expand access to clean cooking, to improve the management of agricultural waste (including waste from livestock), and to produce fertiliser.[14] In Africa, where a large share of smallholders keep livestock, between 5% and 20% are potentially business-oriented, with incentives to significantly expand and upgrade their livestock production. Although the technical potential for household biogas digestors across the continent is about 40 million, existing installations are still less than 150 000, even as biogas production increased by 28% between 2015 and 2020.

There are some **limitations on deploying large-scale renewables-based installations**, in certain areas, such as areas with high population densities or competing activities or functions (e.g. agriculture or protected areas).[15] However, the most significant impact on land will come from the vast wind and solar PV farms that need to be built to supply the required amounts of renewable electricity and green hydrogen. The risk of competing land uses can be reduced if renewable installations are developed in unpopulated desert regions and offshore blocks.

SDG7 and SDG 17: "Strengthen the means of implementation and revitalize the global partnership for sustainable development"

As an intergovernmental agency, collaboration is at the heart of IRENA's approach to the energy transition.

The **12th Session of the IRENA Assembly** took place in Abu Dhabi in January 2022 with the theme *"Energy Transition: From Commitments to Action"*.[16] The IRENA Assembly brought together Heads of State/Government, Ministers and energy decision-makers among its Membership and States-in-Accession, as well as multilateral organisations, global stakeholders, youth leaders and private actors to reassess long-standing assumptions, perceived barriers and default decisions, and discuss the energy transition as an investment in our collective future.

The 2022 edition of the **IRENA Youth Forum** was held under the overarching theme "Youth-led solutions to accelerate the energy transition and achieve climate objectives".[17] The Forum, led by youth from around the globe, highlighted the role of young people in identifying and developing solutions that can promote and accelerate the renewables-based energy transitions to achieve climate targets and other sustainable development goals. It also offered the opportunity to young people to interact and connect with global thought leaders, government representatives, and IRENA experts in identifying the essential areas that require support for youth to contribute to the advancement of a global energy transition.

The IRENA-led **Global Council on Enabling Youth Action for SDG 7** brings together young leaders, expert practitioners and government representatives to develop and implement concrete initiatives that will drive forward youth-led action on energy access and the transition to a renewable energy future.[18]

IRENA is launching a new Global Platform on Education and Training for the Energy Transition to promote international cooperation for meeting skill and knowledge needs. Platform partners,

[14] IRENA and FAO. 2021. *Renewable energy for agri-food systems – Towards the Sustainable Development Goals and the Paris agreement*. Abu Dhabi and Rome
[15] *Geopolitics of the Energy Transformation: The Hydrogen Factor*, International Renewable Energy Agency, Abu Dhabi.
[16] https://irena.org/events/2022/Jan/Twelfth-Session-of-the-IRENA-Assembly
[17] https://www.irena.org/events/2022/Jan/2022-Youth-Forum
[18] https://www.irena.org/newsroom/articles/2022/Feb/Global-Council-on-SDG7-Sets-Youth-focused-Agenda

including UNESCO, will collaborate to develop curricula, educate the educators, and facilitate an exchange of best practices in renewable energy education.

Cooperation with the UN system and their initiatives

- Since April 2019, IRENA has concluded numerous cooperation agreements with a range of UN agencies and entities which are now being implemented (including UNDP, UNFCCC, UN DESA, UN OHRLLS, UNCCD, UNICEF, UNIDO, ESCWA, ESCAP, UN HABITAT, UNECE, FAO, UNDOS, UNICEF).
- IRENA is actively involved in the follow up of the initiatives of the UN **Climate Action Summit (CAS).** The **SIDS Lighthouses Initiative** is a central pillar and implementing framework of the SIDS Climate Package and its Energy Transition Deliverable launched at CAS. IRENA is the coordinator and facilitator of the initiative.
- IRENA is an active member of the **multi-stakeholder Technical Advisory Group on SDG 7**, which was convened by UN DESA to facilitate stocktaking of progress to-date and to seek advice on the technical preparation of the review of SDG 7 and its interlinkages with other SDGs at HLPF.
- IRENA is further a member of the UN-Energy.
- Together with UNEP and UN ESCAP, IRENA co-lead the Energy Transition Theme of the **HLDE in 2021**, as well as provided technical inputs to all other Themes.[19]
- IRENA has submitted more than 10 Energy Compacts to the HLDE, in conjunction with partners or independently. In close cooperation with many partners, IRENA's energy compacts cover a broad range of energy topics and cross-cutting issues - from advancing green hydrogen as a part of the innovation efforts, the food-energy-nexus and project facilitation to mobilising capital for energy projects.

Support to multi-stakeholder platforms

- **IRENA's Coalition for Action** forms a key international network, gathering renewable energy industry associations, private sector companies, civil society and research organisation, to discuss industry trends, determine actions, share knowledge and exchange best practices with the vision to drive the global energy transition in line with SDG 7.[20]
- In 2021, IRENA and the UAE launched the **Energy Transition Accelerator Financing (ETAF) Platform**, a new global climate finance facility to accelerate the transition to renewable energy in developing countries.[21] The UAE committed USD 400 million in funding provided by the Abu Dhabi Fund for Development (ADFD) toward the platform's goal of securing a minimum of USD 1 billion in total funding. In total to date, ADFD has worked with numerous clean energy partners and governments in 65 countries to support the development of 90 renewable energy projects that have the capacity to generate more than 9,000 megawatts of electricity. With the new ETAF contribution, ADFD's total financing for renewable energy projects now stands at USD 1.8 billion.

[19] https://www.un.org/en/conferences/energy2021/about
[20] https://coalition.irena.org/
[21] IRENA press release, 03 November 2021

- Further IRENA Collaborative Frameworks include *Hydropower, Green Hydrogen, Ocean Energy and Offshore Renewables, Enhancing the Dialogue on High Shares of Renewables in Energy Systems, Geopolitics of Energy Transformation and Just and Inclusive Energy Transitions.*

Cooperation with Additional International and Intergovernmental Organizations

- IRENA signed numerous MoUs with international and intergovernmental organizations: Alliance for Rural Electrification, ASEAN, USAID, GIZ, Climate Investment Funds (CIF), Asian Infrastructure Investment Bank, European Space Agency, ILO, IEA among others.

B. Assessment of the situation regarding the principle of "leaving no one behind" against the background of the COVID-19 pandemic and for the implementation of the 2030 Agenda, within the respective areas addressed by your intergovernmental body

IRENA, together with four other international organizations – the International Energy Agency (IEA), the United Nations Statistical Department (UNSD), the World Bank (WB) and the World Health Organisation (WHO), annually tracks the progress in meeting SDG 7 along its different indicators and targets. According to the *2021 Tracking SDG 7: Energy Progress Report*, although the world continues to advance toward SDG 7, its efforts fall well short of the scale required to reach the goal by 2030 (see more below).[22] The COVID-19 pandemic is certain to affect the energy transition and progress toward SDG 7 and its full impact on energy access, energy efficiency, renewable energy deployment, and the full energy transition remains to be seen.

SDG 7.1 Universal access. Recent progress in access to electricity is mixed, as is the outlook for 2030. While the share of people with access grew up to 90 percent in 2019, 759 million people still lack it, compared to 1.2 billion in 2010. Half live in fragile and conflict-affected settings and 84 percent in rural areas**. During the same period,** the global population without access to clean cooking solutions decreased from **3 billion in 2010 to 2.6 billion in 2019**. Under current and planned policies before the start of the COVID-19 crisis, it is estimated that about **2.4 billion people will remain without access in 2030**.

SDG 7.2 Renewable energy. SDG target 7.2 is defined as a substantial increase in the share of renewable energy in the global energy mix. Renewable energy has seen unprecedented growth over the past decade, particularly for the generation of electricity. During the COVID-19 pandemic, renewables have proven more resilient than other parts of the energy sector, and their short-term outlook shows resilience in all regions, helped along by supportive policies and falling technology costs. Despite progress, however, the share of renewables in total final energy consumption (TFEC) is still only 17 percent, not much higher than the year before—because TFEC has grown at the same rate as renewables. The fact is that deployment levels of renewables are still quite far from those needed to meet SDG 7 and to achieve a meaningful decarbonization of the energy sector.

SDG 7.3 Energy efficiency. The rate of global primary energy intensity improvement—defined as the percentage decrease in the ratio of global total primary energy supply per unit of gross domestic product—has slowed in recent years. The SDG 7.3 target is to increase the global rate of improvement in energy efficiency by 2030 to 2.6 percent annually (doubling the

[22] IEA, IRENA, UNSD, World Bank, WHO. 2021. *Tracking SDG 7: The Energy Progress Report*. World Bank, Washington DC.

average of 1.3 percent achieved annually between 1990 and 2010). The rate of improvement in global primary energy intensity improved by 1.1 percent in 2018 compared to 2017. This was the lowest annual rate of improvement since 2010. While early estimates for 2019 indicated an upward trend, with an improvement rate of 2 percent, the outlook for 2020 suggests lower levels (0.8 percent) as a result of the COVID-19 pandemic and its disruptions. Nonetheless, the 3 percent target remains well within reach, provided sufficient and systematic investments are made in cost-effective energy efficiency improvements.

SDG 7.a.1 International public finance. The SDG 7.a.1 indicator measures international public financial flows to developing countries in support of renewable energy. Findings suggest that, although commitments dropped from an all-time high of USD 21.9 billion in 2017 to USD 14.0 billion in 2018, international public financial flows saw a threefold increase over the period 2010–18, viewed as a five-year moving average. While notable across all technologies, the significant decline in 2018 was primarily attributable to a 61 percent drop in hydropower commitments, following a peak in 2017 owing to a large single-project commitment. In the period 2010–18, hydropower received the largest share of commitments, while more recent years have seen flows increasingly redirected toward solar energy, which received 20–25 percent of total commitments in 2016–18. Lately, a larger share of commitments has also been targeted toward other (or multiple) renewables including non-technology-specific support to multipurpose green funds and infrastructure such as grids and storage.

Annual financial commitments to off-grid renewables supporting energy access in emerging and developing countries reached USD 460 million in 2019, up from just USD 6 million in 2008. Investments remained very low until 2014 and have since grown at remarkable rates. Yet off-grid renewables still represent only 1% of the overall finance for projects to expand energy access in access-deficit countries.

C. Actions and policy recommendations in areas requiring urgent attention in relation to the implementation of the SDGs under review

SDG 4: "Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all"

Facilitate deployment of off-grid renewable energy. Facilitating the **deployment of off-grid renewable energy solutions**, such as mini-grids and stand-alone systems, to improve modern energy access requires dedicated policies and regulations.[23]

In the specific case of stand-alone systems, policies can strongly influence the accessibility and sustainability of such solutions for rural communities. Fiscal incentives, such as import duty and value-added tax exemptions, are often introduced to incentivise market development; these directly improve the affordability of stand-alone systems. Other supportive measures include levelling the playing field, introducing quality standards and establishing dedicated consumer/enterprise financing channels as part of a broader programme.

Scaling up renewable energy mini-grids requires dedicated regulations to address key areas such as licensing and permitting requirements, tariff-setting frameworks and the implications of the arrival of the main grid. Moving beyond addressing deployment and investment risks, policies also need to address aspects related to capacity building and linkages between the

[23] IRENA (2021), *World Energy Transitions Outlook: 1.5°C Pathway*, International Renewable Energy Agency, Abu Dhabi

sector and productive end uses. All of these have a strong bearing on the scalability of off-grid solutions and the socioeconomic outcomes of deployment policies.

Support education for energy transition. Early exposure to renewable energy-related topics and careers is vital for sparking young people's interests in pursuing a career in the sector, but also to increase social acceptance by a knowledgeable citizenry.[24] The curriculums at higher education and vocational training institutions need to reflect the skills and competences needed under the energy transition. Certifications and national standards can play an important role in ensuring quality and performance. Professional and supplementary education and training are also important for upskilling the current workforce, ensuring that workers' skills evolve along with the demands of the sector. Targeted skill building is also needed in the energy access context. In addition to strengthening the content of education and training programmes, it is also important to enhance the instructional methods used. For example, experiential learning methods by which students are encouraged to develop problem-solving strategies can help to prepare learners for jobs in the constantly evolving renewable energy sector where independent knowledge seeking will often be necessary.

Public-private partnerships can also play a crucial role in improving overall training quality while meeting sectoral labour requirements, promoting national skill standards and providing workplace training. In addition to training content, public-private partnerships can also play a role in the financing of training provisions through a shift from fees being the primary vehicle to a more integrated approach that incorporates multiple funding mechanisms including payroll-based training levies, tax incentives, scholarships and donations, vouchers and student loans.

SDG 5: "Achieve gender equality and empower all women and girls"

Employ women in the renewable energy transition. Realising the potential of the energy transition requires making use of all the available talent pool as well as equitably distributing benefits. As such, **targeted measures are required to train, recruit and retain women** and offer opportunities for career advancement. Early exposure to renewable energy careers, targeted scholarships and funded training opportunities, mentorships and apprenticeship schemes can all play a role in building the talent pipeline. In the workplace, many women would benefit from policies that allow for work-life balance as well as equal opportunities for professional development.

Support clean cooking. Clean cooking fuels and technologies must be made a top political priority with targeted policies.[25] To achieve the universal target, a multisectoral and a coordinated effort is needed. All household energy needs, including cooking energy and electricity access, should be integrated into a national energy plan. Given the status of access to clean cooking, it is not possible to overstate the urgency for action, especially in Sub-Saharan Africa, where access is particularly low, and the absolute number of people relying on polluting cooking fuels and stoves continues to rise.

SDG 14: "Conserve and sustainably use the oceans, seas and marine resources for sustainable development"

[24] IRENA (2021), *World Energy Transitions Outlook: 1.5°C Pathway*, International Renewable Energy Agency, Abu Dhabi

[25] IEA, IRENA, UNSD, World Bank, WHO. 2021. *Tracking SDG 7: The Energy Progress Report*. World Bank, Washington DC.

Deploy offshore renewables. While key lessons can be learned from other offshore activities, such as conventional oil and gas as well as offshore wind operation, this is yet to be studied in-depth for ocean energy technologies, whose impacts are location specific:[26]

- Exchange experience with environmental impact assessments (EIA) across organisations within the same country and internationally, including the determination of cumulative environmental effects
- Encourage data collection by public institutions, researchers and private companies alike.
- Establish joint environmental research programmes targeting offshore renewables between governments and industry.

Support development of green hydrogen. Key pillars of green hydrogen policy making include:[27]

- **National hydrogen strategy**. Each country needs to define its level of ambition for hydrogen, outline the amount of support required, and provide a reference on hydrogen development for private investment and finance.
- **Setting policy priorities**. Green hydrogen can support a wide range of end-uses. Policy makers should identify and focus on applications that provide the highest value.
- **Guarantees of origin**. Carbon emissions should be reflected over the whole lifecycle of hydrogen. Origin schemes need to include clear labels for hydrogen and hydrogen products to increase consumer awareness and facilitate claims of incentives.
- **Governance system and enabling policies**. As green hydrogen becomes mainstream, policies should cover its integration into the broader energy system. Civil society and industry must be involved to maximise the benefits.

SDG 15: "Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss"

Scaling up renewable energy use in agri-food systems to jointly advance energy and food security will require concerted action by decision makers in government, the private sector, international organisations, financing institutions, academia and nongovernmental organisations.[28] This includes:

- Collect better data to guide renewable energy investments in food systems
- Leverage mapping tools to assess opportunities and inform policy making
- Improve access to finance for end-users and enterprises
- Develop integrated approaches to transforming the food and energy systems
- Mainstream cross-sector perspectives into national sector strategies
- Strengthen innovation for technology and energy-efficient appliances
- Focus on raising awareness and building capacity
- Place inclusivity at the heart of transforming the food and energy systems engaging equally women and youth

[26] IRENA (2021), *Offshore renewables: An action agenda for deployment*, International Renewable Energy Agency, Abu Dhabi.
[27] IRENA (2020), Green Hydrogen: A guide to policy making, International Renewable Energy Agency, Abu Dhabi
[28] IRENA and FAO. 2021. Renewable energy for agri-food systems – Towards the Sustainable Development Goals and the Paris agreement. Abu Dhabi and Rome

SDG 17: "Strengthen the means of implementation and revitalize the global partnership for sustainable development"

Establishing new partnerships which support interlinkages between different SDGs. With 167 Members, IRENA plays a leading role in the energy transformation as a centre of excellence for knowledge and innovation, a global voice for renewables, a network hub and a source of advice and support for countries. IRENA's partnerships go beyond the energy field. Recently signed MoUs support the interlinkages with other SDGs (e.g. FAO, ILO, UNICEF, UNDOS). In light of its work on socioeconomics and a just transition, the Agency will continue to build these partnerships.

D. Policy recommendations, commitments and cooperation measures for promoting a sustainable, resilient and inclusive recovery from the pandemic while advancing the full implementation of the 2030 Agenda

The goals set out in the 2030 Agenda and the Paris Agreement can guide countries to develop an adequate response to the COVID-19 pandemic. A holistic policy approach rooted in a climate-safe energy development, yet also focused on short-term imperatives would reap multiple benefits and help set the stage for a just transition.[29]

Overview of policies to support energy transition solutions [30]

- **Deploy renewable energy in end uses.** These policies include regulatory measures that create a market, as well as fiscal and financial incentives to make them more affordable and increase their cost competitiveness compared to fossil-fuel-based solutions.
- **Deploy renewable energy in the power sector.** The choice of instrument and its design should consider the nature of the solution (e.g., utility scale, distributed, off-grid), the sector's level of development, the power system's organisational structure and broader policy objectives.
- **Increase energy conservation and efficiency in heating and cooling.** Energy efficiency policies such as strict building codes, support for building retrofits and appliance standards are critical for the energy transition in buildings and industrial processes.
- **Increase energy conservation in transport.** Decarbonising the transport sector, among other measures, requires a shift from energy-intensive modes to low-carbon modes.
- **Electrify heating and cooling/ Electrify transport.** Targets for renewable power should consider the rising demand from the electrification of end uses, in line with long-term decarbonisation objectives. Moreover, policies and power system design are needed to support electrification in achieving its potential for providing system flexibility.
- **Support the development of green hydrogen.** An enabling policy framework should consider four key pillars: a national green hydrogen strategy, priority setting, guarantees of origin and enabling policies.
- **Ensure the sustainable use of bioenergy.** Renewable energy is not exempt from sustainability concerns. Some of these concerns include greenhouse gas emissions related to land-use change, and impacts on air and water quality and biodiversity.

Structural change and just transition policies

[29] IRENA (2020), *The post-COVID recovery: An agenda for resilience, development and equality*, International Renewable Energy Agency, Abu Dhabi

[30] IRENA (2021), *World Energy Transitions Outlook: 1.5°C Pathway*, International Renewable Energy Agency, Abu Dhabi

- **Address potential misalignments in labour markets.** Ensuring a just and fair transition will require measures to overcome temporal, geographic and skills-related imbalances.
- **Develop local value chains.** Enhancing and leveraging domestic capabilities requires carefully crafted incentives and rules, business incubation initiatives, supplier-development programmes, support for small and medium enterprises and promotion of key industrial clusters.
- **Provide education and build capacity.** Early exposure to renewable energy-related topics and careers is vital for sparking young people's interests in pursuing a career in the sector, while also increasing social acceptance by a knowledgeable citizenry.
- **Support a circular economy.** Policies and measures are needed to ensure the sustainability of energy transition-related solutions and their smooth integration in existing ecosystems in terms of sustainability, circular economy principles and reduced environmental impacts.
- **Support community and citizen engagement.** Community energy can play an important role in accelerating renewables deployment while generating local socio-economic benefits and increasing public support for local energy transitions.

E. Key messages for inclusion into the Ministerial Declaration of the 2022 HLPF.

Access and transition to affordable, reliable, sustainable and modern energy are a prerequisite to achieve the 2030 Agenda and the Paris Agreement is small. In order to facilitate the transition we need to:

- Promote investments in access and transition to renewable energy which leaves no one behind
- Strengthen the interlinkages between SDG7 and other SDGs
- Pursue the development path that is most likely to drive down energy emissions in the coming decade and put the world on a 1.5°C trajectory
- Support emerging technologies, such as marine energy, most likely to become competitive in the short-term and most effective in achieving emissions reductions in the long-term
- Limit investments in oil and gas to fast-track the energy transition
- Reserve carbon capture and storage technologies for economies heavily dependent on oil and gas and as a transitional solution where no other options exist
- Phase out coal and fossil fuel subsidies
- Adapt market structures for the new energy systems era
- Invest in a set of policies to promote resilience, inclusion, and equity and protect workers and communities affected by the energy transition
- Ensure all countries, including LDCs, LLDCs, SIDS and African countries, have an opportunity to participate in and realise the benefits of the global energy transition, including mobilization of the adequate finance to LDCs, LLDCs, SIDS and African countries to support both the access and transition to affordable, reliable, sustainable and modern energy making it inclusive and just.