



B20 INDIA 2023

R.A.I.S.E.

Responsible
Accelerated
Innovative
Sustainable
Equitable

TASK FORCE ON

Energy, Climate Change & Resource Efficiency

Policy Paper

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**Energy, Climate Change &
Resource Efficiency**

Policy Paper

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Foreword: Chair of the Task Force



Sajjan Jindal

Chair, B20 India Task Force on Energy Climate Change and Resource Efficiency, Chairman, JSW Group

In the midst of an unparalleled global energy crisis, we are facing complex geopolitical challenges stemming from the aftermath of the pandemic. This convergence has disrupted supply chains, resulted in energy shortages and led to soaring prices that impact the entire world. Consequently, the commitments made by countries under the Paris Agreement, aiming to limit global warming to well below 2°C, preferably 1.5°C compared to pre-industrial levels, are on the verge of compromise.

The urgency to address the escalating greenhouse gas (GHG) emissions has reached a critical level as nations witness the intensifying impacts of climate change. The need to accelerate decarbonisation and adaptation has never been stronger. Within this context, carbon markets emerge as a crucial mechanism to alleviate the financial burden of transitioning from fossil fuels to a sustainable economic model.

Aligned with the commanding theme embodied by B20 India, R.A.I.S.E—Responsible, Accelerated, Innovative, Sustainable and Equitable businesses—B20 India strives to empower business leaders to embrace practices that are responsible, expedited, innovative, sustainable and equitable.

Consistent with the B20 theme, we have identified key areas requiring urgent action to ensure an accelerated yet fair and equitable transition. These areas encompass global cooperation, finance, resource efficiency and just transition.

One of the primary focuses of this year's discussions has been the imperative to decarbonise the Hard-to-Abate (HTA) sector globally and within individual nations. The urgency to decarbonise this sector arises from its significant contribution



to greenhouse gas emissions. By adopting cleaner technologies and practices in sectors such as power, transport, steel, cement and chemicals, we can make substantial progress in reducing global emissions.

Moreover, it is crucial to ensure that clean energy technology and climate finance benefits are accessible to the Global South. As these regions are projected to experience substantial economic growth, the current lack of sufficient access to technology and finance could lead to a surge in emissions. Hence, facilitating technology transfer and providing financial support to the Global South becomes imperative to enable them to achieve sustainable economic growth whilst minimising their carbon footprint.

Finance, in particular, plays a pivotal role in achieving net-zero emissions, and carbon markets may prove indispensable in mobilising resources for sustainable initiatives. The overall quantum of global climate finance needs to increase exponentially so that countries and companies can receive essential support to implement their energy transition plans in a more cost-effective manner. There also needs to be a systemic change in the operations of Multilateral Development Banks (MDBs) and Development Financial Institutions (DFIs) regarding climate finance. Governments and MDBs must intensify their efforts to co-invest with the private sector, enabling them to contribute more to global climate finance flows.

Green energy technologies today are in a nascent stage, but as they evolve and become more scalable, we can expect a major cost reduction. Let us take solar and wind power generation as an example. Renewable power is now way cheaper than the traditional thermal coal-generated power. The

steel industry is also working very aggressively on the development of hydrogen generation technologies that are economical and scalable. This means that producing steel will soon be much more affordable compared to using coking coal. These green energy technologies need our support only during this transitional phase.

Furthermore, a just transition is essential to ensure the well-being of individuals and communities throughout the decarbonisation process. Collaborative efforts between the public and private sectors are vital to ensure that the pursuit of net zero considers the social and economic impacts on people's lives and livelihoods. By forging partnerships and considering the diverse implications, we can navigate this transformative transition whilst safeguarding biodiversity and fostering a nature-positive, holistic approach that benefits all stakeholders.

Through concerted collaborative efforts, knowledge sharing and united collective action, this vision strives to pave the way for a future where businesses play an indispensable role in driving positive transformation, creating a world that is not only more prosperous, inclusive and sustainable but also transcends borders and enhances the well-being of humanity.



Messages from Co-Chairs



Accelerating the global transition towards net-zero emissions and the more efficient use of resources in a manner that is conducive for achieving the levels of economic growth needed to meet the aspirations of the world's growing population and with enough speed and urgency to attain our sustainable development and climate change objectives represents the single most important challenge of our era. The recommendations and policy actions brought forward by this Task Force in my opinion provide an important contribution to this effort. I am very proud to have contributed to their development.

MARC-ANDRÉ BLANCHARD

Executive Vice President & Global Head of Sustainability, CDPQ, Canada



This year B20 in India takes place at another critical time. Reaching net-zero emission target is imperative as climate change consequences have become more extreme globally. In order to succeed, all levers must be activated to make this transition a reality. We must enhance global cooperation and accelerate not only the development of renewable power but also of renewable gases. An alliance between green electrons and molecules is vital for the reliability and competitiveness of the energy system of tomorrow. Furthermore, there is an urgent need to define a mature regulatory environment with the right policies and financing models to support the clean energy transition.

JEAN-PIERRE CLAMADIEU

Chair, ENGIE, France





The world wants and needs a better and more balanced energy system that delivers secure, affordable and lower-carbon energy. To solve this energy trilemma, we need to invest into the energy transition, growing lower carbon solutions. But we also need to invest in today's energy system—which is predominantly an oil and gas system—to keep affordable energy flowing where and when it's needed.

WILLIAM LIN

Executive Vice President, Regions, Corporate and Solutions, BP, UK



Despite its low per capita carbon emissions, Indian industry is actively addressing Climate Change, Energy Transition and Resource Efficiency, aligning with Prime Minister Narendra Modi's vision of "One Earth. One Family. One Future". The urgent need for a global shift to sustainable energy sources is clear as we grapple with climate change. The B20 task force's "call to action" recommendations, if adopted by the influential G20 nations, can drive significant change, accelerating energy transition and fostering global cooperation. This collective effort, focused on phasing out fossil fuels and enhancing cooperation in financing, technology and regulations, is crucial to limit temperature rise to 1.5 degree C.

VINEET MITTAL

Chairperson, AVAADA Group, India



In the era of the energy transition, it is imperative that we acknowledge the diverse challenges and opportunities that different regions and industries face. It is part of Raízen's strategy to develop multiple and tailored decarbonisation solutions that address the unique needs of our society. By working together, business communities and government institutions, we can accelerate the shift towards a sustainable and low-carbon future.

RICARDO MUSSA

CEO, Raízen, Brazil





The world is transitioning towards more a sustainable model of development after experiencing significant environmental, economic, social and health implications of the current growth paradigm. Energy forms the foundation of this transition as it is intertwined with economic progress, social upliftment and environmental sustainability. Clean, affordable and low-carbon energy alternatives are the need of the hour for mitigating risks associated with climate change.

TV NARENDRAN

CEO & Managing Director, Tata Steel, India



Never before has the world found itself facing global challenges of which energy is the epicentre and intrinsically the solution. From climate change to sustainable development and international relations, energy transition and resource management must be the backbone of a multilateralism that brings a new efficient and effective cooperation between states and the private sector globally.

PAOLO SCARONI

Chairman, ENEL, Italy



Energy, Climate Change and Resource Efficiency are not just environmental issues, but critical economic and social challenges. They affect everything from societal health to the vibrancy of our economies and the sustainability of industries. The world is in the midst of an energy transition, moving away from carbon-based fuels towards more sustainable sources. Climate change demands urgent action, and efficient resource use is crucial for waste reduction and conservation. These challenges require global collaboration, innovation and a shift towards sustainability in every aspect of our lives, from restructuring supply chains to embracing new technologies.

CHRISTIAN CAHN VON SEELEN

Executive Director, VW Group India





The increasing risk of global warming and climate change encourages all of us to increase our climate resilience and balance the way we consume and produce energy for economic growth and its environmental impact for sustainability. The vision to reach net-zero emissions will require collaborative actions between the Global North and South countries. A strong joint effort in technology development is a key enabling factor for affordable green technology.

NICKE WIDYAWATI

President Director & CEO, PT
Pertamina(Persero), Indonesia



PETER LACY

Global Sustainability Services Lead & Chief Responsibility Officer,
Accenture, UK





Recommendations: Executive Summary

Recommendation 1: Enhance global cooperation in accelerating net zero transition

Policy Action 1.1: Accelerate development and commercialisation of clean energy technologies through coordinated policies and an expanded pipeline of clean energy projects.

Policy Action 1.2: Institutionalise and support industry collaborations to drive net zero transition

Policy Action 1.3: Develop clear and bold pathways to decarbonise the ecosystem and supply chains in alignment with the Paris Agreement

Recommendation 2: Enhance efforts to improve the availability and access to climate finance

Policy action 2.1: Introduce new and expanded low-cost financing options for energy transition by boosting and repurposing public finance, improving delivery channels and promoting local institutional capabilities

Policy action 2.2: Establish a clear mandate for MDBs to support energy transitions via reforming operations, governance, risk-tolerance and fund alignment to provide concessional finance to emerging countries

Policy action 2.3: Develop harmonised international carbon markets for monitoring and reporting emissions, accounting, transparency and environmental integrity

Policy action 2.4: Secure investments in emerging technologies through Public-Private Partnerships and cooperation between developed and developing nations

Recommendation 3: Ensure a just equitable and resilient transition

Policy action 3.1: Achieve a just transition and ensure affordable energy access through a balanced approach to energy transition and via diversification, reskilling and employment opportunities for all

Policy Action 3.2: Address gender equality and just transition for MSMEs dependent on larger producer companies facing phase down or transition

Policy Action 3.3: Promote nature-positive transitions through biodiversity conservation and integrating Ecosystem-based Approaches (EbA) into adaptation planning

Recommendation 4: Create enabling regulatory frameworks, policies, business, financing models and eliminating policy barriers to promoting sustainable economy and resource efficiency

Policy action 4.1: Calibrate and harmonise national and international policy frameworks to mainstream resource efficiency considerations and drive transition to a circular economy

Policy action 4.2: Mobilise and allocate finance through instruments such as taxes, subsidies and tax exemptions to support innovation and the uptake of circular business models

Policy action 4.3: Strengthen Extended Producer Responsibility (EPR) for all waste system and promote resource efficiency through Green Public Procurement (GPP)

Policy action 4.4: Mainstream informal sector within the waste management framework



Introduction

With every industrial revolution, energy consumption and its associated Green House Gas (GHG) emissions have led to a multiplier effect. The industrial revolution was triggered by easier access to fossil fuels, which was not the case in the pre-industrial era when humans were critically dependent on the annual cycle of plant photosynthesis for all types of energy needs.

'India's G20 presidency aims to bring an integrated, comprehensive and consensus-driven approach to address climate change and pursue sustainable growth'—Shri Bhupender Yadav, Union Minister, Ministry of Environment, Forests and Climate Change (MoEFCC), Government of India

The 21st century has witnessed unprecedented consumption of fossil fuels to maintain economic growth, which is unsustainable considering that global temperature may breach the 1.5°C target by 2026 (World Meteorological Organization (WMO)-2022 estimates). Therefore, countries should aim to reach the emissions plateau at the earliest whilst maintaining their economic growth using sustainable energy sources. This will also contribute to limiting extreme climate events.

Based on the 2030 Sustainable Agenda, four key challenges need to be addressed. First, countries and non-state actors must collaborate to accelerate the transition to a net-zero future. Second, the current levels of climate finance—which are inadequate—must be ratcheted up and directed towards clean technology development and implementation. Third, the transition to a low-carbon future should be just, equitable and resilient. This includes addressing the needs of citizens and MSMEs whilst considering gender inclusivity and biodiversity conservation. Finally, systems that encourage resource efficiency, sustainable consumption and integrate the principles of a circular economy should be established.

The B20 Task Force on Energy, Climate Change and Resource Efficiency believes that businesses and governments acting in lockstep can affect the fundamental shift required to achieve the transition to a low-carbon future whilst ensuring inclusivity, sustainable consumption of resources and environmental protection. Economic growth is vital for addressing global challenges such as energy security, but it can be decoupled from emissions through a sound roadmap that enables implementation of technology, access to finance and equity through collaboration with all stakeholders.

Based on the work of the previous B20 and considering changes in the global landscape pertaining to energy, climate change and resource efficiency, the Task Force has identified four key areas of action: enhancing global cooperation in accelerating net-zero transitions; enhancing efforts to improve the availability of and access to climate finance; ensuring a just, equitable and resilient transition; and creating enabling frameworks to promote a sustainable economy and resource efficiency.

First, to achieve the transition to net-zero emissions, collaborative efforts will be required to accelerate the adoption and implementation of clean technologies. A decrease in global energy investments can imperil the pace and scope of net-zero transition. Studies show that between now and 2050, significant annual energy investments are required globally in all energy sectors to meet the targets aligned with the UN Sustainable Development Goals (SDGs) and the Paris Agreement. Due to the global energy crisis, traditional dependence on coal and oil-fired generating facilities in 2021 and 2022 has increased. It is therefore essential that businesses and countries cooperate to expedite innovation and access to and deployment of clean energy and low-carbon technologies. This can be achieved by commercialising these technologies through coordinated global policies, advancing the pipeline of clean energy projects, working with industry-led



coalitions and developing sector-specific roadmaps to decarbonise the supply chain.

Second, to innovate and implement clean technologies, climate finance needs to be directed appropriately. The UNFCCC's Fifth Biennial Assessment and Overview of Climate Finance Flows clearly highlights that whilst climate finance is increasing steadily, it is nowhere near the quantum required by 2030 to limit global warming to 1.5°C. To address this challenge, it is necessary to introduce new and expanded low-cost climate financing options, mandate MDBs and DFIs to support energy transitions, develop harmonised international carbon markets and secure investments in emerging clean technologies through Public-Private Partnerships (PPPs).

Third, energy transitions enabled by low-emission and emission-neutral technologies and circular approaches to production processes and energy usage should be just, sustainable and inclusive. Whilst promoting a shift towards cleaner energy carriers and other efficient technologies can enhance the quality of life, we must be conscious that the impact of the transition on society is not disproportionate. Attention must be directed to the needs of Micro, Small and Medium Enterprises (MSMEs) and women-led businesses as we shift to a new economic paradigm.

Additionally, nature loss and biodiversity conservation should be urgently addressed. This urgency is underscored by the recent launch of the Kunming-Montreal Global Biodiversity Framework (GBF), which outlines a clear set of global targets on reversing ecosystem degradation and protecting nature and has been adopted by 190 countries. We can address these complex issues by adopting a balanced approach to transitions that considers the needs of all sections of society, mainstreaming gender inclusion and the needs of MSMEs into just transition plans and promoting a nature-positive transition through an ecosystem-based approach.

Fourth, continued economic growth has resulted in wasteful resource consumption and increased stress on natural resources. The G20 countries

account for approximately 75%¹ of global materials use; it is imperative to enhance the efficiency of resources, adopt principles of a circular economy and promote the use of secondary raw materials. The creation of enabling regulatory frameworks, policies and business and financing models and elimination of policy barriers to promoting sustainable economy and resource efficiency are critical. This can be achieved by calibrating national and international policy frameworks to mainstream resource efficiency, mobilising the necessary financial support, strengthening EPR, encouraging government-led GPP and integrating the informal sector into waste management mechanisms.

Climate change is a defining issue that requires immediate and radical action as it continues to impact current and future generations. In line with the G20 theme of 'Vasudhaiva Kutumbakam' or 'One Earth-One Family-One Future', collective action by the G20 nations can catalyse climate action to effectively mitigate GHG emissions and scale such efforts by repurposing public finance and ensuring cross-border cooperation, effective and clear policy support for technology development, resource efficiency, biodiversity conservation and a secured future for their citizens.

Collaborations between developed and developing nations can help the Global South address their challenge in balancing growing economies with green growth, thereby leading to a safe and sustainable future for the world.

1 OECD (2021), Towards a More Resource-Efficient and Circular Economy: The Role of the G20, OECD, Paris, <https://www.oecd.org/env/waste/OECD-G20-Towards-a-more-Resource-Efficient-and-Circular-Economy.pdf>



Recommendation 1

Enhance global cooperation in accelerating net zero transition

CONTEXT

At its core, solving the climate challenge involves moving towards clean energy. Attaining net zero emissions will require a fundamental transformation of how power is produced and supplied daily and will have major implications for the global economy. This transformation will entail accelerating the shift to clean sources of energy, such as wind and solar; increasing energy efficiency; electrifying transport, industry and buildings; expanding the use of clean hydrogen and other low-emission fuels; and investing in emission abating technologies, including negative emission technologies.

Governments are aware of the change required and have funded approximately USD 1.34 trillion towards clean energy since the pandemic¹. As per the International Energy Agency (IEA), despite the increased funding in clean energy, the addition of renewable energy capacity, expansion of clean energy supply chains, increased public funding in clean energy Research and Development (R&D), growth of electric mobility through Electric Vehicles (EVs) and expansion of low-energy hydrogen projects pipeline—countries are still not on track to achieve the goal of restricting the rise in temperature to 1.5°C.

Geopolitical challenges have also resulted in an energy crisis with energy markets being particularly volatile. Emerging and developing economies are investing more in fossil fuels as they seek to ensure energy security for their populations. The quantum

of investments required in clean energy by 2030 is in the range of USD 2–4 trillion based on IEA's estimates².

Public finances are insufficient to fund these investments, and there is a clear need to work with the private sector on mobilising funds. Countries will have to collaborate on accelerating the development and commercialisation of clean energy technologies at the global level, institutionalise collaborations with industry on sector-specific challenges and develop clear pathways to decarbonise the ecosystem and supply chains.

Policy Action 1.1: Accelerate development and commercialisation of clean energy technologies through coordinated policies and an expanded pipeline of clean energy projects.

- Learning from the success of solar and wind technologies, which was enabled via coordinated policy actions, countries should explore the adoption of similar interventions for the promotion of other clean energy technologies
- Strengthen grids and their integration with renewables and explore opportunities for cross-border and regional power connections
- Encourage adoption and provide R&D support for biofuels and biogas
- Support the development of a global hydrogen economy and establish standards

¹ IEA (n.d.), Global Energy Transitions Stocktake, IEA, Paris, <https://www.iea.org/topics/global-energy-transitions-stocktake>

² IEA (2022), World Energy Outlook 2022, IEA, Paris, <https://www.iea.org/reports/world-energy-outlook-2022/executive-summary>



Leading Monitoring KPIs

Monitoring KPI	Baseline	Target	Sources
Global RE penetration	3,064 GW [2021]	Triple Renewable Energy Capacity by 2030 over 2021 base. [2030]	United Nations (2021), High-level Dialogue on Energy by the United Nations Secretary-General, September 2021
Energy efficiency improvement	5.6 megajoules (MJ) per USD [2010]	3.4 MJ per USD [2030]	SDG 7.3, 2022, and SEforALL
Green hydrogen cost reduction	> USD 3.00/kg in most parts of the world [2023]	< USD 1.50/kg [2030]	IEA (2019), The Future of Hydrogen
Green hydrogen offtake targets	-	20 MMTPA by 2030	IEA (2022), Global Hydrogen Review.
Increased CO2 mitigation by CCUS	50 MtCO2 per year [2023]	300 MtCO2 per year [2030]	IEA (2020), CCUS in Clean Energy Transitions
Increase the use of biofuels and biogas	146 billion litres/year [2020]	350 billion litres/year [2026]	IEA (2021), Renewables 2021
Global EV sales	14% [2022]	30% [2030]	IEA (2023) Global EV Outlook
Government supported Industry-led coalitions featuring prominent Global South representation	-	Three global coalitions on Hydrogen, CCUS and Battery Storage by 2025	Task Force Recommendation
Development of sector-specific pathways	-	All G20 countries to develop sector-specific decarbonisation pathways for 'hard-to-abate' sectors by 2030	Task Force Recommendation

- Enable R&D and investments into emerging technologies such as Carbon Capture Utilisation and Storage (CCUS), hydrogen and battery storage
- Coordinate government-led global efforts on research, development and demonstration of technologies.

Policy Action 1.2: Institutionalise and support industry collaborations to drive net zero transition

- Establish well-designed low-carbon hubs to create an ecosystem of financiers, start-ups, equipment manufacturers, professional service providers, suppliers and customers across sectors and segments
- Work with existing industry-led coalitions on sector-specific collaborations to ensure that larger market players having most of the market

share move in tandem to avoid competitive disadvantages

- Ensure that major industry-led initiatives and platforms feature perspectives from both governments and businesses from developing countries.

Policy Action 1.3: Develop clear and bold pathways to decarbonise the ecosystem and supply chains

- Develop sectoral decarbonisation pathways at national level that are in sync with global developments and the latest science
- Increase the scale of government-backed procurement commitments to secure their future demands.



Recommendation 1 contributes to achieving UN SDGs: 1. No Poverty, 7. Affordable & Clean Energy, 12. Responsible Consumption and Production, 13. Climate Action and 17. Partnerships for the Goals



Policy Action 1.1: Accelerate development and commercialisation of clean energy technologies through coordinated policies and expanded pipeline of clean energy projects

CONTEXT

The world is witnessing a significant energy shortage backed by strong post pandemic recovery. This has led to supply chain disruptions and high energy prices across geographies. The traditional dependence on coal and oil-fired generating facilities in 2021³ and 2022 has increased.

In regions affected by the energy supply disruptions, a higher share of renewables has led to reduced electricity tariffs⁴. This can trigger a rapid global adoption of net-zero pathways by governments. Renewables also hold the key to electricity access for nearly 770 million⁵ inhabitants worldwide living without access to electricity.

In addition to power generation, significant investments for strengthening transmission and distribution networks, are necessary for sustainable growth, this should also offer opportunities for cross-border and regional power exchange.

The key to the sustainable growth of G20 countries will depend upon the institutionalisation

of several other enabling technologies that require policy support along with appropriate access to finance. Moreover, it is equally important to consider the simultaneous testing of new technologies across geographies and markets for faster adoption. Some promising technologies are as follows:

- Battery energy storage/battery electric storage system,
- Green hydrogen and green ammonia along with allied infrastructure for storage and transportation,
- Low-carbon hydrogen and ammonia production (to accelerate decarbonisation),
- Carbon Capture, Utilisation & Storage (CCUS)
- Modular nuclear reactors,
- Zero emission vehicles (PEV, PHEV and fuel cells)
- Biofuels (Ethanol, Sustainable Aviation fuel [SAF], biomethane and marine biofuels).

Technological advancement and cost reduction across some of these identified technologies should follow the trajectory of solar Photovoltaics (PV) and wind. Both PV and wind benefited from coordinated policy actions resulting in sustained demand for manufacturing and supply chains to achieve scale and cost reduction. Renewable Energy penetration across the globe is supported through a combination of policy actions such as the following:

- Feed-in-Tariff (FIT)
- RE capacity aggregation and reverse auction
- Net-metering (along with provision for wheeling and banking)
- Tax credits and tax holidays
- Renewable energy certificates (extending outreach without physical supply of solar energy)
- Generation Based Incentives (GBI).

3 IEA (2022), Coal-Fired Electricity, IEA, Paris, <https://www.iea.org/reports/coal-fired-electricity> ('In 2021 coal-fired power generation reached an all-time high, increasing by 8% and reversing the declining trend over the past two years. Coal served more than half of the additional power demand in 2021, growing in absolute terms faster than renewable energy for the first time since 2013'.)

4 IEA (2022), Renewable Energy Market Update - May 2022, IEA, Paris <https://www.iea.org/reports/renewable-energy-market-update-may-2022>

5 IEA (2022), SDG7: Data and Projections, IEA, Paris

Whilst there is promising early action in the field of hydrogen, significant collaborative actions are required to ensure a meaningful and time-bound transition of the user industry segments, particularly in the hard-to-abate sectors.



Over the last decade, utility scale solar PV costs have been reducing significantly, making it the cheapest source of power generation. Global and bilateral platforms, including cross-border collaborations, have advanced research, development and deployment of solar PV technology. The establishment of entities such as the International Solar Alliance (ISA), a treaty-based intergovernmental organisation that offers a geography agnostic platform to 86 member countries in an equitable manner, is another example of multilateralism to advance the deployment of commercialised technologies.

As per IEA⁶, several recent policy announcements and national level commitments are noteworthy and likely to make investors, producers, manufacturers and the connected ecosystem take a consolidated view of the global opportunities.

- **China:** 14th Five-Year Plan (June 2022) target of 33% of electricity generation from renewables by 2025 (up from approximately 29% in 2021), including an 18% target for wind and solar technologies
- **The United States:** Introduction of the Inflation Reduction Act (August 2022) to significantly expand support for renewable energy in the next 10 years through tax credits and allied measures
- **The European Union (EU):** Revised RE targets under the RED III directive to a minimum of 42.5% by 2030 and with the aim to reach 45% by 2030. The provisional agreement provides that industries would increase their use of renewable energy annually by 1.6%. They agreed that 42% of the hydrogen used in industries should come from renewable fuels of non-biological origin by 2030 and 60% by 2035
- **India:** Revised Nationally Determined Contributions, NDCs (during COP26, 2021) to 500 GW of total non-fossil generation capacity and 50% renewable electricity generation share (more than double the 22% share in 2020), as well as net-zero emissions by 2070.

Renewable energy investments in 2021 registered a growth of 6% with 295 gigawatts (GW) of capacity addition despite supply chain challenges, construction delays and higher input costs of the raw materials⁷. IEA reports that nearly 50% of the wind and solar projects up to 2025 are planned but are not supported by government-backed auctions or other incentives such as tax credits, rebates and FITs. This poses a threat in light of the declining worldwide demand brought by geopolitical factors and rising global energy prices. This also affects the growth of green hydrogen as the low renewable energy prices are key to green hydrogen production.

Decarbonisation of the power sector depends on deeper and wider penetration of solar and wind energy technologies, which are intermittent and heavily dependent on nature. Several developed countries with higher contributions from solar and wind find grid management challenging. Grid strengthening, enhanced operational processes and higher flexing of coal fired plants have been used to integrate higher proportions of renewable energy, additionally, the cost economics of Battery Electric Storage Systems and smart grids can offer solutions to the challenges posed by larger RE contributions.

CCUS can rescue HTA sectors in their decarbonisation journey by storing or utilising CO₂ produced in industries. Thus far CCUS has not been able to gain significant momentum. Annual CCUS investment has consistently accounted for less than 0.5% of global investment in clean energy and efficiency technologies⁸. A recent IEA report indicates that stronger climate targets and investment incentives are triggering CCUS into momentum. Plans for more than 30 new integrated CCUS facilities have been announced since 2017, mostly in the United States and Europe, along with few projects in Australia, China, Korea, the Middle East and New Zealand. Projects at advanced stages

7 IEA (2022), Renewable Energy Market Update - May 2022, IEA, Paris <https://www.iea.org/reports/renewable-energy-market-update-may-2022>

8 Source: IEA (2020), CCUS in Clean Energy Transitions, IEA, Paris <https://www.iea.org/reports/ccus-in-clean-energy-transitions>, License: CC BY 4.0

6 IEA (2022), Solar PV, IEA, Paris, <https://www.iea.org/reports/solar-pv>



RepowerEU plan

In May 2022, the European Commission published the RepowerEU plan, which outlined the implementation of the European hydrogen strategy. The Commission described the concept of a 'hydrogen accelerator' to scale up the deployment of renewable hydrogen, which will contribute to accelerating energy transition and decarbonizing the EU's energy system. The RepowerEU plan's ambition is to produce 10 million tons and import of an equal amount of renewable hydrogen in the EU by 2030, which is a substantial increase from the 5.6 million tons suggested in the Renewable Energy Directive of July 2021. The approach assumed by EU creates conduit for accelerated deployment of green hydrogen, ammonia and other derivatives in hard-to-abate sectors in manufacturing as well as transportation. Under the EU's Renewable Energy Directive (RED) rule on hydrogen for hourly matching, hydrogen producers are required to ensure that the electricity used for hydrogen production corresponds with the production of renewable electricity on an hourly basis.

The RepowerEU plan also commits to completing the first Important Projects of Common European Interest (IPCEIs) on hydrogen. The first IPCEI, called 'IPCEI Hy2Tech', which includes 41 projects and was approved in July 2022, aims at developing innovative technologies for the hydrogen value chain to decarbonize industrial processes and the mobility sector, with a focus on end-users.

In September 2022, the EU Commission approved 'IPCEI Hy2Use', which complements IPCEI H2Tech and supports the construction of hydrogen-related infrastructure and the development of innovative and more sustainable technologies for the integration of hydrogen into the industrial sector

of planning represent a total estimated investment of more than USD 27 billion, almost 200% of the investment in CCUS projects commissioned since 2010⁹. Hydrogen has emerged as a key piece in solving the industrial decarbonisation puzzle. Hydrogen can contribute to energy security by decreasing dependency on fossil fuels, either by replacing fossil fuels in end-use applications or by shifting fossil-based hydrogen production to renewable hydrogen. The development of an international hydrogen market can additionally contribute to the diversity of potential energy suppliers, enhancing energy security for energy importing countries in particular. Progressive development of the hydrogen and ammonia market over time will require ex-ante planning for optimal infrastructure delivery. This may require the development of an integrated market, storage and transportation infrastructure to facilitate growth of renewable hydrogen market. As per the IEA, if governments implement ambitious policies to meet their climate pledges, hydrogen could help avoid 14 bcm/yr of natural gas use, 20 Mtoe/year of coal and 360 kbd of oil use by 2030. However, for the technology to live up to its potential, strong government support in developing a robust hydrogen ecosystem is crucial.

Biofuels too have been significant contributors to the energy security and decarbonisation of the transportation sector. They can directly replace or blend with fossil fuels to reduce overall emissions in uses such as energy generation, SAF, boilers and furnaces. These interventions should be in compliance with the voluntary certification schemes. Biofuels can act as an accelerator to decarbonise global economies particularly those of the Global South.

Biogas is emerging as an option that eliminates the linear economy model that generates an abundance of waste by adopting a circular approach to organic material reuse and considering organic waste as a valuable resource. Circularity is further enhanced by the fact that nutrient residues arising

⁹ Source: IEA (2022), CO2 Capture and Utilization, IEA, Paris <https://www.iea.org/reports/co2-capture-and-utilisation>, License: CC BY 4.0



as a by-product in biogas production can be returned to the food chain as a fertiliser or processed for industrial needs to replace mineral or fossil nutrients and fertilisers. Further, there is also biomethane, a co-product of biogas that, according to the IEA, is better used in end-use sectors where there are fewer low-carbon alternatives, such as petrochemical industries, heavy-duty transport and maritime shipping. Use of biogas as a fuel in road transport can help to reduce carbon dioxide emissions by up to 90% compared to fossil diesel. Biomethane sees broad-based growth across all sectors by 2030, reflecting existing uses of natural gas, whilst also tapping into markets such as transport, where biomethane demand rises in line with the growing gas-fuelled fleet in some countries and regions¹⁰.

Proposed actions

To enhance global cooperation on developing and commercialising clean energy technologies globally, G20 countries may consider the following sub-actions:

1. **Learning from the success of the solar and wind technologies, which was enabled via coordinated policy actions, G20 nations should explore the adoption of similar interventions for promotion of other clean energy technologies.** Technology adoption will be dependent on country-specific requirements and subject to local and regional market situations. Governments may consider the following:
 - Introducing purchase obligations of low-carbon fuels such as natural gas (in the interim), hydrogen and biofuels by end-use sectors
 - Incorporating requirements for rates of utilising key clean technologies including renewables, EVs etc. by end-use sectors
 - Providing financial incentives for technology investors in the form of grants, subsidies and performance incentives.

2. **Strengthen grids and their integration with renewables and explore opportunities for cross-border and regional power connections:** G20 countries should explore the possibilities of government-led investments in providing low-cost financing for grid strengthening and smart grids to support the transition to RE in developing countries, at scale and at the required pace, in an affordable manner that secures and maintains social and political support for the transition. A larger exercise is further warranted to identify the opportunities for cross-border and regional power interconnection and smart grids to support the transition to clean power systems, which includes opportunities that have been previously considered but not taken forward given the rapidly improving technology, falling costs and increasing need for system flexibility.
3. **Encourage adoption and provide R&D support for biofuels:** The rising relevance of biofuels in various sectors, from SAF and alcohol-to-jet fuel, to biodiesel, compressed biogas for ethanol production and renewable Dimethyl Ether (DME), require support from the G20 nations. Countries should evaluate technological advancements that have provided diverse biofuel feedstock options such as sugarcane, corn, agricultural waste and bamboo based on their availability. Government support on deployment of advanced technologies such as hydrate separation, cryogenic separation, biological methods etc. is also required. Biofuels produced using waste as feedstock, such as crop residues and organic solid waste can also promote a circular economy.
4. **Support the development of a global hydrogen economy and establish standards:** Given the rising importance of hydrogen as a clean energy solution and its potential to create a 'hydrogen economy', governments should assume a structured approach through a prioritised roadmap for deployment, putting the price on externalities such as GHG emissions, identifying and accelerating hydrogen business models.

¹⁰ Source: IEA. Outlook for biogas and biomethane: Prospects for organic growth - World Energy Outlook Special Report.



G20 nations should explore time bound action on the following:

- Establishing bankable offtake schemes for hydrogen project financing. This includes identifying optimal volumes, price and credit risk. Leveraging initiatives such as REpowerEU would be crucial in this aspect.
- Developing contractual mechanisms to reduce risk and build resilience for hydrogen projects
- Developing market structures to facilitate commercially viable hydrogen offtake agreements
- Adopting global standards for 'green hydrogen' or the 'emissions intensity' of hydrogen is essential to facilitate global trade. This can also facilitate growth of low-emission hydrogen production to accelerate achievement of decarbonisation targets. There is a critical need for G20 governments to standardise and adopt internationally consistent definitions for elements such as carbon intensity, renewable energy reconciliation, certificate of origin, etc. when it comes to hydrogen and its derivatives.

5. **Enabling R&D and investments into emerging technologies such as CCUS, hydrogen and battery storage is essential:** Given the importance of emerging technologies like CCUS, hydrogen and battery storage to achieving net-zero emissions, G20 governments should consider introducing demand side policies such as purchase obligations, aggregation through industrial hubs, etc. or supply side measures such as tax incentives and grants, allocation of lower-cost inputs such as interest cost subventions

Through international collaboration, we can make the transition quicker, cheaper and easier for everyone—on the back of faster innovation, greater economies of scale, bigger incentives to invest, level playing fields and benefits that are shared across all parts of society. Without this collaboration, the transition to net zero emissions will be much more challenging and could be delayed by decades'—IEA

or subsidised electricity costs to production units, etc. These measures would help create an enabling ecosystem for rapid scale-up of technologies to commercial scale.

6. **Coordinate government-led global efforts on research, development and demonstration of technologies:** Testing clean energy technologies across multiple regions and markets can bring them to widespread commercial deployment more quickly, especially when supported by government commitments and processes to ensure sharing of learning and viability gap funding.

Policy Action 1.2: Institutionalise and support industry-led collaborations to drive net zero transitions

CONTEXT

Decarbonisation of the economy and transition towards net zero by businesses may also require cross-border policy parties along with industrial and sectoral coalitions of the first movers or spearheading companies. For HTA sectors where efficiency and green electrification are unable to reduce the environmental footprint, difference on the ground can be achieved by a broader set of market leaders working in a coalition and driving forward net-zero agenda in a collaborative manner. Some examples of such collaborations include the following.

- **First Movers Coalition (FMC):** Over 60 leading companies made ambitious pledges across steel, aviation, trucking and shipping upon joining the First Movers Coalition launched by the World Economic Forum (WEF). Although formulating purchase commitments and aggregating demand against these commitments is core to the FMC, the Coalition's activities go beyond this. Other activities focus on supporting members in delivering on their commitments and creating an enabling environment.
- **The WEF initiative** aims to have 100 industrial clusters around the world commit to emissions reductions, job creation and local economic development. 100 clusters could represent 1.6



billion tonnes of CO₂, USD 2.5 trillion in GDP contribution and 17.8 million jobs. The initiative currently has 17 industrial cluster members representing >450 MT CO₂ (larger than the UK), 2.7 million jobs and an annual GDP contribution of USD 218 billion. The initiative spans multiple clean technologies: efficiency and circularity, electrification, hydrogen and CCUS and looks to exploit the synergies of co-location industry and technology.

- **Breakthrough Agenda COP27:** In a crucial step towards building momentum, signatories to the Breakthrough Agenda at the COP27, the G7, China, India, Australia and South Korea, have set out a 12-month hydrogen action plan, which includes deploying 100 'hydrogen valleys' and setting up a certification programme. The countries at COP27 also set a target to deploy '50 large-scale net-zero emission industrial plants' to create demand for green hydrogen. The certification and standards programme are set to be resourced by COP28. This will give industry participants clarity on the CO₂ intensity of renewable and low-carbon hydrogen, which is essential for cross-border trade. The programme has been entrusted to the International Partnership for Hydrogen and Fuel Cells in the Economy (IPHE, established in 2003), supported by the IEA and International Renewable Energy Association (IRENA). The member countries also planned to make a partnership with leading financial institutions, including the World Bank and UNIDO to review available financial support and facilitate greater financial access to hydrogen projects. The member countries are expected to commit for uptake of hydrogen across various sectors along with revised demand in subsequent years.
- **Low-Carbon Industrial Hubs:** By co-locating supply and demand, 'hubs' can bring down infrastructure costs and drive economies of scale, serving as an aggregation point for local demand before expanding transportation infrastructure to provide dispersed supply elsewhere in the country or for export.

Several gigawatt-scale low-carbon/clean hydrogen hubs have been announced across the world in Australia, the Netherlands, China, Oman, Kazakhstan, Saudi Arabia, etc. The US Inflation Reduction Act has galvanised the creation of low-carbon industrial hubs across the US leveraging cross-cutting clean hydrogen and CCUS technologies. The Infrastructure Investment and Jobs Act in the US, passed in November 2021, set aside over USD 21 billion in fiscal years 2022–2026 in support of technologies that will be key parts of low-carbon hub value chains (clean hydrogen and CCUS), as well as USD 8 billion and USD 3.5 billion in direct funding for individual hydrogen and direct air capture hubs respectively. Several states have also individually announced their intent to form and support regional hydrogen hubs.

Proposed actions

Given the rising number of industry-led coalitions working on sector-specific decarbonisation solutions, the private sector's ability to operationalise clean energy projects and bring in private capital flows to complement public finance, it is crucial that governments must institutionalise and support industry-led coalitions (such as those stated above). G20 countries may consider the following actions:

1. **G20 nations should seek to establish well-designed low-carbon hubs to create an ecosystem of financiers, start-ups, equipment manufacturers, professional service providers, suppliers and customers across different sectors and segments.** Through ecosystem collaboration, hubs can accelerate technological development, encourage downstream adoption of clean technologies such as hydrogen and/or carbon capture for multiple end-uses, and drive long-term decarbonisation transformation across industrial value chains. 'Co-opetition' amongst hub members creates conditions that may accelerate hub success by both lowering the perceived risk of investment—as participants see others in their industry investing—as well as by creating more tangible competition.



2. **Work with existing industry-led coalitions on sector-specific collaborations to ensure larger market players having most of the market share move in tandem to avoid competitive disadvantages.** Cross-sector collaborations are also essential to derive ecosystem benefits, drive down risks of investments and improve the efficiency of new technologies by securing higher utilisation and scale.
3. **G20 countries should ensure that major industry-led initiatives and platforms feature perspectives from both governments and businesses from developing countries.** As emissions will continue to rise due to predicted growth of developing countries, it is crucial to have appropriate representation that allows them to take leadership and participate on an equal footing with developed nations. It will also help promote better access to emerging technologies and climate finance.

Policy Action 1.3: Develop clear and bold pathways to transition the ecosystem and supply chains in alignment with the Paris Agreement

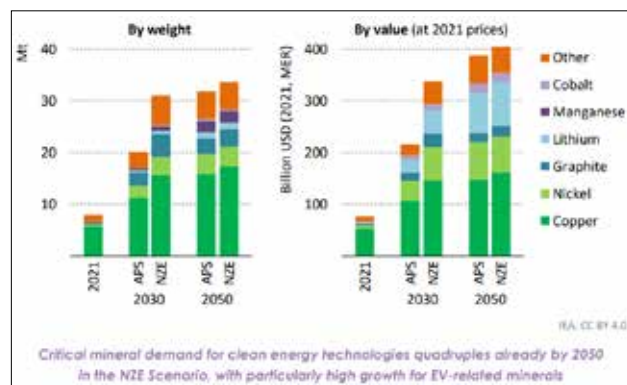
CONTEXT

An important aspect of the energy transition is alignment on targets and actions amongst the governments and industries along with transition of the ecosystem and supply chains. Well calibrated and structured decisions will go a long way in reducing risks across the value chain and will trigger a virtuous cycle of lower-cost financing to follow newer technologies.

For ecosystems to work well, companies will have to give up old notions of 'competitive advantages' in which most moves are exclusively zero-sum and instead think about the value of 'collaborative advantage' and 'adaptive advantage', which comes from working with others—even erstwhile competitors.

There is a greater visibility around the net-zero timelines of several nations. However, the pathways

Figure 1: Demand for critical minerals in the announced pledges scenario (IEA, 2022, World Energy Outlook)



are evolving. IEA's 'Net Zero Emissions by 2050' (NZE) Scenario sees all countries requiring contributing to the pathway to net-zero emissions by 2050, with advanced economies taking the lead and reaching net-zero emissions well before emerging markets and developing economies¹¹. IEA's NZE scenario identifies a range of deficits in the production capacities of critical components to meet 2030 targets.

As clean energy transitions accelerate, demand for critical minerals from the energy sector is set to soar. In the announced pledges scenario, demand for critical minerals for clean energy technologies is expected to increase 250% by 2030 and 400% by 2050 (Figure 1).

Decarbonisation pathways bring clarity on demand, when backed by policy support, will lead to timely investment by suppliers.

The MDBs, which delivered a record USD 51 billion in green finance to low- and medium-income countries in 2021, have affirmed the need to bring in greater transparency and consistency in reporting on climate finance¹¹.

Public and multilateral financing institutions need to work alongside to ensure that financing is committed to areas of priority as determined in national pathways.

Proposed actions

¹¹ Asian Development Bank (2022), MDBs' Climate Finance in Low and Middle-Income Countries Reaches \$51 Billion in 2021, <https://www.adb.org/news/mdb-climate-finance-low-and-middle-income-countries-reaches-51-billion-2021>

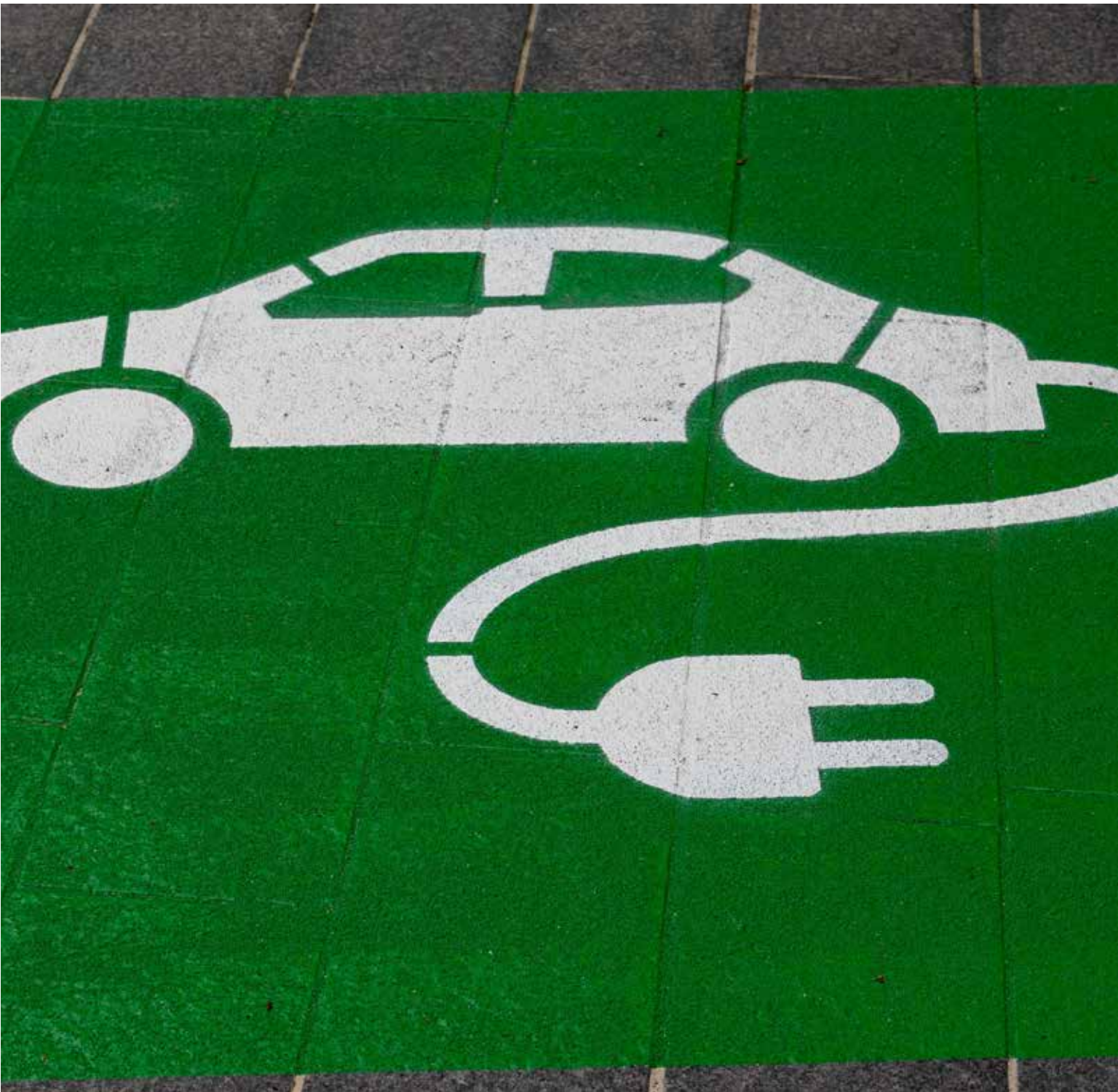


To establish an enabling ecosystem and transition global supply chains to a clean energy future, G20 countries should consider the following:

1. Developing sectoral decarbonisation pathways on a country-level that are in sync with global developments and latest science. Except for electricity and transport in some cases, sectoral pathways are universally lacking in government declarations and need to be the urgent focus of policy actions by G20 countries. From a policy perspective, a comprehensive and coordinated

approach is required to develop and expand global clean energy technology supply chains that are secure, resilient and sustainable.

2. Increasing the scale of government-backed procurement commitments to secure their future demands. Appropriate regulatory support can further strengthen the global demand for near-zero emission products, making it conducive for businesses to invest.



Recommendation 2

Enhance efforts to improve the availability of and access to climate finance

CONTEXT

The UNFCCC's Fifth Biennial Assessment and Overview of Climate Finance Flows states that global climate finance in 2019–2020 was estimated to be USD 803 billion and was 12% higher than in 2017–2018.

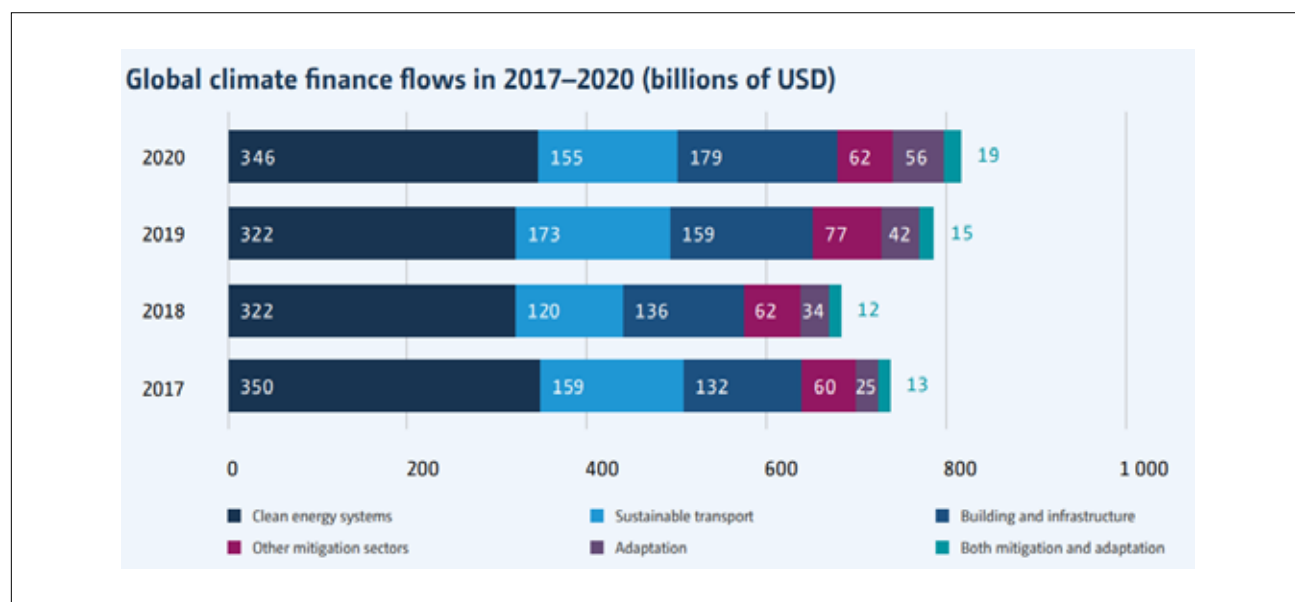
Investments in renewable energy technologies are the largest segment of global climate finance and are close to record highs even as costs continue to decrease. The declining costs of renewable energy alongside the maintenance of high levels of investment indicates that the overall deployment of renewable energy technologies has increased in real terms.

Whilst global climate finance flows are increasing as are public climate finance flows from developed to developing countries, the total quantum is still small relative to the overall needs of developing countries.

This amount is only 31% of the annual investment needed for the global temperature rise to follow a well below 2°C or a 1.5°C pathway .

Recent analysis of global climate finance supports this outlook and estimates that whilst climate finance has increased at a CAGR of 7% from 2011 to 2020, it needs to triple to a CAGR of 21% (approximately USD 4.3 trillion annually) if we wish to avoid the worst impacts of climate change. There are several well-documented challenges in enhancing climate finance.

- **Enabling private sector investment at a greater scale and speed:** As more private sector commits to net zero and sustainable finance practices, sources of climate finance from private capital is increasing but not at the speed or scale required.



Source: UNFCCC Fifth Biennial Assessment and Overview of Climate Finance Flows (2022)



There is still room for public sector to improve the risk-return nexus for private sector capital to be unlocked.

- **Lack of availability of sufficient low-cost financial instruments:** Debt is the main instrument in climate finance whilst concessional and grant financing remain fairly low in comparison.
- Whilst MDBs remain an important cornerstone of sustainable development efforts and can help mobilise private capital that has resources orders or magnitude greater than their own, they are by-and-large not fulfilling their potential and delivering in this critical area. The reason for this primarily lies with their overall operational approach, which seeks to maximise their own investments instead of seeking to maximise total investment into developing countries.
- Data on private climate finance flows to developing countries remains challenging to compile and assess. Overall there is a clear challenge globally on tracking climate finance flows.
- In order to accelerate energy transitions, the G20 countries should consider the following policy actions that have the potential to unlock greater quantum of climate finance and ease access to low-cost finance especially for developing countries.

Policy Action 2.1: Introduce new and expanded low-cost financing options for energy transition by boosting and repurposing public finance, improving delivery channels and promoting local institutional capabilities

- Exploring the possibilities of hedging, credit enhancement and mega insurance instruments through banking and financial institutions
- Improving the risk-return nexus and increasing co-investment with the private sector
- Improve the pipeline of bankable clean energy projects by creating a Global Project Development Accelerator

- Boost the catalytic role of public finance institutions
- Focus efforts on improving planning and tracking to ensure not just the quantity but quality of finance is delivered to enable a just and equitable energy transition globally.

Policy Action 2.2: Set up a clear mandate for multilateral development banks to support energy transitions through reforming of operations, governance, risk-tolerances and alignment of funds to provide concessional finance to emerging countries

- Mandate MDBs to re-orient their operational approach from one that seeks to maximise their own investments to one that seeks to maximise total investment into developing countries by mobilising private capital
- Explore a structured access to Green Climate Fund (GCF) for developing countries (within G20 ecosystem) to accelerate both mitigation and adaptation interventions
- Call for repurposing of public funds and fossil fuel subsidy reforms and ensure consistent global carbon pricing signals
- Re-orient existing platforms and institutions to accelerate funds for energy transitions particularly for the Global South

Policy Action 2.3: Explore harmonised development of international carbon markets for monitoring and reporting emissions, accounting, transparency and environmental integrity

- For international carbon markets, explore harmonised or reciprocal standards for monitoring and reporting emissions, accounting, transparency and environmental integrity. Standards and protocols for harmonisation should be carefully crafted based on Common But Differentiated Responsibilities and Respective Capabilities (CBDR-RC) of the G20 nations. Such



Carbon pricing incentivises emissions reduction by creating economic incentives and cost-effective mechanisms.

- Linking carbon markets can increase the cost-effectiveness of emissions reductions, support investment into lower income countries and support international cooperation.

Policy Action 2.4: Secure investments in emerging technologies through public-private partnerships and cooperation between developed and developing nations

- Linking carbon markets can increase the cost-effectiveness of emissions reductions, support investment into lower income countries and support international cooperation.
- Similar to Japan’s Joint Crediting Mechanism (JCM), other developed countries may also take a similar bilateral route to offer decarbonising technology, services etc., to help implement climate change projects in developing countries

and utilise the credits for meeting their emission reduction targets and NDC commitments.

- Developing a mechanism for developed nations to meet their financing commitments to developing nations by exploring option of contracts for the offtake of clean energy solutions.

Recommendation 2 contributes to achieving UN SDGs: 1. No Poverty, 7. Affordable and Clean Energy, 12. Responsible Consumption and Production, 13. Climate Action and 17. Partnerships for the goals



Policy Action 2.1: Introduce new and expanded low-cost financing options for energy transition by boosting and repurposing the public finance, improving delivery channels and promoting local institutional capabilities

Leading Monitoring KPIs

Monitoring KPI	Baseline	Target	Sources
Global annual clean energy investments	~USD 1.5 trillion per year [2022]	Triple to USD 5 trillion per year [2030]	United Nations (2021), High-level Dialogue on Energy by the United Nations Secretary-General, September 2021
Global annual clean energy investments in developing and emerging countries	USD 250 billion [2022]	Quadruple to USD 1 trillion per year [2030]	IEA (2023), Scaling Up Private Finance for Clean Energy in Emerging and Developing Economies
Triple the current grants for climate action	~USD 15 billion [2021]	USD 50 billion per annum [2025]	United Nations (2021), Climate Finance Report
Private climate finance mobilised by developed countries through bilateral and multilateral channels	USD 13.1 billion [2020]	Triple to ~USD 40 billion [2030]	UNFCCC Standing Committee on Finance (2022), Fifth Biennial Assessment and Overview of Climate Finance Flows
Climate finance provided by MDBs to developing and emerging economies	USD 45 billion [2020]	Triple to USD 180 billion [2030]	UNFCCC Standing Committee on Finance (2022), Fifth Biennial Assessment and Overview of Climate Finance Flows
Operationalising the progress of article 2.1c of the Paris Agreement	-	2025	United Nations Climate Change Conference (2015), Paris Agreement



CONTEXT

A paradigm shift triggered by new energy technologies is expected to result in a higher capital investment for short to medium time frame. Availability of timely and low-cost financing will be the key enablers to transition, particularly in developing and emerging countries.

As per IEA, energy investment in emerging and developing countries has shrunk by one-fifth over the past five years, but this needs to be turned around quickly with a massive expansion in spending on clean energy. Clean energy investments required for the transition rise to USD 1 trillion annually in the developing and emerging countries in the net zero by 2050 scenario whereas it hovers at around USD 250 million by current estimates.

This large expansion in investment and accompanying financing needs is a major challenge for these economies in the face of rising global financing costs and geopolitical instability, which typically translates into higher risk perception and cost of financing for such economies compared to the developed ones.

Whilst structural and domestic issues hinder availability of low-cost financing in these countries, the role and scale of international finance is critical in developing and emerging economies that are under

macroeconomic stress from rising inflation, growing debt burdens and devaluation of their respective currencies against USD.

There are several gaps towards mobilisation of clear and unified focus on financing emissions reductions and clean energy—particularly in the developing world. There are limits on the availability of lower cost, public funds to finance transitions.

Private capital is also not mobilised at the rate required due to various issues such as unfavourable risk-return nexus on investments, inadequate pipeline of projects, regulatory, legal and tax issues.

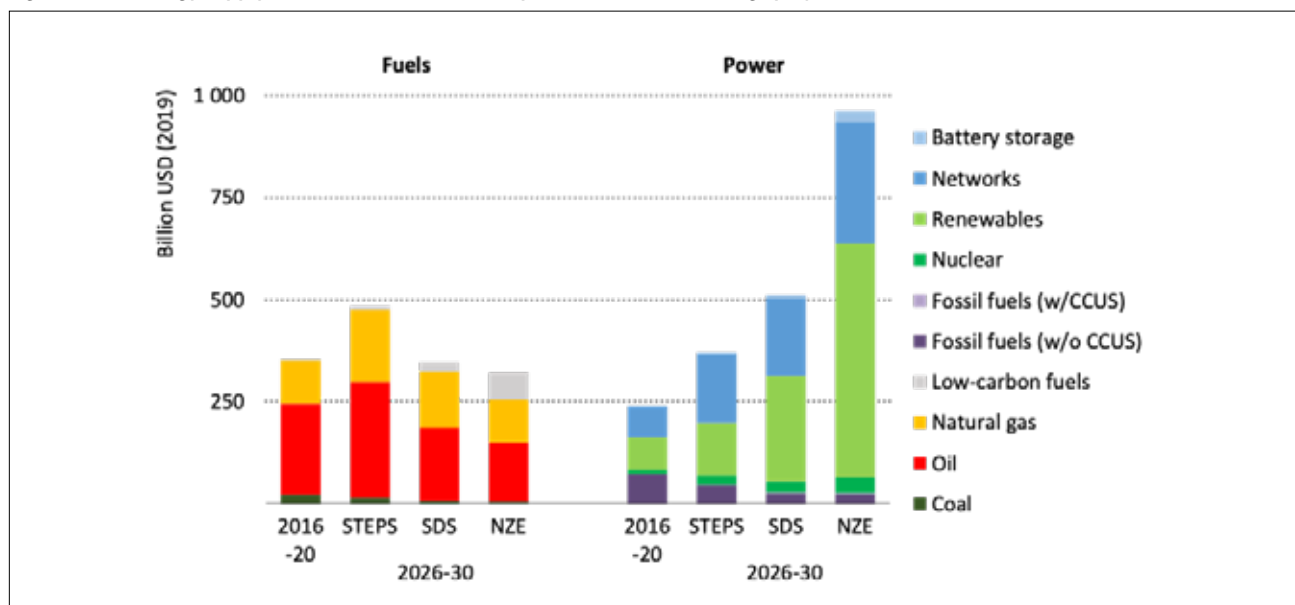
One of the most important obstacles inhibiting the deployment of private and blended finance at scale into emerging and developing economies is the lack of a pipeline of investment-grade or bankable projects.

Proposed Actions

Considering the above, we recommend the G20 countries to introduce new and expanded low-cost financing options towards energy transitions through:

1. Exploring the possibilities of hedging, credit enhancement and mega insurance instruments through banking and financial institutions. There should be a fair engagement between global north and south for exploring such opportunities

Figure 2: IEA: Energy supply investment in EMDEs, compared with annual average projections under STEPS, SDS and NZE, 2026–2030



2. Improving the risk-return nexus and increasing co-investment with the private sector. This could be done if G20 countries commit to creating a sizeable pool of funds that could provide a menu of insurance or insurance-like provisions and also be used to provide resources to mitigate foreign exchange risk. Private investors in turn could access this pool through the payment of a premium.
3. Improve the pipeline of bankable clean energy projects by creating a Global Project Development Accelerator to serve as an intermediary orchestrating the deployment of existing and specialised but dispersed expertise and technical capabilities to develop investment-grade projects, and where gaps persist in existing resources, seek to fill them. The accelerator could foster private sector-led investment partnerships to provide the financing for the construction and operationalisation of these projects.
4. Boost the catalytic role of public finance institutions including repurposing of funds, improving delivery channels and promoting local institutional capabilities.
5. As a new finance goal will be agreed post 2024, the G20 member countries should focus efforts on improving planning and tracking to ensure not just the quantity but quality (for instance the right proportion of grants and debts) of finance is delivered to enable a just and equitable energy transition globally.

Policy Action 2.2: Set up a clear mandate for MDBs to support energy transitions through reforming of operations, governance, risk-tolerances and alignment of funds to provide concessional finance to emerging countries

CONTEXT

MDBs play a significant role in channelising lower-cost, longer-term climate finance whilst also playing a catalytic role in developing markets, promoting

COP27 called 'on the shareholders of multilateral development banks and international financial institutions to reform multilateral development bank practices and priorities, align and scale up funding.... define a new vision and commensurate operational model, channels and instruments that are fit for the purpose of adequately addressing the global climate emergency, including deploying a full suite of instruments, from grants to guarantees and non-debt instruments, taking into account debt burdens' (para 61); and called on 'multilateral development banks to contribute to significantly increasing climate ambition using the breadth of their policy and financial instruments for greater results' (para 62).

projects with demonstrated effects, and providing the policy advice necessary for this systemic change. In 2021, MDBs sustained their efforts on climate finance and delivered USD 51 billion in low- and middle-income countries, of which USD 33 billion (65%) was for mitigation and USD 18 billion (35%) for adaptation; and USD 31 billion in High Income Countries, of which 95% was for mitigation and 5% for adaptation.

There have however been rising concerns around the efficacy of the existing system to allocate funds with clarity and consistency along activities, instruments and regions that are in the highest need of such interventions.

Proposed actions

We recommend the G20 countries to engage with MDBs to as they begin this process of reforming their operations, governance, risk-tolerances and alignment of funds towards climate change. A specific clean energy mandate for MDBs will go a long way in accelerating energy transition in the developing and emerging countries in the world. G20 countries may consider the following policy actions:

1. Mandate MDBs to re-orient their operational approach from one that seeks to maximise their



own investments to one that seeks to maximise total investment into developing countries by mobilising private capital. This can be done through several measures:

- Expanding the quantity of and quality of their de-risking instruments
 - Increasing their willingness to co-invest with the private sector, including by taking positions with greater risk over low-risk positions
 - Setting and reporting on clear, quantifiable targets for private capital mobilisation
 - Scaling up the resources deployed to project preparation activities and enabling the private sector to access their project preparation facilities
 - Creating a comprehensive database open to private investors describing all infrastructure projects the MDBs are considering as well as cataloguing the various de-risking tools they offer
 - Making the Emerging Markets Risk Database (GEMs) publicly available, thereby providing quality credit and market data to potential investors.
2. Explore a structured access to GCF for developing countries (within G20 ecosystem) to accelerate both mitigation and adaptation interventions. This is particularly relevant as countries are developing their project evaluation procedures under the provisions of Article 6 of the Paris Agreement.
 3. Call for repurposing of public funds and fossil fuel subsidy reforms and ensure consistent global carbon pricing signals along with putting a meaningful price on carbon that reflects the full costs of climate change and de-risks investment in key sectors.
 4. Re-orient existing platforms and institutions to accelerate funds for energy transitions particularly for the Global South. For example, the International Finance Corporation can serve as a platform for currency swap agreements, acting as a global hedging mechanism comparable to the TCX Fund. Additionally, climate-specific funds like the GCF could be utilised for hedging climate projects in the Global South.

Policy Action 2.3: Harmonised development of international carbon markets for monitoring and reporting emissions, accounting, transparency and environmental integrity

CONTEXT

Carbon markets play an important role in providing the financing available for clean energy projects and other climate mitigation projects, especially in developing economies where access to finance is often constrained. These are an efficient, cost-effective and flexible way to manage the unpriced costs of carbon. By putting a price on carbon emissions, carbon markets create clear economic incentives for emissions mitigation. The absence of a harmonised financial reporting framework for emission allowances and voluntary offsets and lack of discourse on the assessment of underlying assets are hampering the growth of carbon markets in G20 countries.

To ensure the effective operation of the carbon market, a sufficient scale of transactions needs to be reached to ensure market liquidity. If a country or a region has a limited carbon market with insufficient market participants and investors, the carbon market will be lacking necessary liquidity and cannot effectively determine the market pricing, nor can it set a reasonable carbon price to guide the market taking actions to reduce emissions.

To circumvent this problem, some countries and regions have begun to explore Emission Trading System harmonisation to create a larger carbon market with more efficient transactions and strengthened market liquidity.

Proposed actions

We recommend the G20 countries to drive harmonisation of international carbon markets through several measures:

1. Explore harmonised or reciprocal standards for monitoring and reporting emissions, accounting,



transparency and environmental integrity. Standards and protocols for harmonisation should be carefully crafted based on Common But Differentiated Responsibilities and Respective Capabilities (CBDR-RC) of the G20 nations. Such harmonisation should be on par with coherent carbon accounting and reporting across markets. The latter should build on the already existing frameworks with regards to the tracking of the production and consumption of renewable energy through appropriate market-based instruments such as energy attribute certificates.

2. Governments may choose to link carbon markets across jurisdictions to support lower-cost emissions reductions across linked markets. Linking carbon markets can increase the cost-effectiveness of emissions reductions, support investment into lower income countries and support international cooperation. In addition, linking carbon markets can help address competitiveness concerns of implementing domestic climate policy and avoid carbon leakage.

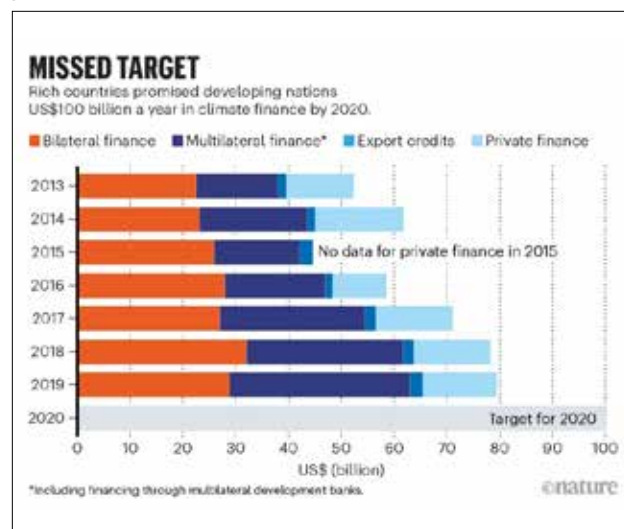
Policy Action 2.4: Secure investments in emerging technologies through public-private partnerships and cooperation between developed and developing nations

CONTEXT

At the 2009 UN Nations Climate Change Conference in Copenhagen, developed nations vowed to channel USD 100 billion per year by 2020 to developing nations for climate adaptation and mitigation. However, a recent report by the Organization for Economic Cooperation and Development (OECD) found only USD 83 billion of climate finance was passed from developed to developing countries in 2020.

Any emission abatement projects that may be funded in developing countries could provide a means for the funding nation to meet their commitments under their NDCs. This is in direct contrast as the host country, i.e. the state where the project is established, would like to keep the emission reduction credits to

Figure 3: Source: Nature (2021), The broken \$100-billion promise of climate finance – and how to fix it



itself to meet its commitments under international treaties rather than providing them to the financing state. This fundamental challenge is one of the key barriers to enabling financial flow from developed to developing nations.

Emerging technologies, such as green hydrogen, CCUS, battery storage and small modular reactors (amongst many others), will require active PPPs and global cooperation to secure investments and achieve commercial scale. Emerging collaborative low-carbon industrial hubs also have a significant role for governments going beyond grants to involve them in some cases as infrastructure providers and off-takers of energy.

In most developing and emerging countries, well-designed PPPs and global cooperation will be required to advance emerging technologies. National energy transition pathways may have to factor in well-designed projects to galvanise the ecosystem players, investors and financiers to commit to such projects on a secure basis.

Proposed actions

We recommend that the G20 help foster such PPPs and global cooperation (particularly between the developed and developing nations). This may be done through:



1. Governments should act as demand aggregators and work with the private sector to scale up investments in key clean energy technologies. Through public–private offtake contracts, technologies may be brought to scale. Lessons can be drawn from the successful demand aggregation and centralised auction programmes for solar PV in many countries where national government agencies have provided the aggregation and signed on to offtake contracts with successful private investors.
2. Governments should consider utilising mechanisms similar to the Joint Crediting Mechanism (JCM), erstwhile BOCM, conceived by the Japanese government. Under the JCM, Japan quantitatively evaluates contributions of Japan to greenhouse gas emission reductions and removals, which are achieved through the diffusion of, among others, leading decarbonising technologies, products, systems, services and infrastructures as well as through the implementation of measures in developing countries and others and to use such contributions to achieve Japan’s NDC. Through public–private collaborations, Japan aims to secure accumulated emission reductions and removals at approximately 100 million t-CO₂ by the fiscal year 2030. Japan will appropriately count the acquired credits to achieve its NDC. As of November 2022, Japan has established the JCM with 25 partner countries. Other developed countries may also take a similar bilateral route to offer decarbonising technology, services etc., to help implement climate change projects in developing countries and utilise the credits for meeting their emission reduction targets and NDC commitments. This may be particularly relevant considering the cooperative mechanisms described under Article 6.2 of the Paris Agreement.
3. Developing a mechanism for developed nations to meet their financing commitments to developing nations by exploring options of contracts for the offtake of clean energy solutions. Such a mechanism could be institutionalised by setting up a Task Force that would develop appropriate rules and protocols.



Recommendation 3

Ensuring just, equitable and resilient transition

CONTEXT

The concept of a 'just, equitable and resilient transition' holds particular relevance for the G20 nations and highlights the crucial role that the Global North can play in supporting the Global South. It calls for a profound departure from the prevailing socio-economic order, necessitating systemic shifts in global economic governance and changes to national fiscal and monetary policies.

For the G20 nations, supporting a transformative transition will entail providing the Global South with the necessary resources, technology transfer, affordable energy and financial assistance to effectively address climate change and pursue sustainable development. This support should go beyond mere financial contributions and include capacity-building initiatives, knowledge sharing and technology cooperation. The Global North can also help alleviate the burdens of trade agreements, debt obligations and World Trade Organization limitations that often hinder the regulatory capacity of developing countries.

In promoting a just and equitable transition, the Global North should prioritise the restoration of public goods, public services and public sector employment in the Global South. This can have a transformative impact on advancing women's human rights and safeguarding the environment. Moreover, efforts should be made to challenge the dominance of monetary value in organising economies and explore alternative models that prioritise social solidarity and inclusive economic arrangements.

Recognising the disproportionate impact of climate change on vulnerable workers and

marginalised communities in the Global South, the Global North must take proactive measures to address their specific challenges. This includes ensuring their inclusion, protection and active participation in decision-making processes related to the transition.

Another key aspect of a just, equitable and resilient transition is on building a nature-positive transition through biodiversity conservation, restoring degraded ecosystems and protecting indigenous rights. The recent adoption of the Kunming-Montreal GBF at COP15 also underscores the need to take urgent action to halt and reverse biodiversity loss to put nature on a path to recovery for the benefit of people and planet by conserving and sustainably using biodiversity and by ensuring the fair and equitable sharing of benefits from the use of resources. The GBF clearly articulates targets on Reversing Nature loss by 2030 and Living in harmony with nature by 2050 and provides a logical means of implementation for G20 countries to commit towards.

Whilst the use of fossil fuels is declining, countries need to transition towards renewable and clean energy sources. They should develop plans that balance the use of fossil fuels with the adoption of renewables and other clean energy sources until sufficient reliable supply is available. Adequate financing, particularly public financing, is particularly important in ensuring a smooth transition to developing capacity, affordability and access to clean energy. Investment in skills development, capacity building, planning and facilitating market linkages are also crucial.



By embracing the principles of a just, equitable and resilient transition, the G20 nations and the Global North can demonstrate leadership and contribute to fostering global cooperation, solidarity and sustainable development.

Policy Action 3.1: Achieve a just transition and ensure affordable energy access through a balanced approach to energy transition and via diversification, reskilling and employment opportunities for all

- Governments should implement policies to prioritise energy access, security and affordability basis country-specific considerations
- Governments, particularly producer economies, should develop comprehensive plans for economic diversification to address the socio-economic impacts of transitioning away from fossil fuels. Establish academies or programmes focused on net-zero industries to provide specialised training and skill development opportunities
- Governments should adopt a balanced approach that considers the employment opportunities of all segments of society and provides opportunities for skill development and retention when considering the transition
- Governments should incorporate sectoral and geographic considerations into their policy and regulatory frameworks, reflecting their unique transition needs whilst balancing sustainable growth
- Governments should invest in technology innovation and digitalisation to ensure energy affordability and access
- G20 countries should continue to prioritise public financing in initiatives that lead to energy access and affordability for all
- Leverage global frameworks such as the Just Transition Framework for Company Action and drive implementation of programmes similar to Just Energy Transition Partnership (JETP) for other developing and emerging economies.

Policy Action 3.2: Address gender equality and just transition for MSMEs dependent on larger producer companies facing phase down or transition

- Implement policies and initiatives that address gender gaps in access to education, finance and market opportunities
- Provide assistance and resources to Micro, Small and Medium Enterprises (MSMEs), including cooperatives and entrepreneurs, to facilitate their transition towards sustainable practices
- Recognise the vulnerability of MSMEs to disruptions during the energy transition and support them in building resilience
- Establish platforms for knowledge exchange and collaboration amongst different stakeholders, including large producer organisations, MSMEs, government agencies and civil society
- Develop policy frameworks that integrate the needs and requirements of MSMEs into the energy transition agenda
- Allocate resources for R&D efforts aimed at identifying new opportunities and technologies in the energy sector for MSMEs
- Foster collaboration between countries, particularly between the Global North and the Global South, to share best practices, experiences and expertise in managing the energy transition.

Policy Action 3.3: Promoting nature-positive transitions through biodiversity conservation and integrating Ecosystem-based Approaches (EbA) into adaptation planning

- Committing to undertaking policy actions to meet the targets defined under the Kunming-Montreal GBF
- Setting country-level targets and allocation of resources for biodiversity conservation and ecosystem restoration efforts



- Enhancing understanding and utilisation of Ecosystem-based Approaches (EbA) in addressing climate change risk
- Mainstreaming EbA approaches in national and sectoral adaptation plans and strategies
- Establishing monitoring and evaluation (M&E) mechanisms for EbA
- Mobilising financing and engaging the private sector on biodiversity conservation.

SDG Goals Impacted



Recommendation 3 contributes to achieving UN SDGs: 5. Gender Equality, 7. Affordable and Clean Energy, 8. Decent Work and Economic Growth, 9. Industry, Innovation and Infrastructure, 13. Climate Action, 14. Life Below Water and 15. Life on Land

Policy Action 3.1: Achieve a just transition and ensure affordable energy access through a balanced approach to energy transition and via diversification, reskilling and employment opportunities for all

CONTEXT

In the effort to reduce global carbon emissions, it is recognised that no single solution alone can make a significant impact beyond the range of 5%–10%. Energy transition pathways present complex

Leading Monitoring KPIs

Monitoring KPI	Baseline	Target	Sources
Treble international financing for just energy transition	Committed funding of USD 8.5 billion [2021]	Funding of USD 25 billion per year [2025]	The Investment Plan, the International Partners Group pledged USD 8.5 billion, including over USD 1 billion from United States Government agencies, including the Development Finance Corporation (DFC), the United States Trade and Development Agency (USTDA), USAID, Treasury and the Department of State
New jobs in clean energy and energy efficiency	We are proposing that using 2023 as a base year where value is zero - we expect 30 and 60 million new jobs by 2030	30 million by 2025 60 million by 2030	United Nations (2021), High-level Dialogue on Energy by the United Nations Secretary-General, September 2021
Global Population without Access to Electricity	770 million [2022]	Nil or universal household electrification [2030]	IEA (2022), SDG7: Data and Projections
Women in the renewable energy sector	32% [2022]	50% by 2030	IRENA (2019) Renewable Energy: A Gender Perspective
Achieving targets under the Kunming-Montreal Global Biodiversity Framework	-	Full achievement of identified 23 targets by 2030	Convention on Biological Diversity (2022), Kunming-Montreal Global Biodiversity Framework (2023), Convention on Biological Diversity, Montreal.



Policy framework for managing labor transition



Source: Authors' extension of the (formal) labor policy approaches developed in Fretwell (2017), World Bank (2018a) and Cunningham and Schmillen (2021)



challenges for producer economies and countries whose energy systems are heavily dependent on fossil fuel-based generation.

For producer economies, the challenge is strategic in nature, as fossil fuel revenues will likely wind down over time and economic measures would be required to ensure diversification and resilience. To achieve this, many producer nations are exploring ways to integrate their energy transition efforts into their economic diversification strategies, repurposing existing supply chains, expertise and supporting industries for clean energy technologies like low-emissions hydrogen.

According to the European Commission, the transition to a greener economy could potentially affect 35% to 40% of all jobs. To address this, the Commission has proposed the establishment of Net Zero Industry Academies as part of the Green Deal Industrial Plan. The socio-economic impact of transitioning away from fossil fuel production is not limited to producer economies alone. It is a challenge faced by producer industries and regions worldwide. Careful handling of this transition is crucial to ensure that no one is left behind. For instance, a World Bank group study highlights that whilst the number of direct coal and lignite mining jobs globally is currently 4.7 million, accounting for a small and declining share of total employment, these jobs have a significant indirect impact across economic sectors and exert a disproportionate influence on local labour markets. In India, for example, coal mining supports the livelihoods of 20 million people across six relatively poorer states. However, the socio-economic impact of this transition extends beyond producer economies and affects industries and regions worldwide.

The global challenge of inadequate energy access is a significant concern, particularly in Africa and Asia, where approximately 770 million people lack access to reliable electricity. This lack of access is further exacerbated by geopolitical issues, leading to rising energy costs and supply challenges. Energy prices account for 90% of the rise in the average costs of electricity generation worldwide. Due to these issues, the number of people without access to modern energy has increased for the first time in

a decade. To tackle this energy trilemma, countries must plan a coherent and just transition towards clean energy sources.

A successful and enduring energy transition should be grounded in energy security—i.e. adequate and reasonably priced supplies—to ensure public support and avoid severe economic repercussions. Countries may have to continue to invest in traditional energy systems to fulfil immediate energy needs whilst accelerating the transition by adopting clean energy technologies. For a resilient energy system, diversity of energy supply is key to lower energy costs over time and enhanced energy security. The energy trilemma must be solved with a rebalancing of the energy systems, with a parallel focus on ensuring security and affordability of energy supply and decarbonising the economy.

To measure the progress and effectiveness of energy transition plans, important performance indicators such as funding allocation towards a just transition and energy affordability should be monitored. Additionally, policies and initiatives should be aligned with national priorities to ensure that they are effectively implemented.

There are several policy and planning lessons reported in this World Bank study, borrowing from the experience of countries that have undergone coal mine closures (Figure 3: Policy and Planning Lessons on Mine Closures under Just Transition). Funds will be required to repurpose coal mines and power plants and to retrain workers. This will include repurposing land and associated infrastructure for clean energy projects and creating new jobs in the clean energy sector. Retraining workers for sectors other than energy is another important aspect of a just transition that will need financial support.

Proposed actions

- 1. Prioritise energy access, security and affordability based on country-specific considerations:** Governments should implement specific policies for investment in energy



and infrastructure expansion, technological upgrades and clean energy in line with their national priorities and local and global energy market considerations. Governments should also implement targeted initiatives that address the needs of underserved communities, promote decentralised renewable energy solutions and explore innovative financing models, such as pay-as-you-go systems, for clean energy access.

2. Formulate economic diversification plans to mitigate potential socio-economic impacts of transitioning to clean energy:

Governments, particularly producer economies, should formulate comprehensive plans for economic diversification to address the socio-economic impacts of transitioning away from fossil fuels. These plans should include supporting affected industries and regions through reskilling and reemployment programmes, facilitating job creation in the clean energy sector and ensuring social safety nets for communities that rely heavily on fossil fuel industries. Additionally, the plans should identify new sectors and industries aligned with clean energy technologies and prioritise their development. Multilateral and bilateral collaborations with other countries and organisations can aid in the implementation of appropriate measures.

3. Adopt a balanced approach that provides opportunities for skill development and retention:

G20 member countries should adopt a balanced approach that provides employment opportunities for all segments of society. Recognising that opportunities for diversification, reskilling and employment alternatives will vary across countries and regions, strategies should be tailored to address specific needs and circumstances. Countries should seek to establish academies or programmes focused on clean energy and low-carbon technologies to provide specialised training and skill development opportunities. These measures will create a qualified workforce capable of supporting the clean energy sector.

4. Establish an enabling environment to promote just transition:

Governments should incorporate sectoral and geographic considerations into their policy and regulatory frameworks to determine unique transition needs whilst balancing sustainable growth. The frameworks should encourage investment in clean energy, access and affordability whilst minimising risks, fostering innovation and promoting transparency and accountability. This approach will align energy transition goals with the socio-economic priorities of specific regions and sectors, ensuring an inclusive and equitable transition.

5. Embrace technological innovation and digitalisation to ensure energy affordability and access:

G20 countries should explore advancements in technology and digital solutions to reduce costs, enhance efficiency across the energy value chain and improve accountability, thereby attracting the necessary investments, generating broader cross-sectoral impacts and leading to increased affordability and access for consumers.

6. Prioritise public financing for affordable energy access:

Public financing remains critical for ensuring affordable access to energy for all. G20 countries should continue to invest in initiatives that lead to energy access and affordability for all.

7. Leverage global frameworks and drive implementation of similar programmes for other developing and emerging economies:

Frameworks such as the the Council for Inclusive Capitalism's Just Transition Framework for Company Action¹ provide a comprehensive guide for governments, companies of all industries and civic organisations to achieve the transition to net-zero emissions in a just manner. The framework offers guidance based on four core pillars: supporting universal access to energy and a net-zero emissions world, evolving the energy workforce to support a low- and zero-carbon

¹ The Council for Inclusive Capitalism's Just Transition Framework for Company Action
<https://www.inclusivecapitalism.com/just-energy-transition-home/>



energy future, building community resilience and fostering collaboration and transparency throughout the process. Additionally, the G7 countries launched JETP, a collaborative forum to address just transition in developing and emerging countries. G20 countries should consider adopting similar approaches to promote just transition in developing countries.

Policy Action 3.2: Address gender equality and just transition for MSMEs dependent on larger producer companies facing phase down or transition

CONTEXT

Ensuring an inclusive transition is paramount as we embark on the journey of energy transition. Whilst the focus is often on large producer organisations and their employees, it is crucial to also consider MSMEs, including cooperatives and entrepreneurs, who rely on larger producer companies. Assisting MSMEs in adopting and navigating transitional pathways is a vital aspect of a just transition. These organisations are particularly vulnerable to disruptions and require access to capacity building and financing to assess risks, enhance resilience and adopt transition mechanisms.

Furthermore, MSMEs have played a significant role in protecting economies during global recessions, and their relevance will continue to be essential in decarbonisation and energy transition. Various studies have highlighted the potential for new and evolved MSMEs to contribute to the energy value

The Global Adaptation Index indicates that India, South Africa, Brazil, Mexico and Saudi Arabia are less prepared (with a Gain preparedness value of around 0.4), whereas the US, Australia, Canada, Japan and South Korea are more prepared for climate change (with a Gain preparedness value of around 0.7). Source: Gain (2019). ND-GAIN country index.

chain, such as in waste management, raw material aggregation, biofuel refineries, renewable energy operation and maintenance, retailing of green products and services and more. Inclusive policies should cater to the specific needs of MSMEs, whilst also ensuring gender equality in policies and financial products.

Upskilling and empowering women is of utmost importance during these times of significant economic transitions. As new technologies and digitisation close gender gaps in education and market access, women have the potential to benefit as workers, consumers and decision-makers. Advancements like mobile money and digital platforms can help women overcome barriers to accessing finance and markets, which are key challenges for starting new businesses. Additionally, the growing start-up culture provides ample opportunities for women to become entrepreneurs and job creators, particularly in the service industry. This presents a significant opening for women to shape work opportunities based on their skill sets and requirements.

Proposed actions

- 1. Promote gender equality and women's empowerment:** Implement policies and initiatives that address gender gaps in access to education, finance and market opportunities. Support skilling and upskilling programmes for women to enable their active participation in the economy, particularly in sectors related to the energy transition. Encourage the involvement of women in leadership positions and entrepreneurship, leveraging technology advancements and the growth of start-ups.
- 2. Foster a supportive environment for MSMEs:** Provide assistance and resources to MSMEs, including cooperatives and entrepreneurs, to facilitate their transition towards sustainable practices. This can include offering capacity-building programmes, access to financing and guidance in assessing and adopting transitional pathways.



3. **Enhance resilience and risk management:** Recognise the vulnerability of MSMEs to disruptions during the energy transition and support them in building resilience. This can be achieved through targeted risk assessment, training programmes and financial instruments that help MSMEs mitigate potential challenges and adapt to new market demands.
4. **Facilitate knowledge sharing and collaboration:** Establish platforms for knowledge exchange and collaboration amongst different stakeholders, including large producer organisations, MSMEs, government agencies and civil society. Encourage partnerships and joint initiatives that foster innovation, promote sustainable practices and create a supportive ecosystem for the energy transition.
5. **Align policies and regulations:** Develop policy frameworks that integrate the needs and requirements of MSMEs into the energy transition agenda. This involves considering sectoral and geographic specificities, providing targeted support and ensuring that policies are inclusive and conducive to sustainable growth for all sections of society.
6. **Invest in R&D:** Allocate resources for R&D efforts aimed at identifying new opportunities and technologies in the energy sector. Support innovation and entrepreneurship by creating funding mechanisms and incentives for sustainable and clean energy solutions, benefiting both large organisations and MSMEs.
7. **Strengthen international cooperation:** Foster collaboration between countries, particularly between the Global North and the Global South, to share best practices, experiences and expertise in managing the energy transition. Support capacity-building initiatives in developing countries to ensure they have the necessary skills and knowledge for a successful and inclusive transition.

Policy Action 3.3: Promoting nature-positive transitions through biodiversity conservation and integrating Ecosystem-based Approaches (EbA) into adaptation planning

CONTEXT

Climate change has a direct and significant impact on biodiversity, resulting in rapid alterations to the composition and functioning of ecosystems. This poses a severe threat to the valuable services that ecosystems provide. Conversely, ecosystems and biodiversity play a crucial role in mitigating the adverse effects of climate change. It is essential to recognise that ecosystems and their services are highly sensitive to climate conditions and must be managed within safe biophysical limits. By doing so, they can effectively contribute to both mitigation and adaptation efforts, as well as socio-economic development benefits.

Ecosystem management and restoration is critical to climate change adaptation, and communities can play a central role in the process, but the evidence base needs strengthening. This will facilitate priority placement for nature and positive contribution from businesses towards restoration and adaptation.

The United Nations Biodiversity Conference (COP15) in Montreal, Canada, ended with a landmark agreement to guide global action on nature through to 2030. COP15 resulted in the adoption of the Kunming-Montreal GBF with a target of Reversing Nature Loss by 2030 and Living in Harmony with Nature by 2050.

The 2030 targets are focused on restoration of 30% of degraded ecosystems and protecting 30% terrestrial and inland water areas and of marine and coastal areas having high conservation importance. These targets also enable financial investments in EbAs and private sector action for addressing nature related risk

EbA has emerged as a widely recognised pillar of nature-based solutions and is identified as approach to achieve the objectives of the Kunming-Montreal Global Diversity Framework. EbA is a people-centric



approach deliberately designed to deliver adaptation outcomes and socio-economic benefits. When properly designed and implemented, EbA solutions offer multiple advantages for adaptation and can be more cost-effective compared to traditional engineered approaches. Country-specific National Adaptation Plans (NAP) provides a comprehensive framework for mainstreaming, mandating and scaling up EbA across national, sub-national and budgetary planning processes. It serves as an opportunity to integrate ecosystem and adaptation planning, allowing for the prioritisation of EbA solutions across various sectors as part of an overall strategy to assist communities in effectively adapting to climate change.

Moreover, the NAP process enables countries to advance the protection of biodiversity whilst aligning with climate adaptation objectives and fulfilling multiple international obligations. It plays a crucial role in reducing vulnerability to the impacts of climate change and facilitates the integration of climate change adaptation considerations into biodiversity policies, programmes and activities.

To ensure that EbA solutions truly help people adapt and enhance the resilience of ecosystems, they must address climate hazards, generate adaptation benefits for vulnerable groups, build ecosystem resilience and promote the sustainable use of biodiversity. These considerations are vital for the successful implementation of EbA and the achievement of long-term climate resilience.

Proposed actions

G20 nations may promote nature-positive transitions and integrate EbA into transition plans through:

1. Committing to undertaking policy actions to reach the targets defined under the Kunming-Montreal GBF and they should be implemented consistently and in harmony with the Convention on Biological Diversity and its Protocols and other relevant international obligations, considering national circumstances, priorities and socio-economic conditions.
2. Setting country-level targets and allocation of resources for large-scale ecosystem restoration efforts, including reforestation and habitat protection and strengthening legal frameworks and enforcement mechanisms to ensure the conservation of biodiversity and the sustainable use of natural resources.
3. Enhancing understanding and utilisation of EbA and environmental ecosystems.
 - Invest in research and knowledge sharing initiatives to deepen understanding of EbA and ecosystems across neighbouring countries.
 - Develop capacity-building programmes to equip stakeholders with the necessary skills to effectively utilise such approaches for sustainable consumption.
 - Mainstreaming EbA approaches in national and sectoral adaptation plans and strategies.
 - Incorporate EbA principles and practices into policy frameworks and planning processes at national and sectoral levels.
 - Allocate resources and establish mechanisms to integrate such approaches seamlessly into adaptation plans and strategies.
4. Establishing M&E mechanisms for EbA.
 - Design and implement robust M&E systems to assess the contribution of EbA approaches to resilience, adaptation, disaster risk reduction and sustainable development.
 - Ensure that the generated knowledge from M&E processes informs decision-making and risk communication efforts.
5. Mobilising financing and engaging the private sector.
 - Develop effective financing strategies that attract private sector investments in achieving the targets of the Kunming-Montreal Framework, going beyond corporate social responsibility.
 - Explore innovative financial mechanisms, such as green credits, green bonds or impact investment funds, to support the scaling up of relevant projects.



Recommendation 4

Create enabling regulatory frameworks, policies, business and financing models and eliminate policy barriers for promoting sustainable economy and resource efficiency

CONTEXT

The continuous economic growth and individual surplus income have driven demand for various natural resources, thus exerting pressures on the environment and raising sustainability concerns. Enhancing resource efficiency, circular economy and promoting the use of secondary raw materials has emerged as a strategy for ensuring that the potential trade-off between growth and environmental well-being can be minimised.

G20 countries account for approximately 75% of global materials use and 80% of global greenhouse gas emissions although there are significant differences amongst these countries. G20 governments are thus expected to play principal role in ensuring resource efficiency and material circularity. Whilst average resource productivity of the G20 grew by about 40% between 2000 and 2017 and further improvements in resource productivity are expected in the future, this will not be sufficient to offset the global increase in materials use.

Several G20 nations have begun developing national strategies for sustainable materials management, resource productivity or the circular economy. During the last decade, principles of resource efficiency and materials circularity—including resource productivity, material recovery, sustainable materials management and the '3Rs' (i.e. reduce, reuse and recycle)—have received increased attention from the highest levels of government of many G20 countries and the G20 and G7 itself.

At the G20, resource efficiency has been on the agenda since 2017 and annual G20 Resource Efficiency Dialogues have been held since, providing

a platform for exchanging views, policy experiences and good practices. Going forward, the G20 could further advance joint work on resource efficiency and the circular economy. Resource efficiency and circular economy principles need to be mainstreamed in domestic policies, considering specific country contexts. National and sub-national action also needs to be aligned to fully leverage the role of cities in improving materials management.

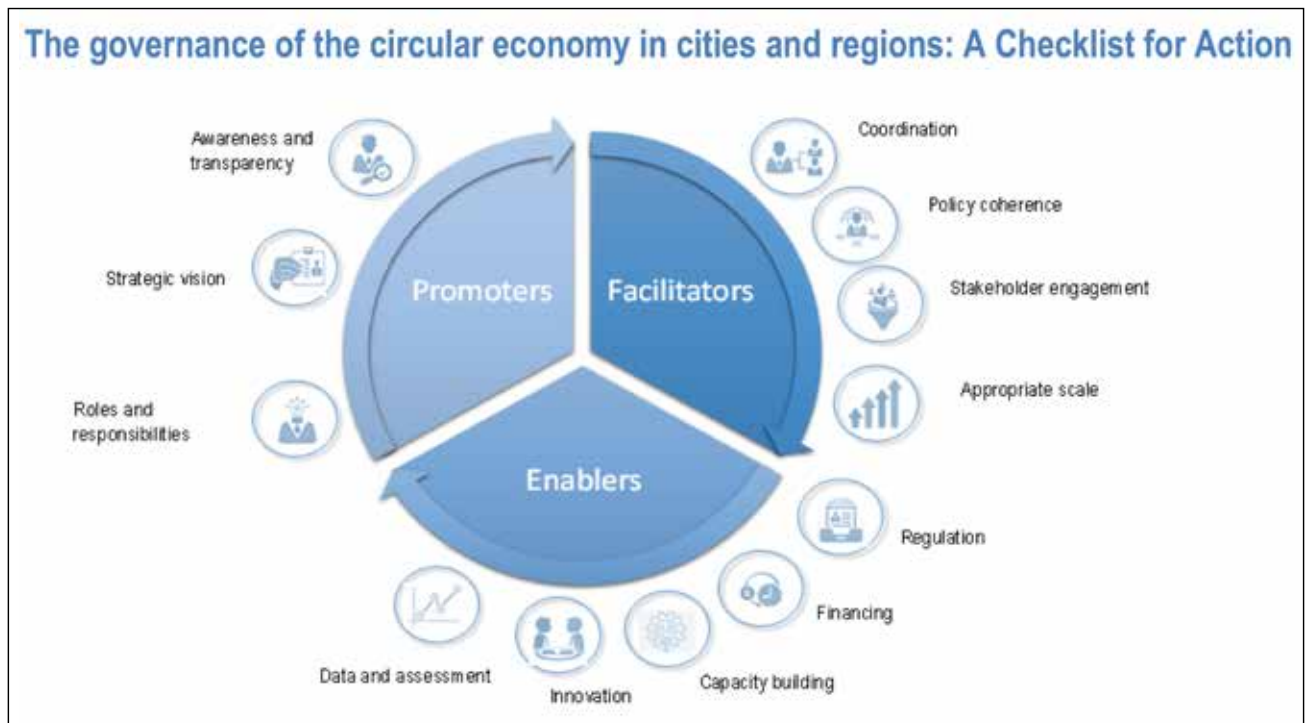
At the national level, various countries have developed strategies, roadmaps and policy packages that address elements of resource productivity. Introducing a circular economy strategy in a city or in a region serves to build a vision, identify priorities and allocate financial resources to achieve these priorities. In the EU, the Resource Efficiency Platform was established as well as the first Circular Economy Action Plan in 2015, followed by a new Circular Economy Action Plan, released in 2020, which is one of the drivers for the European Green Deal and acknowledges the role of cities in the transition.

A few examples of national, regional and local strategies for resource efficiency, waste management and circular economy of G 20 Countries are enclosed in Annexure-A

In the recently concluded G20 summit in Indonesia as well as the COP27 in Egypt, the emphasis was given to the promotion of resource efficiency and circular economy to increase sustainability and work together on scientific knowledge sharing, raising awareness and capacity building, particularly to advance on the ocean-based climate action. The need for strong collaboration and cooperation, including on science



Figure 4: Governance of circular economy in cities and regions



Source: OECD (2021), *Towards a More Resource-Efficient and Circular Economy: The Role of the G20*, OECD, Paris, <https://www.oecd.org/env/waste/OECD-G20-Towards-a-more-Resource-Efficient-and-Circular-Economy.pdf>

and knowledge sharing, particularly in developing countries and amongst governments at all levels, industries, value chain actors, communities, relevant partners and stakeholders including civil society, Indigenous peoples and local communities were underlined to enhance the implementation of circular economy to minimise the negative environmental, social and economic impacts of consumption and production .

The role of strengthening cooperative actions on technology development and transfer for innovation through enhanced international cooperation in R&D as well as deployment and transfer of technology to development was recognised. A few suggested policy actions that can accelerate adoption of circular economy in G20 economies are as follows:

Policy Action 4.1: Calibrate and harmonise national and international policy frameworks to mainstream resource efficiency considerations and drive transition to a circular economy

- Develop holistic policies, such as innovation, investment and education strategies, which integrate resource efficiency objectives for large businesses as well as MSMEs
- Align sectoral policies with resource efficiency principles to ensure coherent policy action
- Establish robust data collection and analysis systems, to help track materials through their life cycles
- Introduce regulations and management of End-of-Life Solar Panels leveraging learning from the EU Waste Electrical and Electronic Equipment (WEEE) Directive
- Develop coherent policies around management of Industrial Solid Waste (ISW)
- Develop policies for recycling of energy critical minerals (includes lithium, cobalt, selenium, silicon, tellurium, indium and Rare Earth Elements) integral to advanced energy production, transmission and storage
- Explore establishing a global alliance, similar to the ISA, to promote and support development of



a global circular economy in order to accelerate sustainable consumption.

Policy Action 4.2: Mobilise and allocate financial stimulus to support innovation and the uptake of circular business models, where needed.

- Explore the use of financial instruments such as taxes, subsidies and tax exemptions to accelerate the transition to a circular economy
- Along with the private sector, G20 countries should look to co-create business models that encourage the use of green technologies
- Advance efforts and support towards direct subsidies, viability gap funding, mandatory public procurement, networking and dissemination of solutions
- Establish a dedicated fund to invest in emerging resource-efficient technologies.

Policy Action 4.3: Strengthen Extended Producer Responsibility (EPR) and promote resource efficiency through Green Public Procurement (GPP)

- Integrate resource efficiency objectives in GPP schemes to encourage resource efficiency along a product’s lifecycle
- Strengthen EPR by creating infrastructure to support collection, segregation and recycling of waste.

Policy Action 4.4: Mainstreaming informal sector within the waste management framework

- Develop policies that enable and empower municipalities and Urban Local Bodies (ULBs) to analyse the current state of the informal sector in the respective country and create frameworks to integrate them in the existing formal sector
- Engage with MSMEs and start-ups and promote Construction and Demolition (C&D) waste conversion businesses

Leading Monitoring KPIs

Monitoring KPI	Baseline	Target	Sources
Share of workers employed in formal sector of waste management and recycling	One-fifth of total waste management workers [2013]	Half of total waste management workers [2030]	International Labor Organization (2015), Decent Work, Green Jobs and the Sustainable Economy
Percentage of countries which have established institutions for policy development and regulatory oversight in the waste sector	70 % of Countries[2021]	80 % of countries [2026]	The World Bank (2018), A Global Snapshot of Solid Waste Management to 2050
Percentage of public sector procurement activities directly or indirectly responsible for global GHG emissions	15% [2021]	6% [2050]	World Economic Forum (2022)—Green Public Procurement: Catalysing the Net-Zero Economy, White Paper.
Percentage of global e-waste recycled	17.4% [2019]	40% [2030]	International Telecommunication Union (2020), Global E-waste Monitor 2020
Primary metallic ores used as a percentage of global materials used	10.11% [2017]	11.98% [2060]	OECD (2019), Global Material Resources Outlook to 2060



- Provide support to emerging and developing nations through knowledge transfer of learning from successfully implemented waste management systems and by providing financial assistance.

SDG Goals Impacted



Recommendation 4 contributes to achieving UN SDGs, 6. Clean Water and Sanitation, 8. Decent work and Economic Growth, 12. Responsible Consumption and Production, 15. Life on Land and 17. Partnerships for the goals

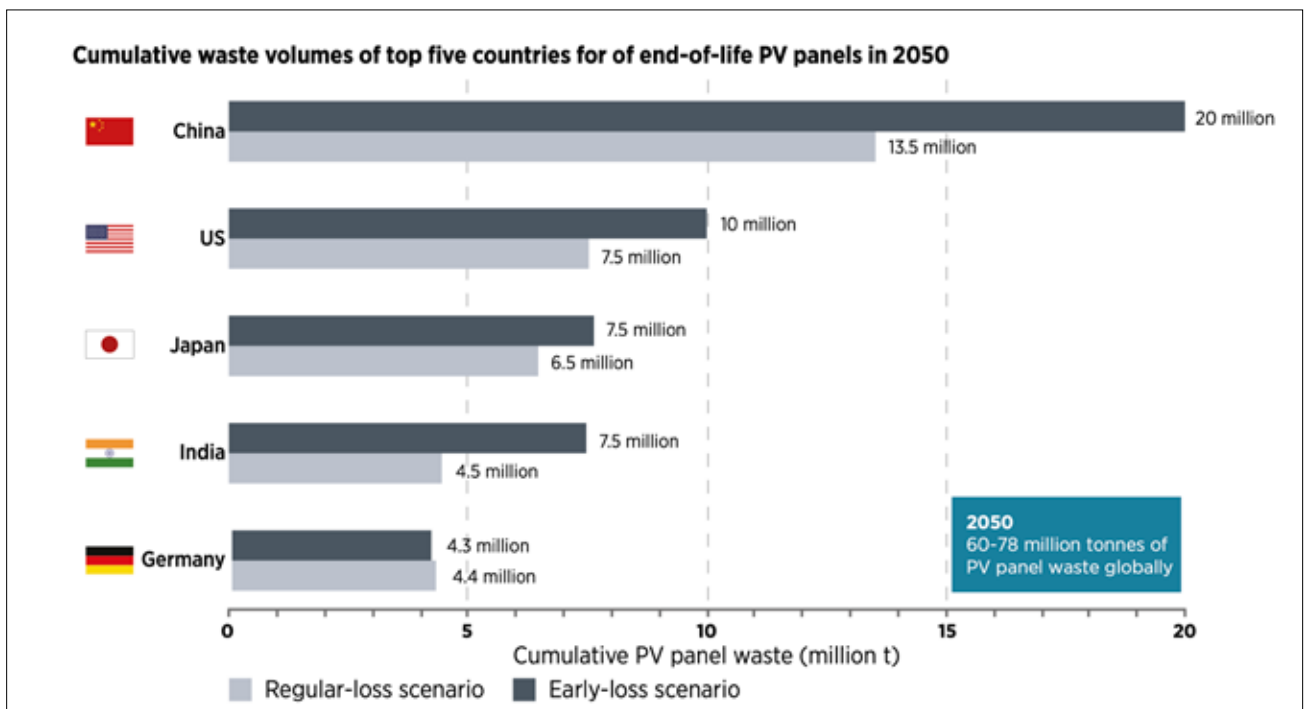
Policy Action 4.1: Calibrate and harmonise national and international policy frameworks on to mainstream resource efficiency considerations and drive transition to a circular economy

The EU has pioneered PV electronic waste (e-waste) regulations, which cover PV-specific collection, recovery and recycling targets. Based on the extended-producer responsibility principle, the EU Waste Electrical and Electronic Equipment (WEEE) Directive requires all producers supplying PV panels to the EU market (wherever they may be based) to finance the costs of collecting and recycling end-of-life PV panels put on the market in Europe.

CONTEXT

Even though policy responses to address resource efficiency and circular economy have already emerged, they have been insufficient to curb the environmental impacts linked to materials consumption. Further stronger policy action is needed to slow down the growth of materials use, improve the share of materials that are kept in the economy and change the materials mix towards less toxic and more environmentally efficient materials.

Figure 5: Cumulative waste volume of top five countries for of end-of-life PV panels in 2050



In G20 countries, there is lack of legislation that will allow the collection and pre-treatment of homogenous waste streams. High-quality recycling is not prevented by regulatory obstacles, but by lacking or unclear legislation. Prime examples are End-of-Waste criteria or quality standards for secondary raw materials that create legal uncertainties for the industry that make it rational to continue to focus on primary raw material input.

G20 countries often face technology barriers in which businesses lack the proven technologies to implement circular economy. Implementation of a circular economy approach is that a typical Small and Medium Enterprise (SME) requires a lot of innovation in its current linear model in order to initiate the transition to a circular model. Even though technical development and support are crucial, such expertise and technologies are still lacking in sustainable practices.

There is also lack of awareness or willingness to engage in adoption of circular economy approach. It has been noticed that the lack of consumer interest and awareness as well as a hesitant company culture, are considered as the main circular economy barriers by businesses and policymakers. Public acceptance is a cornerstone of market behaviour that has the potential to influence companies to shift their business models towards circularity. Companies can be led by consumer demand for sustainable products and services. Ignorance on the part of consumers of the environmental impact of goods and industrial activities continues to impede the transition processes.

The absence of a clear business model, lack of economic viability, lack of design strategies and approaches, such as eco-design and backcasting, restricts organisations from effectively implementing circular economy-based business models. These barriers may be overcome by identifying root causes at different levels by concerned G 20 countries for transition of economy from linear to circular.

A key emerging challenge is growing PV panel waste. Currently, tens of thousands of solar panels installed in the early 2000s are reaching the end of their lifecycles, posing a serious problem for the

industry to contend with. Current solar panel disposal practices are far from being environmentally friendly. As the global PV market increases, so will the volume of decommissioned PV panels. At the end of 2016, cumulative global PV waste streams reached 43,500–250,000 metric tonnes .

Growing PV panel waste presents a new environmental challenge, but also unprecedented opportunities to create value and pursue new economic avenues. There are two scenarios for global PV panel waste volumes until 2050.

- Regular-loss: Assumes a 30-year lifetime for solar panels, with no early attrition
- Early-loss: Takes account of 'infant', 'mid-life' and 'wear-out' failures before the 30-year lifespan.

Policy action is needed to address the challenges ahead, with enabling frameworks being adapted to the needs and circumstances of each region or country. At present, only the EU has adopted PV-specific waste regulations. Most countries around the world classify PV panels as general or industrial waste.

Additionally, rising issues around availability of energy critical minerals, industrial and manufacturing wastes (particularly in developing and emerging economies) and lack of data on material tracking across product life cycles are also major concerns that require policy interventions by G20 countries.

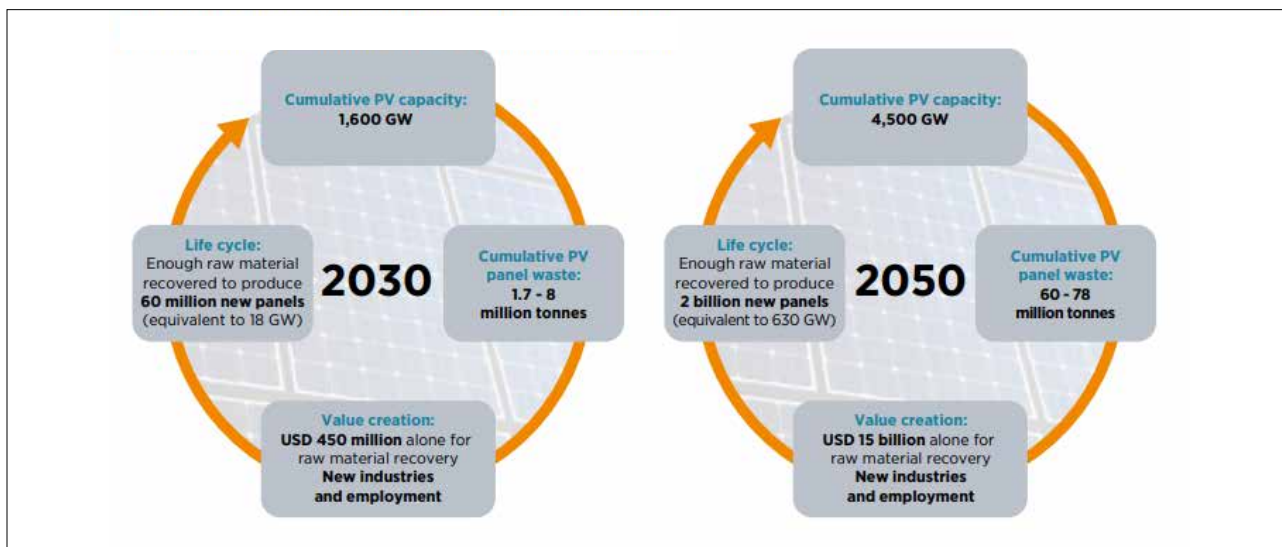
Proposed actions

To promote resource efficiency, G20 governments need to enhance policy coherence across economic sectors, jurisdictions and all stages of the value chain, creating a coherent set of incentives for all relevant stakeholders. Strengthened policy coherence, together with increased coordination amongst all relevant stakeholders, can effectively counterbalance the increasing fragmentation of the global value chain.

National and international policy frameworks need to mainstream resource efficiency and to treat the transition to a circular economy as an



Figure 6: Potential Value Creation through PV end-of-life management



overarching economic policy challenge. The key areas recommended for action are as follows:

1. Develop holistic policies, such as innovation, investment and education strategies, which integrate resource efficiency objectives for large businesses as well as MSMEs. Supporting innovation in MSMEs can help to achieve decoupling of materials use from economic growth, whilst mainstreaming resource efficiency into investment plans and strategies can support a more resource-efficient and low-carbon development.
2. Align sectoral policies with resource efficiency principles to ensure coherent policy action with focus on the most resource-consuming industries, such as agriculture, energy and transport.
3. Establish robust data collection and analysis systems, to help track materials through their life Cycles. G20 governments should invest in capacity building to strengthen their ability to analyse material flows and resulting environmental and socio-economic impacts. In this context, governments could also engage in international efforts to help strengthen developing countries' data and analytical capacity. Blockchain is ideal to help in that circulation task, identifying and monitoring materials and components right through the supply chain so that they can be either reused, remanufactured or (when that is no longer possible) recycled or composted.
4. Introduce regulations and management of End-of-Life Solar Panels leveraging learning from the EU WEEE Directive. End-of-life management could become a significant component of the PV value chain. Recycling PV panels at their end-of-life can unlock a large stock of raw materials and other valuable components. The recovered material injected back into the economy can serve to produce new PV panels or be sold into global commodity markets, thus increasing the security of future raw material supply. End-of-life management for PV panels will spawn new industries, can support considerable economic value creation and is consistent with a global shift to sustainable long-term development. G20 countries may also explore the possibility of exports of end-of-life PV panels and electrical material to other member countries that have a more conducive recycling and asset management ecosystem. This could be lower costs of recycling, more sustainable practices, more robust technology supply chain, higher recovery rates or a well-established disposal ecosystem.
5. Develop coherent policies around management of Industrial Solid Wastes (ISW). Currently



industries generating solid waste must manage such waste by themselves. There is an urgent need to explore the possibility of using such waste by other industries. The latest policies on waste management are emphasising waste recycling and recovery and differentiated responsibilities as part of the 'Polluter Pays Principle'. A larger view is required to be assumed on the potential of circularity from industrial/manufacturing solid waste.

6. Develop policies for recycling of energy critical minerals (includes lithium, cobalt, selenium, silicon, tellurium, indium and REEs) integral to advanced energy production, transmission and storage.. Recycling relieves the pressure on primary supply requirements, which will assume a greater importance as energy security becomes a major concern for countries around the world. The security benefits of recycling can be far greater for regions with wider deployment of clean energy technology due to greater economies of scale. Governmental policies can play a pivotal role in preparing for rapid growth of waste volumes by incentivising recycling for products reaching the end of their operating lives, supporting efficient collection and sorting activities and funding R&D into new recycling technologies.
7. Explore establishing a global alliance, similar to the ISA, to promote and support development of a global circular economy in order to accelerate

sustainable consumption. This organisation can also act as a facilitator to coordinate the integration of resource efficiency and circularity principles in international policy frameworks.

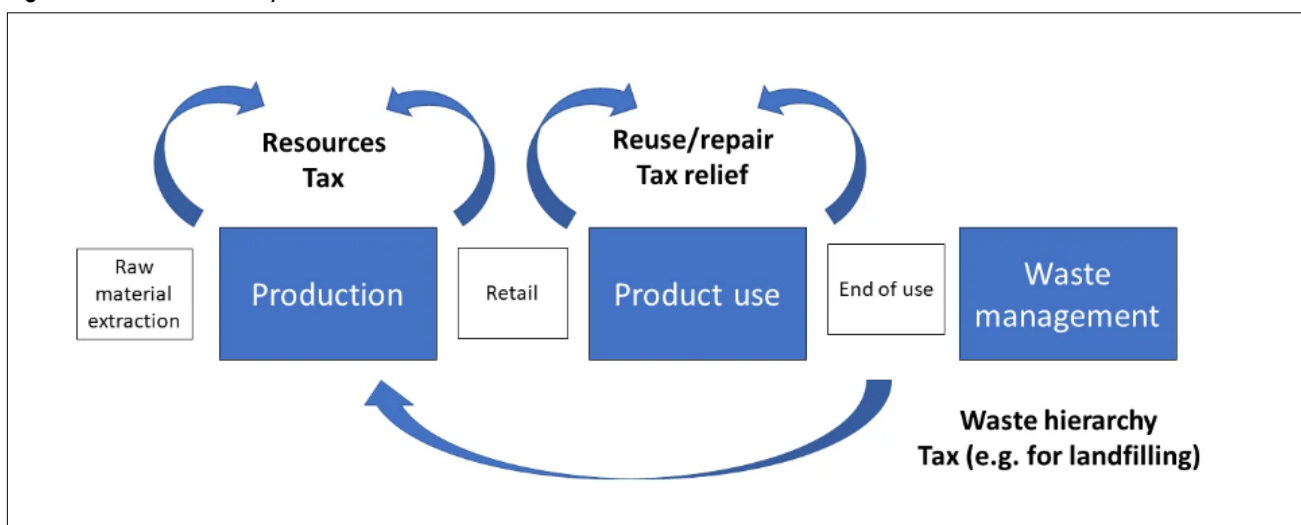
Policy Action 4.2: Mobilise and allocate financial stimulus to support innovation and the uptake of circular business models, where needed.

CONTEXT

Finance is an important enabler of technological innovation as it efficiently allocates resources to the most productive economic agents. The limited access to investment capital/ finance can become barrier to innovation advancement and penetration of circular business models in actual practice. A range of financing mechanisms that are transparent and readily accessible should be available to enable firms to address issues such as high initial investments and long payback periods, which are typically identified as key barriers to the adoption of circular business models. Financial instruments and investments are needed to support the growth of the circular business models and process improvement at scale.

Instruments—such as blended finance and investment guarantees—that support public-private collaboration and financing of the circular economy offer a wider range of possibilities to scale circular

Figure 7: Circular Economy Taxation Framework



economy finance and investments. Establishing financing mechanisms could facilitate G20 economies in following ways:

- Extend the necessary support Circular Economy (CE) projects till they are financially self-sustaining
- Enable the firms/entities to meet high initial costs and address long payback periods
- Support scaling up or technology upgradation
- Revolving funds may be specifically used to incentivise circularity in business by permitting business models or specific resource efficiency measures that are seen as potentially risky to obtain funding

In addition, fiscal incentives are observed to have a 'signalling effect' and impact consumer demand beyond financial considerations. G20 nations should identify selected economic/financial instruments that should keep pace with the evolving market and technical conditions.

Many G20 countries have supported resource efficiency and eco-innovation investments that can support the move towards circular economies. They have financed industry investments that reduce the production of hazardous waste.

Resource-efficient business models must lead to value creation or profit for enterprises so that more and more companies are motivated to get involved. Business models for collaborative consumption and shared economy must be evolved. Amongst the G20, on average resource productivity grew by about 40% between 2000 and 2017. In 2017, in G20 countries, one tonne of materials generated on average USD 2,400, whereas in 2000 the same number of materials generated USD 1,700. This reflects efficiency gains in the production process, structural changes in the composition of the economy and the partial substitution of domestic production with imported goods (i.e. the shift of material-intensive activities abroad).

An uptake of circular business models as well as investments in R&D of circular technologies can generate new economic growth through innovation.

Thereby, the CE can also contribute to the economic recovery from the recent COVID-19 crisis.

Proposed actions

G20 countries can mobilise and allocate financial stimulus to support innovation and the uptake of circular business models through:

1. Explore the use of financial instruments such as taxes, subsidies and tax exemptions to accelerate the transition to a CE. Introducing reduced tax rates for resource-efficient products can make them cheaper and stimulate demand for them. At the same time, tax incentives can also be provided to companies that invest in R&D of these resource-efficient products. G20 governments may also explore tax differentiation for circular products and services.
2. Along with private sector, G20 countries should look to co-create business models based on green technologies, which can be encouraged by using levers like PPP models.
3. Advance efforts and support towards direct subsidies, viability gap funding, mandatory public procurement, networking and dissemination of solutions as well as regulation to accelerate adoption of certain technologies and/or practices.
4. Establish a dedicated fund to invest in emerging resource-efficient technologies, set up green science parks promoting collaborations between businesses, research institutions and universities and provide fiscal incentives for early adopters of circular business models.

Policy Action 4.3: Strengthen Extended Producer Responsibility (EPR) and promote resource efficiency through, Green Public Procurement (GPP)

CONTEXT

EPR schemes have been widely adopted in many countries, further efforts are needed to broaden their scope such as include new waste streams and stronger incentives for eco-design, strengthen



their enforcement and ensure that they operate in a transparent and accountable way.

Circular procurement sets out an approach to GPP that pays special attention to 'the purchase of works, goods or services that seek to contribute to the closed energy and material loops within supply chains, whilst minimising, and in the best case avoiding, negative environmental impacts and waste creation across the whole life cycle'. Circular procurement approaches have the potential to deliver multiple benefits. For example, in addition to allowing purchasers to focus on need fulfilment and consider lifetime costs with potential for savings, circular procurement also provides a framework for more holistic consideration of environmental impacts and waste creation across the whole life cycle of goods and service.

Initiatives such as ecolabelling programmes, including the Global Ecolabelling Network (GEN) , can facilitate the adoption of global benchmarks to strengthen EPR and promote resource efficiency through GPP. Governments, industry stakeholders and organisations can collaboratively establish and enforce effective ecolabelling standards. These efforts can empower countries to either embrace existing ecolabels or develop new ones that align with internationally recognised criteria. Implementing such approaches can ensure consistency and adherence to established standards, promotion of responsible consumption and empowerment of consumers to make informed decisions.

Globally, governments spend approximately USD 13 trillion in public contracts every year, representing approximately 12% of GDP. GPP encourages governments to consider choosing products and services that cause minimal adverse environmental impacts. Modern procurement systems have shifted from sourcing the lowest price (which can lead to low durability and inefficiency) to designing fit-for-purpose procurements that deliver value for money. Although GPP currently is implemented as a voluntary instrument, it can help stimulate demand for more sustainable goods and services, promote innovation in tenders and drive the development of green marketplaces.

Proposed actions

G20 countries can strengthen current EPR practices and promote resource efficiency through GPP by the following sub-actions:

- Integrate resource efficiency objectives in GPP schemes to encourage resource efficiency along a product's lifecycle and establish and incentivise partnerships with businesses and other stakeholders of the value chain to improve coordination. Governments can explore adoption tools such ecolabels to encourage resource efficiency throughout a product lifecycle by integrating resource efficiency objectives across GPP schemes.
- Strengthen EPR by creating infrastructure to support recycling, collection, processing for circularity. The role of EPR is extremely important to support the cost-effective business model of reverse logistics.

Policy Action 4.4: Mainstreaming informal sector within the formal sector in the waste management especially in developing and emerging economies

CONTEXT

Rapid urbanisation has resulted in a population explosion in most of the cities of developing countries. There are gaps and lags in the demand and supply of physical infrastructures such as roads, water supply, electricity, waste disposal, etc. affecting the quality of life of city residents. As per the World Bank report, global waste will increase by 70% on current levels by 2050 if urgent actions are not taken.

It is important to note that the engagement of formal waste management systems remains low in cities of developing countries, primarily due to insufficient funds, low sectoral development and lack of know-how about sustainable waste management businesses. It has severely damaged the environment and public health and strained the capacity of Urban Local Bodies (ULBs) to collect, transport, treat and scientifically dispose of solid wastes.



Globally, 55% of the world's population lives in urban areas and cities represent almost two-thirds of global energy demand, produce up to 50% of solid waste and are responsible for 70% of greenhouse gas emissions. In fast-developing G20 countries, urbanisation rates remain high and cities are expanding at a fast rate, there is a crucial need for a sustainable and formal way for solid waste management.

The global size of the informal waste and recycling sector has been recently conservatively estimated at 11.4 million waste pickers (2020) and previously at between 12.5 and 56 million (2016). Recycling by the informal sector provides a rapid, inexpensive solution to plastic pollution, whilst supporting the livelihoods via their inclusion and empowerment.

MSMEs may also play vital role in handling Construction & Demolition (C&D) in developing economies. C&D waste generation normally varies from 5%–25% of the MSW generated in ULBs. However, due to inadequate capacity of C&D waste processing facilities, material value of C&D waste is lost into landfills, causing huge environmental and economic losses.

In order to integrate the informal sector, ULBs may consider the following steps:

Figure 8: Steps for integrating the informal sector in solid waste management chain



These steps shall facilitate the ULBs not only in the identification of key actors in informal sectors but also help in devising the measures accordingly. This shall also include the engagement with public and social enterprises and the association of informal waste recyclers in managing solid waste to take up

the awareness programmes as well as setting up dry waste recycling centres on municipal land.

It is important that mobilisation of the informal sector entails municipalities establishing direct contractual or covenant relations with informal sector organisations. But to facilitate this, the informal sector needs to organise itself into cooperatives or other legal or semi-legal structures. For efficient waste management, it is more appropriate and economical to integrate the concept of 7R's of Rethink, Refuse, Reduce, Repurpose, Reuse, Recycle and Recover products in informal sector.

A model for integration should be designed in which ULBs can integrate the informal waste sector into a city's waste management system holistically.

This solution will have the greatest benefit to the environment if supporting interventions are targeted at types of plastic pollution that are the most damaging from an ecological and wider risk perspective. Interventions should target three aspects of the pollution: reducing barriers to collection, improving the revenue from the materials and wider informal recycler remuneration and increasing the quality of the materials. Done well, these interventions will increase the collection rate, reduce pollution from plastics and help millions of people escape poverty. They present a scalable international solution to a global challenge; and are likely the only viable solution to the widespread lack of solid waste services and infrastructure across low- and middle-income countries.

Proposed actions

G20 countries can help mainstream the informal sector with the formal sector for enhancing waste management through:

1. Developing policies that enable and empower municipalities and ULBs to analyse the current state of the informal sector in the respective country and create frameworks to integrate them in the existing formal sector. This would entail providing financial support, conducting training and awareness programmes and collaborations between local government and informal sector to

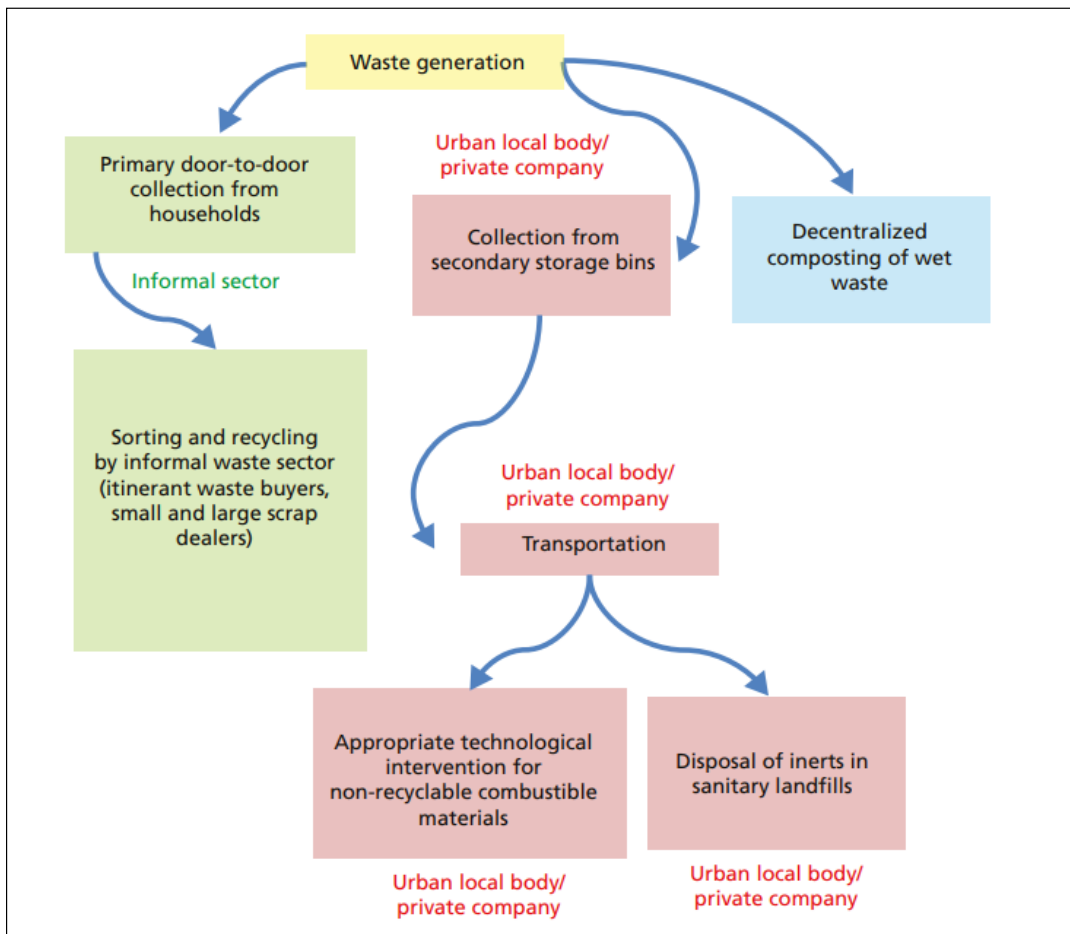


ensure existing workers are fully integrated into the new system.

2. Engage with MSMEs and start-ups and promote C&D waste conversion businesses that are supported with green finance and fiscal benefits.
3. Developed nations should provide support to emerging and developing members of the G20

through knowledge transfer of learning from successfully implemented waste management systems and by providing financial assistance. This may be done through bilateral or multilateral collaborations that prioritise integration of informal and formal waste management systems.

Figure 9: Proposed model for integration of the informal sector in the solid waste management chain



Annexure 1

National and regional strategies for resource efficiency and circular economy of G20 countries¹

Country	Year of introduction	Strategy name
Australia	2018	2018 National Waste Policy: Less waste, more resources
China	2008	Law for the Promotion of the Circular Economy
	2017	Circular Economy Policy Portfolio
France	2018	Circular Economy roadmap of France
Germany	2020	German Resource Efficiency Programme (ProgRes) III
India	2019	National Resource Efficiency Policy
Indonesia	2017	Presidential Decree No.97/2017 on National Policy & Strategy on Management of Household Waste and household-like Waste (JAKSTRANAS) Presidential Decree No.83/2018 on Marine Debris Management (Plan of Action on Marine Plastic Debris 2017–2025)
	2018	
Italy	2017	Towards a Model of Circular Economy for Italy
Japan	2018	4th Fundamental Plan for Establishing a Sound Material-Cycle Society
Korea	2018	Framework Act on Resource Circulation (FARC) & Master Plan on Resource Circulation
South Africa	2020	National Waste Management Strategy 2020
South Korea	2016	Framework Act on Resource Circulation
United States	2015	Sustainable Materials Management Action Plan
Region or City	Year of introduction	Strategy name
Russia	2022	General Approaches to the Implementation of Circular Economy Principles for Enterprises
England (United Kingdom)	2018	Resources and waste strategy for England
Scotland (United Kingdom)	2016	Making Things Last A Circular Economy Strategy for Scotland
London	2017	London's Circular Economy Route Map

¹ OECD (2021), Towards a More Resource-Efficient and Circular Economy: The Role of the G20, OECD, Paris, <https://www.oecd.org/env/waste/OECD-G20-Towards-a-more-Resource-Efficient-and-Circular-Economy.pdf>



Annexure 2

Abbreviations

GHG	Greenhouse Gas
B20	Business 20
RAISE	Responsible, Accelerated, Innovative, Sustainable, and Equitable
HTA	Hard-to-abate
MDBs	Multilateral Development Banks
DFIs	Development Financial Institutions
R&D	Research and Development
CCUS	Carbon Capture Utilisation and Storage
EVs	Electric Vehicles
SDGs	Sustainable Development Goals
RE	Renewable Energy
MJ	Megajoules
IEA	International Energy Agency
GPP	Green Public Procurement
EPR	Extended Producer Responsibility
MSMEs	Micro, Small, and Medium Enterprises
PPPs	Public-Private Partnerships
CESD	Centre for Excellence in Sustainable Development
G20	Group of Twenty Countries
UNFCCC	United Nations Framework Convention on Climate Change
CAGR	Compound Annual Growth Rate
FIT	Feed-in-Tariff
PEV	Plug-in Electric Vehicles
PHEV	Plug-in Hybrid Electric Vehicles
SAF	Sustainable Aviation Fuel
COP	Conference of the Parties
IPHE	International Partnership for Hydrogen and Fuel Cells in the Economy
IRENA	International Renewable Energy Association
GDP	Gross Domestic Product
MT	Megatonnes
CO2	Carbon Dioxide
USD	United States Dollar
NDC	Nationally Determined Contributions
CBDR-RC	Common But Differentiated Responsibilities and Respective Capabilities
GCF	Green Climate Fund
JCM	Joint Crediting Mechanism
EMDEs	Emerging Markets and Developing Economies
JETP	Just Energy Transition Partnership
GBF	Global Biodiversity Framework
EbA	Ecosystem-based Approaches



Kunming-Montreal GBF	Kunming-Montreal Global Biodiversity Framework
M&E	Monitoring and Evaluation
UN	United Nations
SDG	Sustainable Development Goal
NAP	National Adaptation Plans
COP15	15th Conference of Parties (Copenhagen Summit)
G7	Group of Seven (group of major advanced economies)
EU	European Union
ISW	Industrial Solid Waste
REEs	Rare Earth Elements
ULBs	Urban Local Bodies
GEN	Global Ecolabelling Network
PV	Photovoltaic
C&D	Construction and Demolition
7Rs	Rethink, Refuse, Reduce, Repurpose, Reuse, Recycle, and Recover



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Business 20 (B20) is the official G20 dialogue forum with the global business community. Established in 2010, B20 is among the most prominent Engagement Groups in G20, with companies and business organizations as participants. The B20 leads the process of galvanizing global business leaders for their views on issues of global economic and trade governance and speaks in a single voice for the entire G20 business community.

Each year, the G20 Presidency appoints a B20 Chair (an eminent business leader from the G20 host country), who is supported by a B20 Sherpa and the B20 secretariat. The B20 aims to deliver concrete actionable policy recommendations on priorities by each rotating presidency to spur economic growth and development.

The B20 bases its work on Task Forces (TFs) and Action Councils (ACs) entrusted to develop consensus-based policy recommendations to the G20 and to international organizations and institutions. The B20 officially conveys its final recommendations to the G20 Presidency on the occasion of the B20 Summit.

As India holds the Presidency of G20 in 2023, India will host the eighteenth G20 Summit in New Delhi. The Confederation of Indian Industry (CII) has been appointed as the B20 India Secretariat for India's Presidency. CII, as the B20 India Secretariat, will host the B20 India Summit in New Delhi from 25-27 August 2023.

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