

G20 Leadership Required to Keep the Paris Agreement Temperature Goals Alive

G20 Digest
Vol. 3, No.1&2, pp 15-25,
January-June, ©2023,
Research and Information
System for Developing
Countries (RIS).

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Abstract: The G20 leadership should accelerate the implementation of emissions reduction given that these countries account for 75 per cent of global emissions. There has been some significant progress noted in the energy sector. However, the transport sector and food systems remain high emitters. Further, deforestation and forest degradation lead to 11 per cent of global emissions while housing, mobility and food account for 70 per cent of an individual's emissions. This paper highlights the need of the G20 countries to focus on reducing emissions by resorting to the "Avoid, Shift and Improve" principle to meet the 1.5 C target by 2050.

Introduction

The world is losing the 1.5-degree temperature target of the Paris Agreement. Global greenhouse gas emissions have risen 1.1 per cent annually in the last decade, reaching a record 59.1 gigatons of carbon dioxide equivalent (GtCO₂e) in 2019 (see Figure 1). According to IPCC Sixth Assessment Report, average annual greenhouse gas emissions are at highest levels in human history.

Despite reduction in emissions during the Covid-19 pandemic, as per the 2022 Emissions Gap Report, it seems annual emissions in 2021 were like or even higher than the record 2019 levels. Nevertheless, concentrations of GHG

in the atmosphere continue to break records and will continue to rise until the world reaches net-zero emissions. The average global temperature is now 1.2°C warmer than pre-industrial times and even if countries meet, to 100 per cent, their current commitments, temperatures are forecast to rise at least 1.8°C by 2100.¹ If countries only deliver their un-conditional and conditional Nationally Determined Contributions (NDCs), temperatures are forecasted to rise by 2.6°C and 2.4°C respectively. The impacts of climate change can already be felt across the globe with the heat waves, wildfires and flooding in Pakistan and elsewhere providing an insight of

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the magnitude of threat the world is facing. Further, to maintain the 1.5- and 2-degree temperature goals of the Paris Agreement, the report observes that emissions must peak by 2025 and reduce by 43 per cent and 27 per cent respectively by 2030.

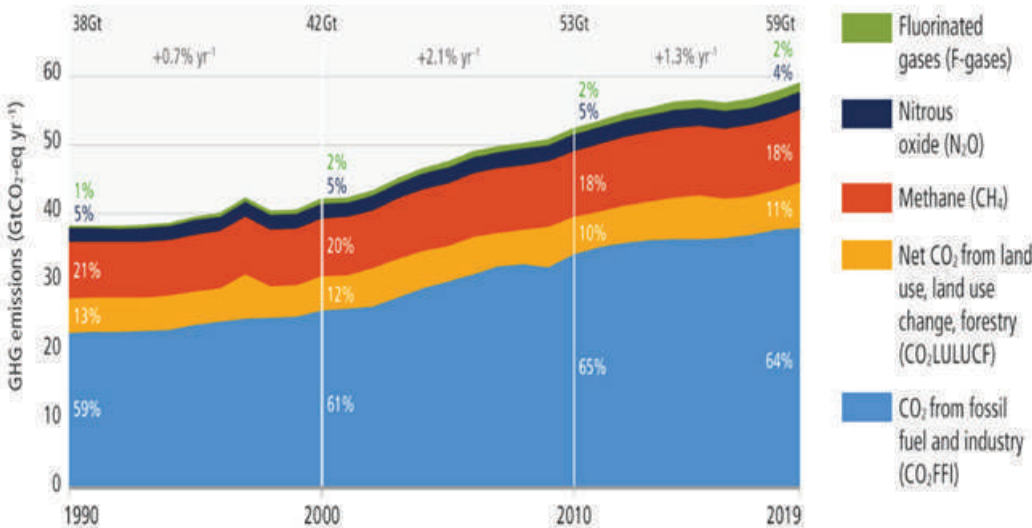
An emerging silver lining but the window to meet the temperature goals of the Paris Agreement is closing. Compared to pre-Paris Agreement, the world was forecasted to reach an average 3.5-4°C heating by 2100, but since the Paris Agreement the collective commitment has taken a step change forward. Globally, 88 parties covering approximately 79 per cent of total emissions have adopted net-zero goals, including all G20 members, except Mexico. In addition, zero emissions targets have been adopted by at least 826 cities and 103 regions.

Of the 139 new or updated Nationally Determined Contributions (NDCs), more than half will result in lower 2030 emissions relative to the initial NDCs.² The quality and coverage of sectors

and greenhouse gases in NDCs has also improved. Figure 2 depicts the implied emission trajectories of the G20 members based on their NDCs and net-zero targets. This illustration does not consider fairness or the principle of common but differentiated responsibilities, but it does point to the importance of alignment between short and long-term climate goals. It further indicates that pathways to net-zero will require early action and backing of effective policies.

As of 2019, most countries had increasing emissions over the past decade (74 countries accounting for 65 per cent of emissions), or remained stable (39 countries, 25 per cent of emissions). A group of 35 countries, accounting for about 10 per cent of global emissions, had peaked and reduced their net GHG emissions, including Land Use and Land use Change emissions, for at least the last 10 years. These countries include Argentina, Brazil, European Union countries, the Republic of Korea, South Africa and North American countries.³

Figure 1: GHG Emissions



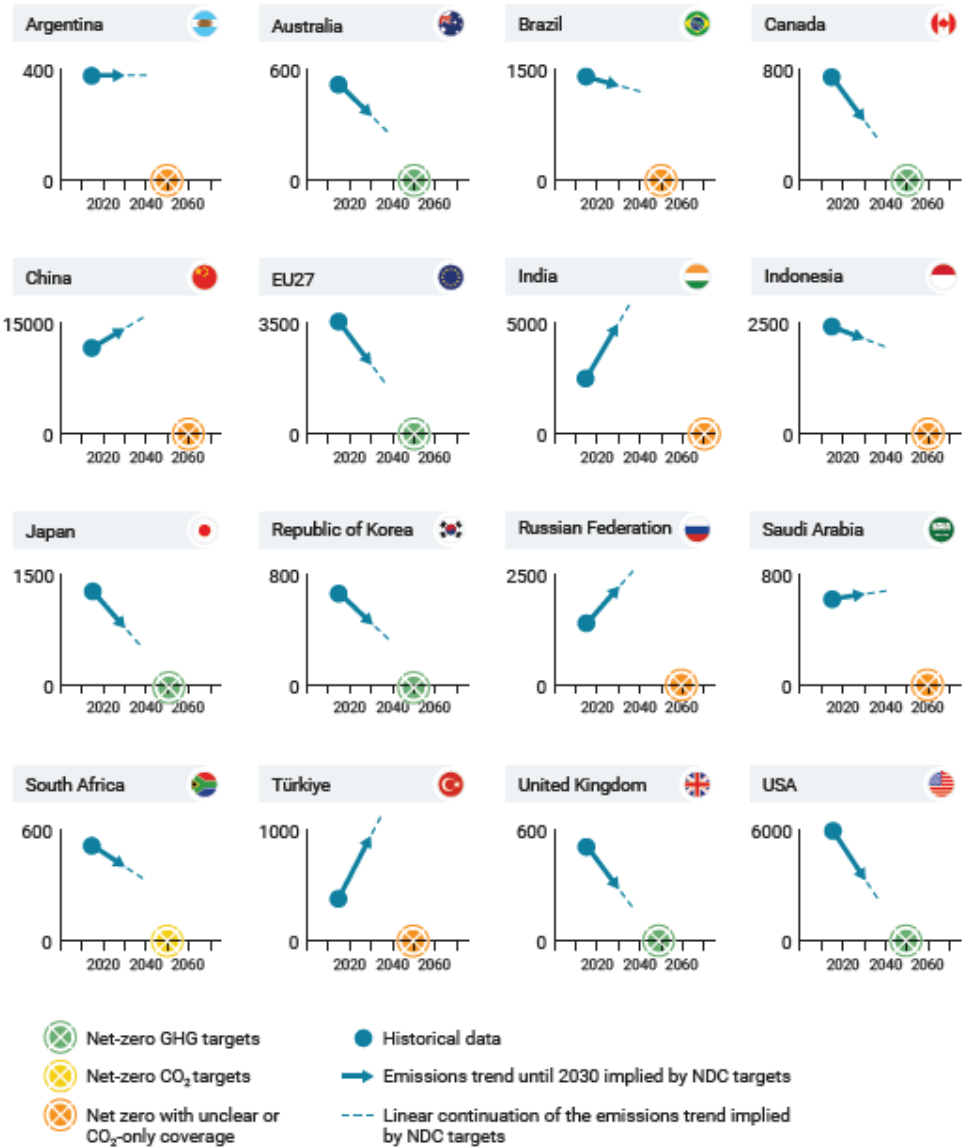
Source: Emissions Gap Report, 2022.

Currently, G20 members account for about 75 per cent of global GHG emissions.

By end of CoP27, the collective ambition of the NDCs of G20 members brings their 2030 emissions to the range of 31-39Gt, accounting for 68-77 per cent

of global emissions. In other words, the share of emissions, based on the current ambition, is expected to stay like the share it was at the time of sealing the Paris Agreement. To close the emissions gap, annual emissions must be cut to 33 GtCO₂e by 2030 to limit warming to

Figure 2: Emissions Trajectories by NDC and Net-zero targets of G20 Members.



Source: National emissions in MtCO₂e/year over time (EGR 2022).

1.5°C and 41 GtCO₂e for a 2°C trajectory. Needless to say, the strengthened leadership of G20 members and their accelerated success in implementing emission reduction will carry a deciding impact on the collective ability of the world to limit global heating to well below 2°C.

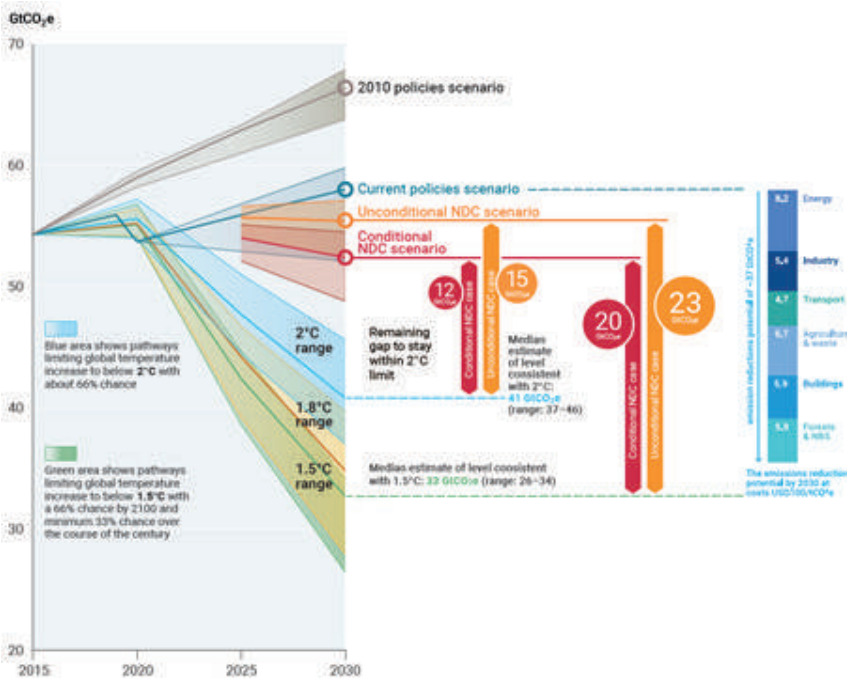
Sectoral Solutions can Close the Emissions Gap

Globally, net anthropogenic GHG emissions have increased since 2010 across all major sectors, but technically and economically, the emissions gap can be closed. Across various energy types and industrial sectors including agriculture, forestry, transport, and buildings there are feasible, scalable,

and economic solutions that are ready for large-scale investments. These solutions are estimated to be able to deliver emission reductions of around 37 Gigaton, at less than \$100/tCo₂e.

This is more than sufficient to reduce emissions from 59Gt to 33 Gt by 2030. The transformation to net-zero GHG emissions will require accelerated action and increased investments in energy, industry, agriculture, forestry, transport and buildings. Of these sectors, energy, especially electricity supply, is the most advanced and a tipping point has been reached, with renewable energy being the cheapest form of new electricity generation in 90 per cent of the market. For building operations and road transport, the most efficient technologies available still need policy and fiscal support, while

Figure 3: Solutions across Six Sectors to Close Emission Gap



Source:

for industry, shipping, and aviation, low-carbon technologies need to be further developed and supported. Noting that public procurement alone accounts for 15 per cent of global emissions, G20 governments can strongly influence the decarbonization of all these sectors. Furthermore, 40 per cent of public procurement related emission reductions can be delivered at a cost of less than \$15/tons of CO₂e.⁴

Climate, and the various sectors that must undertake climate action are well featured in G20 Summit Declarations and the various groups on Climate & Sustainability and Finance. G20 have committed multiple times to climate action on nature-based solutions, buildings and cities, energy, methane, fossil fuel subsidies, etc. Indian Presidency must now focus on finance and implementation of a science-based effort to put the Paris Agreement back on track. The sectoral sections below provide guidance and examples of how this can be done.

Renewable Energy

In August 2022, the United States of America approved the Inflation Reduction Act. The act covers key sectors, such as transport, energy, buildings and it is projected to reduce emissions by one Gigaton. USA also published a supplemental proposal on reducing harmful emissions and energy waste that will achieve 87 per cent reductions in methane emissions from covered sources by 2030 from 2005 levels. Canada has published its proposed regulatory framework to achieve at least a 75 per cent reduction in methane emissions from the oil and gas sector by 2030 relative to 2012. Likewise, Mexico is set to develop and release a plan for methane and flaring reduction activities by the first half of 2023.

According to the Renewables 2022 Global Status Report, renewable power generation continued to attract far more investment in 2021 than did fossil fuel or nuclear plants. G20 has been at the forefront of the growth in low-carbon technologies. In 2021, the world invested a record \$366 billion in renewable energy, with G20 accounting for more than 4/5th of the investments. China accounted for 37 per cent of the total investment in renewable power, with an overall investment of \$137 billion. Among others, European Countries invested \$79.7 billion followed by USA (\$46.7 billion), Brazil (\$11.6 billion) and India (\$11.3 billion). Since 2011, more than two-thirds of global investments in renewable power and fuels has been concentrated in China, Europe and the United States. In China, since 1996 the annual installed solar and wind capacity has, accounted for about 55 per cent of new power installations (Statista 2022).

From 2010–2019, there have been sustained decreases in the unit costs of solar energy (85 per cent), wind energy (55 per cent), and lithium-ion batteries (85 per cent), and large increases in their deployment, e.g., >10x for solar and >100x for electric vehicles (EVs), varying widely across regions. The mix of policy instruments which reduced costs and stimulated adoption included public R&D, funding for demonstration and pilot projects, and demand-pull instruments such as deployment subsidies to attain scale.

The energy transition is yet at the scale needed and the share of fossil fuels in the overall energy mix has only dropped marginally since 2010. The notable growth in renewable energy installations has largely gone to meet the overall growth in energy demand.

Fossil fuel CO₂ emissions grew, in the global energy system, by 4.6 per cent

between 2015 and 2019 (1.1 per cent/year), reaching 38 GtCO₂/year and accounting for approximately two-thirds of annual anthropogenic GHG emissions. Globally, the power system is at 42 per cent, the single largest source of energy-related emissions and investment in the sector is a must to keep the temperature goals of the Paris Agreement alive.

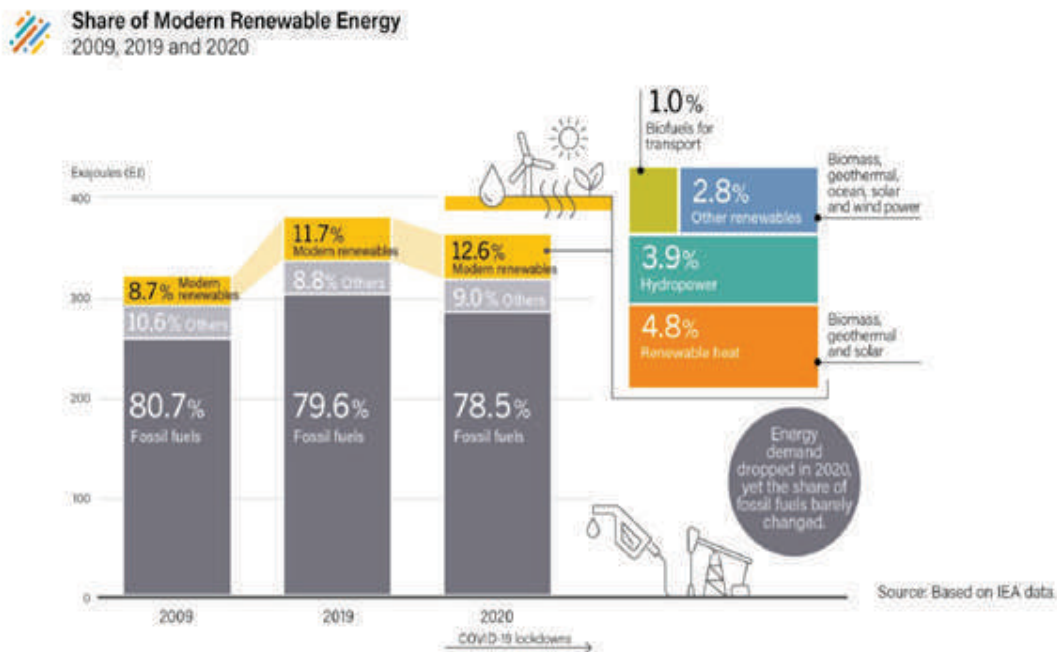
The sector is estimated to hold more than 8 Gigaton of emission reductions potential at a cost of less than \$100/ton. In addition to investments in renewable energy, investments are also needed in the efficient use of energy and in industrial and domestic heating & cooling. For example, IEA estimates that investment in energy efficiency must grow 2 to 7 fold to deliver on the sector’s contribution to decarbonization. Other recommendations for G20 action towards the energy sector transformation include:

- Avoiding lock-in of new fossil fuel intensive infrastructure and cooperate on a just coal phase-out;
- Removing fossil fuel subsidies in a socially acceptable manner and plan for just fossil fuel phase-out;
- Removing barriers to expansion of renewables and invest in system flexibility, interconnections, and energy-efficiency to enable the energy transformation.

Industry

Achieving net-zero emissions in the industry sector is considered challenging but possible. The industry sector is currently the largest contributor to total emissions when direct and indirect emissions are included. If emissions from electricity and heat production are attributed to industry, the sector accounts for 24 per cent of relative GHG emissions

Figure 4 : Share of Renewables in Energy Mix, 2022



(direct emissions 6 per cent). The annual GHG emissions, between 2010 and 2019, continued to grow but slowed compared to the previous decade in industry from 3.4 per cent to 1.4 per cent.

Industry efforts to reduce emissions will require coordinated action throughout value chains, including demand management, energy and materials efficiency, circular material flows, as well as abatement technologies, and new solutions in production processes. The sectoral transformation, including carbon capture and storage, is expected to create new jobs and opportunities in processes using zero GHG electricity, hydrogen, fuels, and carbon management. In industry, electrification and circular material flows contribute to reduced environmental pressure and increased economic activity & employment.

The sector is estimated to have feasible solutions which can deliver at least 5.4 Gigaton of emission reductions by 2030. G20 members should, at the soonest:

- Promote efficiency, circularity and electrification;
- Support research and innovation, and reduce demand for carbon intensive cement and steel production;
- Support and cooperate on carbon pricing mechanisms; and
- Cooperate on hydrogen, basic minerals and materials, and plan for a just transformation.

Transport

The transport sector was the fastest growing fossil fuel combustion sector worldwide from 2010 to 2019, with sectoral emissions rising more than 17 per cent during this period. Transportation is the second-highest emitting sector and the global vehicle fleet is set to double in size by 2050. Decarbonising the

transport sector is essential to meet the Paris climate targets and the sector holds at least 4.7 Gigaton worth of emission reduction potential per year at a cost of less than \$100/ton. To keep the rise in global temperature below 2 degrees Celsius, annual transport emissions must be reduced to 6.5 gigatons of CO₂ or less by 2050; and to keep the rise below 1.5 °C, emissions must be reduced to roughly 3 gigatons of CO₂ or less.

While most G20 countries have started decarbonizing their transport sectors, a global approach should aim at introducing zero emissions fleets worldwide and must also include measures to promote walking, cycling and public transport. To meet the targets of the Paris Agreement, all vehicles being added to the global fleet should be zero emissions by 2035 (IPCC 2018).

The Emissions Gap Report (2022) estimates that annual investment in decarbonizing the transport sector needs to increase seven fold, compared to 2017-2020 levels, to deliver the emission reductions needed from the sector by 2030. G20 members can take the following action to speed up the transition to sustainable transportation through:

- Three groups of interventions; AVOID transport (for example through better city planning); SHIFT to more efficient modes (such as walking, cycling and public transport); and IMPROVE transport modes (by introducing zero emissions electric motor vehicles).
- Elimination of fossil fuel subsidies and phasing out internal combustion engines and a shift of finance to low carbon and resilient transport options.
- Accelerated electrification of buses, cars, vans, and two and three wheelers accompanied by low carbon

electricity supply and advanced grid integration.

- Inclusion of maritime and aviation sectors in global transport decarbonization efforts.

Food Systems

Food systems are major contributors to land-use change, biodiversity, depletion of freshwater resources, pollution and climate change. The food system is currently responsible for about one-third of total emissions (~18 Gigaton Co₂e/year), more than 40 per cent of anthropogenic methane emissions, and two-third of overall global anthropogenic N₂O emissions. Projections show that food system emissions could reach ~30 GtCo₂e/year by 2050 and rapid transformation across the sector is needed to align with the Paris Agreement. According to IPCC Sixth Assessment Report, carbon sequestration in agriculture can contribute 1.8-4.1 GtCO₂-eq /year reduction. Demand-side and material substitution measures, such as shifting to balanced, sustainable healthy diets, reducing food loss and waste, and using bio-materials, can contribute 2.1 GtCO₂-eq/year reduction. In addition, demand-side measures together with the sustainable intensification of agriculture can reduce ecosystem conversion and CH₄ and N₂O emissions. Adding up all GHG reduction potential (including energy, land-use change) for food systems, the reduction potential is about 6.7 Gigaton/year between now and 2030, and the Emissions Gap Report (2022) estimates that by 2050, the reduction potential could be 24.7 GtCo₂e/year, with major health and food security benefits. GHG reduction contribution by food systems will require a 10-31 times higher investment flows compared to 2017-2020. G20 members can support this transition through:

- Alignment of food system governance with climate and health objectives, e.g., reforming dietary guidelines and labelling;
- Update fiscal policies, including taxation and subsidies to contribute to the needed food system transformation;
- Support on-farm, food industry and retailers investments in emission reductions through regulations and targeted investments in manure management and renewable energy; and
- Strengthen international cooperation to ensure a just transition and enhanced resilience of the food system to climate change

Ecosystems

The world still loses 10 million hectares of forests annually, and deforestation and forest degradation account for approximately 11 per cent of emissions. Forests and nature-based solutions provide an intervention with high adaptation and mitigation & livelihood benefits to around 400 million people who live within one kilometer of a forest in G20 member states alone. Eight G20 members are among the top 10 countries with the largest forest area. In fact, the G20 declared a commitment to halt and reverse deforestation and biodiversity loss by 2030.

Nature is not a substitute for other decarbonization pathways but ecosystem conservation and restoration can make a substantial, high-return contribution to building resilience to climate change. Large-scale investments in dryland agriculture, mangrove protection and water management can generate benefits worth around four times the original investment. Nature-based solutions are cost-effective, easily available and proven to deliver high livelihood returns.

Reducing Emissions from Deforestation and Forest Degradation (REDD+) is one of the cheapest opportunity for large-scale climate change mitigation and adaptation.

The G20 Indian Presidency provides the opportunity to translate the growing political ambition for nature into real commitments and a decade of action to enhance mitigation benefits by around six Gigaton/year between now and 2030. This can be done through the three Rio Conventions and action platforms, such as the UN Decade of Action for the SDGs and the UN Decade on Ecosystem Restoration 2021-2030. Both provide large-scale contributions to achieve the Sustainable Development Goals (SDGs), ensure food security and address climate change.

A number of new programmes on oceans, forests and food systems could further accelerate climate action and mobilize private investments. For example, the Green Gigaton Challenge with the UN-REDD Programme can boost the market for forest-based carbon, lifting REDD+ from a niche solution to a major pillar of the Paris Agreement.

Lifestyles

Lifestyle is not directly a sectoral solution but lifestyle does connect to sectoral solutions, e.g. housing, mobility, and food, account on average for 70 per cent of an individual's emissions. Lifestyles are also at the heart of building the political support and consumer demand for low carbon policies and solutions as ensured by the initiative on Lifestyles for Environment (LiFE) proposed by the G20 Indian Presidency.

At a combined GDP of 85 per cent of the global GDP, G20 countries have a distinct role in shaping global lifestyles and consumer behavior. The wealthiest one per cent of households,

are responsible for around 15 per cent of global emissions, more than the combined share of the least wealthy 50 per cent of the global population.

The top 10 per cent wealthiest people (some 782 million people) can be found across all continents, and they account for about half of all emissions. Around 85 per cent live in advanced economies – including Australia, Canada, China, the European Union, Japan, Korea, the United States, and United Kingdom. The rest are from Russia, Saudi Arabia and South Africa, countries with fossil fuel-intensive energy mixes and relatively high income inequality.

It is well known that the average level of consumption emissions varies substantially between countries. For example, per capita consumption emissions in the USA are approximately 17.5 tons CO₂e per capita, which is around 10 times that of India at 1.7 tons per capita. By contrast, the nations of Europe have an average footprint of 6.9 tons per capita. Per capita emissions are an often-highlighted measure when discussing “common but differentiated responsibilities”. While it provides a useful insight, these per capita averages mask significant variation among households within countries and globally.

Addressing unsustainable lifestyle emissions holistically requires therefore a deeper understanding of how consumption emissions are distributed among populations and by activities so that mitigation measures can be targeted in a way that is equitable encouraging reductions from households with the highest consumption emissions and avoiding negative social impacts. For example, Oswald *et al.* (2020) estimate that the top 10 per cent wealthiest households use around 45 per cent of all the energy used for land transport and around 75

per cent of all energy linked to aviation, compared to just 10 per cent and 5 per cent respectively for the poorest 50 per cent households.

Addressing lifestyle emissions of the wealthiest segments of the population does not only deliver the highest emission reductions but it also focuses on people who are able to pay for any additional cost that the transition requires. The potential to rapidly reduce demand for energy and resources via lifestyles remains largely untapped. To some extent this is unsurprising given the politically controversial nature of lifestyle change, which often seeks a shift in focus away from a continuous growth agenda towards equity and wellbeing within ecological limits. Arguments for promoting sustainable lifestyles may challenge powerful vested interests and raise concerns about economic stability. Bridging structural barriers to lifestyle change requires understanding the power dynamics that come into play, and agency, or lack thereof, in rethinking public policy and governance, and navigating corporate interests (Akenji, 2019).

G20 members can address lifestyle emissions through focus on the wealthiest segments of the populations and use of “Avoid, Shift and Improve” principles and country appropriate solutions. The participation of actors and groups across civil society, as well as government, is needed to ensure this happens in ways that meet basic needs and preserve people’s wellbeing while achieving substantial and rapid cuts in GHG emissions.

Way Forward

The task facing the world is enormous. Setting ambitious targets is not sufficient and large-scale, rapid sector-wise decarbonization and system

transformation is required and must happen now to peak emissions by 2025.

The IPCC sixth Assessment Report has called for an emission reduction of 45 per cent under current policy projections, whereas current commitments are estimated to reduce emissions by 5 to 10 per cent depending on the conditionality of the NDCs. To close the emissions gap, G20 members must strengthen their national and collective ambition, and more importantly accelerate implementation of their existing targets.

Collectively, the G20 members are not on track to achieve their current NDCs. There is an implementation gap, which the Emissions Gap Reports (2022) estimates to 1.8-2.6 GtCO₂e annually depending on assumptions. Beyond G20, the global implementation gap for 2030 is estimated at 3-6 GtCO₂e depending on the conditionality of the NDC targets.

Setting the ambition is the first step in designing development pathways to match the temperature pathways of the Paris Agreement. However, most G20 countries also have a policy discrepancy where fossil fuel production plans present a misalignment with their Nationally Determined Contribution. Since the beginning of the COVID-19 pandemic, G20 countries had directed \$300 billion in new funds to fossil fuel activities by 2021. Fossil fuel producing governments had plans and projections for fossil fuel production that would lead to around 240 per cent more coal, 71 per cent more gas, and 57 per cent more oil which would be consistent with limiting global warming to 1.5°C.

To close the ambition gap, further ambition is needed to align G20 member NDCs and their sectoral targets with the Paris Agreement temperature goal. Mexico needs to join other G20 members with a commitment to net-zero, and Argentina, Australia, Brazil, China, India,

Indonesia, Saudi Arabia, South Africa and the USA should upgrade their net-zero commitment to law. Each G20 country must review its pathway to net-zero and provide its economy with credible economy-wide and sectoral pathways (policies and budget allocations) which align with the magnitude of the task ahead.

Endnotes

- ¹ Achieving net-zero targets in addition to unconditional NDCs results in keeping projected global warming to 1.8°C (range: 1.8–2.1°C) with a 66 per cent chance. United Nations Environment Programme (2022). Emissions Gap Report 2022.
- ² 74 NDCs from parties representing 77 per cent of global emissions.
- ³ European and North American countries have started from a high base of per capita and/or cumulative emissions.
- ⁴ WEF 2022 White paper on Green Public Procurement www.weforum.org/whitepapers/green-public-procurement-catalysing-the-net-zero-economy