



HIGH-LEVEL DIALOGUE ON
ENERGY
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THEME REPORT ON
**ENABLING
SDGs THROUGH
INCLUSIVE,
JUST ENERGY
TRANSITIONS**

**TOWARDS THE ACHIEVEMENT OF
SDG 7 AND NET-ZERO EMISSIONS**

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PREFACE

Energy can create transformational opportunities. For the 759 million people in the world who lack access to electricity, the introduction of clean energy solutions can bring vital services such as improved healthcare, better education and affordable broadband, creating new jobs, livelihoods and sustainable economic value to reduce poverty. In regions such as sub-Saharan Africa where half of secondary schools and a quarter of health facilities have no power, clean energy access will help save lives, and offer opportunities for prosperity at a transformative scale.

An energy revolution based on renewables and energy efficiency is urgently needed not just to accelerate economic progress and development, but also to slash emissions that are rapidly warming our planet. The energy sector today, dominated by fossil fuels, accounts for 73 per cent of human-caused greenhouse gas emissions. Global CO₂e emissions must be halved by 2030 to avoid an increasing frequency and severity of dangerous and unprecedented weather extremes, including heatwaves, devastating floods and droughts, risks to food and water security, population displacement, and loss of lives and livelihoods.

As governments start to define a pathway out of the COVID-19 crisis, we must now ensure that all countries have the chance to be part of an energy transition that seizes the opportunity to significantly improve the wellbeing of people, and planet.

This will not be an easy task. To ensure a just transition, we must support countries and communities to adapt to a green economy through social protection and new skills, ensuring all who need to be are equipped to take advantage of the 30 million new green jobs expected by 2030.

To generate the vital momentum needed for this transition, the UN Secretary-General is convening the High-Level Dialogue on Energy in September 2021, the first such meeting in 40 years. The landmark event will offer a global stage for countries to attract new investments and forge new impact focused partnerships to drive forward this energy revolution.

As a foundation for informed deliberations, five Technical Working Groups were established on the five key themes of the High-level Dialogue: (1) Energy Access, (2) Energy Transitions, (3) Enabling SDGs through Inclusive, Just Energy Transitions, (4) Innovation, Technology and Data, and (5) Finance and Investment. These Technical Working Groups brought together leading experts on these subjects from across the world to identify key recommendations for a global roadmap towards the achievement of SDG7 and the climate objectives of the Paris Agreement.

This proposed roadmap illuminates a way forward for how the world can achieve a sustainable energy future that leaves no one behind. We hope that it will help to inspire the actions needed to get there.



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FOREWORD

It is our honour to present the Theme Report on Enabling SDGs through Inclusive, Just Energy Transitions, prepared by the related multi-stakeholder Technical Working Group, under the leadership of the Co-lead organizations: the UN Department of Economic and Social Affairs (UN DESA), the UN Economic and Social Commission for Western Asia (UN ESCWA) and the World Health Organization (WHO), in the framework of the High-level Dialogue on Energy

Pursuing a just and inclusive energy transition offers an important opportunity to catalyse structural transformations in energy and relevant sectors, increase positive synergies and reduce trade-offs with respect to the SDGs while meeting the 1.5°C objective set forth by the Paris Agreement.

About 760 million people globally have no access to electricity, and a third of all people living on our planet cook using polluting means, leading to millions of premature deaths each year, perpetuating poverty and gender inequity, while contributing further to the climate crisis we face today. If we continue our current pathway, we are unlikely to succeed in achieving SDG 7 and consequently many others.

We need to change our energy pathway drastically and implement sustainable energy transition strategies that focus on social equity and inclusiveness. We need to enable the SDGs through systematic and ambitious changes to current policies and institutional hurdles. We need to ensure that our planet's resources, its lands, its waters, and its biodiversity remain in place for future generations, and we also need to couple the pursuit of sustainable development through energy transition to structural measures that increase the representation of the most vulnerable and currently underrepresented groups, including women, children and future generations, people with disabilities, indigenous peoples and other minorities and local communities.

This report presents a synthesis of the deep interlinkages between energy transitions and the 'future we want'. The recommendations promote cross-sectoral synergies, and collective action for using the energy transition as a vehicle for achieving the other SDGs, how best to implement an energy transition that is just and inclusive, and can serve as a critical enabler for achieving the SDGs, the Paris Agreement and a pathway towards net-zero emissions.

We are grateful for the active engagement of the members of the technical working Group and the Global Champions' support in this process. This collaborative work, involving a broad range of stakeholders, demonstrated the opportunities and synergies we can build between energy and other sectors to ensure inclusiveness and a just energy transition.



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1 PRIORITY RECOMMENDATIONS

An inclusive and just energy transition can catalyse transformational co-benefits for the achievement of the Sustainable Development Goals (SDGs). Energy is inextricably linked to virtually all the SDGs, and at the same time progress made towards achieving advancement of the other SDGs can also contribute to achieving SDG 7. Transforming the world's energy systems will create new jobs, advance gender equality, and empower people, communities, and societies. Based on the concept of 'leaving no one behind', a just and inclusive energy transition will enhance human well-being, health, and capabilities, increase resilience, and drive innovation towards a sustainable society at all levels, while also driving huge investments. Although the transition pathways will vary based on the individual needs of countries and regions, all pathways must be just and inclusive in order to accelerate collective actions to deliver on the SDGs and the Paris Agreement and to ensure the 'future we want'.

RECOMMENDATION 1

Every country and region should integrate achievement of the SDGs as a guiding framework into the planning and implementation of their own transition pathways towards clean and sustainable energy. Sustainable energy transitions, involving the electricity, heating/cooling, and transport sectors, can dramatically accelerate the development and the achievement of the SDGs, but only if they are designed to be fully just and inclusive. An integrated, participatory, and inclusive approach should be mainstreamed into policy and programmatic decision-making for energy and climate, including ambitious Nationally Determined Contributions (NDCs) and longer-term strategies under the Paris Agreement. This will ensure that the benefits of the clean energy transition are shared, that no one is left behind, and that the protection of people, the achievement of prosperity, and the preservation of the planet remain at the core of the energy transitions.

RECOMMENDATION 2

Implement a sustainable energy transition strategy with social equity and inclusiveness at its centre to enable the SDGs. Energy transitions will have a disproportionate influence on the achievement of the SDGs, with greater progress potentially being made on some targets than on others, unless specific measures are otherwise implemented. Policymakers can and should explicitly prioritize the needs of the vulnerable through the energy transition pathways by:

- i. Empowering people by ensuring gender equality in its multiple dimensions; enhancing win–win outcomes for health and education, putting the needs of children, youth, local communities and other vulnerable populations first, including safeguarding and protecting the rights of indigenous peoples and addressing the essential energy needs of displaced people and affected communities.
- ii. Protecting the planet by ensuring a pathway to net-zero emissions and the sustainable use of finite resources, such as water, food, and ecological systems; also ensuring biodiversity, high levels of air and water quality and sustainable life on land, below water, and in cities.
- iii. Enhancing prosperity and reducing inequality by empowering populations through modern energy access; creating new jobs and employment opportunities; implementing the framework of a circular economy and promoting diversification within it; increasing the role of the private sector and entrepreneurship development; ensuring sustainability and affordability; and building capacity to reap the full benefits of digitalization while maximizing human potential.

RECOMMENDATION 3:

Integrate access to affordable, reliable, sustainable, and modern energy, including access to electricity and clean cooking, as the central pillar of inclusive, just, energy-transition strategies. Billions of people around the world still lack basic access to electricity and clean cooking, which negatively impacts their health, well-being, livelihoods, and local environment. Ensuring access to clean, modern, and sustainable energy solutions for those currently left behind is the most fundamental element of a just and inclusive energy transition. In such a framework, access to energy needs to be accelerated to the essential services, in particular, to the hundreds of thousands of healthcare facilities that still lack energy access. This will enable basic and life-saving health services for everyone, both in response to the COVID-19 pandemic and beyond. Energy access should be a priority of all energy transition pathways to maximize the co-benefits for the SDGs and the climate goals.

RECOMMENDATION 4

Accelerate the integration of gender equity into energy transition pathways. Gender-transformative approaches should be integrated into all energy transition plans to close gender gaps and empower women by, among other things, ensuring gender parity in the employment, policy-, and decision-making process. Investing in the economic empowerment of women to realize women's rights and gender equality must be a major priority in all energy-transition strategies: this will include enhancing the education of women and their ability to actively and effectively participate in existing markets, gain access to decent work, and enable meaningful participation for them in economic decision-making at all levels.

RECOMMENDATION 5

Enable transformational change by promoting systemic approaches in the energy transition to achieving the SDGs and the climate goals, while ensuring energy security. Pursuing a just and inclusive energy transition offers an important opportunity to catalyse structural transformations

in the energy and relevant sectors—to increase positive synergies and reduce trade-offs across the SDGs, while meeting the 1.5°C objective set out by the Paris Agreement. Harnessing such an opportunity requires integrated approaches tailored to specific country conditions and supported, among others, by:

- i. Long-term vision, integrated planning, and cross-sectoral coordination.
- ii. Participatory and inclusive governance mechanisms.
- iii. Education, training, and capacity-building, promotion of consumer and behavioural change, sharing of knowledge, data, and information, and identification and promotion of skills in the energy and other sectors, particularly in relation to the impacts of energy on a range of SDGs.
- iv. Innovation and technology, supported by adequate research and development policies.
- v. Finance and investment aligned with local needs, including tailored mechanisms to facilitate access (i) to affordable and synergistic finance and support instruments to enhance progress towards achieving multiple SDGs at the same time, and (ii) to increased investment in infrastructure. Additional or specialized support is required for developing countries, in particular, least-developed countries, small island developing states (SIDS), and countries in conflict and/or in the process of disaster reconstruction.

RECOMMENDATION 6

Track progress and integrate an *Energy for SDG Impact Framework* into energy transition strategies. Such a framework should include a set of targets and indicators tailored to specific circumstances and conditions, and help design, implement, and monitor a just, inclusive energy transition as an enabler of the SDGs (see Table 1). The framework should present the disparities faced by different sectors of the population (women, children and youth, indigenous, urban/rural). Data access, collection, analysis (disaggregated by gender, age, ethnicity, disability, etc.) as well as communications will be essential. A crucial role will also be played by transparency, accountability, and good governance.






RECOMMENDATION 7

Strengthen multi-stakeholder partnerships to leverage the transformational potential of energy for enabling the SDGs. Such partnerships should encourage action at the global, regional, national, and local level, and also facilitate coordination among a variety of stakeholders, including governments, financial institutions, businesses, and civil society, as well as impacted and vulnerable communities. The partnerships should facilitate resource mobilization and be designed to support the planning, implementation, and monitoring of just and inclusive energy transitions, guided by the principles of equity, respect, and realization of human rights; they should also be a focus for the voices of the impacted communities and stakeholders (see the Results and Action Matrix). A coalition of partnerships like this will play a valuable role in strengthening knowledge-sharing, facilitating the identification of risks and opportunities for all impacted stakeholders, and targeting advocacy and collective action in the energy and other sectors.

RECOMMENDATION 8

Ensure that the energy transition pathways are sustainably designed and implemented to enhance synergies and reduce trade-offs with other SDGs. In this context, it is essential to design, enforce, and monitor adequate sustainability standards to avoid potential conflicts between energy services and other developmental targets. For example, the expanded use of feedstocks and arable land to produce bioenergy can indeed conflict with food production and affordability.¹ It is thus important to put in place measures to avoid negative impacts on food security and to protect the local resources on which local populations and vulnerable communities depend. Ensuring that appropriate environment and waste management are integrated into the energy transition is also essential; this includes electronic waste related to disposal of power generation and storage systems.

TABLE 1. ENERGY FOR SDG IMPACT FRAMEWORK: EXAMPLES OF POSSIBLE INDICATORS OF AN INCLUSIVE, JUST ENERGY TRANSITION AND ITS IMPACT ON THE SDGs

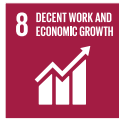
SDG	INDICATORS
 <p>1 NO POVERTY</p>	<ul style="list-style-type: none"> Percentage of low-income households spending more than or equal to 5% of their household expenditure to meet all of their energy demands (by region, gender of head of household, and indigenous populations) Percentage increase in income of marginalized communities due to access to electricity for productive uses (including rural farmers, artisans)
 <p>2 ZERO HUNGER</p>	<ul style="list-style-type: none"> Percentage increase in agricultural productivity due to electricity access in rural and low-income countries (e.g. solar-powered irrigation systems) Percentage of food waste due to electricity access for cold-chain food conservation
 <p>3 GOOD HEALTH AND WELL-BEING</p>	<ul style="list-style-type: none"> Number (or percentage) of health-care facilities with access to reliable and sufficient supply of energy (by energy end-use, e.g., electricity, cooking) Percentage of population with access to clean energy for all basic end-uses in the community (cooking, heating, lighting), disaggregated by type of settings (household, school, health care facility)
 <p>4 QUALITY EDUCATION</p>	<ul style="list-style-type: none"> Percentage of educational institutions (school, university, vocational) with access to a reliable and adequate supply of electricity for all needs (lighting, digital learning, ICTs) (by type of institution, educational level, gender, income, and geographic area). Number (or percentage) of students in energy-oriented educational programmes (formal and non-formal education) (by type and level of institution, gender, and geographic area)
 <p>5 GENDER EQUALITY</p>	<ul style="list-style-type: none"> Share (%) of women employed in the energy value chain for technical jobs related to renewable energy, energy efficiency, and energy access Share (%) of women in senior positions in relevant ministries, national energy agencies, and programmes

SDG

INDICATORS



- Percentage of improved sanitation facilities powered by electricity (by electricity source, gender, geographic location)
- Percentage increase of population with access to quality water services due to increase in access to electricity (by electricity source, geographic location, gender)



- Percentage of fossil fuel-sector employees reskilled for employment in sustainable energy (disaggregated by gender)
- Increase (%) in finance available for women-led energy businesses, disaggregated by geographic area, educational level



- Percentage in increase in productivity from improvements in energy efficiency
- Amount (USD) spent on R&DD programmes for rural/urban infrastructure and agriculture, based on international collaboration



- Percentage of people with disabilities employed by the energy industry in vocational or technical roles
- Increase in funding (%) to support sustainable energy deployment in small island developing states, least-developed countries, and Indigenous people's needs



- Percentage of clean transportation in cities (cars, public transportation) (disaggregated by energy source and technology)
- Percentage reduction in emissions via improvements in energy efficiency and/or increased reliance on renewable energy in buildings



- Percentage reduction in energy intensity by economic sector
- Percentage reduction in water (m³) withdrawn/consumed/discharged by energy source (and cooling technology) at the energy production facility level



- Reduction in GHG emissions from the energy sector
- Reduction in short-lived climate pollutants (black carbon, HFCs, methane, tropospheric ozone) from energy sector (disaggregated by economic sector, geographic location)



- Share of coastal and marine areas used for offshore and onshore oil and gas infrastructure
- Percentage reduction in emissions due to clean energy of shipping sector



- Percentage growth in the share of sustainable wood-forest harvesting for energy use
- Percentage change in arable land for agriculture due to land use for energy production (including for biofuels, ground-mounted solar parks, etc)



- Percentage of displaced people and affected communities with access to sustainable energy (disaggregated by energy end-use, gender, geographic location)
- Number of countries using environmental impact assessment and a participatory process in land use planning related to the production and distribution of energy, involving indigenous populations and other affected communities (disaggregated by geographic location, wealth quintile)

2 RESULTS AND ACTIONS MATRIX

PRIORITY RESULTS	PRIORITY ACTION AREAS	STAKEHOLDER ACTIONS			
		Public	Private	Civil Society	International organizations
<p>Every country and region should integrate the SDGs as a guiding framework for the energy transition and, vice versa, should consider access to sustainable energy as a key element in the achievement of all SDGs.</p>	<ul style="list-style-type: none"> • Mainstream SDGs through policy and planning (such as sustainable energy policies, nationally determined contributions [NDCs] etc). • Place access to energy, including electricity and clean cooking, as a central pillar of an inclusive, just energy transition and of sector strategies. • Target inclusive economic stimulus to low-emission and climate-resilient development pathways in national sustainable energy and development policies to support inclusive transition while mitigating climate change. 	<ul style="list-style-type: none"> • Develop policies and plans such as NDCs, which align with long-term planning of the Paris Agreement and towards net-zero emissions; create jobs and assure inclusion. • Monitor progress and stay accountable to agreements, partnerships, strategies, and plans. • Systematic mapping of areas left without access to electricity and clean cooking fuels and technologies (CFTs) to be a priority in national development policy. • Put in place measures to ensure that the energy transition pathways are implemented without conflicting with other priorities, including use of agricultural land for food production. • Ensure transparency and sharing of data and correct information regarding the energy transition (including on energy potentials, pros and cons of different energy sources and technologies, feasibility, and impact of different energy solutions etc.) 	<ul style="list-style-type: none"> • Increase energy efficiency and gradually phase out fossil fuel use. • Take proactive measures towards clean energy and early retirement of fossil fuel industries and infrastructure. • Create green jobs and promote adequate training, including reskilling of workers. • Integrate SDGs into private-sector activities, for example through the adoption of company-level targets for SDG contributions that are most relevant to own activities. • Engage investors in linking investment returns with the specific sustainability performance of a company. 	<ul style="list-style-type: none"> • Play a part in the shifting economy, by creating or taking new jobs. • Contribute to the circular economy by shifting behavioural patterns, including through recycling. • Contribute to public debate and influence decision-making. 	<ul style="list-style-type: none"> • Build partnership models that integrate energy and other aspects of development, and promote adequate capacity-building and support measures. • Promote policy dialogue and agenda setting.

PRIORITY RESULTS	PRIORITY ACTION AREAS	STAKEHOLDER ACTIONS			
		Public	Private	Civil Society	International organizations
<p>Implement a clean-energy transition strategy with a focus on equity and inclusiveness to help enable the SDGs.</p>	<ul style="list-style-type: none"> Establish specific measures to: <ul style="list-style-type: none"> - create new jobs and employment opportunities, - promote the diversification of the economy to provide diverse employment opportunities, and support training and capacity-building, including reskilling. - ensure affordability of energy services, in particular, for poor and vulnerable people. - build capacity to reap benefits of clean energy and digitalization. Integrate gender- equality transformative approaches, including at the policy and institutional levels. Maximize the impact of energy as enabler of human capital development, including on health and education. Put the needs of local communities and indigenous people first, including safeguarding and protection of indigenous peoples' rights. Ensure sustainability of finite resources such as water, food, and ecological systems while ensuring high ambient-air and water quality. Protect, and address the needs of children, youth, and other vulnerable sectors of population, including those in displacement settings. Ensure energy security and reliability of energy systems, including addressing potential dependence 	<ul style="list-style-type: none"> Prioritize the needs of the vulnerable sectors of the population, including women, children, indigenous people, and people in displacement settings. Promote public consultations involving affected local communities and vulnerable populations. Take advantage of positive synergies to reduce the negative impacts of trade-offs. Pursue carbon pricing or alternatives to offset the potential adverse effects of a rapid energy transition. Support for small and medium-sized enterprises (SMEs,) entrepreneurship, and clean technology innovation at the local level, to enhance local development and job creation, especially for energy and transportation. Redirect subsidies to target energy-efficiency technology, including for industries, support retro-fits ; at the level of energy access, support cleaner energy sources, the cost of the initial connection to a power grid, and off-grid renewable energy equipment for least -income household. Design and implement policies to rationalize energy subsidies in deficit countries in order to target low-income groups more effectively, and by redirecting subsidies to pro-poor applications, such as first-time connection subsidies and price support for improved cook stoves. Put in place and enforce regulation that facilitates grid access, especially for local/community suppliers. Evaluate policies and regulatory frameworks to open up utility sectors to private investment, through supporting community-driven projects as well as a market for distributed energy where this can help close gaps in access. Establish regulatory frameworks for big data, smart grids, and an integrated systems approach; deploy information and communication technology, and design energy markets to promote innovative, sustainable, and flexible business models. 	<ul style="list-style-type: none"> Create decent and green jobs and diversify economically. Support transition of workers to future required skills, including through reskilling and retraining. Expand energy access, possibly through decentralized renewable energy systems. Support public sector through public-private partnership to train the local workforce for next- generation industrial technologies and digitalization of manufacturing: across different industrial sectors, gender and race consideration, for different levels of personnel, continuous and evolving basis. Adopt gender-equity and-empowerment strategies; track progress on implementation and impact on economic activity. Include consultation with local communities as an integral part of company policy before making final investment decisions. Include benefit to local community and highest possible standards of 	<ul style="list-style-type: none"> Spread awareness for sustainability and equitable treatment of vulnerable groups. Promote more sustainable practices in natural resource use, including the circular carbon economy. Mobilize financial support for LDCs, SIDS, and vulnerable populations to improve access to affordable finance. Support local training and capacity building to empower local communities with new access to electricity and CFTs to help translate energy access into localised business growth, with special attention to be paid to women and other vulnerable groups. Strengthen the inclusion and representation of indigenous peoples in consumer-based organisations. Strengthen awareness of the rights of local and indigenous people communities through information, education and (legal) training outreach. Retarget International cooperation projects and development aid to specifically support clean energy development projects and capacity building, in areas such as the responsible use of energy and water in agriculture and 	<ul style="list-style-type: none"> Global support for the use of Environment, Social and Governance (ESG) criteria as a requirement for investment by public funds. Provide data, technical support, and capacity building, including for women and vulnerable sectors of the population. Create and provide the necessary financial resources for energy-access programmes, prioritizing essential services (e.g., health, water and sanitation, education) as well as vulnerable populations (e.g., children) in indigenous local communities as well as in displacement settings. Create capacity-building and green skills development opportunities across industries, helping more to access jobs in new industries. Promote the use of small-scale, decentralized, renewable energy technologies (RETs) including mini-grid and stand-alone systems, for areas that are uneconomic to connect to a central grid. such as remote villages and small islands. Strengthen local, community-owned suppliers, in particular, relating to micro-hydro or rooftop photovoltaic (PV) systems. Strengthen indigenous peoples' representation at the level of

PRIORITY RESULTS	PRIORITY ACTION AREAS	STAKEHOLDER ACTIONS			
		Public	Private	Civil Society	International organizations
	on certain minerals, potential increased vulnerability of electricity systems to cyberattacks and vulnerability to natural disasters and climate risks.	<ul style="list-style-type: none"> Put in place national policies and regulations for gender mainstreaming and empowerment of women in economic sectors. Provide financial capital; provide government loan guarantees for microcredits to rural women, and greater government support for women’s associations and savings groups. Reform land tenure and ownership, ensuring stable and clear tenure rights, not only in regard to women, but to secure many rural livelihoods, and benefit sustainable-energy access in the long run. Phase out fossil-fuel subsidies and redirect energy subsidies to support investment in clean electricity for essential services, including energy access in healthcare facilities. Enshrine the rights of local communities and indigenous peoples to their land, their natural resources, and the protection from contamination of their land by nearby energy-related, industrial, or mining activities in the national policies. Promote and operationalize energy- and water-efficient technologies and processes that improve the efficiency of energy used. Prepare for more technology waste. End-of-life management policies to be part of a broad range of cross-cutting enabling instruments that support the transition to sustainable energy life-cycle policies, including for renewable energy. Tailor activities to specific national conditions and market maturity based on principles of the circular economy. Commit to the principle of science informing policy. Invest in the acquisition of specialized knowledge in interlinked areas such as energy, water, and environmental management. Support adequate training and capacity building, including reskilling of workers who may lose their jobs in the framework of the energy transition. 	shared environmental management as an integral part of companies’ best practices and ethics.	bioenergy, particularly in least-developed countries. <ul style="list-style-type: none"> Participate in inclusive governance schemes and decision-making, as well as monitoring progress. 	international organizations and international negotiations <ul style="list-style-type: none"> Step up capacity for agricultural planning and strategy at government, using a comprehensive planning approach – such as CLEW – that considers climate, land, energy and water in an integrated manner. Anchor responsibility for biodiversity loss and conservation as a central pillar of policy objectives and design, on governments, businesses, and civil society. Promote energy security in the context of the energy transition and address the potential risks related, for example, to potential dependence on selected minerals, the risk of cyber-attacks and natural hazards, etc. Facilitate international cooperation to address climate risks and promote energy security, for example by launching dedicated and inclusive initiatives, and facilitating networks of stakeholders to identify and address the major challenges related to the new energy landscape. Develop, and ensure respect for, relevant international standards, for example to ensure sustainability (e.g., to ensure sustainable bioenergy and biofuels, discourage use of arable

PRIORITY RESULTS	PRIORITY ACTION AREAS	STAKEHOLDER ACTIONS			
		Public	Private	Civil Society	International organizations
		<ul style="list-style-type: none"> Promote energy security; this includes addressing the potential issues deriving from significant dependence on minerals needed to support the energy transition. Involve young people by ensuring an inter-generational approach to a successful clean energy transition Promote integration of SDGs into private-sector activities, for example, through the adoption of company-level target contributions to relevant SDGs. Adopt transparent classifications of sustainable investments, as they are drivers of the needed increase in investments. Promote innovative sustainable impact investment mechanisms (e.g., SDG-linked bonds) which go beyond the traditional project-focused green finance. 			land for energy, etc.) and also to accelerate digital transformation in the energy sector.
Address systemic barriers to bring about coherent, integrated planning and implementation.	<ul style="list-style-type: none"> Reprioritize the coordination of developmental policies across government entities, strengthening integrated policymaking. Strengthen integrated governance frameworks that span policy areas and SDGs. Enhance capacity-building, education, and knowledge. Take concerted steps to enable private capital to flow to those in most need. Catalyse finance and investment. Leverage innovation and technology. Foster the inclusion of gender-equality transformative actions. These may include, among other measures, the promotion of local partnerships to support women workers in low-income countries (e.g., supporting: women's access to ownership of renewable energy products, women's ownership of, and access to, ecosystems-based 	<ul style="list-style-type: none"> Develop cross-cutting policies that align with the SDGs and net-zero and strengthen institutional capacity. Support open access to data and information and support their dissemination to build foundational knowledge and ensure accountability. De-risk investment, encourage transparency, and shape markets author, please be more explicit: markers denoting what? Dedicate resources and policy mandates to inter-governmental and -institutional coordination and the creation of a unified and coherent national agenda: this will include cross-cutting energy and environmental planning systems; information sharing; shared development of regulatory and monitoring frameworks related to the areas of energy, environment, and social development; establishment of transparency and stakeholder engagement rules in energy planning and accountability mechanisms for delivery of energy access; and the integration of energy and climate policy and national NDCs into all government work areas. Promote information exchange between different ministries and ensure coordinated regulations to leverage synergies. 	<ul style="list-style-type: none"> Harness co-benefits in sectors other than energy. Redirect finance flows away from fossil fuels to sustainable energy. Innovate and change through R&D; remove market-distortion factors; support digitalization; conduct electrification of end-use sectors; change transport technology. 	<ul style="list-style-type: none"> Re-evaluate education to incorporate clean energy transitions. Knowledge hubs can promote experiences and best practices Encourage greater transparency among businesses and governments regarding energy use, procurement policies, or regulations. 	<ul style="list-style-type: none"> Provide technical assistance, build knowledge and capacity, share best practices, make direct financial investments and provide risk mitigation instruments. Mobilize financial support for LDCs, SIDS, and vulnerable populations to improve access to affordable finance for projects and programmes that contribute to multiple SDG enhancement Promote innovative concessional financing instruments (e.g., an SDG -enabling fund) tailored to the poor and women workers' needs, especially in the global south, accessible for the nano, tiny ,and micro enterprises owned and managed by women workers, also in the informal sector.

PRIORITY RESULTS	PRIORITY ACTION AREAS	STAKEHOLDER ACTIONS			
		Public	Private	Civil Society	International organizations
	agriculture, and women's access to capital to strengthen livelihoods, etc).				
Establish inclusive monitoring frameworks	<ul style="list-style-type: none"> Establish a set of indicators for monitoring, including data disaggregation on the situation of the most vulnerable groups within the SDGs, in particular women, children, people with disabilities, and indigenous peoples. Undertake a global monitoring exercise based on the set indicators. Ensure transparency and promote open access to information and data. 	<ul style="list-style-type: none"> Monitor progress, ensure accountability, and share results. Track SDG progress at country level. Improve data availability at the level of sub-national government, including regional and municipal governments, urban-rural disaggregation, and regular household surveys. Promote open access to information and data. Enforce and monitor respect of environmental and sustainability standards: this includes promoting sustainable bioenergy; avoiding conflict of energy with food production and use of arable land for agriculture; ensuring adequate management of e-waste such as depleted solar panels and batteries, among others. 	<ul style="list-style-type: none"> Commit to sharing data on SDG 7 and related indicators and key performance indicators (KPIs) set at national level. Set up voluntary reporting mechanisms that may feed into public monitoring frameworks. 	<ul style="list-style-type: none"> Strengthen understanding of the way energy interlinks with other sectors, including their synergies and trade-offs, by using wider sustainable development goals and indicators. Invest in, depoliticize, and publicly support the building of institutional capacity to collect, interpret, and disseminate data and information across sectors. Support progress monitoring, including through independent monitoring schemes. 	<ul style="list-style-type: none"> Track SDG progress at country, regional, and global levels. Promote institutional capacity at country and regional level to collect, interpret, and disseminate data and information across sectors, including basic demographic, macroeconomic, and energy-related data, and also more specifically all indicators stipulated by Agenda 2030. Special attention is required to strengthen data quality and quantity. Channel dedicated financial support and training Provide assistance to countries to develop and monitor indicators.
Strengthen global partnerships by all stakeholders to help leverage transformational potential of energy for enabling the SDGs.	<ul style="list-style-type: none"> Partner internationally to encourage global action. Embrace synergies with other SDGs. 	<ul style="list-style-type: none"> Engage the private sector, including philanthropists, in coalitions to strengthen collective action. <ul style="list-style-type: none"> Make and encourage sustainable behavioural changes 		<ul style="list-style-type: none"> Rethink multi-stakeholder partnerships to achieve cross-sectoral systemic change. 	<ul style="list-style-type: none"> Maintain comprehensive monitoring. Catalyse multi-stakeholder partnerships to achieve cross-sectoral systemic change. Mobilize financial and technological resources. Develop and lead multi-sectoral global and regional initiatives to address and facilitate SDGs synergies, including by promoting coordinated policymaking and regulatory approaches between different sectors. Increase public awareness and promote global advocacy initiatives, such as a sustainable energy international day, to focus on promoting SDG7 and its enabling role for the other SDGs.

3

GOAL

The goals set out in the 2030 Agenda for Sustainable Development and the 2015 Paris Agreement on climate change together provide an integrated pathway towards a more prosperous, equitable, and sustainable future—a future enabled by a just and inclusive transition to clean and modern energy. Despite making progress towards some of the SDGs—like improving maternal health and expanding access to electricity—these advances have sometimes been offset elsewhere, for instance, by rising food insecurity, lack of access to clean cooking, deterioration of the natural environment, and persistent inequalities. The COVID-19 global public health pandemic has caused further disruption to SDG progress, with the world’s most vulnerable people being most affected by it. Meanwhile, climate change is posing tremendous risks to SDG achievement, and the progress being made on the goals remains grossly inadequate. Climate change is affecting those most at-risk and with the least resources to adapt to it, creating yet another pressure point for the vulnerable across the world. In the face of all these challenges, sustainable energy is key to our collective efforts to accelerate the pace of implementation and to deliver on the SDGs and the Paris Agreement. Countries and regions must design and implement their varied energy transitions pathways to be just and inclusive in order to accelerate our collective action, not only to secure delivery of these goals but to ensure the ‘future we want’.

We must ensure that a transition to clean energy systems is both equitable and inclusive. Considering the planet’s finite resources and the importance of limiting global temperature rise to 1.5°C compared to pre-industrial levels, as set out in the Paris Agreement, a wide-reaching transformation of our energy systems is required. As energy has been intimately bound up with human development, the importance of ensuring that such an energy transition is equitable and inclusive could not be greater. A just and inclusive energy transition is a modal shift in the way we produce and consume energy: it strives to leave no one behind while, at the same time, ensuring a healthy population and economy, decent jobs, and a clean environment. Such a transition must maximize benefits for people, the planet, and prosperity, ensuring social protection while minimizing trade-offs with other development priorities.

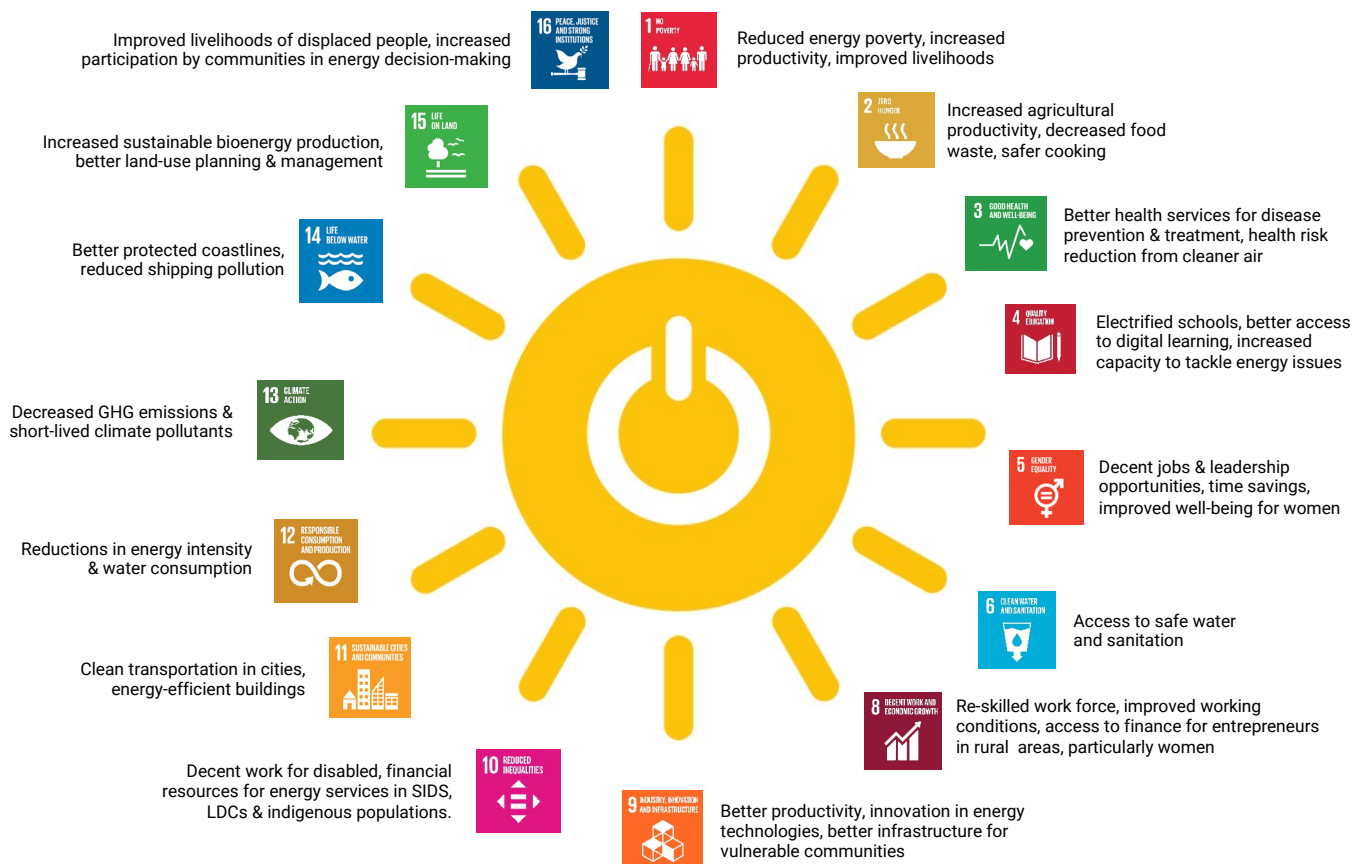
A just and inclusive energy transition is by nature a participatory process that relies on the active engagement and contribution of all relevant stakeholders, particularly the at-risk populations with the most to gain or lose from the energy transition. Such a transition strives to ensure clean and modern energy access for all, using a suite of sustainable and equitable solutions, all the while expanding economic opportunity, protecting the livelihoods of local communities, minimizing hardships for workers, and protecting the fragile state of our ecosystems.

If the energy transition is designed and implemented to be just and inclusive, it will create new jobs; advance gender equality; empower people, communities, and societies leaving no one behind. It will enhance human well-being, health, and capabilities; increase resilience; and drive innovation towards a sustainable society at all levels—at same time, catalyzing trillions of dollars in investment. However, ensuring a just and inclusive energy transition is no small task and will require the commitment of all stakeholders. Policymakers, businesses, and societies will need to examine the potential co-benefits and trade-offs of different energy pathways. To maximize social, economic, and environmental benefits, they will need to work together to design the transition so that the needs of the most vulnerable are placed at its heart.

This report entitled 'Enabling SDGs through Inclusive, Just Energy Transitions' highlights the essential role of inclusive and just energy transition pathways in achieving the Sustainable Development Goals (SDGs). It presents a synthesis of the deep interlinkages between energy transitions and the 'future we want', and it discusses the challenges and opportunities related to it, including the co-benefits and trade-offs. It distils several recommendations aimed at promoting cross-sectoral synergies, integration, and collective action for using the energy as an enabler for achieving the other SDGs (Figure 1).

FIGURE 1. EXAMPLES OF ENERGY AS AN ENABLER OF SUSTAINABLE DEVELOPMENT

Examples of Energy as an Enabler of Sustainable Development



The present report was written pursuant to General Assembly resolution 74/225,² which requested the United Nations Secretary-General to convene a High-level Dialogue on Energy at the summit level during the 76th session of the UN General Assembly in September 2021 in New York. The Dialogue presents a historic opportunity to accelerate SDG 7 action for the achievement of the 2030 Agenda for Sustainable Development and the Paris Agreement on climate change. The recommendations of the report will contribute towards an action-oriented global roadmap for the achievement of SDG 7 by 2030 and net-zero emissions by 2050, to inform the High-level Dialogue on Energy.

4 CONTEXT

Energy is inextricably linked to virtually all of the Sustainable Development Goals: our patterns of development, consumption, and production directly impact our demand and choices in energy. Energy is a powerful enabler for driving progress in areas such as poverty eradication (SDG 1), food security (SDG 2), advances in health and education (SDGs 3 and 4), gender equity and female empowerment (SDG 5), access to water and other basic services (SDG 6), decent work opportunities (SDG 8), and sustainable economic growth, industrial innovation, reduced inequalities and climate change (see Box 1). Our social and ecological well-being are inextricably linked to the way our economies produce and consume energy, and vice versa. At the same time, several factors enable and drive a just and inclusive energy transition, like the goal of SDG 4 to ensure access to an equitable education and lifelong training for everyone. In this case, universal electricity access in schools is an enabler of education for all (SDG 4), while at the same time, ensuring that everyone with a quality education provides the knowledge, capacity, and skills required to facilitate the energy transition for future generations.

Energy is also the single largest contributor to climate change and air pollution. Reconciling our goal of ensuring affordable, reliable, sustainable, and modern energy for all with our responsibility to protect our planet is one of the biggest challenges we will collectively face in the coming decades.

Energy's complex interlinkages with the SDGs require an integrated approach to be taken to planning, implementation, and governance arrangements. In an increasingly globalized and hyper-connected world, understanding trade-offs and synergies between development priorities is more important now than ever before. This is particularly true for the energy transitions, where policies or programmes designed to meet a particular energy goal or target can have direct consequences, sometimes positive and sometimes negative, on the progress or achievement of other development goals or priorities, both within and outside the energy sector. Similarly, synergies and trade-offs exist between goals and priorities in different regions of the world. In some cases, a policy to advance a target in one region can impact progress on a different goal in a different location. Although those interactions often imply trade-offs, they can also give rise to transformative co-benefits for sustainable development. The key to maximizing the potential of a just, and inclusive energy transition lies in leveraging interactions between clean energy and the SDGs away from trade-offs and towards co-benefits. This can only be achieved through evidence-based integrated action led by the energy sector and with the knowledge and support of other sectors and stakeholders.

The global energy transition will have a significant, yet uneven, bearing on the achievement of the other SDGs. Strategic shifts in policies, technological progress, and rapid cost declines are already transforming energy systems in many parts of the world. Even so, progress has been uneven. Left to markets alone, energy transitions are unlikely to be inclusive or just. While a transition from fossil fuels to sustainable energy sources will produce a net employment gain thanks to new renewable energy jobs, it will also displace fossil fuel-related jobs and revenues, including tax revenues and downstream jobs.³ Several of the numerous new job opportunities created by the transition to clean energy will be in different areas from the jobs that will be lost as fossil fuels decline, and they will require different skill sets. It is thus essential to design adequate support policies to minimize the challenges associated with these disruptions, including the training and reskilling of workers, among other measures.

Despite the significant growth of renewable energy in many parts of the world, about 750 million people globally still live without access to electricity,⁴ largely in Africa and south Asia. In addition, 2.6 billion⁵—about a third of all people living on our planet—are cooking with polluting fuels and stoves, causing about 4 million premature deaths annually, with disproportional impacts on women, children, and the poor. Meanwhile, the ongoing COVID-19 pandemic and its associated social and economic impacts add another layer of complexity. The number of people lacking electricity in Africa rose to more than 590 million people in 2020, an increase of 13 million people, or 2%, from 2019⁶. An analysis by the UN Environment Programme (UNEP) shows that only 2.5% of all COVID-19 recovery spending will have 'positive green characteristics'⁷, like reducing greenhouse gas emissions and protecting natural capital.

A better understanding of synergies and potential adverse effects in local, national, regional, and global contexts can inform integrated action to enable the SDGs and close the gap towards achieving climate goals, while ensuring no one is left behind. The design of energy transition plans and related policy instruments will heavily influence the overall synergies between energy and the SDGs. If designed using the available evidence, data, and past experiences, they can spur more deliberate action and collaboration towards realizing co-benefits and minimizing trade-offs across many SDGs. Such actions and collaborations could result in improved design and implementation of policies contributing to multiple SDGs, more direct finance and resources being made available for critical nexus issues, and much needed support being provided for scaling up high-impact activities and initiatives. The role of actors beyond the energy sector will be critical to assessing synergies, providing evidence-based guidance on impacts across the SDGs, both benefits and trade-offs, while facilitating cross-sectoral action in line with the integrated nature of the SDGs and their calls for strengthened partnerships and multi-stakeholder cooperation.

BOX 1. AN OVERVIEW OF THE INTERLINKAGES BETWEEN ENERGY AND THE SDGs.



SDG 1 'No Poverty'

Sustainable energy is a critical enabler of poverty reduction. Low quality fuels and equipment, such as inefficient cooking stoves, and the lack of access to electricity are associated with fundamental constraints on people's lives and socio-economic prospects, leading some to describe lack of access to energy services as a form, an outcome, and a cause of poverty. as a form, an outcome, and a cause of poverty.⁸ A large body of literature confirms the multi-dimensional nature of poverty, highlighting how multiple forms of deprivation are closely connected to the nature of ecosystem services, natural resource access and benefit-sharing,

and pollution impacts on health and welfare.⁹ A just and inclusive energy transition with the right policies and programmes prioritizing clean and modern energy access is a mechanism for alleviating poverty by ensuring that poor households and communities gain access to essential services like health care, education, lighting, and sanitation, as well as thermal comfort, communication services, and clean cooking solutions. Access to modern energy services is a fundamental component of a decent living standard. It supports aspects of people's lives and livelihoods by providing power to support not only agriculture and machinery for productive uses but also computers and digital technologies, thereby supporting income-generation.¹⁰ As the poorest contribute the least to environmental problems, but suffer disproportionately from the negative impacts of unsustainable natural resource management and climate change, it is clear that poverty elimination is inextricably linked to ensuring sustainable energy for all.

In context: 2.6 billion people lack access to clean cooking in the home, leading to millions of premature deaths annually from household air pollution exposure and related safety risks.¹¹



SDG 2 'Zero Hunger'

Ending hunger and achieving food security will not be possible without access to sustainable energy for all. Energy is required throughout the agri-food value chain, including irrigation, agro-processing (grinding, milling, pounding, husking, etc.), food preparation, storage, refrigeration, and transport. Well-designed policies and programmes in a just and inclusive energy transition ensure that access to energy in the agricultural sector means access to modern farming technologies and fertilisers to increase agricultural productivity and crop yield, while minimizing land use and also minimizing trade-offs with bioenergy supply and food security.¹² Clean cooking can displace inefficient traditional stoves and fuels, bringing positive health benefits to some of the poorest populations through reduced exposure to household air pollution¹³ and increased adoption of more varied diets.¹⁴ Modern energy also helps provide access to information and markets, and can help reduce food waste due to post-harvest mishandling in processing, transport, and storage.¹⁵ Smart technologies can support sustainable energy consumption and water withdrawal in agro-processes, thereby helping local communities ensure sustenance for their populations while protecting their local environment and natural resources.¹⁶

In context: Feeding a global population that is expected to reach 9.7 billion people by 2050 will require a 60% increase in food production (compared with 2012 levels).¹⁷



SDG 3 'Good Health and Wellbeing'

Clean and modern energy is critical to the goal of ensuring healthy lives and promoting well-being. A just and inclusive energy transition is an essential element in disease prevention and treatment. Stable, secure electricity in health facilities is a critical determinant of the availability and quality of health-care services and ensuring universal health coverage. Modern energy access enables the use of medical devices and equipment essential for diagnosis and treatment of disease, as well as safer births and family planning, benefiting the health of women and children. Clean and modern energy also serves to prevent disease, particularly in poorer populations, where polluting energy in the home and community puts community members at risk of disease from air pollution. Promoting the adoption of clean cooking solutions, through a just and inclusive transition can save millions of lives and minimize the

disability caused by chronic disease like stroke, cancers, ischemic heart disease, and chronic obstructive pulmonary disease, as well injury, particularly among women and children. In its efforts to improve health, a just and inclusive transition must minimize health risks from the transition itself, including environmental hazards inherent in the energy technology life-cycle, such as pollution in the local environment from upstream production and energy extraction, or from retired technologies.

In context: An estimated 1 billion people currently rely on health facilities that operate without electricity, seriously limiting access to basic health services.¹⁸ Children are the most affected group, with hundreds of thousands of neonatal deaths per year due to lack of electricity in health facilities.



SDG 4 'Quality Education'

Quality education is a critical enabler of sustainable growth and socio-economic progress that depends on access to a reliable, adequate, and affordable supply of electricity.

Educational facilities require energy for lighting, cooking, heating, and cooling, water supply and purification, emergency and medical services, as well as for digital connectivity and remote learning. Electricity allows educational facilities to maintain and extend operating hours, improve lesson preparation and training for teachers, electrify staff quarters, and contribute to staff retention¹⁹. The more that energy-dependent digital technologies like computers and the internet become an increasingly important part of our societies' way of accessing and transferring knowledge and are integrated into school curricula, then the more our access to quality education becomes dependent on access to a sustainable source of energy. Beyond direct benefits for educational facilities, access to energy is associated with improved educational outcomes, a better learning environment, and increased opportunities for children and young people²⁰. This is particularly the case for vulnerable populations such those living in remote communities with no schools or universities nearby, and displaced populations and individuals with learning or other disabilities who are often reliant on energy-dependent assistive technology to support their learning²¹. Conversely, an educated population will also be more knowledgeable about the role and importance of clean and sustainable energy, and therefore more supportive of, and committed to, the energy transition, creating a positive feedback loop for generations to come.

In context: Only 35% of primary schools in sub-Saharan African have access to electricity, and globally over 200 million children go to primary schools without electricity access. This is a barrier to a quality education for some of the poorest and most vulnerable youth.²²



SDG 5 'Gender Equality'

Women are among the greatest beneficiaries of a just and inclusive transition to sustainable modern energy. Access to modern energy can improve women's health and well-being, free up their time, and enable them to become economically empowered.^{23, 24} The regular use of clean energy for cooking, heating, and lighting reduces women's and girls' exposure to household air pollution, minimizing their risk of disease and alleviating the drudgery that many women face from traditional cooking practices. At the same time, it provides them with more available time for education, income-generation, other productive activities, or leisure, all the while improving their overall living standards. Street lighting in the community, and access

to mobile phones and online communications are other ways that energy improves women's well-being and safety while connecting them to the world around them for education or business.^{25,26} The scale up of affordable small-scale, off-grid energy technologies paired with innovative financing can provide women entrepreneurs with business opportunities in the design and distribution of modern energy equipment and services. It can also support women-owned business and operations, particularly in remote or rural settings. With access to a reliable and affordable source of electricity, women business owners can maintain or extend regular working hours, while at the same time reducing operational costs. Gender-responsive policies and programmes are inherent elements of a just and inclusive energy transition. Such a transition holds tremendous opportunity for women to move beyond their traditional role as 'users' or 'beneficiaries' and to become a part of the solution. Women have a key leadership role to play in energy policy, energy innovation, and production and sales.²⁷ This needs to be fully recognized and supported with enabling energy-sector programmes.

In context: *The proportion of women in renewable energy jobs, for example, has increased from 22% in 2010 to 32% in 2018.²⁸ In stark contrast, globally, women hold only 6% of ministerial positions on national energy policies and programmes, and are therefore not on target to achieve gender parity.²⁹*



SDG 6 'Clean Water and Sanitation'

Sustainable energy and water management are closely linked. Populations that lack access to water often lack access to electricity and are amongst the most vulnerable to disease and food insecurities³⁰. Innovations in off-grid and renewable energy for water pumping and purification are critical enablers for ensuring safely managed drinking water and sanitation in the homes, schools, and health facilities of the poorest communities. Such advances in energy technology also support local farmers to pump water to feed their livestock and crops for sustenance and income generation. Facilitating and accelerating access to a safe supply of water and sanitation through an inclusive energy transition will prevent disease, improve well-being, and support food security. While energy is essential for the provision of clean, safe water in most of today's societies, the production, transport, and supply of energy, if not properly managed, can also threaten water safety and security through the pollution of rivers, lakes, and the ocean with residues, accidental oil spills, and dumping of hazardous fuels and chemicals, as well as water overconsumption. Ninety per cent of power generation is water-intensive, and three quarters of all industrial water withdrawals are used for power production.³¹ Overconsumption is of particular concern in the face of climate change, where changes in weather patterns are leading to a more droughts, and making water scarcity a daily threat to survival not only among the poorest communities but also in countries most vulnerable to water scarcity, land degradation, and desertification, as well as food insecurity. Better management of water stocks in reservoirs that anticipate and respond to fluctuations in the energy and water demand are essential elements of a just and inclusive transition. Such a transition ensures that local communities, particularly the world's indigenous peoples, have a safe and adequate supply of energy and water, and that the impacts of the nearby energy infrastructure and fuel cycle are mitigated through participatory and inclusive energy decision-making.

In context: *IEA analysis shows that achieving universal access to clean water and sanitation (SDG 6) would add less than 1% to global energy demand in the Sustainable Development Scenario by 2030.³²*



SDG 8 'Decent Work and Economic Growth'

Modern energy plays a critical role in contributing to the productive use of human energy, whether it be by supporting health provision and education from early on in people's lives, automating mechanical tasks, or enabling access to modern telecommunications, and hence to information. The productive uses of energy are key enablers of income-generating economic activities, from agriculture through industries to service-based work, which many women³³ take up. The energy value chain itself is an important source of employment opportunities, accompanied by a slew of social and economic benefits for communities, as long as they are regulated by appropriate policies and regulations in line with the principles of the Decent Work Agenda.³⁴ Among other policy areas, industrial policies will need to be included to leverage local capabilities and strengthen capabilities along the value chains for renewables and other green sectors. This will facilitate: modern energy enterprise and entrepreneurship development; labour market policies; skills training and retraining (including efforts to coordinate between industry and educational/training institutions); strategies aimed at recruiting, training, retraining, and promoting more women and facilitating the participation of youth and underrepresented communities; and social protection measures for fossil fuel-sector workers as they try to find new jobs. Energy access typically comes tied to a myriad of new economic and job-creation opportunities.³⁵ A just and inclusive energy transition offers employment prospects for a range of skill sets, levels of experience, and technical backgrounds along the energy value chain, thus enabling decent work for many people, including women. Part of the energy transition's ultimate goal—to decouple economic growth from energy consumption—is a direct enabler of the Agenda 2030 goal of increasing global resource efficiency and decoupling economic growth from environmental degradation.

***In context:** IRENA modelling suggests that the renewable energy sector alone could generate up to 30 million jobs by 2030 (up from 11 million in 2018), and up to 42 million jobs by 2050, more jobs than in the fossil fuel sector.³⁶*



SDG 9 'Industry, Innovation and Infrastructure'

Safe, reliable, clean, and affordable modern energy services are a key component of the quality infrastructure needed to support economic development and human well-being.

Modern energy is a critical enabler of industrial activity, and of research, development, and technological innovation. Sustainable energy solutions, including decentralized off-grid energy solutions for households, businesses, and industries can play a substantial role in advancing sustainable and resilient infrastructure in the developing countries. As industries account for a substantial share of global primary energy demand, they also play a critical role in the energy transition in their own right by moving towards low-carbon sources of energy and increasing the efficiency of their energy use. Progress in clean energy-technology development, in turn, is tied to the existence of innovative industries, creating a virtuous cycle. While the inevitable shift of the energy transition to cleaner technologies will have trade-offs for some industries, like the fossil fuel sector, a just and inclusive energy transition with proactive policy measures and innovative thinking in place can minimize the expected 'costs' from a shift in energy production and distribution to instead supporting or even accelerating the transition. For instance, with the expected big shift to renewable energy sources, the demand for fossil fuel infrastructure will decrease dramatically, potentially leaving many refineries and plants out of service. However, with strategic policies in place, such infrastructure can be converted or reshaped into renewable biorefineries, providing jobs and opportunities for economic growth.

In context: IEA's sustainable development scenario, illustrates that there could be an approximately 50% reduction in demand for steel, cement, and aluminium in 2030 by extending building lifetimes through repair and refurbishment and reducing vehicle demand largely through mode-shifting.³⁷



SDG 10 'Reducing Inequality'

Reducing global disparity in energy is key to reducing social, gender, and income inequalities, along with other disparities. The large-scale transformation of energy sectors required for sustainable development has the potential to reduce inequality at various scales, if planned and implemented through a just and inclusive lens.³⁸ Environmental pollution, land expropriation for energy production, and GHG emissions associated with the inefficient combustion—all these create costs for our planet and its people that overwhelmingly affect those who are already disadvantaged, while currently benefiting the big consumers. The systematic social and economic disadvantages that women and other vulnerable populations continue to experience in many parts of the world are exacerbated by lack of secure, affordable energy access, and ensuing lack of access to basic health services and education. For example, decentralized energy systems run on renewable energy, have the potential to accelerate access to clean and reliable electricity among those in need, and thus to help remedy social and economic inequality. On the other hand, efficiency regulations may also disproportionately affect the poor by raising the barrier to technology uptake. A just and inclusive transition must thus ensure affordability and accessibility to encourage the uptake of modern and sustainable energy solutions.

In context: The energy consumption share of the richest 5% exceeds the 20% consumption share available to the poorest half of the population.³⁹



SDG 11 'Sustainable Cities and Communities'

Energy plays a fundamental role in building inclusive, safe, resilient, and sustainable cities and human settlements. Home to some 55% of the world's population,⁴⁰ and consuming 75% of the world's primary energy,⁴¹ cities are a critical driving force of the energy transition. Urban planning, building-efficiency regulations, including heating and cooling, localized energy generation, and a greater reliance on renewables in public transport systems, including electric mobility—all of these serve as opportunities to build sustainable communities through a just and inclusive energy transition.⁴² Modern energy services, including electricity and clean household-energy fuels and technologies for cooking, space heating, and lighting, as well as cooling and other end-use services, have vast impacts on the quality of life, productivity, and building safety in urban areas. Decentralized renewable energy technologies, such as rooftop solar power, can help many urban and rural populations access affordable and safe energy, thus contributing to inclusive and sustainable urbanization. Policies and interventions of the sustainable energy transition aimed at promoting smart energy system controls, waste-to-energy approaches and strategies to efficiently manage industrial emissions and excess heat can create sustainable urban energy systems that ensure access to energy for all, while decoupling development from emissions of air and climate pollutants.

In context: Cities and towns globally consume up to 75% of energy, and are responsible for 70% of greenhouse gas (GHG) emissions, along with 70% of resource use. At the same time, 80% of GDP is generated in cities.⁴³



SDG 12 'Responsible Consumption and Production'

Renewable energy, along with improvements in energy-efficiency, help reduce the depletion of natural resources. These improvements, which include the way we produce and consume energy, are also critical to reducing greenhouse gas emissions and other climate-changing pollutants. A shift towards renewable energy away from limited resources like coal also lessens environmental damage. Such sustainable energy technologies are not without waste problems. For example, solar panels produced 250,000 metric tonnes of waste in 2018 alone⁴⁴. A renewable energy transport system requires a complex mix of metals, such as copper, cobalt, nickel, rare earths, lithium, and silver, the consumption of which could rise dramatically, requiring new sources of primary and recycled metals to be identified. A just and inclusive energy transition must integrate concepts such as the circular economy and the green economy, as they offer opportunities to transform the way we produce and consume energy while accelerating the uptake of renewable energy. Waste-to-energy integrated into the low-carbon transition can further help towards the strategy of 'reduce, re-use, recycle and remove'.⁴⁵ This is the case with biogas and biochar, where by-products serve as a potent biofertilizer.⁴⁶ Securing access to electricity and more energy efficient transport options can, in turn, help reduce food waste, benefiting people, the climate, and the wider biosphere. Education, information, and behavioural change in the area of energy sustainability are critical for sustainable natural resource management, as too are policy reforms targeting inefficient and harmful fossil fuel subsidies; they also encourage an increase in market incentives for alternative sources of energy.⁴⁷

As all industries contribute to GHG emissions, their active role in global efforts towards the net-zero target is essential. A just and inclusive transition must ensure that industries substantially reduce their carbon footprint, while taking into consideration the different contexts in which they operate. In this regard, industry's transition towards energy efficiency and clean energy consumption in the electricity, heating and cooling, and transport sectors are critical.

***In context:** The IEA estimates that around 55% of the cumulative emission reductions in the pathway to net-zero are linked to consumer choices.⁴⁸*



SDG 13 'Climate Action'

A just and inclusive transformation of our world's energy systems is the way to reverse the effects of the human activities that have contributed to climate change while, at the same time, building resilience to those effects, in particular for the most vulnerable.

Taking this pathway can help bring the world into compliance with the Paris Agreement and the global target of holding the global average temperature increase to well below 2°C above pre-industrial levels, while pursuing efforts to limit the preferred temperature increase to 1.5°C. Climate risks and opportunities need to be incorporated into the financial system and into all aspects of public policymaking and infrastructure. Most of the submitted Nationally Determined Contributions (NDCs) involve specific mitigation goals that include renewable-energy and energy-efficiency measures as the basis of national climate action. Past financial assistance to support climate-friendly energy development in developing countries, such as the Clean Development Mechanism (CDM) under the Kyoto Protocol focuses to a large degree on low-carbon, renewable-energy projects. A just and inclusive energy transition that includes decentralized energy solutions is also a vehicle for energy

security and for building resilience to the effects of climate change, particularly among vulnerable populations. Ensuring access to sustainable and modern energy services is fundamental to protecting the health, well-being, and livelihoods of climate-vulnerable populations such as those living in small island developing states. Education and awareness-raising in the areas of sustainable energy and climate change are intrinsically linked; they form the basis of a modern-day understanding of the value of sustainable management of our planet's finite natural resources. 'We borrow environmental capital from future generations with no intention or prospect of repaying.'⁴⁹

In context: *TO*n a global scale fossil fuels accounts for a staggering 73 per cent of the world's greenhouse gas emissions.⁵⁰



SDG 14 'Life Below Water'

Clean and efficient production, transport, and use of energy holds the potential for significant benefits for our marine ecosystems. Oceans help make the planet liveable and are critical to managing the effects of climate change. The effect of deep sea drilling for the production of oil, natural gas, and other minerals has vast potential for lasting damage to fragile ecosystems, through surface damage to coast lines, spills, and underwater noise.⁵¹ Deployment of renewable energy, carbon capture and storage (CCS), and improvements in energy efficiency can help reduce CO₂ emissions, and thus ocean acidification. A just and inclusive transition, which provides solutions for more energy-efficient shipping and promotes the use of sustainable biofuels by cargo ships, facilitates a more sustainable use of energy, while at the same time minimizing environmental degradation to our marine ecosystem. Further research and development is under way to use ocean energy as a renewable source of electricity, including tides, waves, currents and ocean thermal energy conversion. Results from these activities should be used to inform and adapt energy transition pathways.

In context: *Over 250 million people depend on ocean ecosystems for coastal protection and livelihoods and the coastal zone makes up only 10% of the ocean environment but is home to over 90% of all marine species.*⁵²



SDG 15 'Life on Land'

In common with their aquatic counterparts, all forms of life on land, now and in the future, can benefit profoundly from a well-designed, just and inclusive energy transition, ensuring proper land-use management and the sustainable use of our resources. Forests, wetlands, mountains, and drylands often experience decades-long environmental impact from the production of fossil fuels and other energy sources, including deforestation and biodiversity loss. Damage to pipelines, for example, can lead to further damage to both terrestrial and aquatic life. Lack of access to sustainable energy can itself also lead to environmental damage, including deforestation due to overutilization of local forest resources like fuelwood. Bioenergy, and other renewable energy projects also lead to both direct and indirect changes in land use, with direct consequences for the local environment and population. A just and inclusive transition must ensure that the energy needs of the local population are met, while at the same time forests, wildlife, and biodiversity are protected. This can be facilitated by applying appropriate sustainability standards, land-use planning, and environmental impact assessments, as well as ensuring a participatory process engaging all stakeholders, including indigenous and vulnerable populations, to inform policy and programmatic decision-making.

In context: Some 17% of large-scale (>10 MW) renewable energy facilities comprising wind, solar (PV), and hydropower globally operate within the boundaries of important conservation areas, including key biodiversity areas.⁵³



SDG 16 'Peace, Justice, and Strong Institutions'

Access to safe and sustainable energy is a basic human need. Improving access to sustainable fuel, powering health centres and schools, and utilizing solar-powered lighting are all essential steps to protecting the health and well-being of local communities and displaced populations. Fragile situations are susceptible to increased rates of conflict-related, sexual, and gender-based violence. This may be decreased, for example, by reducing the need to collect cooking fuel from the local environment or by improved public lighting. Renewables-based decentralized energy technologies offer a lifeline to those communities for sustainable energy access. An inclusive and just energy transition will also help mitigate climate-related risks, including increased natural disaster, loss of land, and overconsumption of natural resources, thereby helping reduce the risk of future conflict over land and resources and thus of even more people being displaced as a result of climate change impacts on their local environment.

In context: 86% of people without access to electricity worldwide live in fragile states affected by conflict and lack of security.⁵⁴

5

CHALLENGES AND OPPORTUNITIES

An inclusive and just energy transition can yield transformational co-benefits for the achievement of the SDGs. Access to affordable and clean energy services is associated with significant co-benefits, including ones related to: poverty eradication (SDG 1); food security (SDG 2, and some of the water–energy–food nexus (of SDG 6); advances in health and education (SDG 3 and SDG 4); gender equity and women’s empowerment (SDG 5); decent work opportunities and sustainable economic growth (SDG 8 and SDG 11); innovation (SDG 9); and reducing inequalities and the principle of 'leaving no one behind' (SDG 10) (Box 2). A just and inclusive energy transition holds opportunities for improving the health and well-being of the poorest populations, empowering women, stimulating economic growth, providing decent jobs, and preserving the planet and its resource. The provision of clean and efficient energy for all in a climate-friendly way is economically and socially desirable, and it is also technically feasible. The costs of transforming our energy systems are significantly outweighed by the societal, economic, and environmental co-benefits. It is estimated that for every dollar spent on shifting to a sustainable energy system, the transition would generate between USD 3 and USD 7, including through savings made from reduced air pollution, improved health, and less environmental damage arising from the transition to clean energy sources.⁵⁵

BOX 2. EXAMPLES OF THE SDG CO-BENEFITS OF JUST AND INCLUSIVE ENERGY TRANSITIONS.

An inclusive, just energy transition with targets for access to clean energy, renewables, and energy efficiency can produce strong synergies with the SDGs. If designed and implemented with the right enabling factors (e.g., capacity, finance, markets, technology, long-term resources and vision, enabling policies, and broad stakeholder engagement), achieving universal access to affordable, reliable and modern energy services, for example, would electrify health clinics serving 1 billion people without access to a reliable source of power (SDG3)⁵⁶, prevent 4 million premature deaths annually through clean cooking⁵⁷ (SDG 3, SDG 5), dramatically reduce air pollution that is presently killing 7 million people annually⁵⁸ (SDG 3), provide power to over 200 million children at unelectrified schools (SDG 4), empower rural and indigenous women by reducing drudgery (SDG 5), generate business and job opportunities in rural communities (SDG1, SDG 8) and enhance opportunities for some 79.5 million forcibly displaced people worldwide⁵⁹, many with currently little access to energy (SDG 16). A dramatic acceleration of renewable energy and energy efficiency would result, for example, in generating 42 million jobs by 2050 in renewable energy⁶⁰ (SDG 8), improving global GDP by 2.5% by 2050 compared with business as usual (SDG8), phasing out fossil fuel–consumption subsidies of \$400 billion per year⁶¹ (SDG 7, SDG 12), and drastically reducing the social and environmental costs of such fossil fuel subsidies in the order of 5 trillion per year⁶² (SDG 7, SDG 8, SDG 12). Achieving net-zero emissions entails a reduction of 85% of total global CO₂ emissions and approximately 66%⁶³ of the total global GHGs emissions (SDG13).

Deep decarbonization of energy systems towards the 1.5°C goal would facilitate, rather than hinder, the achievement of the SDGs if designed and implemented to be just and inclusive.

According to the Intergovernmental Panel on Climate Change (IPCC)⁶⁴, concerted efforts, in which sustainable energy transition plays a dominant role, to limit global warming to 1.5°C (rather than 2°C above preindustrial levels), would make it markedly easier to achieve many aspects of sustainable development, with greater potential to eradicate poverty and reduce inequalities. Impacts avoided at the lower temperature limit would significantly reduce the number of people exposed to climate risks and lessen the risks of poor people experiencing food and water insecurity, adverse health impacts, and economic losses, particularly in regions that already face development challenges. Avoided impacts expected to occur between 1.5°C and 2°C warming would also make it easier to achieve certain SDGs, such as those related to poverty, hunger, health, water and sanitation, cities, and ecosystems. However, this factor needs to consider the contexts and vulnerabilities of countries and regions based on the principle of common but differentiated responsibilities and respective capabilities, in the light of different national circumstances.

Increasing the share of renewable energy and advancing energy-efficiency measures demonstrate an effective pathway towards strong synergies with the SDGs while minimizing trade-offs.

According to an IPCC analysis⁶⁵, accelerating energy efficiency in all sectors would create synergies with the targets of SDG 7 (energy access and renewables), 9 (industry, innovation, and infrastructure), 11 (sustainable cities and communities), 12 (responsible consumption and production), 16 (peace, justice and strong institutions), and 17 (partnerships for the goals). Low-demand energy pathways would result in significantly reduced pressure on food security, lower food prices, and fewer people at risk of hunger.

At the same time, the rapid pace of such energy transitions, if not carefully managed, would lead to trade-offs with some SDGs.

While energy transitions towards the 1.5°C pathway indicate robust overall synergies with the SDGs, there is a risk of negative side-effects if stringent energy transition pathways are not properly planned and managed. Such potentially negative impacts are context-specific and have different effects on different people, communities, and societies. They also involve winners and losers in the short term, which must be taken into account. Considering the impactful role that the clean energy transition will be playing in the lives of future generations, the engagement of young people as innovative thinkers and drivers of change is critical to managing trade-offs.

Table 2 presents a non-exhaustive list of key potential trade-offs and adverse effects grouped around three outcome areas: enhancing prosperity, empowering people, and protecting the planet, which should be recognized and addressed.

TABLE 2. ENERGY TRANSITIONS AND AREAS OF POTENTIAL TRADE-OFF AND ADVERSE EFFECTS

Impacts on prosperity

Jobs

Expected economic and social impacts of the energy transitions vary greatly depending on the national and local context. Under the 1.5°C pathway, it is anticipated that employment in the fossil-fuel sector would decrease significantly, dropping from the present 30 million jobs to around 22 million in 2050.⁶⁶ During the same period, however, an overall net gain in jobs is expected in the energy sector mainly due to the growth in renewables, with an anticipated 42 million jobs in the sector by 2050⁶⁷. It is important

to recognize that in a just and inclusive transition, 'greener' jobs often require a different and sometimes higher-level skill set, and it must therefore be ensured that adequate training and professional development services, including reskilling of workers, are available and easily accessible to all. This will help minimize trade-offs for affected populations. Greater investments in vocational training and education are also needed, especially in developing countries due to their relatively weaker institutions and their large and growing unemployed youth population. It is important to recognize that although overall net employment will increase, it should not obscure the fact that, without proper safeguards and effective planning, such a large shift in our energy use could potentially disrupt the lives of affected workers and their communities for decades to come. Hence, targeted policies that promote diversification of the economy and the energy sector to create new jobs and employment opportunities, as well as measures to promote retraining of workers, are critical elements of the just and inclusive transition needed.

Affordability

While cleaner energy solutions and energy-efficient appliances (e.g., decentralized solar systems, clean cookstoves) are becoming increasingly price-competitive compared with more traditional sources of energy, affordability may persist as a critical barrier in some contexts. Rapid scaling of clean energy solutions, although more cost-effective in the long run, may trigger initial increases in costs and adversely affect poor populations. Due to the high up-front costs of renewable options, poorer communities will often opt for the less efficient option, like diesel generators, due to lower immediate costs. Carbon pricing and other incentives to discourage the use of fossil fuels could impact the costs of consumer goods derived from fossil fuels (e.g., plastics), as the increased cost of materials are likely to be passed on to the consumer. As an imperative, the just and inclusive energy transitions must include pro-poor support and redistributive policies and programmes, with innovative financing mechanisms (e.g., PayG) to enable poor households and communities to transition to clean energy and ensure that lack of affordability is not a barrier. This will help to ensure that scale up of clean solutions in those communities with the most to gain from the transition to clean energy, like rural woman, will not be left behind.

Economy

The transition to a net-zero economy must be a just transition for all countries, regardless of their sources of income, current energy mix, or level of energy development. To achieve the 1.5°C scenario, a decrease of an estimated 85% in oil demand is required as, too, is a phase-out of coal for power generation by 2050.⁶⁸ This, combined with the rapid decline in the costs of wind and solar technologies, will eventually cause many existing fossil fuels assets—in the order of between \$900 billion⁶⁹ and \$1.8 trillion⁷⁰—to become 'stranded', as the industry investments shift towards the critical rare earths and minerals needed for the renewables sector. One estimation suggests that the power sector's stranded assets could be as high as \$927 billion in G20 countries between 2015 and 2050, with 75% of the total estimated value coming from coal-related assets in the power sector.⁷¹

Inherent in these drastic changes in the energy mix, there may be significant economic risks for those regions and countries that are highly-dependent on fossil fuels for revenue and employment.

However, some commodity-dependent developing countries, including low- and middle-income countries have an opportunity to potentially benefit from the green transition, as many are rich in the commodities needed for the renewables revolution and clean technologies, including lithium, graphite, manganese, cobalt, and critical raw materials.⁷²

Promoting economic equality and smooth transition is an essential component of a just and inclusive transition, which must include diversification of energy sources and export bases, elimination of wasteful fossil fuel subsidies, facilitation of a circular economy, becoming more articulated around sustainable and responsible supply chains, having economic diversification plans, and ensuring adequately supported and reskilled human resources during the transition.

The transition must work so that investors are familiar and fully equipped with the information and enabling factors needed for the just the inclusive energy transition to be fully realized as an 'asset' and manage investments in traditional industries that will increasingly become a 'liability'.

Such a transition must have a long-term vision, account for the growing reliance on certain metals and minerals needed in clean energy technologies, and support countries in resource management of limited natural resources.

Digitalization

Digitalization and many other electricity-reliant energy-end uses like electric transport can be energy-intensive and will lead to a greater demand for electricity as they become further mainstreamed. Digitalization would contribute enormously to the integration of complex energy conversion and transport systems, as well as enable improved education and telemedicine. While digitalization will bring about new business opportunities, there are growing concerns that the new technologies could widen existing inequalities within and among countries and lead to a further concentration of power and wealth due to rising costs and limited electricity access. A just and inclusive transition will need to build institutional capacities and develop skilled workforces to harness and maximize the benefits of digitalization, while ensuring universal access to electricity and digital services.

Impacts on people

Health

A clean energy transition has the potential to improve the health both of the population and of our overall ecosystems at various scales and in numerous ways. Synergies abound for health from a just and inclusive transition: for example, the application of technologies (e.g., clean cookstoves) that greatly reduce emissions of human health-damaging pollutants like fine particulate matter (PM2.5) (e.g., black carbon) and nitrogen oxides, can also ultimately alleviate global warming and protect our environment and populations from other aspects of the climate crisis. However, the magnitude of the health impacts derived, say, from the decarbonization of transport by 2050 or the ongoing clean cooking transition depends on maximizing health gains. The choice of pathways taken towards achieving the 2030 and 2050 goals is fundamental to evaluating what trade-offs will be necessary to achieve set goals. These choices are specifically related to the technological choices made and their implementation. They will have direct implications for reducing the level of exposure to air pollution and to healthier lifestyles in general, ultimately affecting the magnitude of health benefits from the energy transition. To ensure a just and inclusive transition, programmatic decision-making must be based on scientific evidence of the health benefits and trade-offs involved in different interventions, using tools like health-impact assessment and sound monitoring systems to adapt interventions, as needed, to maximize health gains.⁷³

Local communities and indigenous peoples

Land loss, marginalization, and systematic discrimination have often exacerbated the loss of livelihoods, identities, and cultures of many local communities, especially of indigenous peoples, forcing many of them into poverty. The 2011 Report of the Special Rapporteur on the rights of indigenous peoples concludes that activities in the extractive industry, in particular mining, oil, and gas, as well as logging projects, have long constituted 'the most pervasive source of the challenges to the full exercise of [indigenous peoples'] rights.' To be just and inclusive, the energy transitions must fully identify and address potential trade-offs and take care to advance the rights of local communities and indigenous people rather than compromise them. In the framework of a just and inclusive energy transition, ensuring the sustainability of the clean energy value chain will be essential from production to use. Special attention must be given to minimizing potential conflicts of use, such as those between energy production (e.g., ground-mounted solar parks, bioenergy, big hydro power plants) and arable land for agriculture. Ensuring sustainable energy production will mean avoiding conflicts with food production and food security, as well as ensuring the safe management of agricultural land and natural resources. Ultimately such actions, paired with a participatory planning process that ensures the voice of the affected populations in decision-making, will help protect the health, livelihoods, and environment of local populations and vulnerable communities.

Gender equality

Women living in poor communities will be greatly impacted by the energy transition. Currently, female-headed households are less likely than male-headed ones to have access to electricity, whether portable solar, mini-grid, or grid electricity. Women, who are typically the main procurers of energy in the home, are often excluded from taking part in selection of the stoves and fuels used for cooking. Moreover, globally, women hold just 6% of ministerial⁷⁴ positions on national energy policies and programmes, making them under-represented in, or even absent from, decision-making processes. With challenges ranging from insufficient training opportunities, bias in career choices, as well as cultural norms and perceptions, the barriers for women's active participation in the energy value chain are often insurmountable, particularly for those rural women working in the informal sector. A just and inclusive transition must provide an opportunity to reverse this trend and enable gender parity in the sector. By nature, a just and inclusive transition should enable and even encourage stronger engagement of women in the energy workforce by promoting and supporting women's roles as engineers, policymakers, and entrepreneurs.

Impacts on the planet**Water**

Transformations towards clean energy can have major implications not only for freshwater demand but also for water pollution. The scaling up of clean energy through renewables and energy-efficiency would, in most instances, reduce water demand for thermal energy-supply facilities compared to fossil energy technologies, and thus reinforce targets related to water access and scarcity. However, some clean energy options such as bioenergy and hydropower technologies could, if not managed properly, have counteracting effects that would compound existing water-related problems. The demand for bioenergy can result in a substantial increase in water demand for irrigation, thereby potentially contributing to water scarcity in water-stressed regions, unless risk-mitigation measures such as rain-fed production of bioenergy, are put in place.

Food systems

Food systems are energy-intensive, currently consuming as much as 30% of the world's available energy; they are also heavily dependent on fossil fuels, accounting for around 34% of the world's total GHG emissions.⁷⁵ The expanded use of feedstocks and arable land to produce these biofuels can conflict with food production, raising concerns for food security and affordability. Ensuring the sustainability of energy production and reducing energy demand through higher energy efficiency, without compromising the needs of the poor, emerges as a robust strategy for water conservation and GHG emission reductions. It underscores the importance of an integrated approach when developing food, energy and water, and climate policy. Likewise, the adoption of clean efficient cooking and improved food conservation through adequate cold chains can help minimize the energy demand of food production, improve safety, encourage more varied diets, save time, and ultimately improve health and well-being, particularly among women and girls.

Ecological footprint

As energy demand continues to grow to support an increasing global population, its environmental footprint will grow substantially. The expansion of industrialized agriculture, which is energy-intensive, has brought with it a myriad of social and environmental problems, including systematic deforestation and biodiversity loss, contamination of groundwater, and large-scale waste production. In the context of the energy transition pathways, battery systems and some technologies, such as photovoltaic, provide cleaner energy than fossil fuels, but they may also rely on raw material inputs that need to be mined and will inevitably start producing significant amounts of waste, as equipment ages. These aspects need to be taken into account and managed properly to ensure a sustainable transition that protects environment, health, and safety.

The energy transition in electricity, heating and cooling, and transport will not accelerate by itself. This requires systematic change to current policies, institutions, and societal systems using an intergenerational approach. While well-designed energy transitions can maximize benefits and minimize negative impacts, this process is not automatic and will require direct engagement and concerted action from a variety of stakeholders. A number of barriers need to be overcome, including political, regulatory, and financial aspects, market design, and people's behaviour. Dealing with such complex interlinkages between the various dimensions that cross-cut energy, climate action, and the SDGs also poses a significant challenge for planners and decision-makers now and in the future. In addition to deliberate actions in the energy sector, concerted efforts are required in other sectors to truly harness such opportunities. Such systemic, cross-cutting challenges are presented below, grouped around five areas of leverage that are linked closely with means of implementation:

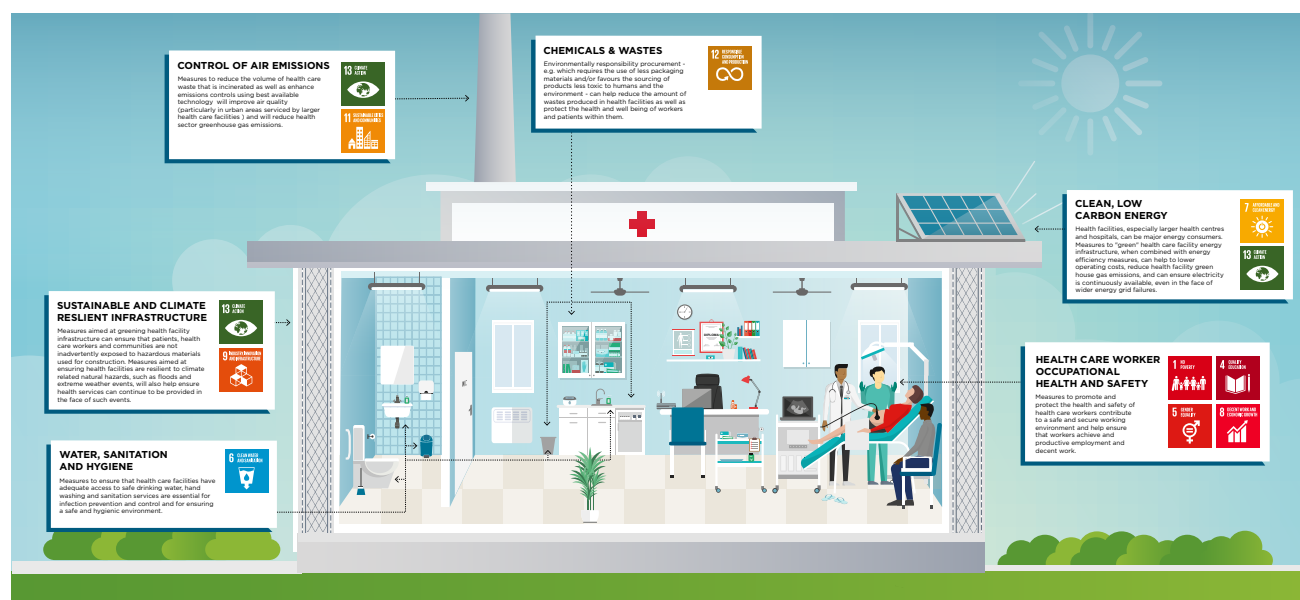
- **Governance:** A just and inclusive energy transformation is a participatory process that requires long- and medium-term planning and well-designed policies and regulations, that engage all impacted stakeholders. Energy policies that include clear evidence-based standards or targets are critical, as they help increase security for investors, reduce system costs, and make clean energy more affordable. Poor regulation and uncertainty about future legislation are all contributing factors to routine market failure for better, cleaner energy technologies, even where these would entail substantial value for consumers and for societies as a whole. Siloed decision-making in sectoral areas, including energy, has failed to address both the synergies and negative impacts involved in more sustainable long-term planning. The continued lack of meaningful inclusion and diversity in political and economic processes, especially of women, youth, and indigenous peoples, remains one of the most fundamental barriers to progress

BOX 3. ENERGY AND PEOPLE: A CLOSER LOOK AT SUSTAINABLE ENERGY AS AN ENABLER FOR THE DELIVERY OF ESSENTIAL HEALTH SERVICES AND BEYOND.

Ensuring sustainable energy in health facilities can improve health care delivery and more (Figure 2). Energy is needed for powering medical devices used in disease diagnosis, surveillance, prevention, control, and case management. It is needed to operate critical medical devices, such as vaccine refrigerators, oxygen concentrators, foetal heart monitors, basic surgical and diagnostic equipment, as well as for lighting, clean water, and communications. In addition to improvements in the quality of health care delivery, sustainable energy in health facilities improves working conditions and supports continued education for health care workers, improves safety and hygiene for patients and staff, and improves accessibility to medical services for the local community through its ability to prolong operating hours. In the face of climate change, improvements in the energy efficiency of medical devices and in the greater reliance on decentralized renewable energy; they will increase the resilience of health care facilities against natural disasters, while at the same time reducing the energy demand and emissions of the health sector, an important source of GHG emissions.

The COVID-19 crisis has shown that sustainable energy, appropriate building design, and efficient medical equipment are some of the critical components for delivering emergency services during pandemics. The SELCO foundation is a non-profit organization working in India to provide sustainable energy solutions to under-served communities. In response to the COVID-19 pandemic, SELCO has deployed low-cost, solar-powered, energy-efficient solutions across the disease treatment pathway to support the poor communities of India. Selco's interventions have provided access to electricity to remote health-care facilities through off-grid solar systems able to power critical medical devices such as oxygen concentrators. Selco has also used solar energy to power mobile solutions, including mobile COVID-19 testing facilities and swab collection units.

FIGURE 2. SUSTAINABLE ENERGY FOR HEALTH CARE DELIVERY AND MORE



Source: SELCO

in sustainable development. Government action on fair, transparent land titling, including in reference to women, and to the collective titles of indigenous peoples, is a critical prerequisite if energy-associated infrastructure development is to result in truly fair and inclusive development. Similarly, development preferences are often shaped by powerful interests that determine the direction of change, anticipated benefits, and what trade-offs are acceptable and unacceptable. Addressing the uneven distribution of voice and power is also critical to the success of societal transformation via a just and inclusive energy transition.

- **Capacity-building, education, and knowledge:** Maximizing the co-benefits of sustainable energy transitions will require a strengthened capacity to innovate, absorb, and deploy new policies, incentives, technologies, and business models, supported by capable policymakers, businesses, and civil society. The existing gaps must be addressed by building the capacity and capabilities of governmental institutions to plan, implement, monitor, and account for action effectively. Strengthened capacity to collect, manage, and share data is essential. Local institutional capacities need to be strengthened. Insufficient awareness and the absence of coherent communication between government entities and key stakeholders further constrains policy effectiveness. Large gaps exist in the knowledge and capacity to coordinate multi-sectoral barriers. Basic education, skills development, and tertiary education need retooling to build foundational knowledge, workforce training, and expand research and innovation with respect to how the energy transitions can benefit sustainable development. Vocational training on technical services, installation, and O&M is essential for long-term sustainability of systems that simultaneously create livelihood opportunities for youth and local communities through skills development in repair and maintenance. Reskilling of workers to facilitate their transition from the fossil fuel sector to other employment will also be essential. Incorporation of energy knowledge into school curricula can begin to build the necessary technical skill base, changing the attitudes of, and empowering our youth to be advocates for, and agents of change in the low-carbon transition.
- **Finance and investment:** Strategic investments in the energy transitions by the public and private sectors, combined with smart policies, can dramatically shape the energy landscape to advance sustainable development, but only if they are explicitly aligned to the SDGs and the Paris Agreement. Energy transition investment plans can lead to action only when national and local governments, leaders in business and finance, civil society organisations, and the international community take concerted steps to enable the flow of private capital. National governments must provide a stable policy framework to de-risk investment, encourage transparency, facilitate the seamless flow of private capital into energy transition investments, and shape markets with incentives, standards, labels, and other regulatory measures, whilst also ensuring that such actions align with local needs. Donor governments and multilateral institutions need to mobilize resources, provide technical assistance, engage in knowledge- and capacity-building, share best implementation practices, and make direct financial investments. Private-sector entities must step up to invest throughout their value chain, demanding innovation from their suppliers. Multilateral institutions and international banks could also offer financial guarantees for private investors keen to engage in sustainable energy projects in countries with a high risk of default and those most vulnerable to climate change. Civil society organizations can encourage greater transparency among businesses and governments regarding energy use, procurement policies, or regulations.

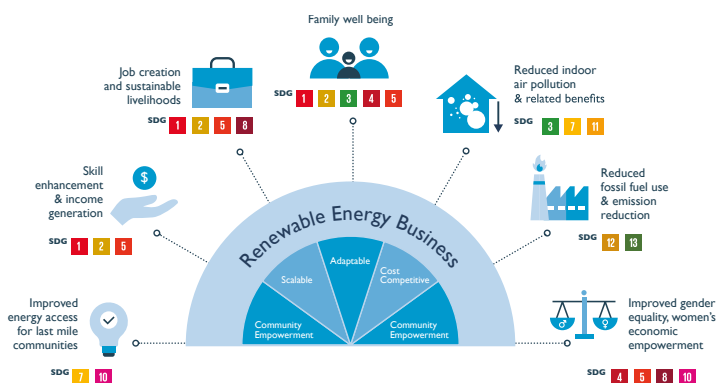
BOX 4. ENERGY FOR PROSPERITY—RENEWABLE ENERGY, GENDER EQUALITY, AND EDUCATION.

The renewable energy sector shows a better gender balance (32% women) than fossil fuels (22%); however, more needs to be done to ensure gender equality, including in senior positions. Women’s participation in science, technology, engineering, and mathematics (STEM) jobs is far lower than in administrative jobs (28% versus 45%)¹. To satisfy its growing skills needs, the renewable energy sector will have to engage and retain more women from a young age. In this framework, it is essential for adequate education, training, and mentorship opportunities to be available to them.

Sector-wide, renewables present plenty of opportunities for women’s engagement along multiple segments of the value chain, including women’s entrepreneurship (see figure 3 below). Decentralized renewables for energy-access systems, for example, provide the opportunity to increase socio-economic development in poor communities and increase the resilience of farmers, including women. Solar-powered pumps are being utilized to provide water for irrigation, improving crop yields and food security for women farmers. Solar dryers, micro-hydro grain mills, solar grinders, and solar refrigeration systems are being used for agro-processing, storage, and adding value to products, while reducing the labour and time spent by women, for example in manual processing and water collection. To tap into the multiple opportunities provided by renewable energy, it is essential to support women as vital agents of change and to empower them with the necessary skills and instruments.

An example of the initiatives created to support the empowerment of women is REGEND, a regional initiative designed and implemented based on an integrated approach to improving access to reliable, affordable, and modern sources of energy and to significantly improve the quality of life of rural communities of the Arab region. REGEND focuses on three main pillars of interventions: field projects, capacity building, and policy development. Small-scale renewable energy systems, along with productive equipment, were donated to rural beneficiaries, combined with capacity-building programmes to cover a wide variety of topics, including agricultural management, food processing and marketing, small-scale renewable energy technologies, and the water–energy–food (WEF) nexus. The initiative targeted women entrepreneurs especially, and their capacity to play a greater role in their respective national economies by promoting pro-poor investments in renewable energy applications focusing on water, energy, and food security in an environmentally adequate and affordable manner. Policy formulation initiatives, directed at policymakers, focused on developing and recommending integrated policy regulatory reforms and the financial and legal frameworks needed to promote small-scale renewable energy. With a focus on regional learning and fostering communication among all the involved stakeholders, REGEND aimed to promote know-how rather than to be the classical handout model. It demonstrates how SDG 7 contributes to achieving several SDGs, namely SDG 1, SDG 2, SDG3, SDG 5, SDG 6, SDG 8, SDG 10, SDG12, and SDG 13.¹

FIGURE 3. THE BENEFITS IN INVESTING IN WOMEN’S RENEWABLE ENERGY BUSINESSES



Source: Author adapted from <https://www.unep.org/resources/report/powering-equality-womens-entrepreneurship-transforming-asias-energy-sector>

- **Innovation and technologies:** The energy transitions will produce development benefits and substantially cut emissions only if there is a significant and concerted global push to accelerate innovation. There is a disconnect between the climate goals and the efforts under way to develop better and cheaper technologies to realize those goals. Many technologies already exist for increasing energy access and moving to sustainable pathways, and those technologies are increasingly affordable. However, further action is required to scale up the implementation and reduce costs through innovation and economies of scale, so that development benefits are widely shared and leave no one behind.

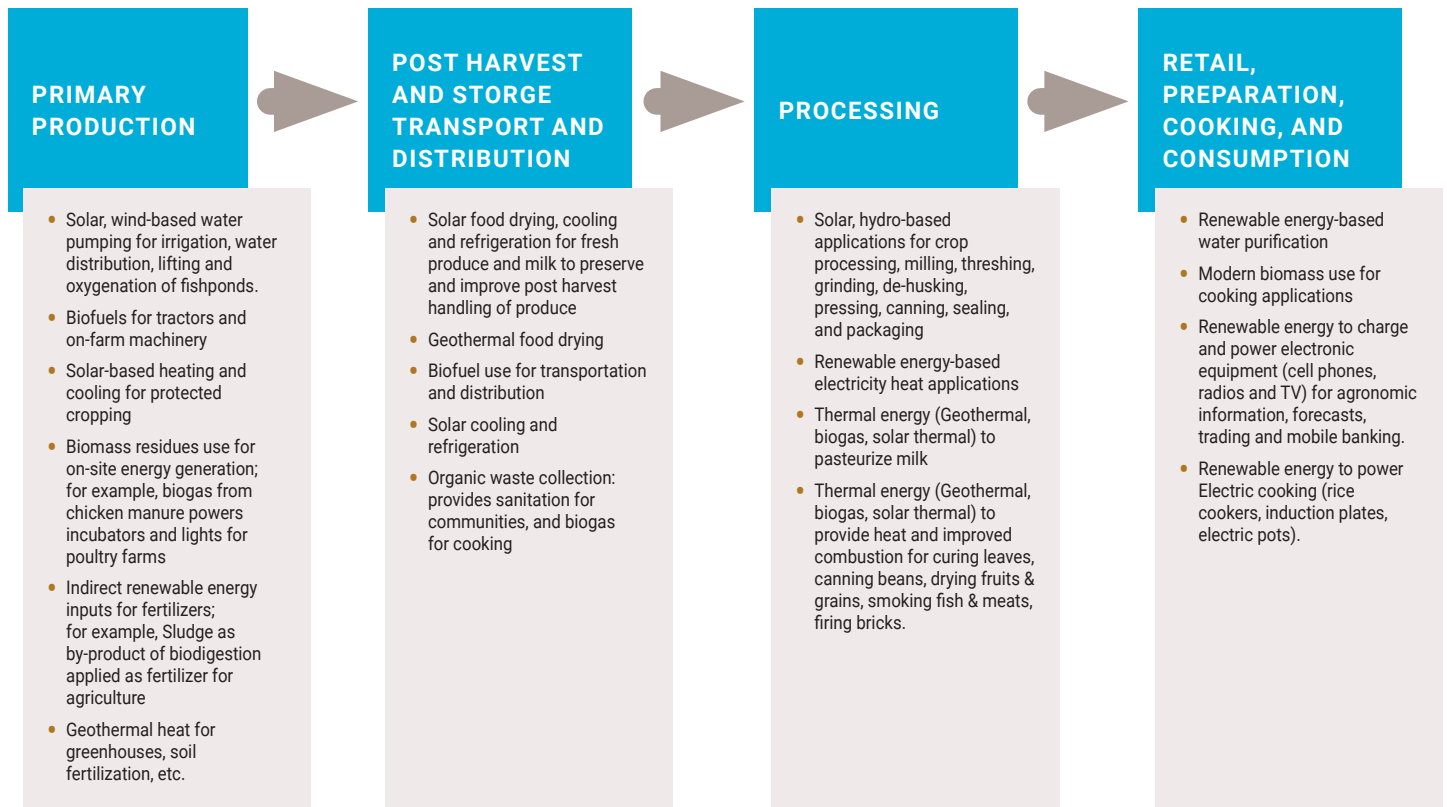
Energy-efficiency measures are very effective ways of reducing energy demand and tackling air pollution, which leads to health benefits. Over the last decades, we have witnessed tremendous innovation in renewables and energy-efficiency solutions. There is, however, still much to be done. The level of research and development that will be needed demand a step change in both the speed at which innovation occurs and the scale at which new technologies are deployed. Such progress must be achieved in a way that makes our energy systems more secure, affordable, and resilient for all, consistent with the objectives of the 2030 Agenda for Sustainable Development. The energy innovation challenge facing the world requires a rapid evolution of the technology mix, particularly in some emerging economies and developing countries that are just starting out on their decarbonization journeys. Serious research and development needs to be invested to support key technologies that demonstrate high impacts on the SDGs.

- **Partnership, cooperation, and collective action:** The 2030 Agenda and the Paris Agreement demand transformational shifts in how we think, plan, and integrate energy into development priorities for those living outside the energy sector. As the SDGs span numerous sectors and distant places, sustained, systemic change in the global energy system cannot be achieved through a single-sector and single-goal approach. It requires common or integrated goals and partnerships to be built by engaging all relevant stakeholders and calling for collective action at the local, national, regional, and global level. A just and inclusive energy transition demands that old partnerships be strengthened and new multi-stakeholder partnerships built to encourage active participation and engagement among all relevant stakeholders in the planning and implementation of the energy-transitions strategies including government, the private sector, civil society, and affected populations. Partnerships are also needed to facilitate community engagement, promoting individual behaviour change in the local context. Such integration is more complex than traditional siloed approaches. Thus, effective monitoring of cross-sectoral partnerships is also critical to ensure that impacts on the SDGs and the pathways to net-zero emissions are both transparent and accountable. Strengthening cooperation at the regional and sub-regional levels is critical to addressing challenges unique to particular areas or communities in the most effective manner possible.

BOX 5. ENERGY AND PLANET: THE FOOD, WATER AND ENERGY SYSTEMS NEED TO BE TRANSFORMED TO MEET GROWING HUMAN NEEDS AND PROTECT OUR PLANET.

Water, energy, and food are essential for human well-being, poverty reduction, and sustainable development. Demand for freshwater, energy, and food is expected to increase significantly over the next decades under the pressure of population growth and mobility, economic development, international trade, urbanization, diversifying diets, cultural and technological changes, and climate change. By 2050, it is estimated that global demand for energy would nearly double, and water demand is set to increase by over 50%. Agriculture accounts for 70% of total global freshwater withdrawals, making it the largest user of water. Similarly, water needs for agriculture, industrial, and domestic purposes will increasingly rely on resources that are harder to reach and more energy intensive to exploit.

FIGURE 4. ROLES OF RENEWABLE ENERGY IN THE FOOD CHAIN



Sources: Author based on IRENA (2019) and SDG7 Policy Briefs by SDG7 TAG (2021)

Renewable energy can play a vital role at each stage of the food chain (Figure 4). This is particularly true for digitized modernization and mechanization, and for performing post-harvest operations (storage, processing, and transport) to improve resilience, enhance livelihoods, and reduce food loss. Lack of energy often causes cold-chain breaks in emerging economies and developing countries, which results in an estimated 20% of food loss. Under current energy systems, the energy used in food chains represents 30% of global available energy, mostly in the form of fossil fuels, which results in 20–25% GHG emissions from food systems. Given such significant interlinkages between energy and food, an inclusive and just energy transition must be designed to ensure food security and protect the most vulnerable.

6

RECOMMENDATIONS

RECOMMENDATION 1

Every country and region should integrate achievement of the SDGs as a guiding framework into the planning and implementation of their own transition towards clean and sustainable energy. Sustainable energy transitions, involving the electricity, heating/cooling, and transport sectors, can dramatically accelerate the development and the achievement of the SDGs, but only if they are designed to be fully just and inclusive. An integrated, participatory, and inclusive approach should be mainstreamed into policy and programmatic decision-making for energy and climate, including ambitious Nationally Determined Contributions (NDCs) and longer-term strategies under the Paris Agreement. This will ensure that the benefits of the clean energy transition are shared, that no one is left behind, and that the protection of people, the achievement of prosperity, and the preservation of the planet remain at the core of the energy transition.

RECOMMENDATION 2

Implement a sustainable energy transition strategy with social equity and inclusiveness at its centre to enable the SDGs. Energy transitions will have a disproportionate influence on the achievement of the SDGs, with greater progress potentially being made on some targets than on others, unless specific measures are otherwise implemented. Policymakers can and should explicitly prioritize the needs of the vulnerable through the energy transition by:

- i. Empowering people by ensuring gender equality in its multiple dimensions; enhancing win–win outcomes for health and education, putting the needs of children, youth, local communities and other vulnerable populations first, including safeguarding and protecting the rights of indigenous peoples and addressing the essential energy needs of displaced people and affected communities.
- ii. Protecting the planet by ensuring a pathway to net-zero emissions and the sustainable use of finite resources, such as water, food, and ecological systems; also ensuring biodiversity, high levels of air and water quality and sustainable life on land, below water, and in cities.

- iii. Enhancing prosperity and reducing inequality by empowering populations through modern energy access; creating new jobs and employment opportunities; implementing the framework of a circular economy and promoting diversification within it; increasing the role of the private sector and entrepreneurship development; ensuring sustainability and affordability; and building capacity to reap the full benefits of digitalization while maximizing human potential.

RECOMMENDATION 3

Integrate access to affordable, reliable, sustainable, and modern energy, including access to electricity and clean cooking, as the central pillar of inclusive, just, energy-transition strategies.

Billions of people around the world still lack basic access to electricity and clean cooking, which negatively impacts their health, well-being, livelihoods, and local environment. Ensuring access to clean, modern, and sustainable energy solutions for those currently left behind is the most fundamental element of a just and inclusive energy transition. In such a framework, access to energy needs to be accelerated to the essential services, in particular, to the hundreds of thousands of healthcare facilities that still lack energy access. This will enable basic and life-saving health services for everyone, both in response to the COVID-19 pandemic and beyond. Energy access should be a priority of all energy transition pathways to maximize the co-benefits for the SDGs and the climate goals.

RECOMMENDATION 4

Accelerate the integration of gender equity into energy transition. Gender-transformative approaches should be integrated into all energy transition plans to close gender gaps and empower women by, among other things, ensuring gender parity in the employment, policy-, and decision-making process. Investing in the economic empowerment of women to realize women's rights and gender equality must be a major priority in all energy-transition strategies: this will include enhancing the education of women and their ability to actively and effectively participate in existing markets, gain access to decent work, and enable meaningful participation for them in economic decision-making at all levels.

RECOMMENDATION 5

Enable transformational change by promoting systemic approaches in the energy transition to achieving the SDGs and the climate goals, while ensuring energy security. Pursuing a just and inclusive energy transition offers an important opportunity to catalyse structural transformations in the energy and relevant sectors—to increase positive synergies and reduce trade-offs across the SDGs, while meeting the 1.5°C objective set out by the Paris Agreement. Harnessing such an opportunity requires integrated approaches tailored to specific country conditions and supported, among others, by:

- i. Long-term vision, integrated planning, and cross-sectoral coordination.
- ii. Participatory and inclusive governance mechanisms.

- iii. Education, training, and capacity-building, promotion of consumer and behavioural change, sharing of knowledge, data, and information, and identification and promotion of skills in the energy and other sectors, particularly in relation to the impacts of energy on a range of SDGs.
- iv. Innovation and technology, supported by adequate research and development policies.
- v. Finance and investment aligned with local needs, including tailored mechanisms to facilitate access (i) to affordable and synergistic finance and support instruments to enhance progress towards achieving multiple SDGs at the same time, and (ii) to increased investment in infrastructure. Additional or specialized support may be required for developing countries, in particular, least-developed countries, small island developing states (SIDS), and countries in conflict and/or in the process of disaster reconstruction.

RECOMMENDATION 6

Track progress and integrate an *Energy for SDG Impact Framework* into energy transition strategies.

Such a framework should include a set of targets and indicators tailored to specific circumstances and conditions, and help design, implement, and monitor a just, inclusive energy transition as an enabler of the SDGs. The framework should present the disparities faced by different sectors of the population (women, children and youth, indigenous, urban/rural). Data access, collection, analysis (disaggregated by gender, age, ethnicity, disability, etc.) as well as communications will be essential. A crucial role will also be played by transparency, accountability, and good governance.

RECOMMENDATION 7

Strengthen multi-stakeholder partnerships to leverage the transformational potential of energy for enabling the SDGs. Such partnerships should encourage action at the global, regional, national, and local level, and also facilitate coordination among a variety of stakeholders, including governments, financial institutions, businesses, and civil society, as well as impacted and vulnerable communities. The partnerships should facilitate resource mobilization and be designed to support the planning, implementation, and monitoring of just and inclusive energy transitions, guided by the principles of equity, respect, and realization of human rights; they should also be a focus for the voices of the impacted communities and stakeholders. A coalition of partnerships like this will play a valuable role in strengthening knowledge-sharing, facilitating the identification of risks and opportunities for all impacted stakeholders, and targeting advocacy and collective action in the energy and other sectors.

RECOMMENDATION 8

Ensure that the energy transition is sustainably designed and implemented to enhance synergies and reduce trade-offs with other SDGs. In this context, it is essential to design, enforce, and monitor adequate sustainability standards to avoid potential conflicts between energy services and other developmental targets. For example, the expanded use of feedstocks and arable land to produce bioenergy can indeed conflict with food production and affordability.⁷⁶ It is thus important to put in place measures to avoid negative impacts on food security and to protect the local resources on which local populations and vulnerable communities depend. Ensuring that appropriate environment and waste management are integrated into the energy transition is also essential; this includes electronic waste related to disposal of power generation and storage systems.

7 IMPACTS: PRIORITIZING ACTIONS FOR ENABLING JUST AND INCLUSIVE ENERGY TRANSITIONS

The recommendations given in this report, including in the priority action matrix (Table 2) provide a set of guiding principles as to how best to plan and implement an energy transition that is just and inclusive, while also suggesting how to ensure that the transition serves as a critical enabler for achieving the SDGs and the Paris Agreement and put us on a pathway to net-zero emissions. The recommendations highlight the importance of a participatory approach, engaging all relevant stakeholders, particularly the more vulnerable populations and sectors within them, like women. They emphasize the need for integrated planning and for monitoring paired with adequate finance that is tailored to local needs to maximize the benefits and minimize the trade-offs of the energy transition, while ensuring its sustainability. Moreover, they recognize the role that multi-stakeholder partnerships can and should play in coordinating and supporting collective action among different stakeholders and institutions.

In the near term towards 2025, all countries should urgently integrate the SDGs as a guiding framework for their energy transition pathways through policy and planning (such as sustainable energy policies, Nationally Determined Contributions etc). This should be accompanied by the implementation of inclusive monitoring frameworks, including appropriate indicators such as those presented in the Energy for SDG Impact Framework.

Towards 2030, implementation of an energy transition strategy with a focus on equity and inclusiveness will need to be strengthened to help enable the SDGs. A regular stock-taking at the national level will be important to assess the impacts of implementation on the SDGs. Systemic barriers will need to be addressed to bring about coherent, integrated planning, and implementation.

Toward 2050, implementation will need to be further accelerated to transform our economies and societies with the clear goal of achieving net-zero emissions by 2050, while leaving no one behind. This will involve creating jobs, diversifying the economy, ensuring human well-being, and empowering women, local communities, and vulnerable groups including indigenous peoples.

By nature, each of the recommendations should be applied throughout all steps of the energy transition. Depending, however, on the local context, and at what stage a country has reached in its energy transition, some recommendations may be more relevant than others and prioritized accordingly. For example, a country just embarking on energy transition and where a significant part of the population still lacks energy access needs to prioritize the implementation of the first two recommendations, as they lay the foundation for a truly just and inclusive transition. Another country more advanced in its transition will likely need be more reflective about its progress to date and will thus be looking to identify opportunities to improve or strengthen its transition to be more just and inclusive: here, recommendations 3 through 8 are a more appropriate focus for their actions.

In all cases, countries will need to design and implement their energy transitions to suit their local needs and context, prioritizing actions that benefit the people, whilst supporting local economies and protecting the environment.

8

APPENDIX: RECOMMENDED READING

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