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A QUARTERLY JOURNAL FOR DEBATING ENERGY ISSUES AND POLICIES

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INTRODUCTION

James Henderson

If COP 26 was the conference which 'kept 1.5 alive', then COP 27—the 27th Conference of the Parties to the United Nations Framework Convention on Climate Change—is the conference that has the difficult job of bringing the world's attention back to the critical issue of CO₂ emissions and limiting global warming amid a myriad of political and economic distractions. Russia's invasion of Ukraine in February 2022 has caused a huge fracture in the global geopolitical landscape, while the limits it has placed on gas exports to Europe in response to sanctions has driven up energy prices and catalysed a cost-of-living crisis in many regions of the world. With Russian oil and coal exports also now disrupted, the winter of 2022/23 is likely to be a difficult one for governments and energy consumers alike, with energy security and high prices much higher up the short-term agenda than saving the global environment. Nevertheless, every year that passes takes the world closer to a level of CO₂ in the atmosphere that will push the post-industrial temperature rise towards and beyond 1.5°C, with the increasingly alarming climate changes that this implies.

The articles in this edition of the *Oxford Energy Forum* discuss the challenges this presents to global policymakers and the issues which they must address at COP 27 and beyond. They also discuss the differing global perspectives on the energy transition and the increasing split between the developed and developing worlds on the issues of the carbon budget, the provision of financing and technology, the responsibility for emissions reductions, and the exploitation of hydrocarbon resources. These are increasingly contentious issues which could, if not handled sensitively, lead to a major rift rather than much-needed collaboration at COP 27.

In the first article, *Giacomo Luciani* discusses the impact of the Russia–Ukraine war on the energy transition agenda. He argues that, although some increased reliance on hydrocarbons is inevitable in the short term, over the medium term several positive trends will emerge. A drive to reduce energy consumption, a renewed acceptance of nuclear, a focus on management of new mineral supply chains, and a renewed drive for indigenous renewable energy sources can all help push the energy transition forwards. However, a huge amount of investment will be needed, and this will not be easy to achieve in a global economy that is currently being squeezed by high energy prices.

Mari Luomi then looks at the key issues for policymakers to address at COP 27. She points out that COP 26 set the bar high on climate ambition, which means that the task for COP 27 and beyond in fostering the implementation of set goals is now even bigger. The intersessional negotiations in Bonn during the summer indicated that an emphasis on short-term energy security will lower many countries' will to step up in Egypt. Furthermore, the goals of the developing world are going to be front and centre at this 'African COP', with increasing frustration evident at the lack of action from the developed world on a number of key issues. Luomi argues that the organizers of COP 27 will have to work hard to find a successful narrative for the conference.

Picking up a similar theme, *James Henderson* reviews the results of COP 26, outlines the key conclusions from the Intergovernmental Panel on Climate Change (IPCC) reports published in February and March 2022 and looks at the conclusions reached at the Bonn climate conference in June 2022. He then reviews the key issues and challenges for COP 27 and again picks out the fact that developing countries are likely to be increasingly vociferous on issues that concern them. In particular, the topic of funding for loss and damage could be very contentious, as it was largely overlooked in the conclusions of COP 26 and has not made it onto the formal agenda for COP 27 but is an area that developing countries feel very strongly about. It could lead to major differences of opinion in November.

Moving on to more specific regional views, *Mostefa Ouki* outlines the expectations for COP 27 from an African perspective and suggests that, among other things, African countries will argue that they should be allowed to develop their hydrocarbon resources to help with their economic development. However, he argues that they also need to be realistic about the future of gas during the energy transition, to see the transition as an opportunity for investment in domestic green energy, and to create a political and commercial environment within which the provision of international finance is easier to achieve.

Noura Mansouri then offers a perspective from a major hydrocarbon exporter, Saudi Arabia. She summarizes the efforts that the country has been making to expand its use of renewable energy and underlines that the Kingdom is developing new technologies, with the development of the new city of Neom being at the heart of this process. However, she also emphasizes another key Saudi message at COP 27, which is the belief that hydrocarbons will be a part of the global energy mix for some time in combination with new technologies—such as carbon capture, utilization, and storage—that will abate the CO₂ emissions.

We then turn to focus on the world's largest emitter, China. *Michal Meidan* makes the important point that, despite its net-zero pledge for 2060, China's primary concern in the short term is energy security, with coal still seen as the bedrock of the country's energy economy. Worsening relations with the US have underscored this security outlook and do not bode well for negotiations at COP 27, where China is likely to seek to maintain a role as the leader of the developing world in demanding extra support from OECD countries. One area where China has made a positive contribution, though, is biodiversity, and there is some hope that outside the COP environment this may become the country's major environmental focus.

Isabel Hilton continues the China theme and provides some hope that, despite the government's short-term focus on COVID 19 and energy security, there is still momentum behind the country's energy transition plans. Legislation has been put in place, the longer-term commitment to reducing coal consumption remains, and China has been investing heavily in expanding its renewable energy capacity. Economic slowdown in 2022 and the imminent 20th Party Congress have caused a hiatus over the 12 months since COP 26, but this does not necessarily mean that China has forgotten its net-zero pledge, and we can expect the authorities to keep it as a long-term priority.

From China we move to the other Asian economic superpower, India. *Mohua Mukherjee* highlights several key issues for the country as the energy transition progresses. The first is that, as with China, energy security and affordability are key priorities, and this tends to favour the use of indigenous coal. Beyond this issue, though, the Indian authorities will use COP 27 to highlight major concerns over climate finance and the need for the provision of new technology without the burden of huge payments to companies in the developed world. Finally, there is the more fundamental question of who gets to use the remaining carbon budget, with India arguing that the developed world has already used more than its fair share.

With this argument in mind, *Klaus-Dieter Borchardt* brings us back to Europe with his thoughts on the EU's transition strategy and how it has been impacted by the war in Ukraine. He argues that although the current focus is on finding alternative sources of hydrocarbons to replace imports from Russia, in the medium term the acceleration of the EU's drive to increased renewable energy can combine energy security with a fast-paced energy transition. He warns, though, that in order to be a credible leader at COP 27, the bloc needs to be realistic about its 2030 goals, perhaps conceding that they will be missed but restating the commitment to a more aggressive strategy in the 2030s to get back on track for net zero by 2050.

Sarah Ladislaw then rounds off our regional perspectives with a view from the USA. Following John Kerry's frantic diplomacy at COP 26, it seemed that the US had re-entered centre stage in the global environmental debate, but the subsequent failure by the Biden administration to pass major climate-related legislation appeared to have dampened hopes of concrete action. This has all been changed by the recent adoption of the Inflation Reduction Act, which includes the most radical support for green energy development ever seen in the country. As a result, the US will enter COP 27 with a real opportunity to encourage other countries to follow its lead. Global geopolitics, especially regarding relations with China and Russia, will not be helpful; but nevertheless, the US delegation will at least have credibility if it demands more action from the rest of the world at COP 27.

Michele Stua and Axel Michaelowa introduce the first detailed discussion of more specific issues with a review of how carbon markets have progressed since the agreement on Article 6 that was reached at COP 26. Importantly, they argue that although there was much fanfare around the completion of the Paris Rulebook in Glasgow with the finalization of Article 6, there is actually a significant amount of work still to be done at COP 27 to fully operationalize the new rules. Not the least of the challenges will be the inclusion of voluntary carbon markets within the compliance framework, especially as there has been huge growth in this area over the past 12 months and the need for proper regulation is becoming urgent.

The full implementation of Article 6 will be critical for the development of carbon reduction and removal technologies, and *Reza Maddahi* addresses this issue in the next article. He reviews the current state of three technologies—carbon capture, utilization, and storage; bioenergy with carbon capture and storage; and direct air carbon capture and storage—and argues that the negotiations at COP 27 will be vital to their future. The IPCC reports published earlier this year suggest that they will have a vital role to play if the world is to meet its net-zero target—with many of the scenarios they describe seeing carbon removal as vital, either to keep the world on target to meet a mid-century goal or, more likely, to remedy a probable overshoot of emissions. In either case, Maddahi argues, the need to provide the architecture to catalyse further development and implementation of these technologies is urgent and should be a major focus in Egypt.

Continuing the theme of technology development, *Dolf Gielen and Elizabeth Press* have authored an article on the Breakthrough Agenda which was agreed in Glasgow, and which has the goal of making clean technologies and sustainable solutions ‘the most affordable, accessible and attractive option in each emitting sector globally before 2030’. The Agenda is focused on five key sectors and energy vectors—namely, hydrogen, power, steel, road transport, and agriculture—with the aim of both reviewing progress towards key targets on an annual basis and coordinating action among key stakeholders. COP 27 will be the first time that the annual review will take place and so marks an important milestone in the overall process.

Martin Lambert continues the hydrogen theme and looks at the future of other ‘green gases’ such as biogas and biomethane. Indeed, he argues that these latter two could have a much higher profile than at previous COPs due to high current natural gas prices and the search for alternative indigenous sources. On hydrogen, the key questions at COP 27 are likely to surround the future of renewable, or green, hydrogen and whether partnerships can be found between developed and developing countries for the expansion of hydrogen production in regions with significant renewable resources which could then be made available for export. The future of blue hydrogen, meanwhile, seems more uncertain due to the high price of its main input, natural gas.

The development of alternatives to natural gas, especially in the power sector, is a theme continued by *Adnan Shihab-Eldin and his co-authors*, who look at the improved prospects for nuclear power as part of a low-carbon power-generation portfolio. The return of nuclear as an option to support the energy transition was one of the features of COP 26; and since the start of the war in Ukraine, it has become an increasing focus as a source of indigenous low-carbon power for the long-term future. Cost remains an issue, especially for developing countries, but the authors argue that the emergence of new reactor designs can help and that nuclear power should be officially recognized as having an important role in the energy transition by being included in the final communique of the COP 27 conference.

The signing of a pledge to increase the role of zero-emission vehicles was another important milestone of COP 26; and in his article, *Anders Hove* focuses in particular on the growth of electric vehicles (EVs) across the world as part of this ambition. He charts the rising share of EVs in new car sales but also highlights a few critical issues still to be resolved, with the development of batteries and expansion of charging infrastructure being the two most important. He suggests that COP 27 will be a vital forum for discussing how the adoption of EVs and other zero-emission transport can be accelerated and how issues across the entire transport value chain can be addressed.

Another important multilateral agreement signed at COP 26 was the Global Methane Pledge, which saw more than 100 countries commit to reducing emissions of this gas, which has a global warming impact up to 80 times greater than CO₂ (depending on the timescale used). *Jonathan Stern* asks whether much progress has been made over the past 12 months and emphasizes that a number of key hydrocarbon-producing countries were missing from the list of signatories in Glasgow. He suggests that for the Pledge to have a real impact, countries like India, China, Australia, and Russia must be added and that real implementation of emission-reduction plans needs to be seen, as the net cost can in some cases be negative and the impact can be rapid.

Finally, *Alice Eliet-Doillet and Andrea Maino* address the critical issue of climate finance. They summarize the key investment requirements estimated by the International Energy Agency and the IPCC to achieve a successful global energy transition and highlight the needs of the developing world in particular. They argue that governments and multilateral lending agencies need to act to create an environment in which private finance can flow more easily, and they lay out several finance options that could then be available, from green bonds to sustainability-linked bonds and project finance. Finance will undoubtedly be an important agenda item at COP 27, and the issue of providing investment funds for green energy projects across the global economy will need to be resolved if the world is to have any chance of achieving its climate objectives.

One final word of introduction to this edition of the *Oxford Energy Forum*. Many of the authors have kindly agreed to be interviewed about their articles for a series of podcasts which will be published in October 2022 on the topic of COP 27. These podcasts can be found on our website at www.oxfordenergy.org/podcasts or can be accessed via the usual podcast hubs such as Spotify or Apple Podcasts.

HOW HAS THE WAR IN UKRAINE RESHAPED THE ENERGY TRANSITION AGENDA?

Giacomo Luciani

The trilemma

The Russian invasion of Ukraine has altered the perception of the relative importance and urgency of the three corners of the 'trilemma' (availability, affordability, and sustainability),¹ underlining the urgency of secure and affordable energy supply, and playing down the relative importance of sustainability—but it would be a mistake to conclude that sustainability is no longer a priority.

Policies to pursue the three trilemma objectives may—in some cases and in the long run—converge, but are more likely to require trade-offs, especially in the short term. This is nothing new: accepting the need for trade-offs is the prerequisite for the formulation of credible, sensible energy policies. Asserting that only one objective matters, and all others are subordinated, or to be achieved as by-products (killing three birds with one stone), is ideological and a recipe for delusion. If the new reality created by the Russian invasion allows countless pie-in-the-sky scenarios of rapid and complete decarbonization to be forgotten, it will be a step forward.

But there is more than the trilemma. The Russian invasion of Ukraine has shattered a key pillar of the international energy and economic order of the last seven decades: the belief that intensification of international trade would consolidate and guarantee peace; and that the best way to procure energy is through unconstrained and competitive international trade. The pillar rested on the assumption that in the end states behave rationally, and rationality is objective. In contrast, we now see that some key players may not be rational, or their rationality may not be the same as assumed.

The implications are very far reaching. It is now a priority to limit energy dependence on foreign sources in general, and specifically on countries whose behaviour does not conform to values that are deemed essential (including not just renunciation of violence for the solution of international disputes, but also respect for human rights with its numerous ramifications, and engagement for sustainability). It will be interesting to see at COP 27 to what extent the already difficult international cooperation to contain global warming will survive the new mood. Following tensions on Taiwan, China has called off environmental cooperation with the US, which had been greatly trumpeted at COP 26 in Glasgow. And Russia has, in practice, been in denial. The likelihood of toxic exchanges and accusations dominating the COP 27 debate seems very high.

The list of problem oil exporters is topped by Russia, but includes several other countries—all the more so since exports of oil and gas are major sources of revenue for the states concerned, hence fundamental enablers of policies that they adopt. Although an international energy market will surely continue to exist, it will be segmented, and different rules and prices will prevail for trade between politically homogeneous countries than for the rest of the world. Proposals to impose a ceiling on prices of crude exported by Russia may in the future be extended to crude exported by other OPEC members, and possibly combined with quotas to limit import dependence or guarantee diversification of sources. The International Energy Agency will rediscover its original mandate: ensure collective security of supply, and confront OPEC.

First priority: rein in demand

The situation created by the Russian invasion of Ukraine underlines the urgency of adopting effective policies to rein in fossil fuels demand. The need to consume less has been highlighted in all decarbonization scenarios, in which improved efficiency always features as a key component of the necessary transformation. Reducing consumption has in fact frequently been presented as the low-hanging fruit in the transition—except that no one seemed interested in picking that fruit.

The extent to which governments have resisted considering policies to reduce consumption is remarkable indeed. The International Energy Agency has been very clear from the beginning that an appropriate response to the dislocation caused by

¹ No energy strategy can afford to pursue just one objective. As in the classic trilemma proposed by the World Energy Council, we need to pursue at least three objectives in parallel: availability (which includes access to energy and security of supply), affordability (which includes the competitiveness of the economy), and sustainability (which includes both local and global dimensions of pollution, hence climate change). The relative importance attributed to each oscillates depending on circumstances and the latest developments, but none of the three can be forgotten.

the war necessarily entailed measures to contain the demand of oil, gas and electricity—but this has mostly fallen on deaf ears so far.

Yet it is just a matter of time before more stringent measures are adopted, certainly in the EU and probably also in the US. It is possible that demand will be destroyed primarily by high prices rather than various administrative measures or outright rationing, but governments on both sides of the Atlantic are clearly unhappy about the distributional impact of high energy prices.

A more decisive drive to reduce consumption (partly through improved efficiency, but mostly through less driving, less heating, less lighting, and so on) is the main aspect for which the concern for security of supply and affordability converges with the dictates of sustainability. Several ideas have been put forward, and in some cases tested, to more effectively promote reduced consumption, but the emphasis on the demand side of the equation remains insufficient.

The attitude towards curbing energy demand is a critical tell-tale of the likely future of energy transitions. We have heard many times that containing global warming is akin to a war, but this rhetoric has not been sufficient to mobilize people and change their habits. Now we find ourselves in front of a real war, whose outcome is decisive for the survival of western democracies. This should offer a very powerful and compelling argument to solicit the active participation of the people in the multiple steps that are needed to obtain a reduction in the demand for energy across the board. Mostly, these are measures and initiatives that are not just feasible, but distinctly low-cost. The obstacle is that they need widespread popular acceptance; governments are reluctant to request this, or sceptical about potential success.

Politically, this is probably the most critical link between the war and the energy transition agenda. If we fail to put in place a valid strategy for containing energy demand, there is little hope that the energy transition may ever succeed in curbing climate change. If no demand containment strategy emerges under current circumstances, the credibility of the decarbonization drive is gravely damaged.

Investment in fossil sources

The Russian invasion of Ukraine accelerated the increase in the price of gas, oil, and coal that had started already in preceding months due to steep post-COVID demand recovery. The root cause is insufficient upstream investment, following the price decline in 2014–2015 and 2020, and pressure from investors and financial intermediaries to return more value to shareholders. On top of the underlying tightness created by insufficient investment, the EU and US decision to reduce imports of all fossil fuels from Russia added an element of significant market dislocation. For gas, the decline in EU pipeline imports from Russia sparked a run on LNG, which led to very high spot prices in both Europe and the Far East, eventually also pulling up the price of gas on Henry Hub.

The response to this situation has been a complete reversal of many governments' attitudes towards upstream investment in oil and gas. Governments now encourage investment in domestic resources where available, as well as the rapid development of new discoveries, primarily in Africa and North America. We have also seen calls to increase production directed to the major OPEC producers, to the point that US President Joseph Biden accepted to meet the crown prince of Saudi Arabia, albeit with palpable reluctance and at high political cost. But the three OPEC members that may actually have spare capacity to increase production—namely Saudi Arabia, the United Arab Emirates, and Kuwait—have pledged to stick to the OPEC+ strategic alliance with Russia, and chose a hostile attitude towards the US and Europe by announcing a major cut to production.

What lies ahead is a reversal of the expectation that, as oil and gas demand may soon start declining, supply will progressively concentrate in the major lowest-cost producers. It might be true that, starting sometime in the next decade, the world will need less oil—but the idea that residual demand will be increasingly satisfied by Russia or the Gulf is no longer tenable. In contrast, companies are being encouraged to invest in countries that are considered reliable with acceptable governments. This will primarily benefit US shale oil and Canadian tar sands, notwithstanding their higher environmental impact. Investment in African and South American resources will also be encouraged. When it comes to gas, Qatar may be expected to gain (as already evident in the significant list of companies now investing in the North Field Expansion plan), also thanks to the fact that it has left OPEC and adopted a political profile distinct from the rest of the Gulf Cooperation Council. The same applies to Oman, while both Iraq and Iran are much too close to Russia to be attractive for western investors.

Failure of marginal pricing and competitive markets

The recent increased level and volatility of prices, especially for gas and electricity in Europe, also evidenced the shortcomings of markets based on marginal (pay as clear) pricing. The huge variation from extremely low levels in 2020 to extremely high and historically unprecedented levels in 2022 indicates that markets are not doing a very efficient job. The expectation that futures markets would allow major players to efficiently navigate price volatility has been destroyed by the large number of bankruptcies in the UK, and expectations of serious financial difficulties for final consumers in the months to come. Hedging is not the answer.

In the aftermath of the Russian invasion of Ukraine and the subsequent massive increase in energy prices, we learned that the latter have macroeconomic, not just microeconomic significance. Energy prices are, directly and indirectly, major components of inflation, and influence the monetary authorities' decisions on interest rates. Energy prices are also major components of households' budgets (or become major components when prices increase very steeply). Hence, consumer demand is depressed and the door is opened to stagflation.

Beyond a certain point, abrupt increases in energy prices so undermine the economics of exposed industrial activities that closures and bankruptcies ensue. Banks are affected through deterioration of the quality of their loan portfolio. At the same time, companies on the right side of the divide become extraordinarily profitable with no specific merit on their part. Yet, extreme uncertainty about the future discourages investment in increased capacity. Inflated profits do not lead so much to increased investment as to intensified share buybacks and dividend payments.

Hence, governments are forced to intervene, with subsidies/tax reductions to final consumers, bailouts of bankrupt companies, taxes on windfall profits, or other ad hoc measures. These increase distortions, and do not address the root causes of the problem. It is becoming increasingly clear that energy security, especially if coupled with progress in decarbonization, cannot be left to the market, but requires long-term planning and government intervention. Capacity additions—new investment in upstream oil and gas as well as in clean electricity generation, transmission, and distribution, not to speak of hydrogen production and adoption—need to be planned, and de-risked with long-term price guarantees. Market prices must be more reflective of average costs and less of marginal costs. Market clearing in conditions of physical scarcity cannot be left to price variations only: active public stewardship of demand is required, including possibly in the extreme form of rationing.

The limits of new renewables

The war has also brought to the fore the limits of renewable sources (including hydro, due to the concurrent drought throughout Europe). It is telling that some of the countries in the forefront of adopting renewable sources are also most exposed to the risk of insufficient electricity supply in the coming months. It should now be evident that security of supply cannot be guaranteed through reliance on renewable sources only—at least not for the next half century.

There are two main implications of the new situation; the first concerns attitudes towards nuclear energy, and the second the availability and supply of metals.

With respect to nuclear energy, even Germany has now extended the life of its remaining nuclear power plants. This would have been unthinkable at the beginning of the year. Most other nuclear countries in Europe have decided to extend the productive life of their plants, and France has doubled down with the announcement of numerous new reactors. The change of sentiment is unmistakable, and will be reinforced by the inevitable restrictions in power availability in the coming months. Faced with reality, prejudices and vetoes will hopefully be abandoned: this should be counted as a major step forward in the path to decarbonization.

It is at the same time becoming evident that the drive towards increased electrification and reliance on renewable sources translates into a major increase in the demand for all metals, not just the exotic rare earths—starting with copper. Too few new mines are being developed, and the progress of major projects is hindered by multiple obstacles. The environmental and social impact of new mines is extremely problematic, and local resistance is universal.

Even assuming that enough ore can be extracted, the refining process is overwhelmingly controlled by one country: China. The market share of China is also dominant in the production of batteries and solar panels, albeit less so than for metals refining. At the same time, concern for reliance on China has further increased after Russia's invasion of Ukraine. China's refusal to condemn the Russian aggression, and to rule out the possible use of military force against Taiwan, has greatly increased the

credibility of a scenario of progressive decoupling from reliance on Chinese intermediate products. Yet, significantly reducing the dependence of the US and Europe on imports from China is an objective that will require years, if not decades, while entailing difficult compromises with respect to environmental impacts. It will also be costly.

A costly transition

Notwithstanding these factors, the Russian invasion of Ukraine is unlikely to damage the commitment of western democracies to decarbonization. While some increased reliance on coal is inevitable, the incentive to reduce energy consumption, the need to depart from pure reliance on markets and adopt more decisive long-term policies, the renewed acceptance of nuclear, and the realization that the supply of metals is critical and cannot be left to China are all developments supporting an acceleration in the energy transition. At the same time, it is also now clear that, contrary to what politicians and ideological environmentalists have been asserting for years, the transition will inevitably be costly.

Improving security of supply while reducing emissions is possible, but requires massive investment in all directions, combined with reduction in energy demand. The net outcome in aggregate economic terms is that investment must increase and consumption decrease. This is not easily achieved in economies that have been led primarily by consumer demand. It is also necessary to critically reconsider the globalization process, and reduce dependence on politically unreliable suppliers of critical inputs. We will see some characteristics of a war economy.

In short, we are faced with events that require our political systems to be more seriously concerned about tackling longer-term issues, and less about the last opinion poll. Vladimir Putin expects that this will not be possible and that short-termism and hedonism will prevail. My bet is that he will be proven wrong.

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KEY ISSUES FOR POLICYMAKERS TO ADDRESS AT COP 27

Mari Luomi

The year 2022 has been anything but easy for the global climate policy agenda. Soon after confirming their commitment to 'keep 1.5 degrees alive' in Glasgow in November 2021, governments' attention turned to energy security and affordability. COVID-19 pandemic recoveries were still ongoing, and economic growth was slowing down. Already in early 2022, China's electricity supply crunch prompted it to signal an increasing emphasis on energy security over more ambitious climate policy. In February 2022, the war in Ukraine sent hydrocarbon prices sky high and created an unprecedented energy security challenge for Europe, food security challenges for many developing countries worldwide, and, most consequentially, a major gap between countries' short-term energy policies and their declared emission reduction goals.

Making the UN Climate Change Conference in Sharm El-Sheikh (COP 27) a success was already going to be challenging without the added turmoil in global energy markets. It will be the second COP to be held after the implementation of the Paris Agreement on climate change effectively started in 2020, and the first one after the so-called Paris Rulebook was fully completed. The focus should now be squarely on climate action at the national level rather than further negotiations. However, COPs since Paris have had difficulties shifting from a 'political mode' that delivers decisions and declarations to a more practical focus on taking stock of how countries and non-state actors are accelerating and orchestrating implementation on the ground.

One important reason for this is that developing countries feel that developed countries have not held up their end of the bargain, namely providing and mobilizing climate finance at a scale sufficient to enable the necessary emission reductions, adaptation, and coping with loss and damage. This issue was always expected to be centre stage in Sharm El-Sheikh and a difficult one to resolve in a single COP. Still, the economic and energy challenges experienced across the northern hemisphere in 2022 have further dampened the prospects of breaking this long-standing deadlock.

This brief article, written in August 2022, takes stock of where global climate governance stands just three months from COP 27 and what the conference might be expected to deliver. It starts by summarizing major outcomes of COP 26 in Glasgow, and related tasks for 2022, and then presents an overview of progress made and expectations laid at the annual intersessional negotiations in Bonn in June 2022. It briefly examines how the Egyptian Presidency's own agenda for COP 27 might influence the conference's agenda and priorities, and it concludes with an overview of some of the key issues that negotiators and policymakers are expected to focus on, particularly on the formal negotiating agenda, in November 2022.

Major outcomes from Glasgow and tasks for 2022

The 2021 UN Climate Change Conference in Glasgow (COP 26) can be seen as having had three broad mandates. First, it was expected to finally complete negotiations on the implementation guidelines for the Paris Agreement—specifically on international market and non-market mechanisms (Article 6), reporting on emissions and support (transparency), and a common time frame for Nationally Determined Contributions (NDCs, or climate policy plans which countries submit regularly to the Paris Agreement). In this, it succeeded—to the particular benefit of global carbon markets, which have seen a considerable boost in focus and interest since. This year, technical discussions will continue to support their scaling up and operationalization in the coming years.

Second, as with all COPs, Glasgow was expected to review the implementation of the UN climate convention and its treaties, the Kyoto Protocol and Paris Agreement, and agree on ways to accelerate progress on collective responses to climate change. This involved lengthy and difficult discussions around climate finance, particularly its insufficiency for developing countries that are already coping with various climate impacts and disasters, some of which cause irreversible loss and damage.

An agreement was reached at COP 26 to create a number of negotiating ‘spaces’ aimed at delivering more ambitious decisions at future COPs on issues including the new collective climate finance target, the global goal on adaptation, scaling up mitigation ambition and implementation, and funding arrangements for loss and damage. Countries are expected to make further progress on all these at COP 27, but no track is scheduled to deliver an outcome yet. This makes the definition of success in 2022 an elusive exercise.

Third, COP 26 also constituted an important moment for gauging the credibility of the Paris Agreement as an international regime aimed at fostering increasingly high ambition in countries’ climate change pledges—and their implementation—in the form of periodic NDC submissions. With 2020–2021 marking the first round of NDC updates, Glasgow was a critical moment of stocktaking. Coinciding with a global trend in announcing mid-century net-zero emissions targets, this collective count also accounted for those pledges. Active diplomacy in the run-up to COP 26 helped raise ambition in both areas—NDCs and net-zero targets. New voluntary initiatives announced in Glasgow, including the Global Methane Pledge and a US–China cooperation agreement, also lifted the spirits. As reported by Carbon Brief in November 2021, the estimated global warming outcomes from the implementation of pledges made before and at COP 26 ranged between 1.8°C and 2.4°C. For comparison, the warming impact of current policies is estimated to be 2.6–2.7°C.

While the UK Presidency’s declared goal of ‘keeping 1.5°C alive’ did not quite hold, COP 26 and its lead-up did a laudable job in raising the bar on ambition. This high bar and the focus on ambition, however, also mean that the task for COP 27 and beyond in fostering the implementation of set goals is now even bigger. The challenge that all COP presidencies face is that pledges and declarations make better photo-ops for global leaders than celebrations of staying on track. This will be particularly difficult for the incoming presidency: how to avoid the temptation of creating a legacy of new pledges and initiatives only.

Bonn intersessionals—progress and expectations

This year’s meetings of the Subsidiary Bodies of the UN Framework Convention on Climate Change (UNFCCC) in June in Bonn were the first in-person intersessional negotiations since 2019. Despite the benefit of being able to hold corridor conversations, the two-week session was described by some observers as divorced from reality. This was nothing unusual, however, for an intersessional meeting, as they generally do not deliver major results or manage to demonstrate a sense of heightened urgency.

However, there were some indications that the shifting priorities on the global agenda further weakened the level of ambition in the talks. The Earth Negotiations Bulletin, which provides reporting services for multilateral environmental regimes, observed that ‘the world is economically fragile, and an energy power is at war[;] ministers are shifting priorities, trying to ensure energy security,’ and, as a result, ‘there’s no sense in pretending the process is the same as before.’

A general sense was that Bonn did not make progress on the politically most contentious issues, and an emphasis on short-term energy security at any cost lowered many countries’ will to step up. From the closing statements, it became clear that COP 27 will not be easy. Developing countries expect results on issues where progress is either difficult to communicate (such as adaptation) or politically unfeasible (primarily finance). With these issues unresolved, in turn, it will be difficult to achieve more ambitious emission reduction pledges from developing countries.

Two familiar themes emerged from countries' interventions. There were many who felt that messages coming from the Intergovernmental Panel on Climate Change on climate science that underscore the urgent need to reduce emissions were not given enough prominence. At the same time, there were those who stressed the need for 'balance' in the process and its outcomes, which is a way to remind developed countries that if developing countries are to reduce emissions, other priority issues on the agenda—adaptation, loss and damage, and finance—need similar attention.

The Presidency's agenda for an 'African COP'

Agendas and expectations for climate COPs first and foremost come from formal mandates established in previous UNFCCC meetings. Yet, other factors, such as the region in which the COP is hosted and the Presidency's own priorities, also play a big role, particularly outside the strict confines of the intergovernmental negotiating agenda. This year, the African States regional group hosts the COP. The region's priorities have generally focused on climate finance and adaptation. Also, given that the lion's share of countries on the UN least developed countries list are located in Africa, loss and damage is another priority.

By the time of writing in August 2022, Egypt, the host country for COP 27, had only outlined its broad thematic priorities. As expected, it is positioning the conference as an 'implementation COP' that will, as per the Presidency's website, 'demonstrat[e] actual success stories on implementing commitments and fulfilling pledges.' Fostering further ambition will also remain high on the agenda, as it should. The website lists the three broad areas around which negotiations have always revolved, namely, mitigation, adaptation, and finance. Other themes, similarly generic, include engagement with all 'relevant' stakeholders, including non-state and subnational actors.

To make COP 27 a success, the organizers will need to address various challenges. The most difficult one is managing expectations around the conference's outcomes. Expectations do not seem to be as high as in 2021. Yet, the visible slowing down of global momentum on climate action through 2022 creates a significant task for COP 27 to demonstrate that countries are still committed to their targets and determined to pursue them. During the Bonn intersessionals, the Presidency communicated that it is expecting 30,000–40,000 participants to arrive in Sharm El-Sheikh, which would be on par with COP 26 and, if realized, would inevitably also raise expectations on this COP delivering tangible outcomes. With few major NDC updates expected in 2022 and finance at the forefront of the agenda, these may need to come from outside the formal negotiating process.

Other challenges relate to logistics, access, and attention to special interests. Since early 2022, many observer organizations and lower-income countries have had difficulties in securing affordable accommodation in Sharm El-Sheikh. Managing access-related expectations among civil society observers and media may also generate some challenges. In terms of the agenda, some African countries declared during the Bonn meetings that they had not yet seen sufficient reassurances that this COP would be treated as an African COP. On the positive side, Egypt is known for its skilled diplomatic corps, which will become particularly important in the second week of the COP when the Presidency's role in delivering a consensus-based agreement across the agenda becomes pronounced.

Key issues and challenges for negotiators and policymakers

Major negotiating items to keep an eye on at COP 27 include how countries manage to demonstrate that they are making progress toward better understanding of what the global goal on adaptation means in practice—how it can be measured and how countries can be supported in reaching it. The Global Stocktake, which was kickstarted at the previous COP and assesses collective progress toward achieving the purpose and long-term goals of the Agreement, will also attract attention from negotiators and observers alike.

Climate finance will receive a lot of negotiating time and likely become the main point of contention at this COP. Always a sticky issue, with multiple negotiating agenda items and tracks, its salience has risen for various reasons. While the historical responsibility principle is deeply ingrained in the Paris Agreement, the Agreement requires all countries to mitigate their emissions. Yet, developing countries often do not have the resources for this. At the same time, they are suffering from the impacts of climate-related disasters, weather events, and loss and damage. Frustration is growing, and patience is running out. With the Paris Agreement guidance agreed, the negotiating agenda is increasingly being dominated by issues relating to tracking and enabling implementation. With only incremental progress expected on climate finance from this COP, policymakers will need to work hard in Sharm El-Sheikh to find ways to convince markets and audiences at home that the world is still on track to meeting the goals of the Paris Agreement.

COP 27—THE DEVELOPING WORLD IS PREPARING TO MAKE ITSELF HEARD

James Henderson

COP 27 is due to take place November 6–18, 2022, in the Egyptian resort of Sharm el-Sheikh. The key objective of the gathering will be to ensure that the progress made at COP 26 in Glasgow in November 2021 is maintained, in order to keep the world on track to limit the global temperature increase to 1.5° above pre-industrial levels. But the location of the meeting in Africa means that the priorities of this conference will be slightly different.

The Egyptian Presidency has positioned itself as the voice of the Global South, and the meeting is being seen as the African COP, with a focus on the issues that matter most to the developing world. Although these do include the implementation of strategies to limit greenhouse gas emissions, there will also be a significant spotlight turned on the need for financial support to be provided by the developed world, on energy access issues, and on the need for a 'just transition'. Furthermore, the conference will not just be about energy, with water resources and food scarcity also high on the agenda.

Most importantly, though, developing world countries will want to see a firm acknowledgement that the developed world is not only committed to meeting its goals for emissions reduction but also prepared to fulfil the promises it has made to help poorer countries, who bear little of the blame for global warming, with financial support both to build their energy economies in a green way and to adapt to the environmental changes that are affecting them now and have already caused significant loss and damage.

Key results of COP 26

COP 26 marked a key moment in the development of global environmental diplomacy, as it was the fifth conference since the Paris Agreement was signed in 2015. (It took place in 2021, having been postponed from 2020 by the COVID pandemic.) As such, it was a time to review progress since Paris, to update national commitments (Nationally Determined Contributions or NDCs) and increase ambitions for emission reduction targets at both the country and sectoral levels. Furthermore, it presented an opportunity to discuss how developed nations could not only fulfil their own commitments but also help developing countries with financial support for achieving environmental and economic targets.

A number of positives did indeed come out of the meeting. The Paris Rulebook, which defined the parameters for making progress in a number of areas critical to the energy transition, was completed with the final agreement on Article 6 covering carbon markets. This was seen as a major step forward in order to allow both allowance and voluntary offset markets to develop, and indeed 2022 has seen a sharp increase in trading in both. Beyond this success, the majority of countries also presented new NDCs which increased their commitments to emission reductions, and there was agreement that they should be reviewed again in 2022. Furthermore, a number of multilateral sectoral pledges were signed, including the Global Methane Pledge, the Deforestation Pledge, and the Zero Emission Vehicles Pledge.

Importantly, too, a number of countries also went further than their NDCs and made promises to achieve net zero emissions by some point mid-century, with India's promise to achieve this by 2060 perhaps the most notable. Also encouraging was the agreement between China and the US to conduct negotiations on environmental issues during 2022, while the mentions in the final conference text of the need to reduce coal consumption and to remove fossil fuel subsidies were also firsts. Finally, a commitment by the developed world to double funding for adaptation was encouraging as was the formation of the Just Partnership for South Africa, which will provide finance to ease the move away from coal in that country.

However, for all this positive news there were also some significant caveats. Firstly, it was argued by a number of NGOs that the commitments made in the country NDCs still fell short of what is needed to keep global temperatures below 2°C, let alone 1.5°C. Indeed, even if all the net-zero pledges were met, the world would still warm by 1.8° above pre-industrial levels.

Secondly, despite the proliferation of sectoral pledges, many key countries failed to sign a number of them, with the absence of some of the key oil and gas producers from the Global Methane Pledge being a prime example.

Thirdly, the commitments on reducing coal use were watered down at the last minute, with the words 'coal phase-out' being changed to 'coal phase-down' in the final communique at the insistence of India and others. Finally, and perhaps most importantly for the developing world, the financial commitment by the developed world to provide \$100 billion per annum to the developing world was missed, and discussions on the need for payments for loss and damage were largely glossed over. These

issues will be at the forefront of negotiations at COP 27, as will be the question of whether the COP process has managed to 'keep 1.5 alive', as was claimed by Alok Sharma, the head of the UK delegation, at the end of COP 26.

The International Panel on Climate Change reports

Since COP 26 the International Panel on Climate Change (IPCC) has published two major reports as part of its continuing mission to highlight key climate change issues. In February its Working Group II put out an analysis on *Impacts, Adaptation, and Vulnerability*, while in March, Working Group III put out a 3,000-page review on *Mitigation of Climate Change*. Both reports summarize and review the conclusions of key research on the impact of climate change and how to limit future emissions, and will be a foundation for the discussions at COP 27. A number of key conclusions are worth highlighting, as they will be very relevant to the negotiations.

Firstly, from a mitigation perspective, it is clear that the world is not on target to meet emission targets that could limit the temperature rise to 1.5°. All the scenarios which the IPCC envisages to achieve this goal necessitate global CO₂ emissions peaking by 2025 and being in significant decline by 2030, and there is as yet no sign of this happening. Indeed, emissions are set to rise significantly in 2022, as they did in 2021. This reality may have to be faced by policymakers and politicians at COP 27.

Secondly, in many of the pathways to a low-carbon world laid out by the IPCC, carbon removal technologies such as carbon capture and storage, nature-based solutions, and direct air capture play a significant role. In the past, many environmental NGOs have seen these technologies as an excuse for the hydrocarbon industry to keep producing oil, gas, and coal for longer, but it now seems clear that all technologies will have to be considered if we are to meet aggressive climate goals. Technology neutrality is likely to be a key theme at COP 27.

Thirdly, the availability of financing will be a critical issue, especially for the developing world. According to the IPCC, funding for mitigation technologies needs to increase by a factor of 3–6 from current levels if 2030 targets are to be met, and the \$100 billion per annum commitment for financing by the developed world for the developing world needs to be radically increased, perhaps to as much as \$1 trillion per annum by 2030. This will be a major theme of COP 27, as the \$100 billion target was meant to have been achieved by 2020 and now seems unlikely to be met before 2023 at the earliest.

Fourthly, and perhaps most critically for the developing world, the report on adaptation and vulnerability highlighted that 3.3–3.6 billion people, or approximately half the world's population, live in regions that are highly vulnerable to the effects of climate change and where significant economic, social, and biodiversity impacts are already being felt. Africa, Central and South America, Asia, small islands, and the Arctic are the regions most at risk, and the representatives of these areas will not only be arguing loudly at COP 27 for a rapid increase in funding for adaptation but will also be demanding a fund to supply compensation for loss and damage already incurred. This could be a major bone of contention with developed world countries at the conference.

The Bonn climate change conference

Ahead of every COP the UN organizes a climate conference that is known as the Session of the Subsidiary Bodies but whose role is effectively to start a more technical dialogue on some of the key issues for the forthcoming COP and to decide what will be on the formal agenda. As such, it can provide a preview of some of the major topics that will be discussed and some of the key areas of potential disagreement. In 2022 the meeting was held in Bonn in early June and did indeed highlight some critical areas for discussion.

A first dialogue on the impending Global Stocktake, which is due to take place ahead of COP 28 in 2023, underlined the focus on the need for countries to implement plans and make progress towards climate targets rather than just making ambitious promises. Discussions around climate justice, led by the G77 group of developing countries, confirmed the major divides that exist on financing issues. Loss and damage was a particular area of disappointment for many, as it was not included as a topic on the main agenda of the COP, due to objections by the US and the EU. Adaptation was also raised by the African Group of countries as they sought to define and establish a clear work programme for the Global Goal on Adaptation, which was agreed in Glasgow. Again, little formal progress was made, in particular on the issue of whether funds should be provided as loans or grants.

Finally, there was a call for countries to update their NDCs ahead of COP 27 and to increase ambition, although to date only Australia, following the election of its new government, has made any meaningful move in this direction. Again, this has upset developing countries, who argue that the developed countries which are responsible for climate change are not making enough effort to rectify their own emissions and are failing to provide financing to help the poorer countries who are suffering the most. As a result, the Bonn conference served mainly to highlight the divides that could become major rifts at COP 27.

Key agenda items and themes

Following the Bonn conference, the developing countries are now pinning most of their hopes on Egypt, as the Presidency of COP 27, to focus the meeting on issues that are critical to the Global South. And so far the Egyptian Presidency does seem to be defining the key themes in this direction, stating that the four main objectives it intends to address at the conference are mitigation, adaptation, finance, and collaboration. As noted above, Sharm El-Sheikh is becoming known as the African COP, and the definition of the four themes reflects this understandable bias.

Under *mitigation*, the main objective is to raise ambition on emissions reduction in the presentation of revised NDCs, as agreed in Glasgow, but also to focus on implementation of strategies to meet the new targets. In particular, the emphasis will be on 'countries that are in a position to upgrade and fulfil targets' (namely, developed countries) to actually do so, although this emphasis is likely to cause some debate as a number of developed countries are arguing that some developing countries, especially China, should now be included in a new grouping of 'major emitters' with an obligation to catalyse change as well.

On *adaptation*, the Egyptian Presidency's focus is, not surprisingly, on helping the most vulnerable countries to enhance their resilience against climate change, and they will be demanding significant funds to do this. The final text of the Glasgow COP did promise a doubling of finance for adaptation, and so this will no doubt be reviewed in Sharm El-Sheikh.

With regard to *finance*, the key issues will not just concern the amounts to be provided for mitigation, adaptation, and loss and damage but will also concern how funds are provided. Many developing countries complain that the definition of finance from developed countries is often very untransparent and so the funds are sometimes not additional and are very hard to access through multiple layers of bureaucracy. Furthermore, they argue that funding is often very slow and unpredictable, while of course the levels are also seen as inadequate. All these points will be brought to the negotiating table at COP 27 and could lead to a very lively debate.

Finally, and perhaps most optimistically, the Egyptian Presidency is hoping to foster greater levels of *collaboration*, not just between countries but also between the public and private sectors and civil society. As a result, we can expect a full review of the multilateral sector pledges that were made in Glasgow as well as the transnational agreements that were reached, with great hope being placed on the Just Partnership for South Africa mentioned earlier as an example of how the developed and developing world can work together.

The main challenges

While these themes are likely to cause a fair amount of controversy, the backdrop to the conference as a whole is clearly volatile as well. Russia's invasion of Ukraine has not only driven up energy prices and refocused the attention of many countries onto energy security and hydrocarbons rather than the energy transition, it has also exacerbated the political divide between many developing and developed countries. Furthermore, it has caused a significant redistribution of wealth that has undermined the ability of many countries to afford investment in domestic green energy plans, let alone provide support for others.

Additional geopolitical tension has been added by the widening divide between China and the US. Many of the most important advances in climate diplomacy at COP 21 in Paris and COP 26 in Glasgow were driven by a willingness of these two major emitters to cooperate, but the recent visit of Nancy Pelosi, the Speaker of the US House of Representatives, to Taiwan and the countries' opposing positions on Russia mean that a similar collaboration is very unlikely in Egypt, which could undermine the foundations of the conference.

Indeed, getting world politicians to focus on achieving a positive outcome from COP 27 could be a huge challenge in its own right. It is customary for agreement on many topics to be close before a COP starts, meaning that the meeting itself is used for final confirmation and last-minute adjustments. It will be critical that the Egyptian Presidency targets some clear successes for the conference in order to maintain the momentum of COP 26, but the challenge of getting the key players to look beyond the short-term energy crisis will be very difficult.



Finally, as has been obvious throughout this article, getting agreement on the provision of finance from the developed to the developing world could also be a huge challenge. The issue is clearly high on the agenda of countries from the Global South. However, many developed countries, and in particular the US and the EU, are hugely concerned about their ability to provide funding while also having to deal with domestic economic crises, and are also worried about finding themselves committing to potentially unlimited liabilities for loss and damage. Squaring this circle could be the biggest challenge of all for the Egyptian Presidency.

Conclusions

COP 27 will take place against a hugely challenging global economic and political backdrop. An energy crisis faces many countries, meaning that politicians are more concerned with short-term energy security than with longer-term environmental issues. Furthermore, relations between key players are at a low ebb, and a divide is opening up between the developed and the developing world, especially over climate finance. The one bright light is that the US has recently introduced new climate legislation (see later article by Sarah Ladislaw), which will give a significant boost to its credibility as a climate negotiator in Egypt. The best hope for a positive outcome, therefore, may be that the US delegation, led by John Kerry, can repeat its performance from Glasgow and can find a way to collaborate with the Egyptian Presidency to find a path through the complex issues on the agenda and to bring together many divergent views on how the 193 parties to the conference should proceed towards the global goal of net zero emissions by mid-century.

COP 27: TIME FOR AFRICA TO ADJUST ITS EXPECTATIONS AND STRATEGY

Mostefa Ouki

The United Nations Climate Change Conference of the Parties (COP) is returning to Africa for its fifth meeting on the continent. COP 27, which will be held next month in Egypt, is likely to be dominated by the active involvement of African countries. These countries will be pushing for concrete actions beyond pledges and aspirational speeches, though this has become a recurrent expectation before every COP.

Egypt's COP 27 Presidency, in its posted statement, is emphasizing the need 'to move from negotiations and planning to implementation.'² Implementation is expected to be a key feature driving the decisions and measures that will be discussed at this African COP.

Since COP 26 in Glasgow, African stakeholders have been actively preparing the continent's position for the COP 27 negotiations. The latest African Economic Outlook, issued by the African Development Bank in May 2022, focuses on the topic of *Supporting Climate Resilience and a Just Energy Transition in Africa*.³ This theme reflects the position of regional and national institutions in Africa. This was further reiterated in July 2022 when the African Union adopted the African Common Position on Energy Access and Just Transition.⁴

What are the African countries' expectations and concerns, and what actions will they focus on at COP 27 and on the way forward? This article looks at the key elements underlying this complex question.

Africa's climate change context

The African continent consists of more than 50 countries with diverse political, economic, financial, population, cultural, geographical, and natural resource endowment characteristics. Therefore, countries or groups of countries in Africa are likely to follow different energy transition pathways. But the difference is much more pronounced and fundamental when contrasting African countries' energy transition with that of developed economies.

² COP27 website, accessed in August 2022. <https://cop27.eg>

³ African Development Bank (2022), *African Economic Outlook 2022: Supporting Climate Resilience and a Just Energy Transition in Africa*, <https://www.afdb.org/en/knowledge/publications/african-economic-outlook>.

⁴ African Union (2022, 22 July), 'Africa speaks with unified voice as AU Executive Council adopts African common position on energy access and just energy transition', *press release*, https://au.int/sites/default/files/pressreleases/42071-pr-PR-The_Executive_Council_Adopted_African_Common_Position_on_Energy_Access_and_Transition.pdf.



Africa's awareness and concerns regarding the adverse impact of climate change have evolved significantly since the establishment of the United Nations Framework Convention on Climate Change in 1992 and the 1997 Kyoto Protocol. Addressing this impact has become a key priority for African policymakers. The African continent is now more frequently exposed to extreme weather events that are severely affecting its population and economies. As indicated by the Intergovernmental Panel on Climate Change, Africa is one of the least climate-resilient and most vulnerable regions of the world.⁵ It is also one of the least prepared for climate change. Africa's high vulnerability is mainly due to its 'desert and semidesert climatic zones, low levels of socioeconomic development, and lack of technological capacity and finance for adaptation.'⁶

An African focus on adaptation

Africa accounts for less than 3 per cent of the world's energy-related carbon dioxide (CO₂) emissions.⁷ However, Africa continues to be disproportionately affected by the adverse impact of climate change. It is this situation that African policymakers consistently highlight to make the case for a just or fair energy transition for Africa, more focused on adaptation measures.

African countries do not underestimate the need for mitigation measures. In fact, several countries have already developed mitigation plans, especially for the development of renewable sources of energy. What is repeatedly argued by African institutions and African COP negotiators is the need to have a fair balance between mitigation and adaptation measures and their funding, to combat climate change in Africa. They insist on an emphasis on the financing of adaptation measures.

This African call for a focused approach on adaptation for vulnerable regions of the world is not something new. Assisting 'developing country Parties that are particularly vulnerable to the adverse effects of climate change to meet the costs of adaptation' is clearly called for in the Paris Agreement.⁸ It was also one of the key pledges in the COP 26 Glasgow Climate Pact. The commitment to 'doubling 2019 levels of adaptation finance by 2025' is even hailed as the 'first time an adaptation specific financing goal has ever been agreed globally.'⁹ Egypt's COP 27 Presidency in its Vision and Mission statement reiterates the adaptation message by stating that 'the Global Goal on Adaptation was one of the significant outcomes of COP 26.'¹⁰

Therefore, African countries will continue to focus on the implementation of these adaptation pledges formulated during successive COPs. As highlighted earlier, the emphasis on adaptation measures does not mean that the role of mitigation measures is ignored. Both are needed in Africa. In fact, the Nationally Determined Contributions submitted by African countries cover both adaptation and mitigation targets, though most are conditional on 'receiving international financial, technical and capacity building support'.¹¹ But the urgency of addressing the adverse impacts of climate change, which are increasingly affecting millions of Africans, requires the prioritization and sequencing of these measures.

Constrained climate finance—a perennial issue

The implementation of adaptation and mitigation measures in developing economies will very much depend on how the persistent issue of insufficient climate funding is addressed. This is a key issue that the African Group of Negotiators on Climate Change will raise again at the forthcoming COP 27 as a priority.

In 2020 (the latest year for which data are available), a total of US\$83 billion was mobilized by developed countries for climate finance for developing countries. This is still below the developed economies' pledge of US\$100 billion per year,¹² which is itself well below various estimates of Africa's climate change funding needs. So far, the bulk of the climate funding has been allocated

⁵ Intergovernmental Panel on Climate Change (2022, 27 February), *Climate Change 2022: Impacts, Adaptation and Vulnerability*, Sixth Assessment Report of the IPCC, <https://www.ipcc.ch/report/sixth-assessment-report-working-group-ii/>.

⁶ African Development Bank, *African Economic Outlook 2022*.

⁷ International Energy Agency (2022, June), *Africa Energy Outlook 2022*, <https://iea.blob.core.windows.net/assets/6fa5a6c0-ca73-4a7f-a243-fb5e83ecfb94/AfricaEnergyOutlook2022.pdf>.

⁸ United Nations (2015), *Paris Agreement*, https://unfccc.int/sites/default/files/english_paris_agreement.pdf.

⁹ COP26 Presidency (2021), "COP26: The Glasgow Climate Pact Outcomes", <https://ukcop26.org/wp-content/uploads/2021/11/COP26-Presidency-Outcomes-The-Climate-Pact.pdf>.

¹⁰ COP27 website, accessed in August 2022. <https://cop27.eg>

¹¹ International Energy Agency, *Africa Energy Outlook 2022*.

¹² United Nations Framework Convention on Climate Change (2021, 7 June), 'UN climate chief urges countries to deliver on USD 100 billion pledge', <https://unfccc.int/news/un-climate-chief-urges-countries-to-deliver-on-usd-100-billion-pledge>.



for mitigation activities and focused on energy and transport. Over the 2016–2020 period, Africa was the beneficiary of 26 per cent of total climate change funds.¹³

Most of these climate funds are loans from public sources. According to the African Development Bank, ‘debt instruments have been increasingly used to finance climate-related projects in Africa, often on non-concessional terms.’¹⁴ This is a serious challenge for some African countries and will worsen an already fragile debt burden situation. Data from the International Monetary Fund indicate that public debt in sub-Saharan Africa reached a two-decade record of 58 per cent of gross domestic product in 2020.¹⁵

African countries have already called for more sustainable approaches to financing climate-change-related projects and for a scaling up of their funding. Furthermore, the very sensitive and controversial question of loss and damage financing, which occupied a significant amount of African negotiators’ time in Glasgow, will undoubtedly be part of the agenda again at COP 27.

But repeatedly raising these financing issues at successive COPs without satisfactory outcomes has become an increasingly frustrating exercise. Despite the legitimacy of the arguments put forward for a fair energy transition in Africa, and in other developing regions of the world, African countries must face today’s hard realities. Public funding from developed countries, especially on concessional terms, is presently constrained by severe domestic economic difficulties (unprecedented cost of living crisis in Europe, economic recession, etc.). This situation is unlikely to change quickly. In fact, it could get worse. Moreover, developed countries themselves have large and challenging energy transition programs that require substantial levels of public financing.

Although the first stages of the current energy crisis predate the Ukraine war, the highly damaging impact of this war on energy and food markets worldwide has changed the order of priorities in several regions of the world considerably. In developed countries, mobilizing public financing on favourable terms for the less economically fortunate countries of the world, which was already complicated, is likely to become very challenging.

Therefore, African countries must look (or continue to look) for alternative sources of funding to supplement what is realistically likely to be made available through the pledged \$100 billion climate finance program. The African Development Bank indicates that different ‘innovative climate finance instruments’ such as ‘green bonds and loans, sustainability or sustainability-linked bonds and loans, and debt-for-climate swaps’ could be used to capture Africa’s domestic climate finance potential.

Africa will need to focus more on private sources (international and local) of financing for climate adaptation and mitigation projects. These could take the form of potential investment opportunities. But making this happen effectively and at the needed scale requires serious and timely adjustments driven by courageous policy decisions on the part of Africa’s policy decision-makers. Africa is already suffering from the impact of the Ukraine war, with grave food crises emerging or looming in several African countries, and continuous extreme weather conditions are worsening this situation. Thus, Africa cannot afford further delays in pledge implementation. Effective and rapid action is urgently required.

Critical need for reforms

Attracting financing for infrastructure projects in Africa has always been problematic, even in countries endowed with abundant natural resources, such as oil and natural gas. Africa has been facing challenging funding issues since long before climate finance became a prominent issue. There is no shortage of liquidity, but rather a lack of bankable projects, and several African climate-change-related projects could fall into this category—though this is far from being an African exclusivity.

The reasons for this unfavourable situation in several African cases are multi-faceted and include policy, regulatory, institutional, governance, and transparency problems that significantly constrain the bankability of projects. These issues are regularly pointed out by different local, regional, and international organizations, like the African Development Bank and the World Bank.¹⁶ What is essential to address these barriers is effective action from Africa’s policy decision-makers. They must

¹³ Organization for Economic Co-operation and Development (2022, 29 July), ‘Statement by the OECD Secretary-General on climate finance trends to 2020’, <https://www.oecd.org/environment/statement-by-the-oecd-secretary-general-on-climate-finance-trends-to-2020.htm>.

¹⁴ African Development Bank (2022), *African Economic Outlook 2022*.

¹⁵ Georgieva, K. (2022, 23 June), ‘The road ahead for Africa—fighting the pandemic and dealing with debt’, International Monetary Fund, <https://www.imf.org/en/News/Articles/2021/06/23/sp062321-the-road-ahead-for-africa-fighting-the-pandemic-and-dealing-with-debt>.

¹⁶ World Bank (2020, August), *CPIA—Assessing Africa’s Policies and Institutions*,

undertake adequate and timely structural reforms of their countries' policy, regulatory, institutional, and governance systems to mitigate financing risks and attract climate funding.¹⁷ In the long term, these actions will not only help de-risk energy transition projects but generate desperately needed socio-economic benefits¹⁸ on a continent where 60 per cent of the population is less than 25 years old.

Africa's natural gas¹⁹

Africa's call for financing support and its need for funding alternatives are not limited to projects that are widely accepted as fostering climate adaptation and mitigation. They also include natural gas development projects, considered a means to reduce CO₂ emissions because of natural gas's lower emissions relative to other fossil fuels—a narrative that is strongly challenged by several parties. But the case for natural gas seems to be strengthened—at least in the short to medium term—by the unexpected impact of the Ukraine war on European energy markets (including this year's adoption of natural gas in the European Union green taxonomy).²⁰

Even though only a few regions of Africa are endowed with large natural gas reserves, the issue of allowing African countries to develop their natural gas potential to supply energy and feedstock to their domestic markets and generate export revenue, wherever relevant, has become a rallying call for wider African concerns. Africa's goals of energy access and fair energy transition go beyond the narrow discourse on climate change. They encompass the persistent problems of energy poverty and access and the right to economic development. Two often-quoted figures that symbolize this very sad African reality are that about 600 million people in Africa have no access to electricity and about 1 billion Africans lack access to clean cooking.

In recent years, international decarbonization measures to restrict or stop the financing of fossil fuel projects affected potential hydrocarbon investments in developing regions such as Africa. This has triggered strong complaints by several African countries about the fairness of such decisions. This was forcefully expressed at last year's COP in Glasgow and will undoubtedly be raised again at COP 27. Europe's current interest in African gas to replace Russian gas supplies or rather part of these supplies²¹ is unlikely to help the argument against the financing of natural gas development projects. In fact, it is causing some uncomfortable credibility issues for Europe's decarbonization policies.

But the focus should not be on whose argument is weakened or strengthened, or on further confrontation on issues that presently appear unsolvable and keep being re-tabled at each COP. Rather, it should, again, be on the urgency of globally addressing the rapidly increasing adverse impacts of climate change. All parties must concentrate their efforts on realistic, implementable solutions.

It would be futile to ignore or contest the fact that African countries endowed with natural gas reserves are determined to go ahead with their development. In July 2022, the African Union in its Common Position stipulated that 'Africa will continue to deploy all forms of its abundant energy resources including renewable and non-renewable energy to address energy demand.'²² Even international organizations, such as the International Energy Agency, have now acknowledged this reality about the role of natural gas in Africa's energy transition,²³ along with a critical need to scale up Africa's renewable energy capacity.

https://openknowledge.worldbank.org/bitstream/handle/10986/34325/WB_CPIA_Report_Aug2020.pdf.

¹⁷ Adrian, T. (2022, 1 June), 'Climate finance and financial stability: some areas for further work', International Monetary Fund, <https://www.imf.org/en/News/Articles/2022/06/01/sp060122-climate-finance-dialogue-opening-remarks-by-tobias-adrian>.

¹⁸ International Renewable Energy Agency (2022, January), *Renewable Energy Market Analysis: Africa and its Regions*, <https://www.irena.org/publications/2022/Jan/Renewable-Energy-Market-Analysis-Africa>.

¹⁹ According to the International Energy Agency, use over the next 30 years of all the natural gas discoveries that have been made so far in Africa, and yet to be developed, would only increase Africa's share of global CO₂ emissions to 3.5 percent—International Energy Agency, *Africa Energy Outlook 2022*.

²⁰ European Union (2022, 2 February), 'EU taxonomy: Complementary Climate Delegated Act to accelerate decarbonisation', https://ec.europa.eu/info/publications/220202-sustainable-finance-taxonomy-complementary-climate-delegated-act_en.

²¹ Ouki, M. (2022, June), *African Gas Supplies to Europe: Between Hopes and Hard Realities*, Oxford Institute for Energy Studies, <https://www.oxfordenergy.org/publications/african-gas-supplies-to-europe-between-hopes-and-hard-realities/>.

²² African Union (2022). "Africa Speaks with Unified Voice as AU Executive Council Adopts African Common Position on Energy Access and Just Energy Transition", *press release*, 22 July. https://au.int/sites/default/files/pressreleases/42071-pr-PR-The_Executive_Council_Adopted_African_Common_Position_on_Energy_Access_and_Transition.pdf.

²³ International Energy Agency, *Africa Energy Outlook 2022*.

However, even if the role of natural gas in Africa's energy transition is presently acknowledged (or temporarily tolerated), international decarbonization measures (especially in Europe) at some stage will indiscriminately target natural gas projects and their carbon footprint. Therefore, African energy policymakers will have to carefully prepare the future development of their countries' natural gas reserves. This includes investments to significantly reduce associated gas flaring, as well as methane emissions, which have a much more potent effect on global warming, and eventually investments in carbon capture, utilization, and storage schemes. This will also require the satisfactory and timely reform of investment frameworks.

Concluding thoughts

This year's COP, to be held for the fifth time in Africa, is again raising expectations about the implementation of past COPs' decisions and pledges. African COP negotiators will be concentrating on the interlinked themes of adaptation, mitigation, and climate finance, with a focus on a fair balance between adaptation and mitigation, reflecting Africa's low share of global emissions and its high climate change vulnerability.

At COP 27, Africa's representatives will also strongly make the case for Africa's right to develop its natural gas potential in order to address the continent's chronic energy poverty and energy access problems. Even if it does not apply to all African countries, the implications of this African battle for gas are much wider. But African policymakers should not ignore the fact that unabated natural gas has its sustainability limitations, and its future development is unlikely to evolve the way it did historically.

The question of developed economies making available adequate levels of climate finance is at the centre of Africa's (and other developing regions') negotiation challenges. This immensely frustrating issue is constantly raised at COPs without much progress. COP 27 will be taking place against the background of severe international economic crises and geopolitical conflicts. These issues are worsening developed economies' ability to mobilize and disburse public funding on favourable terms.

Therefore, it is time for Africa to face the new economic and geopolitical realities by adjusting its expectations and strategic approach to the funding of climate adaptation and mitigation projects. This will require the political will and courage of Africa's policy decision-makers to reform their countries' investment and financing environment. This is undeniably not an easy task for most African countries, but it is unavoidable in a world rapidly undergoing radical changes and a reordering of priorities.

CLIMATE DIPLOMACY AND THE ROAD TO NET ZERO: SAUDI ARABIA'S CLIMATE GOVERNANCE, AMBITIONS, ACTIONS, AND EXPECTATIONS FOR COP 27

Noura Y. Mansouri

From COP 26 to current affairs

Looking back at COP 26, and revisiting pledges that countries made, if we examine the Glasgow Climate Pact text, we find unprecedented urgency in the language—for example, '*recognizes* that the impacts of climate change will be much lower at the temperature increase of 1.5°C compared with 2°C, and *resolves* to pursue efforts to limit the temperature increase to 1.5°C'; the explicit mention of reducing CO₂ by 45 per cent by 2030, achieving net zero by 2050, and a specific reference to fossil fuels for the first time; and 'the phasedown of unabated coal power and phase-out of inefficient fossil fuel subsidies.'

While the outcome in the Glasgow Climate Pact may have kept alive the goal of preventing global temperatures from rising more than 1.5 degrees Celsius (°C) above pre-industrial levels, collective climate action and effective multilateralism are required to turn these pledges into reality. Conflict in Ukraine broke out in February 2022, just three months after these pledges were made in Glasgow, changing everything once again. In an already fragile world recovering from COVID-19, the conflict in Ukraine adversely impacted energy markets and may have further derailed climate actions.²⁴ The conflict triggered a series of multifaceted disruptions, creating even more challenges, causing the worst energy security crisis in modern Europe, a global economic slowdown, energy and food crises, inflation, and 'stagflation', all of which are still unfolding.

²⁴ Hook and Hume, "Will the Ukraine war derail the green energy transition?," FT, March 08, 2022, <https://www.ft.com/content/93eb06ec-ba6c-4ad2-8fae-5b66235632b2>

Multilateralism is in crisis. Leading up to the G20 Bali Summit, to take place in November 15–16, 2022, G20 ministers failed to reach consensus in different working group meetings. G20 ministers clashed on language over the Russia–Ukraine conflict, climate finance, and whether the world’s climate target should be 1.5°C or 2°C. The latter contentious issue seemed to have been settled at COP 26, yet it still feels very much unsettled. This raises many questions on the effectiveness and sustainability of global climate governance and the progress being made that seems to stagnate or even be reversed with every global emergency (for example, the COVID-19 pandemic in 2020 and the global financial crisis in 2008). Delivering on the Paris Agreement, the Glasgow Climate Pact, and other climate goals will be virtually impossible without a unified global stance on collective climate action.

The Russia–Ukraine conflict is a grave reminder of the reality of our world today, where climate change concerns lose their salience when countries are faced with a growing need for energy security. The European Union (EU) was accused of hypocrisy during climate talks in the Bonn session.²⁵ On the one hand, it has reverted to using more coal to replace Russian hydrocarbon imports, disregarding the COP 26 pledge to phase down unabated coal and its own EU Green Deal. It has also consistently blocked negotiations on climate finance for loss and damage, along with the United States (US), and this continued during the Bonn talks in June 2022. The EU and US have rejected calls for a dedicated climate finance channel for loss and damage. They argued that climate funding can be done through existing humanitarian, development, and climate institutions.

The EU is also accused of hypocrisy for its efforts to negotiate with developing countries for new investments aimed at further exploiting hydrocarbons. These include Germany’s efforts with Senegal and France’s and Italy’s efforts with North African countries.²⁶ The US and EU (along with the G7) had pledged at COP 26 to stop financing fossil fuel projects abroad by 2022.²⁷

Developing countries’ climate targets are also adversely affected by the current Russia–Ukraine conflict. China and India continue to build new coal power plants as the appetite for coal continues to grow to replace Russian hydrocarbons. Reverting to coal, even in the short term, will likely make it more difficult to reach net zero on time.

Developing countries voiced their discontent and disappointment with developments at the Bonn talks in June 2022, which were meant to lay the groundwork for COP 27. In particular, they noted their concern with the lack of momentum to help vulnerable countries affected by climate change and the exclusion of loss and damage from the discussions. This discontent and disappointment were further fuelled by the failure to fulfil the promise of \$100 billion a year from 2020 for climate mitigation and adaptation, to be provided and mobilized by developed countries, to help developing countries adapt to climate change impacts already being felt, such as floods, heat waves, and storms. Developing countries, especially in Africa, are pushing for loss and damage to be included in the agenda for COP 27 in Sharm El-Sheikh. It will be the first African COP in six years.

The voice of the Global South promises to be highlighted at COP 27, given its leadership in multilateral platforms this year both at the COP and G20. For two consecutive years, the COP and the G20 will be hosted by nations in the Global South: COP 27 in Egypt, COP 28 in the United Arab Emirates, G20 2022 in Indonesia, and G20 2023 in India. There is a growing momentum not only to include developing countries’ agendas, but also to push them further. However, current events triggered by the conflict in Ukraine may adversely impact this momentum.

Shifting government priorities and global policy agendas result in ineffective global climate governance. The health emergency of COVID-19 and the economic stagnation, geopolitical risks, and energy and food crises caused by the conflict in Ukraine have created a sense of urgency that has caught governments’ immediate attention. However, climate change is a global priority that requires urgent solutions. More than ever, collective climate action must embody sustainability, flexibility, and inclusivity.

²⁵ EURACTIV.com with AFP, “Europe accused of ‘hypocrisy’ as Bonn climate talks close without a deal,” Jun 17, 2022, <https://www.euractiv.com/section/climate-environment/news/europe-accused-of-hypocrisy-as-bonn-climate-talks-close-without-a-deal/>

²⁶ Paquette and Halper, “Senegal sees opportunity and ‘hypocrisy’ in Europe’s search for gas,” Washington Post, March 13, 2022, <https://www.washingtonpost.com/world/2022/05/13/africa-gas-europe-russia-ukraine/>

²⁷ OCT, “Explainer: What the COP26 and G7 promises to stop funding fossils in 2022 mean for climate and communities,” Oil Change International, July 28, 2022, <https://priceofoil.org/2022/07/28/explainer-what-the-cop26-and-g7-promises-to-stop-funding-fossils-in-2022-mean-for-climate-and-communities/>



Saudi Arabia's climate governance, ambitions, and actions

The circular carbon economy framework, formulated under the Saudi G20 Presidency, offers that much-needed flexibility for countries. It enables them to contribute to sustainable global climate governance, support a just energy transition, and sustain these climate action efforts in ways best suited to their national circumstances.

Keeping all energy options open is key for energy security and will support a more sustainable climate action strategy. Saudi Arabia has maintained its upstream investments, even when others called for a phase-out of hydrocarbons, particularly in Europe. This resilient and sustainable investment in its hydrocarbons sector, which has weathered oil prices as low as \$30 per barrel, has enabled Saudi Arabia to remain one of the few highly reliable and flexible spare capacity suppliers.

In May 2022, Saudi Arabia appointed its first climate envoy, Adel Al Jubair, a seasoned diplomat who has been in the Saudi diplomatic service for over 35 years. He previously served as the Kingdom's minister of foreign affairs and ambassador to the US and currently serves as the minister of state for foreign affairs. The message is clear: Saudi Arabia is taking its climate diplomacy to the next level. This effectively ends the dichotomy between climate change and hydrocarbons, and essentially separates the climate and energy agendas, at least institutionally, where historically, the climate agenda has been managed by hydrocarbons-based institutions, such as the former Ministry of Petroleum and Minerals, now Ministry of Energy, and Saudi Aramco.

In fact, the shift in rhetoric started a long time ago, as the Kingdom steadily moved away from its traditional hydrocarbon-defined agenda, pivoting toward a more progressive stance. As the long-standing negotiator representing the Arab League, Like-Minded Developing Countries, and G77+China, Saudi Arabia had a reputation for obstructing negotiations. However, its stance has shifted in recent years toward a more constructive and even proactive approach to negotiation.

Saudi Arabia announced its net-zero target of 2060 ahead of COP 26, more than doubling its Nationally Determined Contribution target, raising its ambition from 130 metric tonnes of carbon dioxide (MtCO₂) per year to 278 MtCO₂ per year by 2030. This is part of the greater Saudi Vision 2030, which details the country's plan to develop a green economy, including its first package of investment of \$187 billion.

The Kingdom recently launched two major initiatives, the Saudi Green Initiative (SGI) and Middle East Green Initiative, to plant 10 billion trees in the country and 40 billion trees across the region. The SGI alone promises to reduce global greenhouse gas emissions by 4 per cent per year. This is at least double Saudi Arabia's current emissions, which is around 1.47 per cent per year.

Saudi Arabia has made strides in renewable energy. This includes the launch of the 300 megawatt (MW) Skaka, the first ever utility-scale solar energy project, and the launch of the 400 MW Dumat Al-Jandal, the first ever utility-scale wind energy project. These efforts are on target to diversify Saudi Arabia's energy mix, shifting its reliance on oil to cleaner energy. It intends to use 50 per cent renewables and 50 per cent natural gas by 2030. The Kingdom plans to gradually develop over 35 parks across the Kingdom using solar photovoltaic, concentrated solar power, and wind power. Today, 700 MW of renewables are connected to the grid, and 3 gigawatts are under construction. These projects will produce 3,700 MW and power 600,000 homes, and by doing so will reduce greenhouse gas emissions by 7 million tonnes.

In addition, Neom has made notable progress toward its green hydrogen plans, which will produce 1.2 million tonnes of green-hydrogen-based ammonia per year. Saudi Aramco is also investing in blue and green hydrogen, exporting the world's first shipment of blue ammonia to Japan in 2020. The Kingdom has also established the Saudi Nuclear Energy Holding Company, aimed at developing nuclear power plants to produce electricity, desalinate seawater, and power thermal energy applications.

Moreover, the Gulf Cooperation Council Interconnection Authority has signed agreements to expand the grid beyond Gulf Cooperation Council countries to include regional neighbours Egypt, Jordan, and Iraq. This pan-Arab electricity market will be connected to Europe to enable clean energy exports from Saudi Arabia. Saudi Arabia is seeking collaboration on clean energy with its US and European partners. Recently, Greece signed a memorandum of understanding with the Kingdom on renewable energy; electrical interconnection; electricity exports to Greece and Europe; the transportation of clean hydrogen to Europe; energy efficiency; the oil, gas, and petrochemical industry; innovation in the field of energy; and joint energy research between the countries' universities and research centres. Further, Saudi Arabia and France have agreed to boost cooperation on

renewable energy, including solar energy and clean hydrogen. Most recently, Saudi Arabia and the US established strategic partnerships on climate and energy transition initiatives.

Notable progress is being made on the Public Investment Fund's gigaprojects, including Neom, the Red Sea Development Project, Amaala, and Qiddiya, in an effort to diversify Saudi Arabia's economic base and grow its sustainable tourism sectors. One of the initiatives announced alongside the SGI was the Saudi-led Sustainable Tourism Global Centre's Tourism Panel on Climate Change. It intends to contribute to the climate–tourism interface and mainstream innovative energy solutions in the tourism sector.

Finally, shortly after COP 26 concluded, Saudi Arabia was elected to chair the Adaptation Fund. This is in addition to its longstanding membership on the Green Climate Fund board. This crowns the Kingdom's stewardship and leadership efforts in climate finance on behalf of the Arab League, the Like-Minded Developing Countries, and G77+China. Notably, Saudi Arabia has helped secure several climate finances projects in the region, including in Palestine and Bahrain.

Expectations for COP 27

Expectations for COP 27 include making progress on operationalizing Article 6, after COP 26 resulted in the completion of the Paris Agreement Rulebook. Significant progress was made on operationalizing Article 6 during the June negotiations in Bonn, but some challenges are still expected regarding non-market approaches and what to include in the COP 27 work program. Nevertheless, developing countries would like to see the full implementation of Article 6 as soon as possible.

The transparency agenda mandate, concerning reporting on climate action, was completed at COP 26, with the operational guidance for reporting on action and support perceived to be balanced. Negotiations on the remaining minor issue concerning the voluntary review of adaptation in Article 13 started in June, and a decision should be adopted at COP 27. COP 27 will continue preparations for the Global Stocktake that will take place at COP 28 in 2023 in the United Arab Emirates. On the climate finance agenda, developed countries must honour their promise and deliver on the commitments they have made. This must be addressed at COP 27.

It is important to honour the Paris agreement, and not deviate from it; this will continue to be an important message for Saudi Arabia at COP 27. The Kingdom also maintains that hydrocarbons can continue to be used with important emission reduction technologies to be deployed for carbon circularity and neutrality, such as carbon capture, utilization, and storage, as well as hydrogen. For Saudi Arabia, it is important to recognize the diversity of mitigation options without any bias towards or against any source.

CHINA: GOOD COP, BAD COP

Michal Meidan

Ahead of COP27, as of the time of writing, China has done little internationally to show greater ambition or urgency in its Nationally Determined Contributions. What is more, the country's renewed appetite for coal seems to be complicating, if not undermining, its efforts to achieve its 'dual carbon' targets of peaking emissions before 2030 and reaching net zero by 2060 (the '30-60 targets'). Finally, the freezing of climate cooperation with the US, as part of China's response to US House of Representatives Speaker Nancy Pelosi's visit to Taiwan, further raises questions about whether China is backtracking from its climate pledges.

But the reality is more complicated. China remains committed to its climate pledges, even though the current market volatility and concerns about energy security are leading to a renewed emphasis on coal. And it will continue to pursue them independently of its agreements, or disagreements, with the US. But in the eyes of developed countries, China will likely be falling short. At the same time, COP 27, nicknamed Africa's COP, will be all about the developing world and vulnerable nations. China, despite being the world's second-largest economy, has classified itself as a developing nation. And as a result, at the upcoming COP, it may well try to position itself alongside African and small island nations in the fight for the pledged US\$100 billion in climate aid.



An increasing focus on energy security in China, following power outages in 2021 and again in mid-2022, combined with energy price volatility following the Russian invasion of Ukraine, seem to be putting the 30-60 targets on the back burner. Coal is now even more consistently emphasized as the 'bedrock'²⁸ of China's energy system, with coal industry lobbies arguing that the country could add as much as 250–270 GW of thermal capacity through 2025,²⁹ even though the government has not issued any formal targets or guidance. Indeed, the 14th Five Year Plan sets no limits for domestic coal production, consumption, or power generation capacity, but rather talks of 'strengthening coal's role as energy security guarantee' and 'the regulating role of coal power in the power system'.³⁰ Coal power plants can, according to the Plan, be built or retrofitted as flexible rather than baseload power sources, with the aim of regulating the fluctuations of renewables. There is a risk, however, that local provincial governments, seeking to ensure supply security and generate economic activity after the downturn seen thus far in 2022, will approve coal-fired capacity that will ultimately operate as baseload, thereby locking in coal assets for decades to come. But even though officials are seeking to promote more capacity, power companies are less enthusiastic as coal power has been unprofitable for the past year.

And just as coal is making a strong comeback, renewable capacity additions have increased dramatically too. In the first half of 2022, China added 31 GW of solar capacity and 13 GW of wind, compared to 13.2 GW of thermal fired capacity.³¹ This, combined with the ongoing real-estate slump and strict COVID control measures (which have weighed on economic and industrial activities), means that China's emissions have now fallen year-on-year for four consecutive quarters,³² extending what was already the longest sustained decline in recent history.

Moreover, Chinese policymakers continue to issue medium- and long-term plans that advance it toward its 30-60 pledges (if fully implemented). Both the 14th Five Year Plan and the 1+N documents³³ include measures to promote low-carbon development, scale up clean energy sources, and invest in industries of the future. But they also recognize the need to balance low-carbon development with other goals including energy security, and to participate actively in climate diplomacy.

Increasingly, China's leaders seem to equate energy security with resilience and a system-wide approach to resources. This would require building a national energy market and, as the 14th Five Year Plan for building a modern energy system also suggests, laying the foundations for the energy system of the future.³⁴ This can be achieved through renewables as well as coal, requiring effective storage systems and pricing mechanisms. The power price reforms introduced in October 2021, in response to the power outages, could also help level the playing field and improve the economics of renewable energy. Moreover, in December 2021, China's top officials listed energy security as the top priority,³⁵ and gradual, step-by-step deployment of renewable energy as one of several solutions.

Renewable deployment has now, therefore, clearly become part of the energy security narrative, alongside domestically produced coal, gas, and oil. That said, the 30-60 goals are not only driven by the urgency to address climate change. China's policymakers recognize that the country's dominance of clean-energy manufacturing could offer it long-term strategic benefits:

²⁸ Byford Tsang, "Will China's power crunch shift its climate policy?", The 2021 energy crisis: Implications for China's energy market and policies – Issue 131 of the Oxford Energy Forum, <https://www.oxfordenergy.org/publications/oxford-energy-forum-the-2021-energy-crisis-implications-for-chinas-energy-market-and-policies/>

^{29,29,29} Bloomberg, "China May Boost Coal Power Plant Building Amid Energy Crunch", 8 September 2022, <https://www.bloomberg.com/news/articles/2022-09-08/china-to-add-more-coal-plants-than-thought-to-ease-energy-crunch?leadSource=uverify%20wall>; David Stanway, "Analysis: China no closer to peak coal despite record renewable capacity additions", Reuters, 22 August 2022, <https://www.reuters.com/world/china/china-no-closer-peak-coal-despite-record-renewable-capacity-additions-2022-08-22/>

³⁰ 14th Five Year Plan for a modern energy system, http://www.nea.gov.cn/1310524241_16479412513081n.pdf

³¹ National Energy Administration, "January-June 2022 national power industry statistics", 19 July 2022, http://www.nea.gov.cn/2022-07/19/c_1310643468.htm

³² Lauri Myllyvirta, "Analysis: China's CO2 emissions fall by record 8% in second quarter of 2022", Carbon Brief, 1 September 2022, <https://www.carbonbrief.org/analysis-chinas-co2-emissions-fall-by-record-8-in-second-quarter-of-2022/>

³³ The '1' in '1+N' refers to a long-term approach to combating climate change, as set forth in the State Council's Working Guidance for Carbon Dioxide Peaking and Carbon Neutrality. The 'N' refers to specific plans to peak carbon dioxide emissions by 2030, such as the National Development and Reform Commission (NDRC) Action Plan for Carbon Dioxide Peaking Before 2030.

³⁴ Michal Meidan, Anders Hove, Erica Downs, "How Russia's War on Ukraine is Impacting Beijing's Search for Energy Security", CSIS Interpret China, 20 July 2022, <https://interpret.csis.org/how-russias-war-on-ukraine-is-impacting-beijings-search-for-energy-security/>

³⁵ Anders Hove, "Opinion: China's new power market reforms could accelerate energy transition", China Dialogue, 23 February 2022, <https://chinadialogue.net/en/energy/chinas-new-power-market-reforms-accelerate-energy-transition/>



China's rapid deployment of renewables could, over time, enhance the country's energy security while also enabling it to pursue climate targets and insulate itself from potential technological decoupling.

Geopolitical tensions, industrial policy, and extreme climate events, such as the heat wave and drought that plagued China in the summer of 2022, all suggest that the country will pursue its 30-60 goals, regardless of coordination with the US or international forums such as COP 27.

While the US–China agreement at COP 26 in Glasgow may have injected considerable momentum into the final stages of the talks, it did not include ambitious new pledges from China. The agreement was significant for US–China relations in that it was set to create new avenues for dialog and discussion, namely on methane emissions, in the context of rapidly deteriorating ties. China had pledged to issue a domestic methane action plan, but that was not, and is not, contingent on US–China collaboration or even coordination. In that vein, China's decision-makers are still assessing and analysing domestic methane emissions. In May 2021, seven Chinese gas companies established the China Oil and Gas Methane Alliance, aiming to reduce the average methane intensity in natural gas production to below 0.25 per cent by 2025, with an additional company joining the alliance in June 2022. However, the domestic methane action plan has yet to be issued. Meanwhile, US–China plans to form joint working groups had failed to materialize well before tensions peaked with Pelosi's visit to Taiwan.

Even though the freezing of US–China talks is unlikely to undermine China's own commitment, the lack of coordinated US–China action could cast a shadow on the summit, and even become an excuse for other countries to limit their ambition. Moreover, discussions about whether China is a 'large emitter' or a 'major emitter' could further undermine global efforts. China is likely to underwhelm a developed-country audience. Even though studies conducted in China suggest the country could peak its CO₂ emissions around 2027,³⁶ it is unlikely to commit to such targets at COP 27.

But can it maintain its status as leader of the developing world? Ahead of COP 26 last year, China pledged to green its Belt and Road (BRI) investments, although the promise to stop funding overseas likely did not apply to projects that were already in the pipeline. Yet by April 2022, 12.8 GW of coal power projects had reportedly been shelved or cancelled since the pledge was issued. With many developing countries now struggling to pay for imported commodities and their economies sputtering, there are growing concerns about their indebtedness to China. China is the largest bilateral creditor to 52 BRI projects, with the debt owed by the 10 most indebted BRI countries totalling \$64.2 billion in 2019.

Climate scientists have called on China to adopt a 'debt-for-nature' swap, which would involve China selling these countries' debts to environmental trust funds at a discount. These funds will in turn offer grants for local adaptation projects in developing nations. To date, there have been few concrete actions from China to initiate such swaps, even as it has participated in multilateral debt relief efforts. That said, Chinese guidelines concerning investments along the BRI include increasingly stringent environmental standards, and a growing trend of exports of clean tech. Part of China's assistance to Egypt, the host of COP 27, was reportedly grants with which the Egyptian Ministry of Environment was able to purchase Chinese solar and energy-saving equipment.

China could also seek to emphasize its leadership of the COP 15 biodiversity talks. After two years of delays, due to the COVID-19 pandemic, the UN biodiversity conference took place in two parts. The first, in October 2021, resulted in the Kunming Declaration, signed by over 100 countries, but the second, initially scheduled for April, has been moved to Canada and is now scheduled for December 2022. The COP 15 biodiversity conference was particularly appealing to China as a forum in which it can demonstrate its green leadership credentials, especially since the US is not a party to it. The theme for Kunming was Xi Jinping's term 'ecological civilization', a term that was even written into China's constitution in 2018, pointing to its significance as part of China's revamped development model. In October 2021, President Xi also launched the Kunming Biodiversity Fund, to which China has contributed RMB 1.5 billion (\$230 million). The hope is that this Fund catalyses additional investments. Meanwhile, draft targets for the biodiversity agreement include proposals to protect 30 per cent of land and sea, cuts to chemical runoff from agriculture, and restoring at least one-fifth of degraded freshwater, marine, and terrestrial ecosystems. If the December conference manages to negotiate these targets, it could become the 'Paris moment' for biodiversity. China could point to its achievement, given that this is the first presidency it is holding for a major UN environmental agreement.

³⁶ "Carbon peaking 'around 2027'; EU-China summit; Food systems for cutting CO₂", Carbon Brief, 7 April 2022, <https://www.carbonbrief.org/china-briefing-7-april-2022-carbon-peaking-around-2027-eu-china-summit-food-systems-for-cutting-co2/>

CHINA'S CLIMATE STRATEGY AND ITS INFLUENCE ON COP 27

Isabel Hilton

The closing moments of COP 26 gave rise to some modest hope among the thousands of delegates, journalists, and observers gathered in Glasgow for the critical but forcibly postponed meeting. Joe Biden had won the US presidential election, just days before the COP, and the US was back in the Paris Agreement; after a pandemic-induced delay of a year, the meeting had concluded without breaking down; some last-minute compromises had left room for future progress, and there seemed to be an appreciation of the urgency of the climate crisis that mandated a return within one year to greater ambition. The US and China, despite the tensions of their growing rivalry, had agreed to work together on a limited climate cooperation programme that included joint efforts on controlling methane.

Eight months later, in the course of a summer of extreme weather events that ripped across the world creating droughts, floods, forest fires, and an alarming increase in methane released in the northern hemisphere, China suspended all climate cooperation with the US over House of Representatives Speaker Nancy Pelosi's visit to Taiwan. The inaugural China–US Climate Working Group meeting was put off; bilateral discussions on methane, forestry, clean energy, and city-level climate actions, all scheduled for September 2022, were cancelled; and China's domestic climate discourse had turned from stressing ambition to energy security.

The effort to keep climate cooperation between the world's two biggest emitters free from other geopolitical tensions was on life support, if not actually in the morgue. When the Biden administration managed to push its much-reduced climate programme through Congress in August, China rejected an invitation to resume talks. Prospects of a return to a collaborative approach before COP 27 seemed remote, despite a public appeal by John Kerry, the US climate envoy—although some held out hope that a meeting between Biden and Chinese President Xi Jinping, tentatively proposed for November, would inject some fresh thinking into how to advance a climate agenda that both leaders separately embrace.

The impact of the world's multiple crises on China's climate policy proved complex and multifaceted in 2022. The economic, supply chain, and energy market disruptions that followed the pandemic and Russia's invasion of Ukraine created political distraction in advanced economies and limited available funding for the climate transition. China's continuing zero-Covid policy, with its economic impacts and limitations to face-to-face meetings, added to global geopolitical tensions, have greatly reduced the prospects for progress in preparation for COP 27.

In February, the Intergovernmental Panel on Climate Change published its compendious report on climate impacts. The warnings it contained were stark and uncompromising:

Human-induced climate change is causing dangerous and widespread disruption in nature and affecting the lives of billions of people around the world, despite efforts to reduce the risks. . . . The world faces unavoidable multiple climate hazards over the next two decades with global warming of 1.5°C (2.7°F). Even temporarily exceeding this warming level will result in additional severe impacts, some of which will be irreversible.

In over 3,000 pages, the report detailed the increased heat waves, droughts, and floods that are already driving mass mortalities in trees and corals and pointed out that these simultaneous weather extremes are causing cascading impacts that are increasingly difficult to manage. 'Ambitious, accelerated action is required to adapt to climate change, at the same time as making rapid, deep cuts in greenhouse gas emissions,' it concluded.

The report left no doubt that climate change is under way and the pace of change is accelerating. At the same time, there are increasing gaps between action taken and action that is needed. But despite this latest appeal from climate science, the pace of negotiations on key issues that need to be advanced between COP 26 and COP 27 has been slow. At the Bonn climate talks, held midway between the two COPs, progress towards implementing the painfully agreed Paris Rulebook was minimal; the clamour from emerging economies for funds for mitigation and adaption produced no tangible result; and progress on a fund to compensate for loss and damage was again postponed. Nor was there much progress on the mitigation work programme that was intended to accelerate the mitigation timetable to meet Paris targets, as negotiations bogged down, apparently lacking the will to progress on the basic terms.

The lack of coordination between the US and China left the responsibility for preparations for COP 27 to the UK and Egypt, the outgoing and incoming presidencies, who are responsible for driving the agenda. But the UK spent months in a prolonged leadership crisis, and Egypt faced a daunting list of tasks with little support. After the Bonn talks, hopes of avoiding failure at COP 27 were focused on opportunities at the G7 summit, the Petersburg Climate Dialogue, the UN General Assembly, the Clean Energy Ministerial, and the International Monetary Fund and World Bank meetings.

Following the successful adoption of the Paris Agreement, John Kerry and Xie Zhenhua, both veteran climate negotiators for their respective countries, had tried to shield climate cooperation from the adverse effects of geopolitical rivalry. But a speech in 2021 from China's foreign minister, Wang Yi, in which he compared US–China climate cooperation to an oasis that risked being taken over by the surrounding desert of hostile relations, signalled China's growing willingness to use climate as a bargaining chip to advance other policy goals. At the same time, while China's international posture has been defensive, domestic climate policy is a more nuanced picture.

Three important factors continue to influence China's climate policy: security (and an appreciation of China's vulnerability to climate impacts), opportunity (the ambition to dominate the technologies, goods, and services the world needs for the energy transition), and diplomacy (the wish to be perceived as a benign and responsible global actor, especially in the climate-vulnerable Global South). Whilst these factors remain constant, their relative importance can fluctuate with other influences, including economic and political headwinds.

In 2022, a number of factors affected China's energy and emissions map. The economy, which had begun to recover from the first impacts of the pandemic, was again severely affected by Covid lockdowns in Shanghai and other major cities, in the continuing pursuit of the government's zero-Covid strategy.

At the same time, the property sector, which had been a major driver of the Chinese economy for more than three decades, continued its decline, which substantially reduced demand for steel and cement; the economic slowdown also reduced demand for transport.

On the other side of the balance sheet, a historic drought along the Yangtze River valley had such severe impacts on water levels that Sichuan Province's hydropower output dropped by 50 per cent. In 2021, in a period of Covid recovery, China had suffered acute power shortages due to the mismatch between high prices for coal and fixed prices for energy. The 2022 drought, combined with heightened concerns about the security of external supply, reinforced a flight to safety: domestic coal production was allowed to rise, and instructions were given that decarbonization was to proceed only when substitutes were in place.

China was balancing its decarbonization ambitions against other domestic and international developments. There was a notable increase in references to the importance of energy security in major political speeches, and in policies aimed at mitigating the adverse economic impacts of the pandemic with government-funded programmes—developments that led to concerns that China's emissions reduction ambitions could slacken.

China's Nationally Determined Contribution at COP 26 had been unambitious, however, essentially restating promises already made—to peak emissions 'well before' 2030, and to reach net zero by 2060. Despite its slackening of restrictions on coal, a continuing expansion of coal capacity, and an uptick in coal-fired power generation in July and August, China's emissions appear to have continued to decline in the first two quarters of 2022, and the country was well on target to meet its carbon peaking pledge, according to analysis by Climate Action Tracker.

The trajectory for the second half of the year remains less clear. The zero-Covid policy is unlikely to change, certainly not before the important party congress scheduled for October 2022, so an economic rebound is unlikely. On the other hand, some economic stimulus programmes are directed towards infrastructure projects, while others are aimed at green technologies. Regardless of the immediate impacts in 2022, however, the longer-term assessment of China's targets is that much greater ambition is required if China is to be Paris-compliant.

Behind the headline emissions rates and energy market distortions, China is putting in place the legislative and policy underpinning of a continuing industrial and energy transition. In late March, for example, the National Development and Reform Commission and the National Energy Administration jointly released the 14th Five Year Plan for a Modern Energy System,

which outlines plans for China's continuing transition. The document acknowledges the urgency of the energy transition if China is to meet its 2030 and 2060 targets and seeks to advance the reform to the energy system required to achieve the transition without disruption to supplies.

The government had already promised that coal consumption would be strictly controlled during the remaining three years of the 14th Five Year Plan, and that coal use would decline in the 15th Five Year Plan. However, as noted above, coal remains the bedrock of China's energy security. The plan contains no coal phase-out targets and even removed limits both on total consumption and on the percentage of coal in primary energy. The document also stresses the importance of energy security and advocates 'clean and efficient use of coal' as a guarantee of security, a position further reinforced in a State Council Standing Committee meeting in April, which advocated 'developing coal's role as a major source of energy.'

These developments came as a disappointment for advocates of a rapid coal phase-out. China's policy advisers insist, however, that the direction remains firm, even if the speed may vary. They point to the absence of a cap on total energy consumption in the new plan, which they argue is in line with a State Council announcement that any newly added renewable energy will remain outside local government energy consumption and intensity targets to encourage growth in renewables.

The plan also seeks to give the electricity system more flexibility and resilience to allow it to absorb more renewable power. The removal of upper limits on coal consumption per kilowatt hour, they point out, allows coal power to function as a capacity market, supplying peak regulation for variable renewable power. Using coal power in this way results in more coal consumption per unit of electricity; but if coal were substantially a standby source, overall consumption would decline.

How effective this policy is will depend on how closely local governments observe the government's energy intensity targets, and the degree to which they will embrace renewables and new sources of energy such as hydrogen to expand production. It will also require further price reforms. At present, China's coal-fired power stations are paid to generate electricity, and many run at a loss due to under-utilization. For such plants to function as standby sources of electricity, to allow greater access to the grid for renewable power, would require both fundamental price reform and a greater capacity for provinces to trade electricity according to demand, rather than on inflexible contracts. Greater flexibility would reduce the need for each province to retain its own coal capacity as backup.

On the positive side of the balance, China continues to add renewable energy capacity at pace to meet its promised target of at least 1.2 TW by 2030. What is less clear is the degree of ambition China will bring to COP 27. China's 2030 target has not changed substantially since it was first aired in Paris in 2015, and China is comfortably on track to meet it. But if Beijing seeks to claim climate leadership, there will be expectations of new targets that would bring the world's biggest emitter closer to a 1.5° pathway.

A VIEW FROM INDIA: DEFINING AND TRACKING CLIMATE FINANCE ARE THE NEEDS OF THE HOUR

Mohua Mukherjee

The Indian government made two public statements on the COP process in August 2022. The first was upon the submission of India's updated Nationally Determined Contributions (NDCs) to the United Nations Framework Convention on Climate Change (UNFCCC), and the second was at the G20 meeting of environment and climate ministers in Bali, Indonesia, on 31 August.

As per the updated NDC, India will reduce the emissions intensity of its GDP by 45 per cent by 2030, from the 2005 level, and ensure 'about 50 percent cumulative electric power installed capacity...from non-fossil fuel-based energy resources by 2030'. India will also pursue a citizen-centric approach to sustainable lifestyles in the updated NDC. Daily individual lifestyle choices (the demand side for activities creating greenhouse gas [GHG] emissions) must complement clean energy infrastructure accumulation and investment in nature-based solutions (both supply-side actions for reducing emissions). India hopes to demonstrate by example. It notes that mindful consumption and sustainable lifestyles with a low carbon footprint would eventually be required everywhere, to complement global GHG reduction efforts and achieve targeted global warming limits.

India's official press release on the updated NDC also stated the following (emphasis added):³⁷

India's climate actions have so far been largely financed from domestic resources. However, providing new and additional financial resources as well as transfer of technology to address the global climate change challenge are among the commitments and responsibilities of the developed countries under UNFCCC and the Paris Agreement. India will also require its due share from such international financial resources and technological support.

India's NDCs do not bind it to any sector specific mitigation obligation or action. India's goal is to reduce overall emission intensity and improve energy efficiency of its economy over time and at the same time protecting the vulnerable sectors of economy and segments of our society.

A recent analysis confirmed that India has been financing its climate investments using mostly domestic public and private funding but noted that it is currently able to mobilize only a quarter of what it needs.³⁸

Energy security is a guiding principle

India's emphasis on development needs and the high importance given to domestic energy security have been perennial themes. Ambitious plans for expanding ongoing national renewable energy investments will continue. However, long-duration energy storage technologies are not yet affordable. The large and growing scale of renewable energy capacity already deployed therefore remains intermittent.

Developing country governments, including India's, which are pursuing rapid economic growth, increased employment, removal of poverty, and increased standards of living, cannot contemplate the full displacement of fossil fuels at present. This is likely to remain the case until storage technologies mature further and become affordable and easily accessible to complement and firm up clean energy generation.

India has also launched an ambitious National Green Hydrogen mission to diversify its clean technology options and pursue cost reduction in electrolyser technology to increase the affordability of green hydrogen. This strategy is partly to avoid excessive reliance on energy storage technologies that require rare earth metals and minerals that have risky, concentrated supply chains.

At the Bali G20 environment ministers' meeting on 31 August, India noted its own role as a problem solver that is already making strides in its large investment program to combat climate change through mitigation and adaptation.

India's emphasis on domestic energy security was also articulated by the environment minister at COP 26 in Glasgow. Asked about coal phase-outs, the minister, Bhupender Yadav, said:

The term phase-out of coal would mean putting a complete stop on coal, while phase-down would mean the proportion of coal in total energy would reduce...we are not phasing anything out completely right now. We will move towards green energy, as per our national needs and national circumstances.³⁹

This pragmatic perspective on coal turns out to apply to more countries than India and China. Less than four months after COP 26, the invasion of Ukraine upended energy security calculations in Europe amid self-declared boycotts of fossil fuel imports from Russia. Like the choices faced by developing countries every day, European governments were suddenly confronted with the impact of energy shortages on (voting) citizens and the risk of high unemployment and reduced economic growth. The same countries that had expressed utter consternation regarding 'phase-down' at the end of COP 26 quickly came

³⁷ <https://pib.gov.in/PressReleaseIframePage.aspx?PRID=1847812>

³⁸ Khanna, N., Purkayastha, D., and Jain, S. (2022, August 10), *Landscape for Green Finance in India 2022*, Climate Policy Initiative, <https://www.climatepolicyinitiative.org/publication/landscape-of-green-finance-in-india-2022/#:~:text=green%20finance%20flows%20must%20increase,net%2dzero%20emissions%20by%202070.>

³⁹ <https://indianexpress.com/article/india/phase-down-vs-phase-out-at-cop-bhupender-yadav-stresses-national-circumstances-7638091/>

to a similar conclusion on the primacy of energy security, even if it meant using coal-fired power plants, to underpin their economies and standards of living.

Climate finance accounting and tracking remain unaddressed

India's chief concerns regarding the COP process are still about delayed provision of climate finance to developing countries and the repeated failure of developed countries to put in place systems for tracking climate finance. This allows for double counting of development assistance.

As far back as 2015, in response to an OECD report that estimated that climate change finance flows from developed to developing countries had reached US\$52 billion in 2013 and US\$62 billion in 2014, the Indian Ministry of Finance came out with a rebuttal discussion paper that strongly contested the OECD figures, primarily on four counts, making the following arguments:⁴⁰

1. Climate finance must be additional, and therefore only finance flowing from dedicated climate funds should be counted.
2. Only disbursed funds, and not pledges and commitments, should be counted.
3. Projects should not be 'self-tagged' by multilateral development banks and official aid agencies, using methods such as the Rio markers, to count towards climate finance.
4. Only the grant-equivalent element of any claimed climate change financing—not the gross face value of all loans, guarantees, export credits, and other elements—should be counted.

In terms of private finance, the paper called for a distinction between climate-related investments and business-as-usual investments.

India's convictions on the various determinants of international climate finance are, therefore, quite clear: such finance should be motivated by climate change concerns; it should be in the form of grants and preferably from public sources; and finally, it should be new and additional.⁴¹

Surprisingly, 25 years into climate change negotiations, we still lack an adequate system for defining, categorizing, and tracking international climate change finance. The UNFCCC reporting guidelines leave considerable discretion for a range of accounting approaches, which greatly impedes any comparisons between contributing countries' provision of climate finance and assessments of performance in mobilizing private climate finance over time. It is currently impossible to meaningfully identify any potential geographical or sectoral gaps in financial assistance from the international community to developing countries.⁴² Another complication makes multi-year comparisons almost impossible: many contributing countries changed their climate finance accounting and reporting methodologies between their first and second biennial reports to the UNFCCC.

The website of the UNFCCC's Standing Committee on Finance (SCF) noted in September 2022: 'In response to COP 26 and CMA3 mandates and building on the work undertaken in 2021, the SCF aims to seek further inputs on definitions on climate finance.'⁴³

Different strokes for different folks?

While the UNFCCC is lagging in the definition and reporting of climate finance, efforts under the appealing heading of Enhanced Transparency Framework (ETF) have been progressing at comparatively lightning speed since COP 24 in Katowice, Poland.

Unfortunately, these ETF and trust-building activities are being fast-tracked only to measure GHG reductions and not financial contributions. To ensure transparency, it seems the emission reduction claims of developing countries must be verified by third-party technical experts. The following chart from the UNFCCC website summarizes current requirements.

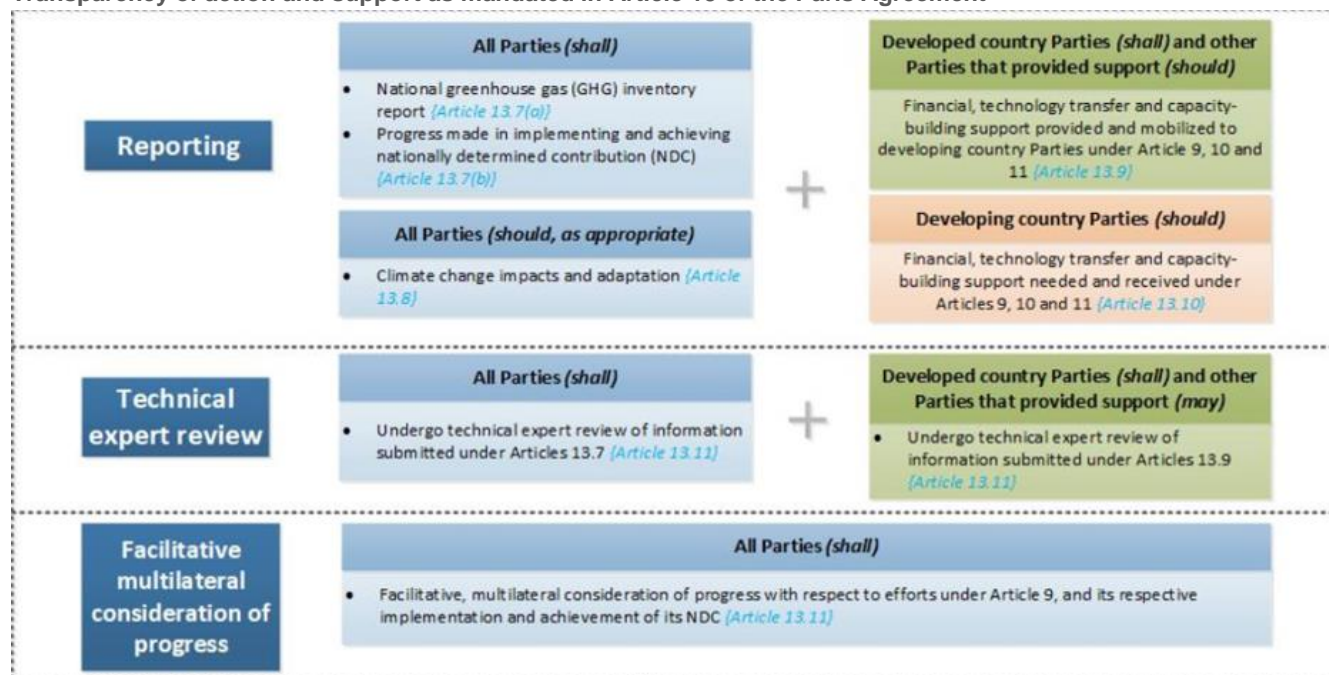
⁴⁰ <https://dea.gov.in/sites/default/files/ClimateChangeOEFDReport%20%281%29.pdf>

⁴¹ Mandal, K. K., *India in a Warming World*, November 2019, <https://academic.oup.com/book/35227/chapter/299755147>.

⁴² <https://www.tandfonline.com/eprint/CEEu8EBenKj6HH7cMEzv/full>

⁴³ https://unfccc.int/sites/default/files/resource/Call_for_inputs_Definition_ClimateFinance_2022.pdf. For additional information and insight, see also *Biennial Assessment and Overview of Climate Finance Flows*, UNFCCC; *Fourth Biennial Assessment and Overview of Climate Finance Flows*, 54307_1 - UNFCCC BA 2020 - Report - V4.pdf; and *Standing Committee on Finance Meetings and Documents*, UNFCCC.

Transparency of action and support as mandated in Article 13 of the Paris Agreement



Source: Reproduced from United Nations Framework Convention on Climate Change (n.d.), 'Reporting and review under the Paris Agreement', <https://unfccc.int/process-and-meetings/transparency-and-reporting/reporting-and-review-under-the-paris-agreement>.

The same UNFCCC web page goes on to state:

Through the detailed guidance on the reporting/review/consideration processes for the information to be submitted and by making these reports publicly available, the ETF will make it possible to track the progress made by each country. In this way, it will be possible to compare a country's actions against its plans and ambitions as described in its Nationally Determined Contributions.⁴⁴

Developing countries have in vain been requesting transparency from developed countries, particularly on tracking of climate finance contributions from source to use. They have asked to see the amounts provided by individual historical emitters, juxtaposed with confirmations that these climate funds have been received and deployed for specific climate-related uses. However, developing country negotiators report that developed countries routinely rebuff any requests for transparency on climate finance tracking while insisting on transparency in reduction of GHG emissions.

A developing country citizen, observing this process, may well conclude that the historical emitters believe transparency is 'good for thee but not for me'. Naming, shaming, and pressuring by publicizing GHG reports, but sharing no information on the funding provided—this is not healthy.

Meanwhile, the Rocky Mountain Institute has rung another alarm:

Developing countries have described . . . applying for and implementing climate finance as obstructively complex. Nations seeking to access climate finance opportunities face complex and varying funder requirements, lengthy project development timelines, and new requirements for data collection and reporting. One diplomat . . . noted: 'The way in which power is organized in decision-making of global finance institutions and funds is asymmetric—the issue is not the money. It is almost by design that we cannot access the money...'. Another highlighted the difference between accessing finance for climate

⁴⁴ <https://unfccc.int/process-and-meetings/transparency-and-reporting/reporting-and-review-under-the-paris-agreement>



mitigation and accessing conventional finance for destructive or polluting activities. 'If you want to get access to money to destroy a forest, you can get funded in six months—and get a tax refund,' said Diann Black-Layne, Ambassador for Antigua and Barbuda. 'If you want to protect that forest—I'll see you in five years.'⁴⁵

Most developing countries are not in the same position as India, which is continuing to roll out its investment program with its own resources, in the absence of clarity on international climate finance.⁴⁶ Therefore, it is mystifying as to where the GHG reductions in most developing countries are supposed to come from, without transparent external support.

The independent technical experts being mobilized under the ETF to verify the emissions reductions, and thereby build trust, may in practice have little to do. Climate action in most developing countries cannot proceed without funding, technology transfer, and capacity building. What reduced emissions will be verified?

No to clean-tech debt

Technology transfer is another sticking point. Previous Indian environment ministers have publicly asked for clarity on clean technology transfer arrangements, in particular their pricing and the intellectual property rights for their replication/local manufacture and widespread use (e.g. COVID-19 vaccines). One previous minister emphatically noted that India will never indebt itself to pay inflated prices for decarbonized technology that comes with patent protection.

The incumbent Indian environment minister at the Bali G20 meeting also expressed concern that limited available climate finance has come mainly in the form of loans, leading to unsustainable levels of indebtedness for many developing countries: 'Stressing that climate finance must be in line with the Paris deal, India said resources provided by developed countries must not [be] repurposed overseas development assistance.' The minister also said, 'In 2019, 70 percent of public climate finance was given out as loans instead of grants. In 2019–20, only six per cent of climate finance was in grants. This is pushing developing countries into more debt.'⁴⁷ He may have been thinking of the South Africa case among others, where about 80 per cent of the US\$8.5 billion pledged by rich nations for South Africa's shift away from coal will be loans, not grants as requested by South Africa; some of the loans will be hard to unlock due to national rules protecting domestic jobs.⁴⁸

Observers point out that development assistance itself is shrinking and being diverted to European domestic priorities.⁴⁹ Some European countries including the UK, Sweden, and Germany have already announced sharp cuts in overseas development assistance (ODA).⁵⁰ The UK reduced its development budget by £4 billion in 2020, and further cuts are likely. Germany is one of the largest development support donors. Germany's ODA will shrink to €10.8 billion, while the defence budget is set to increase to over €50 billion due to the war in Europe.⁵¹ Germany aims to uphold its commitment to spend 0.7 per cent of economic output on ODA. However, and importantly, government spending for refugees in Germany and humanitarian assistance organized by the foreign ministry count as part of ODA as well and make up more than half of development assistance spending.

⁴⁵ Hussin, D., and Matson, J. (2021, October), *The Crisis of Climate Finance: Access Means Survival*, <https://rmi.org/the-crisis-of-climate-finance-access-means-survival/>.

⁴⁶ Khanna et al. (2022), *Landscape for Green Finance in India*.

⁴⁷ https://indianexpress.com/article/india/climate-crisis-india-showing-intent-as-problem-solver-says-bhupender-yadav-at-g20-8122148/?utm_source=newsmate&utm_medium=email&utm_campaign=eveningbrief&pnespid=Xbow.ktEuSsDIFGP4cDaD0ZKuhsinK5moVtdALoYPZvKNKGS05aFL

⁴⁸ Last year the United States, European Union, Britain, France, and Germany committed to investing \$8.5 billion over three to five years to help South Africa reduce its carbon emissions, which are among the world's highest because it depends on coal for 80 per cent of its electricity. At the time it was believed that, if successful, it could be a model for other coal-dependent emerging economies in the global fight against climate change. https://www.reuters.com/world/africa/rich-nations-fund-80-safricas-climate-plan-with-loans-some-hard-unlock-2022-09-01/?mkt_tok=Njq1LUtCTC03NjUAAAGGsXHuoRHRISM2AsYEhig4mwFlpKqfmH5R2dGLOzpq1fp6xWWA_n32oSXkili8hBgZ1ZqES25G9y4YRw9SDBSP4S3oY0uH8KROebJQI9R4_q2

⁴⁹ 'Climate compensation fight looms over Egypt summit', <https://www.politico.eu/article/climate-change-egypt-summit-united-nations-cop27-europe/>.

⁵⁰ The Crisis of global south-global north trust at UNGA <https://www.devex.com/news/devex-newswire-the-crisis-of-global-south-global-north-trust-at-unga-104066> and Development Budgets are on the Chopping Block <https://www.devex.com/news/devex-newswire-development-budgets-are-on-the-chopping-block-103917>

⁵¹ <https://www.dw.com/en/germany-looks-set-to-cut-development-aid/a-61260059>

Conclusion

Indians will want answers to at least two questions at COP 27.

What is the status of the \$100 billion annual commitment for 2023?

High-income countries' spending priorities have taken a U-turn since COP 26. When numerous countries trim their aid budgets at the same time, it adds up to a global disappearance of funding support for energy transitions—and cuts will continue through 2026. This is despite earlier predictions of doomsday in seven years and statements urging developing countries to sacrifice their turn at development due to the climate emergency (ironically caused by historical emissions). Furthermore, India will be asking why there are still no agreed definitions of climate finance, adaptation finance, and loss and damage.

At COP 27, developing countries are at a minimum owed some honesty and candour on what historical emitters are thinking.⁵² Without such an honest discussion, at least for a country like India which has started by self-funding its transition, millions of citizens may soon be asking what the point is of continuing to participate in such lopsided international discussions where the goalposts shift overnight. The transition will continue but at India's own pace, without the farce and trappings of these kinds of meetings.

Who will protect the planet's remaining carbon budget?

At COP 26 some 20 high-income countries pledged to stop financing fossil fuel projects abroad by 2022.⁵³ At that time, developing countries wondered how such bans alone would propel the growth of renewable energies, particularly across Africa, which has trouble attracting private finance. Now there is a split-screen of key European nations pushing for developing gas fields in Africa while also calling for a ban on development funds for gas in Africa. India and others will be asking whether this once again means that those with deep pockets who can pay upfront can feel free to grab the world's very limited remaining carbon budget.

EUROPEAN CLIMATE POLICY IN THE CONTEXT OF THE UKRAINE WAR AND ITS IMPACT ON COP27 NEGOTIATIONS

Klaus-Dieter Borchardt

Introduction

Since the last COP meeting in Glasgow Europe has undergone dramatic changes. Energy prices have gone up in an unprecedented manner (according to Commission figures in its quarterly price report in Q1 2022 the average price was 201 €/MWh which means 281% higher than compared to the average price during the year 2021). In February Russia invaded Ukraine which has brought back war to Europe and doubled the energy prices again. These changes in the geopolitical and economic environment have undoubtedly had far reaching impacts on the security of energy supply, energy prices and food supply.

From an environmental perspective it is vital that these new challenges do not overshadow or even endanger the European Union's climate targets for 2050 and its underlying decarbonisation pathway. To the extent possible these new challenges should ideally be used to accelerate the move from a fossil fuel-based energy system to a zero and low carbon energy system. However, a recalibration of the tri-dimensional energy objectives (some call it "trilemma") is needed. With the "Fit for 55" legislative package the EU has focused exclusively on the "sustainability" objective. The energy price shock then led to ad hoc measures driven by the "affordability/competitiveness" objective. Finally, Russia's war against Ukraine has brought the "security of energy supply" back to the forefront.

⁵² African nations are increasingly united ahead of the summit, demanding more international support to adapt to the impacts of climate change—which, they note, has mostly been caused by emissions from high-income nations. Key focus areas for African negotiators in November will include climate change mitigation; an equitable energy transition; adaptation, loss, and damage; climate finance; and carbon trading—<https://www.devex.com/news/african-nations-finalizing-demands-ahead-of-cop-27-103748>.

⁵³ <https://edition.cnn.com/2021/11/03/world/countries-agree-to-end-fossil-fuel-financing-abroad-cop26-climate/index.html>

The question to be dealt with in the following article is to what extent the recalibration of the tri-dimensional energy policy objectives can be reconciled with the extremely ambitious European climate policy and what could be the impact on EU's position in the COP27 negotiations.

Impact on EU targets 2030 and 2050

The EU has sought to make it clear that the current geopolitical and economic challenges should not lead it to lose sight of the still growing concern about the climate challenges for our planet. The continuous and ambitious combat of these climate challenges still need utmost attention and must remain a political priority. Therefore, the current geopolitical and economic challenges should not be (ab)used to push back on the Green Deal, but rather the Green Deal should be used as a vehicle to address the tri-dimensional energy policy objectives and at the same time pursue the pathway toward the net-zero emission target by 2050.

If this can be achieved then the 2050 target for a zero-carbon economy in the EU need not be in jeopardy. The 2030 targets might be compromised but the comprehensive plan outlined by the EU to the new challenges in its REPowerEU plan in May 2022 show that it is seeking an acceleration of the decarbonisation of the European economy between 2028 and 2035 with a faster implementation of the "Fit for 55" plan and the gas and hydrogen legislative packages.

Core measures under the REPowerEU

The REPowerEU plan involves a fundamental shift in the vision of the evolution of the energy landscape in the EU in response to the Russian invasion of Ukraine. It outlines a roadmap for the fast implementation of all "Fit for 55" legislative proposals, plus higher targets for renewable energy and energy efficiency to compensate for a stronger and faster reduction in EU gas consumption that will limit *"the role of gas as a transitional fuel"*. Due to the significant phase down of natural gas pipeline imports other energy sources, such as LNG, coal and nuclear, will see their role renewed as the Commission stated that *"some of the existing coal capacities might also be used longer than initially expected"* (a significant trade-off in climate terms) and that *"nuclear power and domestic gas resources"* would also have a role to play. Implementing this vision, the EU aims to rely on three levers in order to phase out Russian energy: (i) energy savings, (ii) diversification of energy import sources, and (iii) a faster switch to clean non-fossil energy sources, all three pillars being underpinned by new "smart investments".

Energy savings

The measures on energy savings are a combination of short term behavioural incentives (mainly by European citizens but also by businesses) and higher long-term energy-efficiency targets. The Commission proposes to set the EU energy efficiency objective to 13% by 2030 (against 9% in the "Fit for 55" proposal). It will be for the Council and the European Parliament to decide whether to follow the Commission and include this increased target in the revision of the Energy Efficiency Directive. The energy efficiency measures are mainly recommendations to Member States to put in place fiscal incentives for companies and individuals to invest in energy efficiency in buildings and transport.

In addition, the Council adopted on 4 August 2022 a Regulation coordinating the demand-reduction measures for gas. It foresees an indicative target for each Member State to reduce its natural gas consumption by 15% between August 2022 and March 2023 compared to average consumption over the last 5 years (known as the "voluntary" demand reduction mechanism). If the Council declares a Union alert (in case of a substantial risk of a severe gas supply shortage or an exceptionally high demand of gas), the 15% reduction targets become binding (known as "mandatory" demand reduction mechanism).

Diversifying energy imports

Diversifying energy imports away from Russian energy essentially means diversifying import sources for gaseous fuels (natural gas, LNG, hydrogen). The most important aspect of the EU's diversification strategy is the EU Energy Platform which was established on 7 April 2022 with the aim (i) to aggregate gas demand, (ii) to optimise the use of gas supply infrastructure and (iii) to carry out a large part of the EU's international outreach for the voluntary common purchase of gas, LNG and hydrogen.

Faster switch to clean non-fossil energy sources

Regarding the faster switch to clean non-fossil energy sources, the EU aims for the *"massive speed-up and scale-up in renewable energy in power generation, industry, buildings and transport"*. To do so, it has announced a number of targets, some to be enshrined in legislation, others not. The headline target is the increase of the share of renewable energy in EU final energy consumption to 45% by 2030 in the Renewable Energy Directive, up from 40% in last year's proposal. This "massive speed-up

and scale-up” also requires scaling up renewable electricity, hydrogen, biomethane, as well as supporting the decarbonisation of industry and enabling the faster permitting of renewable projects. The Commission has therefore also introduced:

- a target for solar energy of 320 GW of newly installed solar photovoltaic capacity by 2025 (over twice today’s level) and of almost 600 GW by 2030;
- a target for renewable hydrogen of 10 million tonnes of domestic renewable hydrogen production by 2030 (which supersedes the "Fit for 55" target) and of 10 million tonnes of renewable hydrogen imports by 2030; in this context the Commission also aims at a faster decarbonisation of industry, notably via the switch to renewable hydrogen wherever possible.
- a target for biomethane production of 35 bcm by 2030 (twice today’s level).

External dimension

The Commission’s new external energy strategy complements the REPowerEU plan and lays the foundations of a new global energy system. It focuses on short-term measures addressing the need to phase out the imports of Russian energy as soon as possible and to find alternative sources to replace it. The Commission sets out potential sources of LNG imports as well as potential hydrogen partnerships with reliable partner countries to ensure open and undistorted trade and investment relations. It envisages three major hydrogen import corridors: - the North Sea region (Norway and the UK) - the Southern Mediterranean (Egypt) and - Ukraine. To kick-start the global renewable hydrogen market, the EU is also considering the development of a Global European Hydrogen Facility.

The EU is also committed to leading and speeding up the global green transition and supporting its international partners in the process. This includes working together on renewable energy, energy efficiency and savings, on the circular economy, green growth, natural resource protection, critical raw materials, clean technologies and future-proof infrastructure.

Furthermore the EU plans to continue supporting international cooperation and multilateral initiatives in line with its global approach to research and innovation, in particular for renewable energy and hydrogen and other key areas for an innovation-driven transition. In this regard, the Commission explicitly supports technologies such as carbon-capture utilisation and storage (CCUS).

Another important focus has been put on support and cooperation with Ukraine and the Western Balkans as well as a quite comprehensive strategy with regard to the Gulf region which has been developed in a separate Communication, underlying the importance of that region for the EU.

Investments and Financing

The REPowerEU plan will require additional investment of 210 billion euros between now and 2027, on top of what was already needed to realise the objectives of the "Fit for 55" proposals. A significant part of those investments will go to infrastructure projects that are needed because the REPowerEU plan brings a significant change to the energy system in terms of quantities and directions of energy flow.

In addition, Member States and the EU will need to coordinate investments and financial support/subsidies into other parts of the REPowerEU plan (energy efficiency, renewable energy production, etc.). To coordinate these investments at EU-level, the Commission’s main proposal is to rely on the Recovery and Resilience Facility, the main instrument of the European Recovery Plan established in the aftermath of the Covid-19 crisis. The Commission considers that EU-coordinated national recovery plans “*have proven highly suitable to implement urgent priorities in a joint EU framework, based on needs by Member States and with a strong results orientation*”. To implement this plan, the Commission proposes to reform the Recovery and Resilience Facility Regulation, together with a number of other budget-related regulations.

Under this reform, the Recovery and Resilience Facility would enjoy the following sources of funding that Member States could access:

- (new) grants from the funds derived from the auctioning of a given number of allowances of the Emissions Trading System;

- (new) grants originating from funding that Member States could decide, with given limits, to transfer from resources currently allocated to other EU structural funds dedicated mainly to the Cohesion Policy and the Common Agricultural Policy;
- (existing) remaining EUR 225 billion of loans, that stems from the original design of the European Recovery Plan, but that could be more easily allocated to different Member States to incentivise and catalyse their use.

Combining grants and loans, this would amount to a total close to EUR 300 billion, according to the Commission.

Impact on COP27 from the EU perspective

With the REPowerEU there is a clear commitment by the EU to continue the path of the Green Deal despite the extremely difficult geopolitical and economic situation in Europe. The envisaged measures will even accelerate the decarbonisation of the European economy between 2028 until 2035, although the new targets set for 2030 are more political aspirations than practically achievable targets. This inconsistency between political target setting and concrete achievement might become visible already in COP27, and at the latest in 2023-2024, with the reality check which will come when Member States have to align their National Energy and Climate Plans (NECP) and when it becomes clear that the new targets cannot be reached by 2030.

However, at COP27 the EU will reiterate its determination to continue its pathway towards net-zero emissions by 2050 and will double its efforts to convince likeminded partners to join the EU on this journey. The new international strategy will play an important role here by setting the framework for an intensified search for climate partnerships through cooperation in areas such as renewable electricity and gases (including hydrogen, ammonia, biogas, biomethane), energy efficiency and savings or green technologies.

The global outreach will be underpinned by concrete proposals and commitments for financial assistance, notably for developing countries, an issue that COP27 has set as one of its priorities. In this regard the EU has launched a new European strategy “Global Gateway” to boost smart, clean and secure links in digital, energy and transport sectors and to strengthen health, education and research systems across the world. The Global Gateway will be delivered by bringing together the EU and its Member States with their financial and development institutions, including the European Investment Bank (EIB) and the European Bank for Restructuring and Development (EBRD) in order to leverage up to EUR 300 billion of investment in 2021–2027. Under the Global Gateway initiative, the EU will also mobilise EUR 2.4 billion in grants for sub-Saharan Africa and EUR 1.08 billion for North Africa to support renewable energy, energy efficiency, the just transition and the greening of local value chains.

It might be hoped that for these initiatives the EU will receive rather positive feedback recognizing the leading role the EU in the combat against climate change. However, there are three issues for which the EU might be criticized:

- The first relates to the political target setting: in fact the 2030 targets set by the Fit for 55 legislative package might have been perceived already as over optimistic, the further increase of the headline targets by the REPowerEU plan might be seen as undermining the credibility of the EU climate policy. Indeed, no reality check has taken place before setting the new increased targets; the Commission has just looked what would be needed to master the new challenges without clearly indicating by which concrete measures these increased targets could be reached by 2030. Instead this was left to the Member States and it is already foreseeable that the Member States in their updated and aligned National Energy and Climate Plans (NECP) will not deliver on the new increased targets for 2030.
- The second issue relates to the hype around the ambitious plans of LNG imports into the EU to replace Russian supplies of natural gas. The fear, notably of NGO's, is that the extensive investments in LNG terminals and offtake contracts until the 2040s create a long-term dependence on climate-damaging natural gas with only two main suppliers Qatar and the US as the only countries who can significantly increase export volumes in the short term. The often heard justification that the new LNG terminals can be easily converted for future hydrogen imports is rebutted by the technical complexities and the high investments for such a conversion.
- The third issue is closely linked to the second and relates to EU's hypocrisy being talked about notably by developing countries with regard to the Commission's attitude toward hydrocarbons. First, the Commission preaches that

hydrocarbons are not needed much longer and (developing) countries shouldn't develop new reserves, but then the Commission is begging for more natural gas and LNG in the short and even longer term to replace Russian gas; on top of this, the Member States are burning more coal. This could be seen as if the EU changes course at the first sign of trouble, because the Commission itself sends out contradictory messages: on the one hand the Commission proposes measures which would lead according to its own estimates to a reduction of natural gas consumption of 235 billion cubic meters by 2027 and even 310 billion cubic meters by 2030 – twice as much as the Russian gas imports in 2021 and therefore speeding up the phase out of natural gas; on the other hand and in stark contrast to these figures the Commission has intensified its efforts in concluding deals for long term imports of natural gas of non-Russian origin, for instance lately the agreement with Azerbaijan to increase the export capacities for Azeri gas through the Southern gas corridor by 10 billion cubic meters.

Conclusion

With the REPowerEU plan the EU has clearly stated that the current geopolitical and economic challenges will not stop the realisation of the Green Deal with its ultimate target to achieve climate neutrality for the EU by 2050. On the contrary, there are expectations that with the envisaged measures, once implemented, the decarbonisation of the European economy could even be accelerated although the increased targets for 2030 are not realistic.

These are definitely good news for the COP27 discussions. The EU still hopes to present itself as a credible leader of an ambitious and achievable transformation of the global economy toward climate neutrality. Good news for COP27 also includes the commitments of the EU to intensify its efforts to enter into as many climate partnerships as possible and to provide also the necessary financial assistance, notably to the developing countries. This is a very strong signal to all those COP27 members who are still lacking behind their promises regarding the financial support of countries in need.

However, if the EU is to remain a trusted and accepted leader of the global climate combat it has to undertake a serious reality check of its targets and ambitions in the short and mid-term. It seems to be evident that the new increased targets for 2030 cannot be achieved. A reality check as soon as possible, e.g. in the context of the updated NECP, is needed. Political target setting is a widespread practice and in itself not to be condemned, because those targets show the direction and give indications on the pace needed. However, at a certain moment these targets need to be aligned with what is achievable in real terms; missing one after another of the targets undermines the credibility of the climate policy as such and will only lead to blame games, notably between the European and the national level, the EU blaming the Member States for not having done enough to reach the targets set at EU level and the Member States blaming the EU for having set completely unrealistic targets which could not be achieved even under best efforts in the set timeframe.

Furthermore, the EU clearly needs to have a coherent long-term view on the role of hydrocarbons which not only takes into account its own views but also those of developing countries and hydrocarbon exporters. Its current actions have led to accusations of hypocrisy on this issue which need to be properly addressed in order to nip doubts about the credibility of the EU in the bud.

US CLIMATE POLICY AND THE ROLE OF THE US AT COP 27

Sarah Ladislav

At COP, could US turn a crisis into an opportunity on climate?

When world leaders gather in Sharm El Sheikh next month for the 27th Conference of the Parties, they will be faced with a unique set of challenges for the US and the global climate community. The world is in the midst of perhaps the first truly global energy crisis. Prices for oil, natural gas, and coal, along with critical minerals and food commodities, are high and volatile. The impacts of climate change are extremely visible—with heat waves, deadly fires, and punishing floods touching every continent. And while countries could commit to more ambitious targets and timetables as an outcome of COP 27, there is widespread agreement that, as the world enters the third year of this decisive decade, the time for setting distant goals has passed and only progress towards existing goals truly matters.

For the U.S., the largest historical emitter of greenhouse gases, the question is whether historic action on climate change, with the passage of the single-largest investment in clean and renewable energy in history, move the world closer to those goals.

The US has always played an influential role in international climate change negotiations. Sometimes it takes a leadership role—pioneering influential pollution-reduction mechanisms like cap-and-trade systems or negotiating landmark agreements like the Kyoto Protocol and the Paris Agreement. Other times, when the US has tried to move away from the formal negotiation process, even its absence shapes the global dialogue. Two examples of this are the proliferation of international technology partnerships under the George W. Bush administration and the intensification of subnational and corporate climate action during both the Bush and Donald Trump administrations.

Most recently, under the Joseph Biden administration, the US launched an all-out global diplomatic effort in advance of COP 26 both to persuade countries across the world of the US commitment to tackling climate change and to rally the world's major economies and others to raise the ambition of their 2030 and 2050 climate goals. This effort, along with the work of many other countries including the UK, led to the Glasgow Breakthrough and a compilation of pledges that, if carried out, could limit global temperature rise to 1.8 degrees.

By the spring of 2022, it became clear the next round of climate negotiations would take place in a world where emissions are still not on track and are, in the near term, headed in the wrong direction. For the US, the climate momentum of President Biden's first year in office had been dampened by a lack of progress on the domestic legislative agenda, deteriorating economic conditions, and a resurgent, though not entirely antithetical, global preoccupation with energy security as a result of Russia's reckless invasion of Ukraine. Now, several months later, the situation is still quite challenging, and it looks as though for COP 27 the US will have good things to contribute, hard things to answer for, and the major challenge of galvanizing the world to keep focus on its share of climate objectives.

US progress

If 2022 was supposed to be the year of implementation, then the US has certainly delivered. The most notable success is the recent passage of the Inflation Reduction Act (IRA), which provides approximately \$360 billion of incentives to manufacture and deploy a wide range of clean energy technologies. The bill represents the largest single investment in climate change mitigation in US history—at 3.5 times the size of the post-2008 economic crisis stimulus package, which is credited with spurring a surge in renewable power generation components over the last decade. The IRA is also roughly as large as the EU climate budget.

While it is significant enough on its own, the IRA is not the only climate investment made by the US Congress in the last two years. Congress also passed the Bipartisan Infrastructure Law (Infrastructure Investment and Jobs Act), which allocates close to \$60 billion for clean energy infrastructure. Congress has also created significant room to increase clean energy research and development funding through the CHIPS and Science Acts, which could contribute another significant increase in US clean energy research and development spending over the next decade.

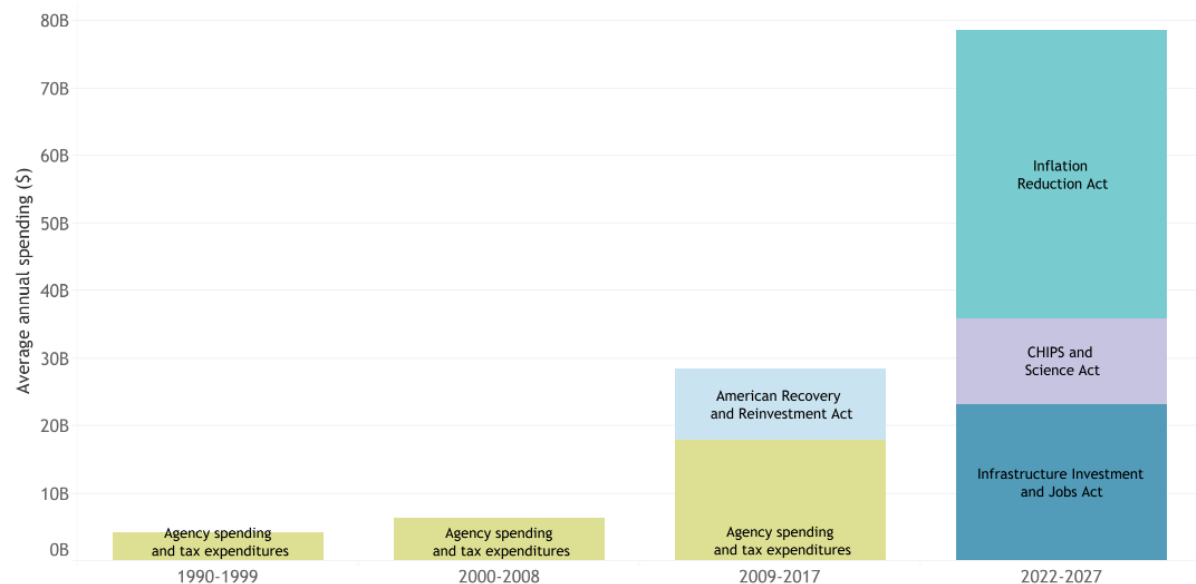
At current estimates, this complement of climate legislation is by far the largest investment in climate change in US history and is quite likely even larger than the headline figures suggest, for two reasons. The first is that several of the tax incentives programs are not capped and therefore could yield a great deal more investment. The second is that much of the research and development spending is likely to leverage additional private sector investment.

According to recent analysis, these measures should put the US on track to reduce greenhouse gas emissions to 32–42 per cent below 2005 levels by 2030, compared to the previous estimate of 24–35 per cent. The IRA alone is projected to deliver 1 billion metric tons of emissions reduction and close two-thirds of the remaining gap between the current level and the US target to halve emissions by 2030.⁵⁴

⁵⁴ Jesse Jenkins., Erin Mayfield, Jamil Farbes, Ryan Jones, Neha Patankar, Qingyu Xu, Greg Schivley. September 21, 2022. "Preliminary Report: The Climate and Energy Impacts of the Inflation Reduction Act of 2022," REPEAT Project. https://repeatproject.org/docs/REPEAT_IRA_Preliminary_Report_2022-09-21.pdf

Past and projected US average annual climate spending

Over the past 2 years, we have seen historic investment in federal climate spending. Over the next decade, spending on climate will more than triple historic levels



Notes:

Average annual spending, adjusted for inflation. Note that time periods shift from 2000-2008 to 2009-2017. This is to 1) consolidate the impact of the American Recovery and Reinvestment Act to one bar and 2) address missing data between 2018-2021. The analysis that includes these data ends at 2017.

Values are based on RMI estimates using agency spending data from the Government Accountability Office (GAO), tax expenditure data from the Joint Committee on Taxation (JCT), and internal analysis on 2021-2022 legislation (Infrastructure Investment and Jobs Act, CHIPS and Science Act, Inflation Reduction Act). Spending from the American Recovery and Reinvestment Act is based on a White House memo on clean energy spending from 2010.

The averages for the Infrastructure Investment and Jobs Act, CHIPS and Science Act, and Inflation Reduction Act include both appropriations and authorizations. Note that CHIPS funding estimates are based on authorizations.

We do not include agriculture, land, or resilience appropriations from the Inflation Reduction Act in this figure because they do not directly target clean energy technology supply chains.

Data can be viewed by clicking on any interactive part of the visualization.

Correction (8/24/22): The original visualization included tax expenditures (\$5.8B) for agency spending 2009-2017. We have updated to have average annual agency spending (\$11.9B).

Beyond its sheer size and direct impact, the bill is expected to have important knock-on effects. First, as a recent RMI (formerly Rocky Mountain Institute) analysis makes clear, these measures are targeted along the full value chain of technology development and deployment, with the added plus that the bulk of the incentives last for 10 years. From a green industrial policy perspective, this sends all the right signals to private industry that creating and deploying clean energy technologies is in the long-term strategic interest of the US. Second, this level of investment and anticipated deployment is likely to help drop the cost of many clean energy technologies and therefore reduce the compliance cost of federal and state climate change policies and regulation. The Biden administration has thus far been somewhat slow to enact new climate regulations within its reach, and now is likely to have an easier time justifying the potential cost of compliance with those regulations.

Finally, the incentives in the bill are quite sophisticated by US policy standards. Many of the tax provisions also include labour standards and provisions for low- and moderate-income communities. Many incentives are intended not only to spur clean energy deployment but also to create domestic supply chains for clean energy materials and manufacturing. The most notable example of this is the electric vehicle (EV) tax credit structure. The IRA makes a 30 per cent tax credit for electric vehicles more accessible by extending it for 10 years, removing the cap for EV manufacturers, allowing the credit to be converted into a rebate, and including a tax credit for purchasers of used electric vehicles. However, the IRA also makes the EV tax credit more focused on domestic manufacturing by restricting the vehicles and purchasers that qualify. Starting immediately, only vehicles manufactured in the US are eligible, and starting in 2024, there are restrictions on battery manufacturing and materials sourcing locations as well. There are also caps on the income levels of qualifying purchasers. All of this was done with good reason, as lawmakers, particularly West Virginia Senator and Energy and Natural Resources Committee Chair Joe Manchin, were loathe to create US dependence on vehicles and batteries manufactured in other countries, particularly China.



US climate policy advancements are happening outside the federal level as well. States including Illinois, Washington, Massachusetts, and most recently California, have passed important climate policies that will help them move closer to their climate goals and serve as examples for other states as well. All of these states have ambitious emissions reduction goals, but none were previously on track to deliver against those targets,⁵⁵ so additional measures were sorely needed. In previous years, state- and city-level climate action has served as a stand-in for unambitious or even antagonistic federal policy. This year, state and city policymakers have important roles to play, taking the baton of federal leadership and putting implementation policies and programs in place to spend the record federal resources on offer. Indeed, according to one analysis, how states choose to spend the infrastructure investment dollars in the transportation sector alone could yield either a growth or reduction in overall transportation emissions. State and city action will also play a major role in closing the gap between current emissions and the goal of 50 per cent emissions reduction by 2030.

Finally, the US is once again trying to reframe the nature of climate negotiations going into COP 27. Annual climate negotiations are useful for taking stock of the world's collective mitigation and adaptation efforts and creating a focal point around which to rally for more action. However, over the last couple of years, as the gap between commitments and actions fails to narrow, there is a growing consensus that climate action must be more deeply embedded in all government and intergovernmental action and that short-term delivery against those commitments, even if incremental, is more important than setting additional global and far-reaching targets. To that end, the US has endeavoured to use its leadership at the International Energy Agency and its role as host of the Clean Energy Ministerial and Mission Innovation forum to drive this year's focus toward action and implementation of programs that will begin to show delivery against government climate targets.

Along those lines the US is supplementing these two forums with a new Global Clean Energy Action Forum, recognizing the 'need to look back at 2022 as the year the world took giant steps to build a new energy economy that benefits all, improves energy security, tackles climate change, and reaps the rewards of a clean energy market'.⁵⁶ This could of course be viewed as just another summit, but the intent is to push countries to deliver on climate progress in concrete ways over short intervals of time in order to build up credibility and momentum towards global climate goals.

US setbacks

Despite the remarkable progress made in US climate policy, the US faces criticism particularly around some of the measures taken in response to the high and volatile energy prices that resulted from Russia's invasion of Ukraine. This ongoing crisis is creating acute energy pricing issues in oil, natural gas, coal, and power markets in Europe, the US, and indeed all over the world. In response, Europe and the US took measures to ensure and communicate oil and natural gas market stability. The US role in all of this was to release a record amount of oil from its strategic petroleum reserve, push for a coordinated strategic stock release commitment, and assure Europe of US LNG supplies.⁵⁷ The US also took measures to expand access to domestic clean energy development and use of biofuels for transportation.

This focus on oil and natural gas market security has, however, created significant criticism for policymakers in both the US and Europe as evidence of their lack of commitment to domestic climate goals. Despite countless attempts to explain that near-term energy security measures designed to forestall economic catastrophe as a result of the ongoing energy crisis do not signal a meaningful departure from a focus on energy transition, members of the international climate community are not entirely convinced.

The energy crisis and the juxtaposition of developed countries going to great lengths to secure oil, coal, and natural gas resources will undoubtedly stoke existing tension between developed and developing countries. At COP 26, developed countries admitted that they were behind in delivering on the \$100 billion finance pledge made in 2009 and would not fulfil that

⁵⁵ Ashna Aggarwal, Courtney Bourgoin, Kyle Clark-Sutton, Jacob Corvidae, Jake Glassman, Nathan Iyer, Wendy Jaglom-Kurtz, Zack Subin. June 30, 2022. To Help US Reach Climate Goals, Front-Runner States Are Setting Examples for Others to Follow. RMI. <https://rmi.org/climate-goals-states-are-setting-for-others-to-follow/>

⁵⁶ Global Clean Energy Action Forum website: <https://gceaf.org/about-page/>

⁵⁷ Fact Sheet: Biden Administration Responds to Putin's Price Hike by Awarding First Barrels from Historic Strategic Petroleum Reserve Release & Deploying Clean Energy. April 21, 2022. White House. <https://www.whitehouse.gov/briefing-room/statements-releases/2022/04/21/fact-sheet-biden-administration-responds-to-putins-price-hike-by-awarding-first-barrels-from-historic-strategic-petroleum-reserve-release-deploying-affordable-clean-energy/>



pledge until at least 2023.⁵⁸ The US has pledged to quadruple its level of climate financing and this spring requested \$11 billion for international climate finance in its annual budget request.⁵⁹ It looks unlikely that this budget will be enacted in time for COP 27, so the atmosphere of under-delivery on climate finance, ongoing energy security and pricing concerns, growing worries about food insecurity, and widespread recognition of the growing fragility of developing countries in the face of ever more severe climate impacts will make for a very difficult environment, particularly for a negotiation set on the African continent and intended to highlight the role of developing countries in the region.

Finally, one bright spot from COP 26 that may not be working in the US's favour at COP 27 is the status of cooperation with China. At COP 26, Secretary Kerry and China's top climate negotiator, Xie Zhenhua, unveiled a framework for US/China cooperation on climate change for the 2020s.⁶⁰ The agreement was notable because the US/China relationship was widely regarded as having deteriorated on both sides but was seen as crucially important for the future of global climate action. Recently, in response to a high-level visit of US lawmakers to Taiwan, China has called off cooperation on climate change with the US.⁶¹ This, along with growing tensions between the two countries over their respective positions on Russia's invasion of Ukraine and ongoing trade tensions, has clouded the chances for deep strategic cooperation on climate change to play the same supporting role in the global climate talks this year.

Galvanizing action

The US has some notable successes to bring to COP 27 but also continues to face some daunting challenges, the sum total of which make the path forward quite unclear. In order to address the dual challenges of climate change and energy security, the only option is to accelerate the energy transition with a focus on building a new and more resilient energy system as quickly as possible. This means not just deploying new clean energy technologies quickly but working to build up secure and robust supply chains for those technologies in a way that guarantees security of supply and helps developing countries benefit from the investment in new clean energy technology value chains.⁶² This may seem outlandish at first blush, but it is, quite frankly, what countries around the world have done for decades in trying to ensure oil and natural gas supply security. In practice this means creating differentiated markets for early adopters of clean materials produced by a decarbonizing heavy industry (steel, cement, hydrogen, shipping, etc.), increasing domestic investment in as many places as possible in critical clean energy materials and supply chains to create diversity and increase capacity, creating a clean energy strategic competition with China, and ensuring that supply chains for green technology extend into developing countries in ways that convey lasting economic value in those places.⁶³ With any luck, the US will help forge a pathway at COP 27 to prove that out of crisis comes real opportunity.

⁵⁸ Jennifer A Dlouhy and Jess Shankleman. October 25, 2021. Rich Nations Fail to Meet Climate Fund Target in Blow to COP. Bloomberg. <https://www.bloomberg.com/news/articles/2021-10-25/rich-nations-fail-to-meet-climate-finance-target-in-blow-to-cop>

⁵⁹ Maxine Joselow. March 29, 2022. Biden Wants Record Billion in Climate Aid. Congress May Not Deliver. Washington Post. <https://www.washingtonpost.com/politics/2022/03/29/biden-wants-record-11-billion-climate-aid-congress-may-not-deliver/>

⁶⁰ US China Joint Glasgow Declaration on Enhancing Climate Action in the 2020s. November 10, 2021. US Department of State. <https://www.state.gov/u-s-china-joint-glasgow-declaration-on-enhancing-climate-action-in-the-2020s/>

⁶¹ Echo Xie. August 12, 2022. Suspension of China-US climate talks clouds prospects for joint research, academics say. South China Morning Post. <https://www.scmp.com/news/china/diplomacy/article/3188744/suspension-china-us-climate-talks-clouds-prospects-joint>

⁶² Nikos Tsafos, Lachlan Carey, Jane Nakano, and Sarah Ladislav. May 2021. Reshore, Reroute, Rebalance: A US Strategy for Clean Energy Supply Chains. Center for Strategic and International Studies. https://csis-website-prod.s3.amazonaws.com/s3fs-public/publication/210519_Tsafos_Reshore_Reroute.pdf?oIS49QNCeuHW43Hqwm83aOuBEuxfVqbx

⁶³ Sarah Ladislav and Nikos Tsafos. July 2020. Race to the Top: The Case for a New US International Energy Policy. Center for Strategic and International Studies. https://csis-website-prod.s3.amazonaws.com/s3fs-public/publication/200706_SRF_Racetothetop_WEB_v2%20FINAL.pdf. Lachlan Carey, Sarah Ladislav, and Nikos Tsafos. March 2021. US Climate Leadership at the G20. Center for Strategic and International Studies. https://csis-website-prod.s3.amazonaws.com/s3fs-public/publication/210330_Ladislav_Climate_Strategy.pdf?kQwUjstPUmgRT38gaamad8FJryJkrMkl



INTERNATIONAL CARBON MARKETS UNDER ARTICLE 6 IN THE RUN-UP TO COP 27 AND BEYOND

Michele Stua and Axel Michaelowa

COP 26 decisions

International carbon markets have been a highly contested topic in international climate negotiations. After the crash of the Clean Development Mechanism (CDM) market from 2012 onwards, many observers were expecting that international carbon markets would not play a relevant role in the Paris Agreement to be negotiated in 2015.⁶⁴ However, the Paris Agreement recognized two forms of international carbon markets in Article 6: bilateral markets (dubbed 'cooperative approaches') under Article 6.2, and multilateral mechanisms under international oversight specified in Article 6.4.

Following the Paris conference, negotiators agreed to finalize the detailed rules for the different elements outlined in the Paris Agreement by the end of 2018. While this was achieved for most elements, Article 6 was one field where consensus remained elusive. The second attempt in 2019 at the Madrid conference also failed. There was no COP in 2020 due to the COVID-19 pandemic. So all attention focused on COP 26 in Glasgow in November 2021.

The UK Presidency declared Article 6 a key topic for COP 26. An experienced team of experts collaborated very closely with the UNFCCC (United Nations Framework Convention on Climate Change) Secretariat and was extremely effective in churning out revised negotiation texts on a daily basis. No competition became visible. Moreover, the negotiators specializing in Article 6 had developed a kind of team spirit during intense virtual negotiations throughout 2021. These negotiations had clarified the options on the table sufficiently that the structure of a possible deal emerged.

The key challenge of negotiations had previously been the fight between the supporters of stringent environmental integrity principles led by the EU and the Alliance of Small Island States (AOSIS) and, for the most part, emerging economies who wanted to be enabled to sell emissions credits without too much of a hassle. The latter also wanted to ensure that CDM projects and their credits could be transitioned into Article 6. There were now two possibilities for a deal: not accept any CDM transition but be lenient on Article 6 principles, or agree on strict principles but transition a significant amount of CDM credits as a 'sweetener'.

The final deal was struck along the lines of the second option. Principles for accounting, baseline setting, and additionality determination are much more stringent than under the CDM. For all internationally transferred mitigation outcomes (ITMOs), double bookkeeping has to be undertaken, the so-called corresponding adjustment. Additionally, national and international registries are now required to guarantee tracking of the whole crediting process (from issuance to exchange and final use), hence increasing transparency, for ensuring that there is no double counting. The price paid for this was that all credits from CDM projects registered until 31 December 2020 are now eligible for transition. The volume of these credits is likely to reach 100–150 million tonnes of CO₂ equivalent.⁶⁵ The fact that corresponding adjustments are now required for all international transactions closes loopholes.

Robust baseline and additionality determination is the cornerstone of credible international carbon markets, especially when comparing these with past mechanisms such as the CDM.^{66,67} Regarding additionality, it is now clear that an activity needs to show that it would not have happened in the absence of the incentives provided by the market mechanism. Moreover, COP 26 decided that baselines shall be generally set below business-as-usual and be adjusted downwards to ensure alignment with the

⁶⁴ Michaelowa, A. Shishlov, I., Brescia, D. (2019), 'Evolution of international carbon markets: lessons for the Paris Agreement', *WIREs Climate Change*, 10.

⁶⁵ Michaelowa, A., Censkowsky, P., Espelage, A., Singh, A., Betz, R., Kotsch, R., and Dzikowski, T. (2021), 'Volumes and types of unused Certified Emission Reductions (CERs)', Perspectives and ZHAW, Freiburg and Zurich.

⁶⁶ Broekhoff, D., Füssler, J., Klein, N., Schneider, L., and Spalding-Fecher, R. (2017), *Establishing Scaled-Up Crediting Program Baselines under the Paris Agreement: Issues and Options*, Washington, DC: World Bank, <https://openknowledge.worldbank.org/handle/10986/28785>.

⁶⁷ Schneider, L., and La Hoz Theuer, S. (2018), 'Environmental integrity of international carbon market mechanisms under the Paris Agreement', *Climate Policy* 19:3, 386–400.

long-term goal of the Paris Agreement. This now makes it possible to apply technical tools to determine higher ambition, with scholars now focusing on the identification of the ideal tool to apply.^{68,69}

Finally, in contrast to the Kyoto Mechanisms, it is now mandatory to report on the sustainable development co-benefits of Article 6.4 activities. Moreover, stakeholders can raise their grievances with the Article 6.4 Supervisory Body. Therefore, it is likely that NGO criticism of Article 6 will be reduced compared to the Kyoto Mechanisms.

While the Glasgow results led to general relief in the carbon market community, with countries pioneering bilateral Article 6 collaborations stepping up their activities, several issues are still unsolved, and remaining tasks still require effort.

Remaining tasks for COP 27

The unfinished business regarding Article 6 to be addressed by COP 27 includes a wide array of matters. First, detailed reporting rules for Article 6.2 collaboration need to be specified. As 'naming and shaming' on the basis of reporting that is comparable across countries is the only way to put pressure on countries that engage in 'rogue' activities, getting the reporting right is crucial to ensure that Article 6.2 lives up to its principles. With a public emissions registry now a basic requirement for countries willing to be active in Article 6, these may ideally become instruments to facilitate reporting. Nevertheless, registries alone cannot satisfy the requirements for a solid monitoring, reporting, and verification (MRV) system, which requires well-established standards and methodologies for its full implementation.⁷⁰ In addition to standards, several commentators now see information technologies as poised to play an increasing role to enhance the MRV systems embedded in Article 6.⁷¹

Another uncompleted element concerns the harmonization of existing systems that may interact under the framework of Article 6. These systems consist of a variety of carbon pricing instruments adopted to determine the economic value of carbon credits (by either carbon taxes or emissions trading schemes). Ideally, carbon pricing should converge towards a standardized system that, under the Article 6 framework, should act as an instrument to guarantee a commonly recognized value to carbon credits produced by mitigation actions. With 36 carbon taxes and 32 emissions trading schemes currently in place, each of them determining a specific carbon price, today's reality apparently hinders the necessary cohesion process. Hence, the current status of carbon pricing jeopardizes Article 6 by limiting interaction between the different regimes and by significantly impacting transparency in MRV.

The full definition of Article 6.4 by its Supervisory Body represents another unsolved matter. First, Article 6.4 emission reductions are not (yet) formally authorized by governments for international transactions and may continue to be used by voluntary carbon market (VCM) participants. Hence, the need to regulate the linkage between VCM and Article 6 has now become a priority.⁷² Given that current VCM registries apply highly different degrees of scrutiny, they would have to be reformed carefully to ensure use of a unique identifier that addresses all characteristics of Article 6 to ensure that VCM credits conform to the Article's principles.⁷³

Second, the Article 6.4 Supervisory Body—with a full plate of tasks, many of which require bold decision-making—has started its work only slowly and thus may face challenges when operationalizing the stringent baseline and additionality principles. Will it become possible to harmonize the different elements composing Article 6? And if so, would this harmonization process be meaningful? Answering these questions requires reflection on the perspectives of Article 6 beyond COP 27.

⁶⁸ Stua, M. and Coulon, M. (2017), 'The Mitigation Alliance target and its distribution', in Michele Stua (ed.), *From the Paris Agreement to a Low Carbon Bretton Woods*, Cham, Switzerland: Springer International Publishing, 69–84.

⁶⁹ Michaelowa, A., Michaelowa, K., Hermwille, L., and Espelage, A. (2022), 'Towards net zero: making baselines for international carbon markets dynamic by applying "ambition coefficients"', *Climate Policy*, forthcoming.

⁷⁰ Tan, X-C., Kong, L-S., Gu, B-H., Zheng, A., and Niu, M-M. (2022), 'Research on the carbon neutrality governance under a polycentric approach', *Advances in Climate Change Research* 13:2, 159–168.

⁷¹ Siphthorpe, A., Brink, S., Van Leeuwen, T., and Staffell, I. (2022), 'Blockchain solutions for carbon markets are nearing maturity', *One Earth* 5:7, 779–791.

⁷² Fattouh, B., and Maino, A. (2022), *Article 6 and Voluntary Carbon Markets*, OIES Energy Insight 114, Oxford, UK: Oxford Institute for Energy Studies.

⁷³ Zaman, P., and Queck, R. (2021), *COP26: Article 6 and Its Impact on Voluntary Markets*, HFW Briefing, Singapore.

<https://www.hfw.com/COP-26-Article-6-and-its-impact-on-voluntary-markets>

Article 6 beyond COP 27

Article 6 contains two main topics that recur throughout its text: setting higher ambitions in Nationally Determined Contributions (NDCs), and adopting reliable crediting mechanisms to demonstrate these ambitions.

In order for countries to be able to develop an Article 6 strategy in line with (and exceeding) their NDC targets, and to allow a robust assessment of proposed activities for authorization of ITMOs, this process may be initially guided by the use of Article 6.2. This in fact is currently working as a tool to enrol efficient and effective pilots in several areas across the world. Nevertheless, the expectation of a uniform adoption of Article 6 worldwide may imply the need for a system to monitor and verify any action developed through the Article. In such a case, the Supervisory Body mandated by Article 6.4 may become the single mechanism to certify and issue standardized credits which can then be used in all bilateral, multilateral, market, and non-market systems described by the Article. Moving from the current situation to an Article 6.4-based structure represents a challenging but potentially effective way to ensure that Article 6 achieves its highest potential.⁷⁴

By overcoming the traditional interpretation of Article 6 as composed by independent pieces of legislation, a novel and interdependent interpretation of the same Article would be reached. This interpretation can be described as follows: Article 6.1 represents the overarching framework (higher ambition), Article 6.2 describes bilateral and multilateral approaches to implementing activities the Article; Article 6.4 describes a mechanism to credit mitigation actions covered by the Article (including the uncited market mechanisms); and Article 6.8 defines non-market approaches to the use of credits (e.g. in-kind exchanges and self-cancelling).⁷⁵ While adaptable to the key aspects of the current operationalization of Article 6, this novel interpretation would require a long-term effort to define its principles and functioning, hence implicitly representing an effort whose implementation would go far beyond COP 27.

In the meanwhile, it is imperative to quickly roll out the implementation of Article 6 based upon the achievements reached so far, prioritizing large-scale capacity-building programs worldwide. Several cooperative institutions and countries have started launching programs based upon such an imperative. For instance, the NDC Partnership, an informal alliance bringing together 115 countries and other institutions to plan and deliver on ambitious climate action that helps achieve the Paris Agreement and the Sustainable Development Goals, is now launching multiple activities related to Article 6. The UNFCCC Regional Collaboration Centres are also upscaling their activities, while regional carbon market alliances, first set up in West and East Africa, are now seen as lighthouse approaches informing formation of similar alliances in other regions.

Country-led initiatives are growing, too. The Japan-led Joint Crediting Mechanism involves 18 countries partnering for the international transfer of emission reductions, aiming to facilitate the mitigation of greenhouse gas emissions through diffusion of leading low-carbon technologies, products, systems, services, and infrastructure. Switzerland has reached bilateral agreements for the implementation of Article 6-based projects with a variety of countries worldwide, including Chile, Georgia, Ghana, Peru, Senegal, and Thailand.

Most of these initiatives appear to have the structure of informal climate clubs, aimed at promoting higher ambitions among their members. Climate clubs are highly relevant to the topic of raising ambitions. With William Nordhaus, the creator of the climate clubs concept,⁷⁶ being awarded the Nobel Prize in Economics in 2018, climate clubs have gained ground among climate practitioners and policymakers. During its G7 Presidency, the German government officially launched a proposal for the establishment of an open and cooperative international climate club to ensure that the 1.5° target of the Paris Agreement remains achievable.⁷⁷ The proposal found unanimous support from the G7 members in June 2022, while G20 members have showed interest in the climate club idea since 2021.⁷⁸ More recently, the Confederation of European Business hinted at the

⁷⁴ Stua, M. (2017), 'Architecture of the Mitigation Alliance', in Michele Stua (ed.), *From the Paris Agreement to a Low Carbon Bretton Woods*, Cham, Switzerland: Springer International Publishing, 69–174.

⁷⁵ Ibid.

⁷⁶ Nordhaus, W. (2015), 'Climate clubs: overcoming free-riding in international climate policy', *American Economic Review*, 105:4, 1339–70.

⁷⁷ German Government. Progress towards an equitable world (2022). Berlin, Germany: G7 Presidency Programme. January 2022.

<https://www.g7germany.de/g7-en/current-information/g7-presidency-programme-2000772>.

⁷⁸ Unger, C., and Thielges, S. (2021), 'Preparing the playing field: climate club governance of the G20, Climate and Clean Air Coalition, and Under2 Coalition', *Climatic Change*, 167, 41, <https://doi.org/10.1007/s10584-021-03189-8>.

establishment of a joint climate club between the European Union and China,⁷⁹ thus demonstrating the wide interest of stakeholders in this matter.

Despite the similarities that can be spotted between the climate club theory and the initial implementation of Article 6, little has been done to link the two elements to date. An initial theorization concerning this linking was launched in 2017,⁸⁰ but further studies of the idea have only emerged in the most recent years.⁸¹ Equally limited have been policymaking initiatives so far, with these mainly led by the World Bank and its Climate Market Club.

Conclusions

Rather than the end of the Article 6 operationalization process, the rulebook approved at COP 26 and included in the Glasgow Climate Pact is a tool to launch sound pilot activities and to define the foundation of the Article's future architecture. Hence, to fully implement the Article, a significant number of tasks must be completed by COP 27 and beyond:

- Harmonize the registries' transparency and implement adequate MRV systems.
- Harmonize the different carbon pricing instruments underpinning the generation of ITMOs.
- Incorporate VCMs within the compliance system.
- Fully implement the Article 6.4 mechanism.
- Establish a link between Article 6 and overall increased ambition.
- Establish a sound and efficient crediting process.
- Define the role of Article 6.8.
- Develop the link between Article 6 and the climate clubs.

Only a full implementation of the listed tasks will grant Article 6 the potential to be fully unleashed in 'moving the trillions' necessary for radical decarbonization and progress towards carbon neutrality. Nevertheless, any actions developed based on the already defined tools of Article 6 will provide incremental benefits in this direction.

CARBON MANAGEMENT TECHNOLOGIES: A CRITICAL ISSUE FOR COP 27

Reza Maddahi

The 2022 United Nations Climate Change Conference, more commonly referred to as COP 27, to be held in Sharm El-Sheikh, Egypt, intends to start putting the Glasgow conclusion into practice by launching its climate change mitigation, adaptation, and finance plans.

Carbon capture utilization and storage (CCUS) was a prominent topic during COP 26, which took place from November 1–13, 2021. Carbon management technologies were seen as essential to achieving the goals of the United Nations Framework Convention on Climate Change. The primary result of the meeting, which was deemed a success worldwide, was agreement on Article 6. This lays forth the guiding principles for a global carbon market that is technology-neutral, delivering a clear message to all nations about the viability of CCUS and other negative-emissions technologies.

⁷⁹ EU-China relations - Engaging with a systemic rival (2022). Brussels, Belgium: BUSINESSEUROPE publications. July 2022.

<https://www.buinesseuropa.eu/publications/eu-china-relations-engaging-systemic-rival>

⁸⁰ Stua, M. (2017), 'A transformational club within the Paris Agreement: a climate-club perspective on Article 6', in Stavins, R., and Stowe, R. (eds.), *Market Mechanisms and the Paris Agreement*, Cambridge, MA: Harvard Project on Climate Agreements, 67–72.

⁸¹ Deere Birkbeck, C. (2021), *Priorities for the Climate–Trade Agenda: How a Trade Ministers' Coalition for Cooperation on Climate Action Could Help*, London, UK: The Royal Institute of International Affairs; Monkelbaan, J. (2021), *Interactions between Trade and Climate Governance: Exploring the Potential of Climate Clubs*, Stockholm, Sweden: Global Challenges Foundation; Elkerbout, M., Bryhn, J., Righetti, E., and Chapman, F. (2022), *From Carbon Pricing to Climate Clubs: How to Support Global Climate Policy Coordination towards Climate Neutrality*, Brussels, Belgium: Centre for European Policy Studies (CEPS) Research Report; Stua, M., Nolden, C., and Coulon, M. (2022), 'Climate clubs embedded in Article 6 of the Paris Agreement', *Resources, Conservation and Recycling* 180, 106178.

Additionally, the political commitment to phase down unabated coal serves as a clear invitation for nations to consider the use of carbon management technologies in their revised Nationally Determined Contributions (NDCs), which must be updated during 2022 and again submitted to the 2023 summit of world leaders.

Taking a broader view of carbon management technology advances, several nations are currently transitioning from the development stage into the deployment stage. During the next 10 years, the implementation of carbon management technologies will need to increase at a rate that is many orders of magnitude higher if we are to stay inside the 1.5° limit.

Carbon management technologies

Strategies for reducing the amount of carbon dioxide (CO₂) emitted into the atmosphere and mitigating climate change are heavily debated nowadays. There are numerous such solutions; CCUS is one that is commonly suggested. Bioenergy with carbon capture and storage (BECCS) and direct air carbon capture and storage (DACCS), two critical negative-emission technologies, are frequently discussed in the same conversations.

The CCUS process consists of the separation of CO₂ from industrial and energy-related sources and either using it as a resource to create valuable products or services or transporting it to a storage location for the purpose of long-term isolation from the atmosphere.

CCUS can be used in a variety of sectors (natural gas processing, power generation, iron and steel production, cement manufacturing, etc.). CO₂ is captured from natural gas or exhaust gas, transported via pipes or ships, and stored in geological formations (saline formations, oil and natural gas reservoirs, un-mineable coal seams, basalt formations, organic-rich shales, etc.) for the purpose of permanent storage. CCUS also sets the stage for carbon removal or negative-emissions technologies, whether the CO₂ originates from bio-based processes or straight from the atmosphere.

One strategy for achieving net negative emissions is BECCS; there are several approaches to doing this. One approach is to burn sustainably produced biomass in replacement of coal and oil and then utilize carbon capture and storage (CCS) on the CO₂ that is generated. The biomass will absorb CO₂ from the atmosphere as it grows. There will be a net reduction in emissions if the CO₂ emitted during the burning of the biomass is caught.

Another option, DACCS, directly extracts CO₂ from the surrounding air through chemical reactions. The CO₂ is then extracted from the chemicals and trapped, where it can be injected into geological formations or utilized to create durable goods. This technique may be applied everywhere in the world and is one of the cleanest methods of removing CO₂ when driven by renewable energy or electricity from waste.

Role of carbon management technologies in the climate protection regime

Climate change is defined by long-term changes in two parameters: temperatures and weather patterns. According to many reputable organizations, including the Intergovernmental Panel on Climate Change and the US National Aeronautics and Space Administration, anthropogenic emissions of greenhouse gases since the 1800s, primarily CO₂ from fossil fuel combustion and industrial processes, have been major contributors to climate change, prompting the need to stabilize the amount of CO₂ in the atmosphere. It is well known that climate change is presently causing severe droughts, water scarcity, devastating fires, increasing sea levels, flooding, melting polar ice, catastrophic storms, and dwindling biodiversity, among other things.

In order to combat climate change, a variety of strategies have been proposed, ranging from widespread tree planting to sophisticated direct air capture systems that absorb CO₂ from the atmosphere. According to the existing agreement, we can more quickly stop global warming if we implement these measures while also lowering our use of fossil fuels. We shall hopefully reach net zero by the middle of this century, when all anthropogenic emissions will be balanced by removals. Assuming that natural carbon sinks continue to function, after net zero has been reached, global temperatures will stabilize.

The Paris Agreement is currently the cornerstone of global cooperation on climate change and seeks to hold the increase in the global average temperature to well below 2°C above pre-industrial levels and pursue efforts to limit the temperature increase to 1.5°C above pre-industrial levels. Carbon management technologies will become increasingly essential as countries move towards the achievement of those goals. However, the Agreement does not directly refer to any mitigation option.

Climate change mitigation scenarios consistently indicate that carbon management technologies are crucial to reduce atmospheric CO₂ emissions in order to limit warming to the Agreement's 2°C and 1.5°C targets. Despite that, these technologies currently make a much smaller contribution to greenhouse gas mitigation than other mitigation options.

Two main areas under the Paris Agreement that could significantly influence these technologies are Article 6 and the Global Stocktake (GST).

The Global Stocktake

The GST is a key element in the Paris Agreement's ambition mechanism and is to be carried out every five years to assess countries' collective progress toward the Agreement's long-term goals. The GST is a fact-finding process aimed at informing the next round of NDCs in order to increase their level of ambition. It also offers the opportunity to evaluate the need for enhanced action and support and potentially represents a strong incentive for countries to make progress towards adding CCUS, BECCS, and DACCS to their national climate agendas.

The GST should cover mitigation, adaptation, and climate finance measures. Where carbon management technologies are used in the context of mitigation, assessment of their effectiveness in helping to achieve the Agreement's targets would also be needed. The balance between emission reductions through CCUS and removals through BECCS and DACCS is a crucial feature of the NDCs that is of international significance. The GST may also provide an opportunity to assess the technological readiness of these approaches to ensure that the balance struck portrays technological realities and addresses concerns relating to equity and human rights. The GST is presently in its first cycle, which will last through 2023 and will be repeated every five years after that.

Article 6

Article 6 of the Paris Agreement is widely regarded as a transformative new support mechanism for deploying CCUS, BECCS, and DACCS. As countries voluntarily add these technologies to their NDCs, the push to integrate them into market mechanisms will increase. In fact, the main goal of Article 6 is to strengthen voluntary cooperation between parties in order to achieve the emission-reduction targets set out in their NDCs using international market mechanisms. This is to be done in two ways: (1) voluntary cooperative approaches, under Article 6.2, which allow the use of internationally transferred mitigation outcomes in accordance with a robust accounting framework to ensure no double counting, and (2) the sustainable development mechanism under Article 6.4, by establishing the basis for quantifying the emission reductions associated with projects. Developed and developing countries are both qualified to take part.

After years of tense talks, the rules for Article 6 were finally established at COP 26. There will be a large amount of intersessional work, requests for technical papers, and workshops in the weeks ahead on the way to Sharm El-Sheikh. These should be able to help nations come to an agreement on Articles 6.2 and 6.4 at COP 27. Governments will in fact need to catch up to a thriving global voluntary carbon market in order to participate in this developing market.

The establishment of a 'club' of countries seeking to engage in voluntary cooperation, in accordance with Articles 6.1 and 6.2 of the Agreement, on CCUS, BECCS, and DACCS as part of their contribution towards the achievement of the Agreement's goals would be one way of driving collective action on these technologies. The club's membership could be drawn from highly fossil-fuel-dependent countries seeking to incorporate the technologies into their NDCs and achieve differentiated contributions based on the common pursuit of cleaner fossil fuels. However, the club's membership won't be limited to fossil-fuel-dependent countries.

Deploying carbon management technologies by pooling finance and technical resources would be the club's primary goal. In addition, the development of domestic legal and regulatory frameworks is essential to the successful management of these technologies as well as the safe and secure storage of CO₂. Some countries currently have elaborated legal and regulatory structures for these technologies. Having a platform to share relevant knowledge and experience seems essential.

The club could also include non-state actors with interests aligned to its goals. In view of the content of Articles 6.2 and 6.4, the purpose of such a club must be to support deployment that creates verifiable outcomes that count towards the achievement of NDCs.



Expectations and concluding remarks

The Intergovernmental Panel on Climate Change has stated unequivocally that we are currently in extremely perilous terrain. Every minor delay in taking commensurate action brings us closer to irreversible damage to the environment and its ability to support human life. COP 27 is likely to be pivotal in determining the future of CCUS, BECCS, and DACCS. With the conclusion of the Paris Agreement Rulebook at COP 26, efforts under the Paris Agreement must now focus on delivering strong climate action aligned with the 1.5°C target. As countries approach closer to implementing climate pledges, the importance of technologies such as these becomes clearer.

At COP 26, many slightly elevated promises were made. The focus of COP 27 will be on how to carry out those pledges. The Glasgow Climate Pact, the formal consequence of COP 26, proposes that countries increase the 2030 objectives in their NDCs to correspond with the Paris goal by the end of 2022. As a result, COP 27 is more important than past COPs. Parties will seriously examine carbon management technologies in order to achieve their obligations. However, this is highly dependent on other issues that will be discussed at COP 27—such as the \$100 billion annual climate finance that developed countries were supposed to deliver each year from 2020 to 2025, post-2025 climate financing, the implementation of Article 6 of the Paris Agreement, the launch of the carbon market mechanism among countries and at the global level, an effective phase-down of coal and fossil fuels, and GST dialogues.

THE BREAKTHROUGH AGENDA—ACCELERATING ACTION IN HYDROGEN, POWER, ROAD TRANSPORT, AND STEEL

Dolf Gielen and Elizabeth Press

The Breakthrough Agenda was launched at COP 26 in Glasgow under UK leadership with the aim to make clean technologies and sustainable solutions ‘the most affordable, accessible and attractive option in each emitting sector globally before 2030’. The Agenda was endorsed by 44 countries and the EU, representing more than 70 per cent of global GDP.

The Breakthrough Agenda focuses on key emitting sectors through strengthened international cooperation and coordination. It complements multilateral climate diplomacy with an action-oriented approach that builds on established collaborative initiatives and drives enhanced multilateral action. It seeks to catalyse collaboration around priority actions to make the transition quicker, cheaper, and easier for everyone. Such coordinated action can leverage and amplify national efforts to drive faster innovation, greater economies of scale, bigger investment incentives, and level playing fields where needed.

As part of the Agenda, ministers will review global progress annually, informed by a report developed by the International Energy Agency (IEA), International Renewable Energy Agency (IRENA), and UN high-level climate champions, in collaboration with others as required.⁸² This report intends to deliver an independent, authoritative stock-take on global sector progress and the international action needed consistent with 1.5-degree pathways and measured against the objectives of the Breakthrough Agenda and, in particular, the Glasgow Breakthrough’s goals.

So far, the focus is on five key sectors and clean energy vectors: hydrogen, power, road transport, steel, and agriculture. The State of Sectoral Transitions Report was released at the Clean Energy Ministerial/Mission Innovation event in Pittsburgh in September 2022. The energy-related part of the report draws on existing IEA and IRENA empirical and analytical work to outline the following:

- the significance of each sector for reaching net zero and the progress that has been made in recent years
- goals for the sector until 2030, consistent with 1.5 degree pathways and the Glasgow Breakthrough’s goals
- critical actions until 2030, highlighting those areas where international collaboration is vital

⁸² IEA, IRENA and HLC (2022) The breakthrough agenda report 2022. <https://www.irena.org/publications/2022/Sep/Breakthrough-Agenda-Report-2022>

- a review of the current landscape of international collaboration
- recommendations on the most urgent and high-impact opportunities to strengthen international collaboration that can accelerate progress towards those goals
- a framework for tracking progress in subsequent years.

Snapshots of the situation in selected sectors, based on IRENA's work to date, are presented below.

Hydrogen

Hydrogen production from fossil fuels is well established, with around 120 Million tonnes (Mt) produced yearly. Today, the bulk of H₂ is used for oil refining and ammonia production, and less than 5 per cent of H₂ and its derivatives (such as ammonia) are traded internationally. The net-zero pathways, however, require clean and renewable hydrogen, both blue and green. (Blue hydrogen is produced from fossil fuels with carbon capture and storage, and green hydrogen is produced from water electrolysis using renewable electricity.)

Today, less than 1 per cent of H₂ is blue and less than 1 per cent is green. The bulk of green hydrogen today is a by-product of chlorine electrolysis (20–30 GW installed capacity). Dedicated hydrogen electrolyser capacity is less than 1 GW, which yields less than 0.1 Mt per year of hydrogen.

Around 0.5 GW of electrolyser capacity was sold in 2021. That needs to accelerate substantially in years to come, with about 15 GW manufacturing capacity by 2026. That manufacturing capacity will need to grow further to have 150-350 GW electrolyser capacity in operation by 2030.

Every Mt of annual green hydrogen production requires approximately 10 GW of electrolyser capacity and around 20 GW installed renewable power. The numbers depend on the power source type and its variability. Today large projects aim for sites where high-quality complementary solar and wind profiles occur, for example in Oman or along the Red Sea, to achieve sufficiently high load factors for the electrolyser.

It should be noted that, at the moment, the largest electrolyser has only a 20 MW capacity. Combining such modules into GW-scale plants will require significant engineering effort. Electrolyser system cost must be reduced further from today's US\$1,000/kW to well below US\$500/kW. Several electrolyser types exist, dominated by alkaline electrolyzers with proton exchange membrane as a promising technology with higher productivity. However, it is not yet clear which type will prevail long term. This also depends on the availability of critical materials; for example, today's proton exchange membrane uses scarce indium and platinum.

The cost of clean and renewable hydrogen production is still high relative to high-carbon fuels, as well as the costs of transporting, converting, and storing it. Production of 1 kg of hydrogen requires over 50 kWh, with limited remaining efficiency potential. Therefore, only sites where power costs are well below 2 cents/kWh will be able to produce hydrogen at less than US\$1.5 per kg, an industry benchmark.

Such low-cost power is typically available in remote desert areas. Bringing the hydrogen from these locations to demand centres adds logistical and cost challenges. New IRENA analysis suggests that a quarter of ammonia may be traded internationally in the long term, with an equal role for pipelines and shipping.⁸³ Ammonia is the most promising hydrogen transportation mode, but liquid and organic hydrogen carriers are also being explored. Also, there is increasing attention to manufacturing end-products close to the hydrogen production sites, such as ammonia, iron, methanol, and jet fuel. However, process integration aspects (such as coupling variable renewable power with hydrogen production and steady ammonia production processes) are not yet well understood. Better integration may help accommodate higher solar photovoltaic (PV) and wind electricity shares in power systems, and it can help reduce the cost of green hydrogen production.

⁸³ IRENA (2022) A Quarter of Global Hydrogen Set for Trading by 2050. <https://www.irena.org/newsroom/pressreleases/2022/Jul/A-Quarter-of-Global-Hydrogen-Set-for-Trading-by-2050>



The supply of hydrogen will be constrained by the pace of deployment of capital and the cost of production, particularly where long-term markets are not assured. IRENA and the World Economic Forum have jointly developed a roadmap for enabling frameworks to accelerate hydrogen deployment,⁸⁴ to help accelerate progress in the coming 5–10 years. This roadmap has been deployed for Europe and Japan and will be expanded to other regions.

Finally, clean hydrogen needs coherent and transparent rules, standards, and norms to facilitate its deployment across countries, regions, and sectors. Significant work is going on in this regard. For example, IRENA is working with the German G7 Presidency to explore harmonization strategies, and this work will be released at COP 27.

Emerging hydrogen and hydrogen commodity trade is a topic that brings developed and developing countries together in deployment of low-carbon solutions. Access to abundant renewables is an asset in the clean hydrogen race, but it might not be enough. Many other factors come into play, including existing infrastructure, the current energy mix, the cost of capital, and access to necessary technologies. Whether the technical potential can be realized will also depend on soft factors like government support, the investment climate, and political stability. International co-operation will be necessary to devise a transparent hydrogen market with coherent standards and norms that contribute to climate change efforts meaningfully. COP 27 presents an opportunity for a constructive dialogue on these issues, especially as new hydrogen partnerships are being developed, and a number of these will be launched in Sharm El-Sheikh.

Power

Worldwide more than 3 TW of renewable power generation capacity was installed by the end of 2021,⁸⁵ with around 30 per cent of all power generated from renewables. In 2021, 257 GW of renewable power was added, dominated by solar PV and wind, accounting for over 80 per cent of all power added globally. While the trend is positive, it falls significantly short of the 10 TW of renewable power by 2030 that is required for IRENA's 1.5°C pathway. This means a tripling of annual capacity additions.

The cost of renewable power generation continues to fall. In 2021, the global weighted-average levelized cost of electricity (LCOE) of utility-scale solar PV fell by 13 per cent, year-on-year, from US\$0.053/kWh to US\$0.046/kWh. The global weighted-average LCOE of onshore wind projects fell by 11 per cent, year-on-year, from US\$0.037/kWh in 2020 to US\$0.033/kWh. The weighted-average LCOE of offshore wind fell by 9 per cent, from US\$0.086/kWh to US\$0.075/kWh. In 2021, around 73 per cent (163 GW) of newly commissioned utility-scale renewable power generation capacity had LCOEs lower than the cheapest fossil-fuel-fired option in the G20.⁸⁶

Solar is especially slated for rapid growth, with around 180 GW of modules added in 2021. Chinese solar PV manufacturing capacity will grow to 500 GW in 2022, more than 90 per cent of the world's total. Other parts of the world, including Europe and the US, are also ramping up manufacturing, albeit at a smaller scale. Such manufacturing capacity growth opens up the perspective of accelerated deployment in the coming years.

Wind capacity additions face considerable permitting and regulatory issues in many countries, which limits the number of suitable sites and results in many years of lead time for typical projects. Moreover, the same type of problems often hamper grid expansion and grid access. Enabling frameworks must be created to overcome these problems. In some cases, a workaround can be developed; for example, where there is a lack of acceptance for onshore wind, offshore wind may be a viable solution. But this entails additional costs. The Global Wind Energy Council has developed a five-point plan to streamline the enabling frameworks.⁸⁷

⁸⁴ IRENA and WEF (2022) Enabling Measures Roadmap for Green Hydrogen.

https://irena.org/-/media/Files/IRENA/Agency/Collaborative-Frameworks/IRENA_Enabling_Measures_Roadmap_for_Green_H2_Jan22.pdf?la=en&hash=8FC3CDEB9128B1D23A90541B2E499C1F6DDEEFA6

⁸⁵ IRENA (2022) Renewable Energy Statistics 2022. <https://www.irena.org/publications/2022/Jul/Renewable-Energy-Statistics-2022>

⁸⁶ IRENA (2022) Renewable Power Generation Costs in 2021. <https://www.irena.org/publications/2022/Jul/Renewable-Power-Generation-Costs-in-2021>

⁸⁷ GWEC (2022) Accelerating renewables to achieve energy security, affordability and climate action. https://gwec.net/market-intelligence/resources/accelerating-renewables-to-achieve-energy-security-affordability-and-climate-action/?mc_cid=76aec1a5ee&mc_eid=c26d871c34

As the share of variable solar and wind grows and the share of dispatchable fossil power plant decreases, other types of flexibility must be deployed to ensure the smooth functioning of the power system. The goal is to minimize curtailment and to ensure that supply meets demand at all times. IRENA has identified 30 types of innovations across four key pillars that can be deployed: new technologies, markets and regulations, operational practices, and business models.⁸⁸ Often several innovations must be combined to create enabling solutions.

Grid operators are increasingly comfortable with high shares of variable renewables in their system. For example, AEMO in South Australia is aiming for 100 per cent instantaneous renewables by 2025. California ISO already achieved 99.9 per cent instantaneous renewables in May 2022. Eirgrid achieves 75 per cent system non-synchronous penetration in an all-island system. In Germany, 50 Hz had a 56 per cent renewable energy share in end use in 2021, primarily wind. G-PST is a new platform for best practice exchange among system operators.

Technologies needed to meet the 2030 climate goals exist, so the efforts must be around deployment and market and regulatory reforms to account for the changing energy mix and increasing connections between power, transport, and heating/cooling. Moreover, the deployment of technologies must be widespread; the current trends are concentrated in China, the EU, India, and the US. The Just Energy Transition Partnership, established between South Africa and the G7 countries during COP 26, is considered a step forward, and efforts are ongoing to broaden this approach to other countries. The goal is the phase-out of coal power while renewable power deployment is accelerated. As COP 27 is taking place in Africa, energy access will be a prominent point, given that some 600 million people did not have it in 2021. With Egypt prioritizing the issues as part of the Presidency agenda, this may be an occasion to make COP 27 a turning point for African countries and global partners who will be needed to support this effort.

Road transport

Road transport energy use can be split into passenger cars and freight, namely vans and heavy-duty trucks, while other modes are of lesser importance in the context of decarbonization.

For passenger cars and delivery vans, the main trend is toward electric vehicles (EVs). Today plug-in hybrid electric vehicles (PHEV) and battery electric vehicles (BEV) dominate the clean market. The longer-term expectation is that BEV will become the main form. In 2021 around 7 million EVs were sold (PHEV and BEV), with Europe as the world's largest market. This segment needs to grow to around 40 million units by 2030, according to the BNEF and IEA. This opens up a perspective of an EV-dominated global fleet by 2050.

One indicator of progress is battery manufacturing capacity. BloombergNEF projects more than a quadrupling from 586 GWh in 2021 to 2,539 GWh in 2025. Battery manufacturing amounted to 200–300 GWh in 2021, but China alone produced 62 GWh of batteries in May 2022, so production is ramping up fast, and EV manufacturing will follow suit.

Going forward, battery production—meaning EV manufacturing as well—may be limited by access to critical materials, notably lithium. Analyses indicate a growth requirement increasing from 400 kilotonnes (kt) lithium carbonate equivalent in 2021 to around 2,000 Mt by 2030.⁸⁹ While significant untapped potential exists, there is a gap between the planned mine expansion and the growing demand. In response, lithium prices have increased four- to fivefold. The price increase for lithium and other critical materials has resulted in rising battery prices, the main cost component of EVs. It is expected that this situation will stabilize in the mid to long term, not only with additional production but also with product innovation, recycling, and reuse.

Apart from batteries, a recharging infrastructure is needed. The majority of charging will take place at home or at the workplace, but public charging infrastructure is also needed. For example, in EU-27, there is a need to increase the installation rate of public chargers sevenfold from 2021 levels.⁹⁰ Whereas most attention is focused on passenger cars and delivery vans, there

⁸⁸ IRENA (2021) Innovation toolbox. <https://www.irena.org/innovation/Toolbox>

⁸⁹ Global PST consortium (2022) Who we are. <https://globalpst.org/who-we-are/>

⁹⁰ ACEA (2022) E-mobility: 14,000 public charging points should be installed weekly across EU, new analysis shows. <https://www.acea.auto/press-release/e-mobility-14000-public-charging-points-should-be-installed-weekly-across-eu-new-analysis-shows/>



are also encouraging signs for electrification of heavy-duty vehicles.⁹¹ However, the jury is still out on which solution will prevail, as hydrogen fuel cells and synthetic fuels may also play a role.

At COP 27, transport will not have a dedicated thematic day as it had in previous years, but it will be covered in the 'solutions day'. This reflects the sector's maturity on the one hand, but also the major gap in the context of Africa, where conversation around EVs lags, given the lack of energy access and infrastructure. It is essential, however, to sustain the focus on road transport, including two- and three-wheelers, given what needs to be achieved by 2030. There is also a pressing need to grow and diversify critical materials supply for battery production, representing an emerging economic opportunity. Various countries in Africa, Asia, and Latin America are experiencing growth in mining and processing, but the creation of local economic activity and jobs and respect for Environmental, Social and Governance (ESG) aspects are critical. While a range of international initiatives exist, more needs to be done. COP 27 could be a stepping stone in advancing this important conversation.

Steel

Primary steelmaking is dominated by the blast furnace/basic oxygen furnace route, which uses coal and coke. Less than 10 per cent of all primary steel is made from direct reduced iron (DRI). Iron ore is converted in its solid state, using natural gas or coal, to yield DRI. Primary steelmaking from ore is supplemented with scrap recycling, accounting for around a quarter of all steelmaking. Steel scrap recycling is limited by scrap availability.

Full decarbonization of primary steelmaking relies on either CO₂ capture and removal or the use of hydrogen. Progress with carbon capture and storage has been limited; so far, only one small pilot plant is operated in France (Dunkerque). Also, one plant in the United Arab Emirates produces DRI using natural gas and captures the CO₂ and uses it subsequently for enhanced oil recovery. In recent years, attention has shifted to hydrogen-based DRI production.⁹² A large Mt-scale plant is being built in Sweden and two in Spain; ambitious plans exist in Australia and Mauritania;⁹³ and several 100-kt-scale projects are being established across Europe and China. However, significant upscaling will be needed in light of nearly 2,000 Mt per year of steel production. Whereas around 10 Mt of clean steel is foreseen by 2030, more than 10 times that amount will be needed by 2030 to ensure full decarbonization by 2050. Thus, a massive scale-up will be needed going forward, and a shift to DRI may also entail industry relocation. IRENA is working with major steelmaking countries such as China and India to develop strategies for the decarbonization of their steel sectors.

The debate on steel decarbonization has changed with the likely introduction of Carbon Border Adjustment Mechanisms in Europe and the US, aimed at levelling the playing field for steel imports and national producers that face an emissions price. The impact of Border Carbon Adjustments is yet to be seen, but these draw attention to carbon leakage, which needs to be tackled as part of net-zero strategies.

Various international initiatives exist to accelerate deployment of net-zero steel—for instance, the business coalitions Zero steel and ResponsibleSteel. Consortia are working to develop green steel, such as Hybrit in Sweden (a mining, steelmaking, and power company), and H2 Green Steel and Iberdrola in Spain. Higher-level international discussions are taking place, for example, in the context of the Mission Possible Partnership and Leadership Group for Industry Transition.

There is a need for international standards and ground rules for the clean technologies of the future to improve market certainty and facilitate trade. IRENA is currently focusing on standards for hydrogen-based green commodities, including iron and steel.

Steel decarbonization is in a nascent stage, and conversations at COP and other fora have intensified in recent years, especially with the revival of the hydrogen agenda. The concentration of production in a relatively limited number of countries means that targeted action can bring significant impact. Better coordination of various international initiatives is warranted, including with the major steel-producing nations. At the same time, it is critical to ensure that the necessary clean energy supply infrastructure is in place. COP 27 presents a timely occasion to have a more nuanced conversation on creating demand for

⁹¹ Bloomberg (2021) BloombergNEF's global EV outlook 2021: Commercial vehicles.

<https://www.bloomberg.com/professional/blog/bloombergnefs-global-ev-outlook-2021-commercial-vehicles/>

⁹² Gielen, D., Medlock, K. and Bazilian, M. (2021) Steel, Hydrogen And Renewables: Strange Bedfellows? Maybe Not...

<https://www.forbes.com/sites/thebakeryinstitute/2020/05/15/steel-hydrogen-and-renewables-strange-bedfellows-maybe-not/>

⁹³ Esau, I. (2022) Mauritania details ambitious drive to exploit huge gas, solar and wind resources. <https://www.upstreamonline.com/energy-transition/mauritania-details-ambitious-drive-to-exploit-huge-gas-solar-and-wind-resources/2-1-1226062>

green steel and promoting diversification by enabling renewable-rich countries in the developing world to set up local value chains and job-creating green steel industries.

Conclusions

We have the technologies needed for energy transitions until 2030. But their deployment needs to accelerate significantly. There are indications that this will happen in the coming years. The innovation focus will shift from research and development to enabling frameworks, business models, and broader just-transition imperatives. International cooperation needs to focus on the identification of best practices, fostering international trade while maintaining competition and supply security. The Breakthrough Agenda tackles important emitting sectors and holds the potential for this accelerated action. Going forward, it will be equally important to consider and understand the cross-sectoral links and shifting boundaries in order to pre-empt the challenges and take advantage of emerging opportunities. All of these areas will be discussed intensively at COP 27, and these discussions can help countries in raising their Nationally Determined Contributions and their Long-Term Low Emissions and Development Strategies, the two key elements of the formal process. New leader-level commitments from existing and new participating countries for enhanced ambition and action are essential, but so are operational plans and wide-ranging collaboration between public and private players. COP 27 is meant to be an 'implementation COP', so participants should come armed with good will, open minds, and preparedness to turn commitments into action on the ground.

THE FUTURE OF GREEN GASES—HYDROGEN, BIOGAS, AND BIOMETHANE

Martin Lambert

COP 27, taking place in Sharm El-Sheikh, Egypt, in November 2022, is likely to differ significantly from its predecessor, COP 26 in Glasgow in November 2021. Not only is the weather likely to be much more pleasant, but (more importantly) the global energy agenda has been transformed by the Russian invasion of Ukraine in February 2022, and there is growing public awareness of the significant impacts of climate change. This article discusses the ways that hydrogen, biogas, and biomethane, as renewable or 'green' gases, are likely to be addressed at COP 27.

Looking back to November 2021, it should be noted that, except at various side events (notably the Hydrogen Transition Summit organized by Climate Action⁹⁴), there was relatively little discussion about hydrogen, and even less about biogas and biomethane, at COP 26. In the final Glasgow Climate Pact,⁹⁵ hydrogen was mentioned in just one bullet point—'Hydrogen Breakthrough: ensuring affordable, renewable and low carbon hydrogen is globally available by 2030', as part of the Breakthrough Agenda endorsed by 40 countries. That bullet point clearly states a bold objective, but as with so much else regarding the energy transition, it contains little detail on how the ambitions are intended to be achieved.

The COP 26 conference did see a limited number of announcements related to hydrogen. For example, the United Arab Emirates set a target to have a 25 per cent market share of global low-carbon hydrogen production by 2030 and signed a collaboration deal with Germany. Japan announced a (relatively small) \$100 million commitment to support conversion of fossil fuel plants to low-carbon ammonia and hydrogen. Biomethane appeared to get even less attention, except by companies and lobby groups (notably the World Biogas Association) aiming to promote it.

There are reasons to expect that renewable gases may receive more explicit attention at Sharm El-Sheikh in November 2022.

The impact of the Russia–Ukraine war and REPowerEU

On 8 March 2022, shortly after Russia invaded Ukraine on 24 February, the European Commission published its communication 'Joint European Action for more affordable, secure and sustainable energy', a plan referred to as REPowerEU.⁹⁶ This publication had the stated objective to 'make Europe independent from Russian fossil fuels well before 2030'. The initial paper set the broad intended direction, and more details were subsequently published on 18 May.⁹⁷ These documents envisage a

⁹⁴ <https://www.climateaction.org/news/highlights-from-the-hydrogen-transition-summit-at-cop26>

⁹⁵ <https://ukcop26.org/wp-content/uploads/2021/11/COP26-Presidency-Outcomes-The-Climate-Pact.pdf>

⁹⁶ European Commission (2022, March), 'RePowerEU', https://ec.europa.eu/commission/presscorner/detail/en/ip_22_1511.

⁹⁷ https://ec.europa.eu/commission/presscorner/detail/en/IP_22_3131

broad range of measures (including more LNG and pipeline gas imports)—including, particularly relevant to this article, a significant ramp-up in the ambition for production and use of renewable gases.

Prior to REPowerEU, the latest targets had been set in the Fit for 55 package in July 2021.⁹⁸ The most significant changes in REPowerEU regarding renewable gases were as follows:

- biomethane: an increase in the 2030 target from 17 billion cubic metres to 35 billion cubic metres
- renewable hydrogen: an increase in the 2030 target from 5.6 million tonnes to 20 million tonnes (of which 10 million tonnes to be imported).

These targets will certainly be challenging to achieve (as discussed in more detail in an OIES Comment published in July 2022).⁹⁹ Nevertheless, they have certainly had the impact of focusing the attention of many stakeholders on the potential for renewable gases and the action needed to progress towards the ambitious targets.

Prior to REPowerEU, **biomethane** appeared to have dropped down the policy agenda (except in certain niche markets like Denmark), having been displaced by a much greater focus on renewable hydrogen. It was not entirely clear why biomethane had been receiving less attention. With estimated biomethane production costs of around €50–80/MWh, it was admittedly higher than European natural gas prices which were below €25/MWh until mid-2021, but still considerably cheaper than any form of low-carbon hydrogen as well as being much more compatible with existing natural gas infrastructure.

With European TTF (Title Transfer Facility – the Netherlands hub) wholesale natural gas prices since March hovering around €100/MWh, and more recently reaching above €200/MWh, biomethane costs suddenly look very attractive. If investors could be confident of an offtake price for biomethane, say around €60-90/MWh, it is likely that many biomethane plants would be economically feasible. If governments and regulators are willing to hold auctions for contracts for difference or similar mechanisms to create a business case for investors in biomethane plants, there could be a rapid roll-out of new production facilities, either upgrading existing biogas production or building new anaerobic digesters. The European Biogas Association has published documents setting out suggestions for the required policy measures and confirming that there is sufficient potential sustainable biomethane production to meet the target.¹⁰⁰

The original Fit for 55 **renewable hydrogen** target of 5.6 million tonnes by 2030 was already likely to prove very challenging, requiring around 100 GW of electrolyser capacity (depending on full load hours) and around 250 TWh of additional renewable power generation. To put those numbers in context, the total renewable power generation in the EU in 2020 was 530 TWh, and the largest electrolyser under construction is 200 MW. To achieve 100 GW of electrolyser capacity would require 500 of those 200 MW projects to be constructed by 2030.

These ambitious targets had already stimulated a large amount of activity from players seeking to develop GW-scale hydrogen projects, so it is not clear that the increased ambition in REPowerEU will lead to an increase in that activity. Indeed, it remains difficult to see how even the original Fit for 55 target will be achieved, with the REPowerEU objective even further out of reach.

Prior to the Russian invasion of Ukraine, there had been a growing consensus (at least in some countries including Norway, Netherlands, and the UK) that some initial large-scale low-carbon hydrogen production may come from natural gas reforming with carbon capture and storage. With a desire to reduce overall methane consumption, however, this is now looking less likely to be a preferred option.

Thus, from a European perspective, the main impact of the Russia–Ukraine war and the REPowerEU document is likely to be a renewed focus on biomethane, as well as continuing the drive to scale up production of renewable hydrogen.

COP 27 likely to have an African focus

While it is clearly a global conference, the location of the COP in Sharm El-Sheikh, Egypt, has led it to being portrayed as the ‘African COP’, where key African climate initiatives are likely to be announced.¹⁰¹ The focus of renewable gases in Africa is

⁹⁸ https://ec.europa.eu/commission/presscorner/detail/en/IP_21_3541

⁹⁹ <https://www.oxfordenergy.org/publications/repowereu-can-renewable-gas-help-reduce-russian-gas-imports-by-2030/>

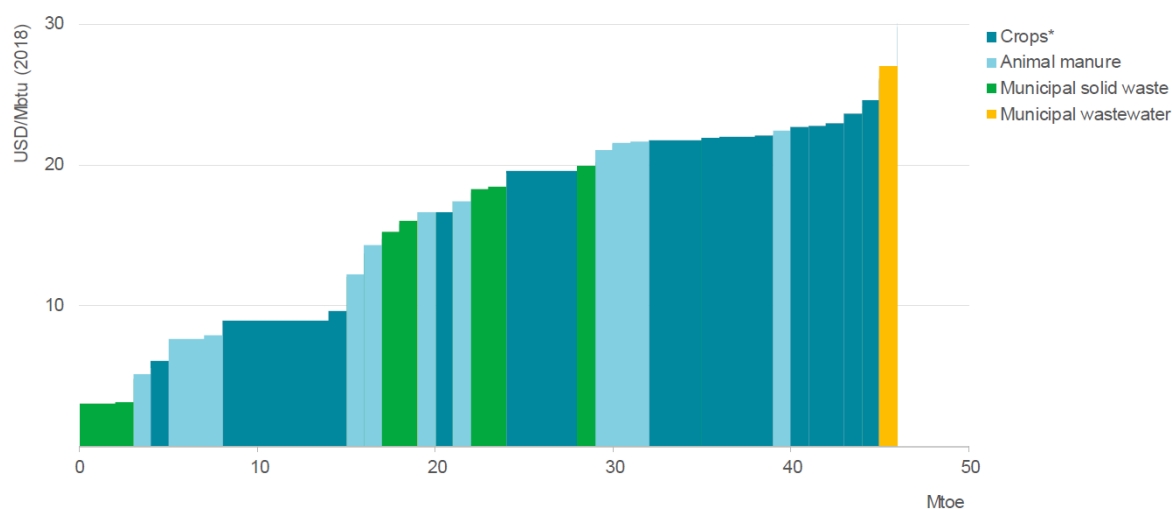
¹⁰⁰ <https://www.europeanbiogas.eu/22506-2/>; <https://www.europeanbiogas.eu/biomethane-production-potentials-in-the-eu/>

¹⁰¹ <https://climatechampions.unfccc.int/cop27-will-be-a-global-conference-with-an-african-focus/>

likely to be rather different from that in Europe and in other developed countries. Major energy priorities for Africa include widening the access to 'modern, clean and affordable energy for all of its peoples'.¹⁰²

In that context, a key priority for renewable gas in Africa is for use of raw biogas (a mixture of methane and biogenic CO₂) from anaerobic digesters as a clean cooking fuel, as well as potentially for power generation to complement intermittent renewables. According to the International Energy Agency (IEA), in sub-Saharan Africa, 900 million people lack access to clean cooking facilities. It is estimated that there is sufficient sustainable feedstock for biogas to satisfy the entire energy demand for clean cooking in Africa (see chart). The IEA acknowledges the challenge of financing the upfront costs of the digester, but envisages that by 2030 around 100 million people in Africa could be using biogas for cooking.¹⁰³

Cost of potential biogas supply in Africa by feedstock, 2018



Source: IEA.

Notes: The 'crops' category includes crop residues only; energy crops are excluded given concerns about their sustainability. One MBtu = 0.29 MWh.

For much of Africa, there is a less strong case for upgrading biogas to biomethane on account of the lack of existing natural gas infrastructure, so the main focus at the COP is likely to be on stimulation of production and use of raw biogas for cooking and for small-scale power generation in Africa as well as in other developing countries.

For low-carbon hydrogen, the focus for Africa is likely to be as a producer of hydrogen, or derivatives like ammonia, to export to developed markets—particularly from North Africa to Europe, given its relative proximity. Exports could also potentially target North-East Asia, although it may be harder for Africa to compete with low-cost supplies from the Middle East in that market. Use of low-carbon hydrogen within Africa is likely to be more challenging given its relatively high cost compared with fossil fuels.

At COP 26, there was considerable debate regarding the extent to which the developed world would be able and willing to provide financing to support the energy transition in the developing world, and this theme is likely to develop further at COP 27. This could be particularly relevant to consideration of low-carbon hydrogen investments. For example, Morocco has been frequently mentioned as a potential supplier of green hydrogen to Europe.¹⁰⁴ At one level it makes little sense to install renewable power to make hydrogen in Morocco when over 60 per cent of Morocco's power generation is from coal, as the renewable power would be better used to decarbonize the power grid in Morocco. Potentially, however, a deal could be negotiated for Europe to finance large-scale renewable power to help Morocco decarbonize, in exchange for just part of that electricity being used for low-carbon hydrogen for export to Europe. This approach has certain parallels with previous fossil fuel

¹⁰² IEA International Energy Agency (2022), *Africa Energy Outlook 2022*, <https://iea.blob.core.windows.net/assets/6fa5a6c0-ca73-4a7f-a243-fb5e83ecfb94/AfricaEnergyOutlook2022.pdf>.

¹⁰³ <https://www.iea.org/reports/outlook-for-biogas-and-biomethane-prospects-for-organic-growth>

¹⁰⁴ See for example, the German-Moroccan hydrogen initiative, <https://idw-online.de/de/news751895>.



export deals whereby an export project developer had an obligation to provide domestic supply to the host country to promote economic development in that country.

Thus the main focus at the COP for renewable gas in Africa and in other developing countries is likely to be on use of locally produced biogas as a clean cooking fuel and for power generation to complement intermittent renewables. This could be complemented by potential financing deals to help developing countries decarbonize in return for exports of green hydrogen.

Hydrogen leakage and global warming potential

Since COP 26, some significant work has been published by the UK government, updating the understanding of the global warming potential (GWP) of emissions of hydrogen to the atmosphere. This new data has led to some alarmist headlines like 'Miracle Fuel Hydrogen Can Actually Make Climate Change Worse.'¹⁰⁵ This concern has parallels with the growing understanding in recent years of the global warming impact of methane leakage, and how in some circumstances that could call into question claims that natural gas is a cleaner fossil fuel than coal.¹⁰⁶ It is likely that this new understanding will also be reflected in discussions at COP 27.

For hydrogen, the understanding of the impact of leakage is still evolving, but the overall conclusion appears to be that, while it is important to take all steps to minimize leakage (and given the high cost of clean hydrogen, there will be strong incentives to do so), even a 'worst case' leakage scenario does not outweigh the carbon savings from switching away from fossil fuels. According to the detailed study commissioned by the UK government, the GWP of hydrogen over a 100-year time horizon is 11 times that of CO₂ (with an uncertainty of +/-5), and over a 20-year time horizon it is 33 (with an uncertainty range between 20 and 44).¹⁰⁷ These numbers compare with GWPs for methane of around 25–35 times that of CO₂ over a 100-year horizon and around 85 times that of CO₂ over a 20-year horizon.¹⁰⁸

The UK government report concludes that under an illustrative scenario of future global hydrogen usage assuming between 1 and 10 per cent leakage from hydrogen infrastructure (the latter seeming very high), the estimated hydrogen emissions to atmosphere could range between 9 and 95 million tonnes per year, equivalent to between 100 and 1,000 million tonnes of CO₂ equivalent over a 100-year horizon. Most importantly, however, the same scenario estimates a reduction of around 26 000 million tonnes per year of CO₂ which would otherwise have been emitted had fossil fuels been used instead of hydrogen. Thus, while it is clearly important to take all steps to minimize hydrogen leakage, the potential for leakage does not significantly impact the savings in CO₂ emissions from replacing fossil fuels with hydrogen.

Conclusion

At a high level, it is likely that, as at COP 26, renewable gases will not form a major part of the wide-ranging discussions at COP 27, which are more likely to focus on the growing challenges of decarbonization in the context of energy security and growing energy poverty, together with the challenges of financing the energy transition. However, as described above, it is reasonable to expect that there should be more discussion on the role of biogas and biomethane than was the case at previous COPs. For low-carbon hydrogen, it will be interesting to see whether deals can be reached to help developing countries decarbonize while also providing supplies of hydrogen to developed markets. Whatever happens at COP 27, it seems clear that despite, or perhaps because of, the unprecedented high prices of fossil-derived natural gas, renewable gases should take on a growing importance as the challenges of cost and scale are addressed in the coming months and years.

¹⁰⁵ <https://www.bloomberg.com/news/features/2022-05-31/hydrogen-fuel-investments-could-risk-making-global-warming-worse>

¹⁰⁶ See, for example, Stern (2022): <https://www.oxfordenergy.org/publications/measurement-reporting-and-verification-of-methane-emissions-from-natural-gas-and-lng-trade-creating-transparent-and-credible-frameworks/>.

¹⁰⁷ https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1067144/atmospheric-implications-of-increased-hydrogen-use.pdf

¹⁰⁸ See Stern, OIES (2022) for more details on the impact of methane leakage, <https://a9w7k6q9.stackpathcdn.com/wpcms/wp-content/uploads/2022/01/Measurement-Reporting-and-Verification-of-Methane-Emissions-from-Natural-Gas-and-LNG-Trade-ET06.pdf>.



IMPACT OF THE UKRAINE WAR ON NUCLEAR POWER AND COP 27

Adnan Shihab-Eldin, Charles McCombie, H-Holger Rogner, Robert J. Budnitz, Robert N. Schock, and Noura Y. Mansouri

An article published in OEF before COP 26 argued that nuclear power is mature, safe, and highly reliable, with extremely low greenhouse gas emissions, and that it compares well with all alternative low-emission electricity-producing technologies.¹⁰⁹ The article further argued that, given the necessity of reducing greenhouse gas emissions to avoid catastrophic climate changes, the nuclear energy option should be kept open, noting that the climate benefits of increasing global nuclear energy can be obtained without significant impacts on safety, security, or energy costs. Although expansion of nuclear energy would help combat climate change, it is contingent on acceptance politically and by large segments of the public, on more consistent economic performance, and on the need for the record of safe operations to be maintained and continuously advanced, including through the strengthening of the international safety regime.

In the final conclusions of COP 26 there was, however, no reference to nuclear power. This article considers to what extent Russia's ongoing war in Ukraine and the resulting focus on the political importance of energy security might affect the potential for nuclear power expansion as well as the debate surrounding nuclear power at COP 27. The global impacts of the conflict on current and potential future nuclear energy programs and plans are both political and technical. Some are relatively short term; but others may directly affect the future deployment of nuclear power—and hence the goal of greenhouse gas reductions—for decades into the future. Furthermore, there have recently been nuclear energy activities (e.g., in planning for small modular reactors [SMRs]) that may enhance the drivers for introducing or expanding nuclear energy and for directly pointing to this option in COP 27.

Following Russia's invasion of Ukraine and the ensuing international political debate on sanctioning Russia, the strong dependence of many countries on Russian oil and gas became a major issue. In the EU in 2021, gas generated almost 20 per cent of the electricity. In some smaller countries the gas supply is almost totally from Russia; and in some major economies such as Italy, Poland, and Germany, 40 to 50 per cent of the gas is of Russian origin. The EU is now putting forward proposals to reduce gas imports from Russia dramatically and to do away with oil imports totally.

Russia is also a global provider of nuclear power plants (NPPs), equipment and fuel services. It produces around one third of the world's supply of uranium hexafluoride (for uranium enrichment processing) and has about 43 per cent of the global enrichment capacity. Importantly, Russia is a leading exporter of NPPs, and often also provides access to the required funding. However, there is now a broadly recognized need to avoid too heavy a dependence on a single supplier of any energy source or essential supply infrastructure. Energy security is back high on the political agenda.

Nuclear policy changes introduced by the Ukraine war

At the time of COP 26, various previously reluctant countries had begun to accept that introducing or expanding nuclear power could contribute directly to helping them meet their declared climate goals.¹¹⁰ China and Russia were aggressively pursuing a new-build program and seeking to expand exports of NPPs. The USA, the UK, some EU member states, and numerous developing countries have been discussing the option of increased use of nuclear energy for climate reasons. In some countries, however, phasing out nuclear power was the national strategy; examples are Germany, Switzerland, South Korea, and Belgium. In other major nuclear power users, such as France, there was debate on reducing dependence on nuclear energy, partly to diversify energy supply and partly because of perceived risks.

The nuclear policies of many countries are, however, changing rapidly as realization of the importance of energy security grows in light of the prospect of losing access to Russian oil and gas. The immediate impacts of the war are exemplified at an international level by developments within the European Community. In July 2022, members of the European Parliament approved legislation which includes nuclear in the taxonomy of sustainable technologies. The positive vote was larger than

¹⁰⁹ Shihab-Eldin, A., Rogner, H.-H., Budnitz, R. J., McCombie, C., and Mansouri, N. Y. (2021), 'Keeping the nuclear energy option open', *Oxford Energy Forum* 129, 45.

¹¹⁰ Rogner, H.-H., Budnitz, R. J., McCombie, C., Mansouri, N. Y., Schock, R. M., and Shihab-Eldin, A. (2022, March), Keeping the Nuclear Energy Option Open, KAPSARC Discussion Paper, March 2022, <https://www.kapsarc.org/research/publications/keeping-the-nuclear-energy-option-open-2/>.



expected due to the concerns raised by the war. The arguments in favour were also put in an open letter signed by energy ministers from 10 EU member states, who wrote: 'As a result of Russia's unlawful actions, EU citizens and industry are suffering from high and volatile energy prices. If the Union wants to stay on the course of decarbonisation and at the same time ensure security of supply, we need a change in approach to nuclear energy.'

Individual countries have also examined their nuclear policies in response to the Russia-Ukraine war. In Belgium, the nuclear phase-out decision has been revised to extend the NPP lifetimes by a decade. According to the Belgian prime minister, 'This extension will strengthen our country's independence from fossil fuels in a turbulent geopolitical environment.'¹¹¹ South Korea also reversed its phase-out policy. The reasons given were its goal of greenhouse gas emissions neutrality, the escalation of the Russia-Ukraine war, uncertainty in the global supply chain, and energy security. In the UK, the prime minister released plans to build up to eight new nuclear plants by 2030 to ensure 'we are never again subject to the vagaries of global oil and gas prices'.¹¹² France's president is now calling for six to eight new NPPs, a clear reversal of his 2017 proposal for shutting 14 reactors to reduce the country's dependence on nuclear electricity. In Japan, the prime minister supports restarting idled NPPs in order to stabilize energy prices and supply. The recent US Inflation Reduction Act, which provides important support for nuclear energy, was passed more easily because of heightened awareness of energy security challenges.

In some small and new nuclear power countries, the Ukraine war has also had direct impacts. In Slovenia, the option of combining expansion of renewables with nuclear power rather than gas was chosen for future electricity production, with an industry official noting that the war 'gave important acceleration to the nuclear option'.¹¹³ In some currently non-nuclear-power nations, such as Poland, Latvia, and Serbia, plans or proposals for nuclear plants have now been put forward. The Polish government has signed an agreement for the potential construction of 10 small nuclear reactors. In the Philippines, a new executive order calls for further studies on the use of the long-abandoned Bataan NPP. Even in Australia, with its anti-nuclear tradition, the leaders of the new Liberal-National coalition have indicated that nuclear energy could be part of the coalition's future policy platform.

However, political opposition to nuclear power remains entrenched in some countries, such as Germany and Switzerland. In Germany, while the government announced the extension of operation of two of the three remaining nuclear plants, on a standby basis—recognizing that this approach is supported by over half the population—its anti-nuclear position remains.

As illustrated by the examples above, energy security is now high on the political agenda worldwide, and the energy security argument, combined with existing climate arguments, has significantly strengthened the political and technical drivers for expanding nuclear energy.

Technical and regulatory developments affecting nuclear expansion

In the last year or two, significant and important developments in a number of areas have enhanced the prospects that new advanced nuclear power reactors will be built soon in many countries worldwide. Some of these advances are in engineering areas, and others are related to the regulatory environment.

This latter area is vital because these advanced designs cannot become a reality unless the many nuclear regulatory agencies worldwide develop safety regulations tailored to them, these regulations are accepted in the political arena, and then they are exercised in actual licensing decisions. Current safety regulations are tailored to the existing technologies. They are technically unsuitable in many ways for assuring the safety of the new advanced designs, so revised regulations are needed.

There have been two major advances in this area in the last year or two. First, national regulatory agencies, such as the US Nuclear Regulatory Commission, are developing regulations technically tailored to the new designs, especially SMRs. Second, there is a widespread recognition that the next round of safety regulations needs to be more standardized worldwide than they have been in the past, accompanied by introduction of international oversight and enforcement. This means coordination of regulatory development in advance. This issue has been recognized for a long time. However, in the last year, spurred on by the new light the Ukraine war has cast on the potential future role of nuclear power and by the advent of some mature SMR designs, this international effort has taken on higher priority. This became clear in discussions at the International Atomic

¹¹¹ Belgium pushes off nuclear energy exit by 10 years due to Ukraine war (aa.com.tr)

¹¹² Minister admits energy plan 'won't help with bills now' as Labour says it will cost people more | ITV News

¹¹³ War in Ukraine generates interest in nuclear energy, despite danger - The Washington Post

Energy Agency during the first Nuclear Harmonization and Standardization Initiative meeting in June 2022 as well as in several other forums recently.

On the reactor-development front, the furthest along of the advanced reactor development projects around the world are getting closer to being accepted and built. A handful of new SMR projects are under construction worldwide, and many more will be soon. This increased pace of development is the result partly of the natural evolution of the many projects, but has also been influenced by the changes in attitudes toward nuclear power that have emerged since the Ukraine war began.

Not all the impacts of the Ukraine war enhance the prospects for global nuclear power expansion. The war may **also** restrict Russia's ability to supply the global nuclear services mentioned above, especially if the Ukrainian proposals to extend sanctions against Russia to include nuclear activities are adopted. This may slow nuclear adoption or expansion in some of the many countries with which Russia has cooperation agreements. Many of these negative impacts, however, will be short or medium term, because the lost capabilities can be replaced by competitors or by reinstitution of the Russian position should the war come to an end in a way that allows this.

Financial developments affecting nuclear expansion

With energy security back on the agenda globally, a critical concern is financing of essential energy infrastructures targeted at replacing fossil-fuel-burning plants. Nuclear power infrastructure investment is generally characterized by high upfront capital outlays and long amortization periods but considerably lower operating costs. Given the new geopolitical circumstances (and supply chain delays), foreign direct investment is expected to decline while the cost of borrowing is likely to rise. For nuclear investments, SMR developments may provide a positive impetus. SMRs (with a capacity of 50–300 MW) require lower total capital **involvement** than large reactors (1,000–1,600 MW). The greatly reduced economic risk exposure may enable financial participation by private sector sponsors and financial institutions in partnership with governments. Moreover, SMRs have been earmarked for industrial process heat, district heat, seawater desalination, and hydrogen production. This wider spectrum of applications may attract more investors.

Even before the Russia-Ukraine war, climate and resource concerns were persuading more governments and private investors to support nuclear expansion, and this tendency has intensified. Financial support for promoting new NPPs has strengthened. For example, the US, UK, and some other governments are providing sites and research and development funding, and several SMR start-ups have been funded by private investors at levels required for demonstration or pilot reactors.

A critical open issue, however, is the readiness of major commercial financial institutions to fund new-build NPPs and their associated infrastructures. Since the mid-1980s, financial institutions have generally shied away from financing nuclear power projects. Since the turn of the millennium, the main reasons have been the concept of sustainability of nuclear energy and a fundamental lack of knowledge about the risks and benefits of nuclear projects. The aforementioned inclusion of nuclear power in the EU parliament's sustainable-technology taxonomy and the efforts towards an internationally harmonized SMR licensing approach are expected to greatly lower the reservations of financial sponsors of nuclear projects who are concerned about the environmental, social, and governance factors determining the sustainability of their investments.

Conclusions and recommendations for COP 27

Already before COP 26, the contribution to climate mitigation that would result from increasing global nuclear power was clear. Many of the recent nuclear policy changes described above result from the Ukraine war and the consequent re-emergence of energy security as a high-priority item on national energy policy agendas. The war has also contributed to the acceleration of technical advances in new reactor designs, speeding the deployment of SMRs and the standardization and coordination of regulatory regimes. The war also has contributed to softening some of the opposition to nuclear power and to wider recognition that all technologies capable of delivering clean energy, sustainably and at large scales, must be considered on an equal playing field if the world is to meet the Paris Agreement and COP 26 climate goals.

Worryingly, some European countries are derailing the COP 26 goal of phasing down unabated coal by reverting to coal to replace Russian gas. Nevertheless, momentum is building towards a significant expansion of global nuclear power capacity over the next decades. Nuclear energy should play an important role in the energy transition. But for the promise of a nuclear 'renaissance' to materialize, there is a need for realism and avoidance of overpromising amongst policymakers and industry

representatives—and an imperative to continue work to address sociopolitical challenges, to control costs of all new builds, to maintain consistent economic performance, and to speed up the strengthening of safety regimes on an international scale.

It is too soon to conclude that another nuclear renaissance is in the making. Some precursors are visible, but it remains to be seen if they will lead to lasting change at a sufficient level to contribute significantly to improving global energy security and to accelerating the transition to net zero emissions. Alternatively, as was the case following the Fukushima accident, a budding renaissance may encounter unforeseen events that could derail it. An example would be if a significant amount of radioactivity was released as a result of military activities at a nuclear facility, which is a current concern at the Zaporizhzhia plant in Ukraine.

It would be a serious omission if these major shifts in views and policy changes concerning the nuclear energy option are not accounted for in COP 27 discussions; in fact, the nuclear option should share centre stage in the debate at COP 27. Nuclear energy deserves to be recognized explicitly in the final communique as an important clean supply technology within the energy transition towards sustainability and zero emissions. COP 27 should include language in its final communique to encourage countries to consider adopting policies and strategies that enable nuclear power, as part of any future global energy mix, to contribute its share to the electricity grid and to other industrial applications, side-by-side with renewables and decarbonized hydrocarbon fuels.

CAN RAPID PROGRESS ON ELECTRIC VEHICLES ENABLE MORE AMBITION ON ZERO-CARBON TRANSPORT?

Anders Hove

In August 2021, various parties signed the COP 26 declaration on accelerating the transition to 100 per cent zero-emission cars and vans. The declaration commits to achieving 100 per cent zero-carbon passenger vehicles and vans in new vehicle sales by 2040 worldwide, and in major markets by 2035. It also states that fleet operators and municipal fleets should transition to zero-carbon cars and vans by 2030. In practice, this is likely to imply adoption of electric vehicles (EVs) in place of combustion engines.

Signatories included nearly 40 national governments, dozens of city and provincial governments, several major automakers and equipment providers, major investment firms, electric utilities, and fleet owners. European countries as well as emerging economies such as Mexico and India joined the declaration, but not the US, China, or Japan. US, Chinese, and European automakers signed on, but no Japanese carmakers.

The electric vehicle transition has accelerated over the past two years, with more models available from almost every carmaker, a rising EV share in new vehicle sales in major car markets, and EV options becoming available for buses, various utility vehicles, and trucks. Charging infrastructure has continued to expand as well. There remains considerable uncertainty about the trajectory to meeting the COP commitment to low-carbon transport, given the distance to reach 100 per cent EV sales in leading markets by 2035, and policymakers have major concerns about the supply of critical minerals and battery materials.

For the next COP, led by Egypt, two major questions can help determine where the COP 26 signatories go next on low-carbon transport. Broadly, they relate to whether the parties focus on expanding the number of countries and other entities committed to the terms of the existing declaration or on making the declaration itself more ambitious.

- Can the growing success of EVs bring more commitments from more parties to the existing COP 26 declaration—especially in major car markets like Japan and the US?
- Can the transport sector begin to move beyond targets for new cars and vans and begin to add in more challenging heavy-duty transport and utility vehicles—especially in retiring the oldest and most polluting vehicles and replacing them with emissions-free vehicles?

While more difficult, progress on the latter goal would help ensure that vehicle electrification produces the greatest benefits for both climate and human health, especially among those living in urban areas where heavy-duty vehicle emissions predominate as a source of air pollution.

Growing EV share, led by China and Europe

The recent growth in EV market share bodes well for the COP target of 100 per cent EV sales in major markets by 2035 and worldwide by 2040. In 2021, total battery electric vehicle (BEV) and plug-in hybrid EV sales surged 108 per cent year-on-year, led by China, which saw a 155 per cent increase. In a single year, between 2020 and 2021, the BEV and plug-in hybrid EV market share for new vehicle sales rose globally from 4.1 per cent to 8.5 per cent, according to the International Energy Agency. Among the major car markets, the BEV share rose from 2.4 per cent to 3.4 per cent in the US, from 5.4 per cent to 9.1 per cent in the EU, and from 6.2 per cent to 15.5 per cent in China, the world's largest new car market.

Exemplified by Norway, where EV sales now dominate, individual European countries have taken the lead in boosting EV adoption through specific incentives. Denmark, the Netherlands, Sweden, and Iceland all saw surging plug-in sales in 2021.

The first half of 2022 provided more encouraging signs. On a monthly basis, China's EV share crossed 25 per cent in mid-2022, with the potential to surpass 30 per cent by the end of the year. In Europe, BEV sales have risen to a 12 per cent share, and new low-cost models are likely to help sales in the second half of the year. The US EV market share has even started to catch up, reaching a 5.6 per cent share in the second quarter.

New car models are facilitating the transition to EVs in most markets. China has seen an explosion in new EV brands, most of which have connections to existing domestic carmakers. Whereas China's domestic EVs once focused only on the low or high end, the country now has a variety of attractive models at various price ranges. NIO and Geely have been joined by newer players like XPeng, Li Auto, and Zeekr (owned by Geely). Established players like SAIC and BYD are continuing to expand their product offerings.

In Europe, attractive mid-range smaller vehicles from VW, Fiat, Skoda, Kia, and Hyundai have captured market share from Tesla and brought EVs to a wider range of car buyers. Chinese EVs have also begun to arrive in Europe.

In the US, the market with the least diverse EV fleet, Tesla continues to dominate, with a market share of almost 70 per cent in the first half of 2022. This is likely to change as more Ford F-150 Lightnings, Mustangs, Rivians, and VW ID.4s come into volume production in 2023. The number of EV models for sale in the US rose from 19 in late 2021 to 33 in mid-2022, and the number of EVs for sale with a range over 300 miles tripled. However, the US preference for larger SUVs and tariffs on imported vehicles have hindered availability of lower-priced models there. The new North America assembly requirements for the \$7,500 federal tax credit may further discourage global carmakers from bringing affordable EVs to the US.

Policy not necessarily driving trends

Recent increases in EV sales have enabled more ambitious policies in many markets, but policy is not necessarily driving EV adoption currently. For example, China's rising EV sales have far surpassed the country's 2025 target to account for 20 per cent of the new vehicle market. As a stimulus measure, China has delayed phasing out subsidies for smaller, slower New EVs, and other policies such as easier license plate registration for EVs have played a role. A rising number of EV models at all price levels, better onboard information technology, new domestic EV brands, growing battery manufacturing capability, plus expanded charging infrastructure (including battery swap stations) have together helped expand the EV market in China. China presently has no deadline for phasing out combustion engines.

In Europe, several countries have announced plans to phase out combustion passenger vehicles, and in June 2022 the EU adopted a preliminary policy setting a 2035 target for such a phase-out, in line with the COP target. Norway has the most ambitious phase-out date of 2025, followed by Iceland, Ireland, Sweden, and the Netherlands for 2030, Denmark and the UK for 2035, and France for 2040. However, the International Council on Clean Transportation notes that these countries currently lack implementation details or binding regulations, making these targets notional for now. Similarly, the EU is still working on implementation and regulations, which will include stricter CO₂ emissions regulations for all vehicles and including road transport into the EU's emissions trading scheme.

The EU's 2035 target also includes an exception for so-called e-fuels, or carbon-neutral liquid fuels powering combustion vehicles. While carbon-neutral e-fuels are unlikely to be economical by 2035, given the advances in battery technology and the low efficiency of making liquid fuels from renewable sources, such an exception could encourage carmakers to delay EV investments in the hope that their combustion vehicles will retain political support.

In the US, state-level policy has played an important role in EV adoption and scaling up manufacturing. California's zero-emission vehicle (ZEV) credits were instrumental in the early rise of Tesla. California still accounts for over 40 per cent of EV sales, followed by other states that abide by California's ZEV mandate.

The US government has also fostered EV adoption with tax credits for EV purchases and installation of EV charging infrastructure. Infrastructure legislation adopted in 2021 enables extra subsidies for state-designed charging infrastructure programs, and the August 2022 Inflation Reduction Act substantially extended tax credits for EV purchases, while limiting such credits to vehicles manufactured in North America and tying future credits to domestic battery manufacturing and sourcing of minerals outside of China or Russia.

While various subsidies for EV purchases, charging infrastructure, or CO₂ limits have encouraged EV adoption, technology gains have likely played a more important role in transforming the perception of electric cars from the low-range eco-options of the early 2000s to today's halo cars (and trucks). For example, the 2011 Nissan Leaf—still one of the most successful EVs worldwide—had a range just over 100 km, and charged at speeds of 22 kW or 50 kW. Now, the typical EV offers a range over 400 km and fast charging over 100 kW. Higher-end EVs might offer charging of 200 kW or better. GAC Aion claims it will shortly launch a vehicle with 400 kW charging and a range of over 1,000 km. The faster acceleration provided by EVs has led to an arms race over acceleration times, but even EV city cars like the Renault Zoe or Fiat 500e provide superior handling and performance compared to their combustion equivalents.

Improved battery energy density and falling prices for batteries explain most of this improvement. On a cost-per-kWh basis, battery technology exhibits a technology learning rate faster than either wind power or solar photovoltaic, reflecting its modular characteristics, use in a wide variety of applications, and the many technology pathways for optimizing performance, safety, materials usage, and other factors. In recent years, convergence towards a uniform lithium-ion battery chemistry based on nickel-manganese-cobalt has reversed, with lithium-iron-phosphate competing to offer good performance at a lower price. Newer battery chemistries, not limited to solid state lithium-ion, have high potential to enter the market at scale in the next five years.

The recent supply chain disruptions and shortage of battery materials will further incentivize innovation in battery technology, augmented by government-led research and development in every aspect of battery technology. The demand for grid-scale energy storage is also encouraging new entrants, while also promising a second market for used EV batteries. Battery swap technology, led by Chinese carmakers such as NIO, could enable rapid electrification of fleet vehicles and heavy-duty transport. Power shortages and electricity price spikes in various regions—including California, Texas, and China—are likely to spur new interest in vehicle-to-grid (V2G) or vehicle-to-home technologies, as already shown by the popularity of the Ford F-150 Lightning, which advertises home power backup as a key selling point. VW has indicated future EV models will come with V2G capability as a standard option.

Batteries and battery materials recognized as a critical issue

Both policymakers and the automotive industry in the US and Europe have increasingly recognized the urgency of diversifying supplies of battery materials and battery supply chains. Even before the supply chain disruptions in 2022—which halted or threatened battery manufacturing in parts of China and nickel supplies from Russia—Europe was moving to boost domestic battery manufacturing capacity, and automakers were signing long-term supply contracts for batteries and minerals. The 2022 disruptions further boosted policy efforts to diversify supplies.

As of 2022, according to Benchmark Minerals, China accounted for over 80 per cent of global anode and cathode production, almost 80 per cent of global battery cell manufacturing, and the vast majority of chemical processing and refining for battery materials such as nickel, cobalt, lithium, manganese, and graphite. Indeed, 100 per cent of global graphite processing is in China, and 99 per cent of lithium-iron-phosphate cathode material is made in China, along with 78 per cent of nickel-manganese-cobalt-811 cathode material.

On the mining side, outputs of lithium, cobalt, manganese, and nickel are all concentrated in just a few countries. The International Energy Agency has noted new mines typically take over a decade to approve and begin production. While both Canada and the US are likely to boost mining output, shortages of key minerals are almost certain to represent the largest bottleneck to expanding EV production over the next few years. Incentives built into the recent Inflation Reduction Act in the US,

and similar initiatives in Europe, could boost minerals processing and battery manufacturing in America and Europe. Increased recycling—until now hindered by the lack of used batteries—will likely also play a role.

Charging infrastructure growing, but major gaps remain

Once considered a nearly impossible chicken-and-egg dilemma, EV charging infrastructure is now growing rapidly, and most markets have sufficient fast charging infrastructure to enable convenient long-distance trips. The number of charging points will have to continue to expand to match the growth of EV numbers and enable EV adoption to move beyond early adopters with easy access to home charging.

Policymakers and carmakers alike have tended to focus on the number and speed of public chargers as indicators of the infrastructure rollout, which reflects the need for capital investment. However, charging numbers alone do not capture the full picture. In the US, Europe, and China, broken or poorly functioning chargers are a major complaint, with the Electrify America network coming in for rising criticism in the US.

While many charging network operators claim to monitor and limit downtime—increasingly required as a condition for government subsidies—information on charger function or availability is often unavailable on popular apps or navigation tools, leading to unnecessary range anxiety. Many charging networks advertise interoperability by accepting credit and bank cards, or subscriptions across charging networks, but in practice payment for public charging is far from a seamless experience. The main exceptions include plug-and-charge networks like Tesla's proprietary network, and public charging in China, which usually relies on a single scan of a QR code to enable payment via WeChat or Alipay.

Conclusions: rapid progress, daunting challenges for COP 27

The rapid growth of EV adoption in major markets bodes well for the COP target for EVs to make up 100 per cent of new vehicle sales in these markets by 2035. Technology development, automaker investment, and consumer interest are all starting to align. Even in the most challenging fields, such as heavy-duty transport, technology solutions such as battery swap are starting to emerge. That said, EVs have a long way to go.

The two largest challenges are charging and battery supplies. Charging infrastructure is expanding, but the public charging experience is inadequate to meet the needs of many users. The concentration of battery manufacturing and materials supplies in just a few countries is already a limiting factor for the supply of EVs in Europe and the US, keeping prices high for both new and used EVs, and hindering introduction of more mid-range EV models. Policymakers and the auto industry have their work cut out for them.

The COP 26 declaration established clear goals for 2035 and 2040, focused on reaching 100 per cent EV penetration in major markets and worldwide by those dates, respectively. The declaration contained few specifics. Given the bottlenecks now hindering EV adoption, there is potential for COP 27 to do more to accelerate this process. This could include new provisions on boosting investment in mining and manufacturing in major markets, improving coordination and standards around EV charging interoperability, and targeting subsidies for retiring the oldest and most polluting combustion vehicles, particularly in fleets and goods transport. Expanding the COP 26 declaration to cover a wider variety of issues, particularly larger vehicles, could help bring more benefits to the developing world, where EVs are likely perceived as an option only for the wealthiest households or for countries with large automakers. Expanding the base of support during the Egyptian Presidency will be critical to progress, and may require more effort to demonstrate the economic case for electrifying vehicle fleets as an energy security measure.

The COP 26 declaration also treated electric cars and vans as a standalone issue, which was appropriate at the time. Since then, the rapid increase in grid-tied energy storage to balance renewable energy output and enhance resilience has presented an opportunity to highlight the potential for EV charging to play a similar role. So far, smart charging and aggregation of EV charging as a grid resource are both in their infancy. V2G is even less developed, though more vehicles are coming on the market with this capability. Setting a voluntary target through the COP may be an appealing way to push governments and industry to work together to ensure that EV charging not only is grid-friendly but actively supports the transition to clean energy.



THE GLOBAL METHANE PLEDGE: AN URGENT NEED FOR PROGRESS AT COP 27

Jonathan Stern

In September 2021, the US, EU, and seven additional countries committed to a Global Methane Pledge. Two months later, the launch of the Pledge was one of the high-profile successes at COP 26. The Pledge is

a collective effort to reduce global methane emissions by at least 30 percent from 2020 levels by 2030 which could eliminate over 0.2 degrees C warming by 2050. Participants also commit to moving towards using the highest tier IPCC [Intergovernmental Panel on Climate Change] good practice inventory methodologies, as well as working to continuously improve the accuracy, transparency, consistency, comparability, and completeness of national greenhouse gas inventory reporting... and to provide greater transparency in key sectors.¹¹⁴

Methane is the second-largest contributor to warming after carbon dioxide and by far the biggest contributor of the non-CO₂ gases. It has attracted increasing attention because of the urgency to implement measures which can have a significant impact on global temperature rise prior to 2050. Working Group 3 of the IPCC's 6th Assessment Report, published in April 2022, concluded:

Global methane emissions from energy supply, primarily fugitive emissions from production and transport of fossil fuels, accounted for about 18% of global GHG [greenhouse gas] emissions from energy supply, 32% of global methane emissions and 6% of global GHG emissions in 2019. About 50–80% of CH₄ emissions from these fossil fuels could be avoided with currently available technologies at less than US\$50/ton CO₂e.¹¹⁵

The Pledge includes methane from all anthropogenic sources, which means agriculture and waste as well as fossil fuels. But while agriculture (and in some countries waste) accounts for a larger share of methane emissions than fossil fuels, the latter are the immediate focus because, compared with other sectors, reductions involve a relatively small number of companies at costs ranging from relatively low to (at 2022 international prices) substantially negative. Both the International Energy Agency and UN Environment Programme's Climate and Clean Air Coalition have set targets of at least 75 per cent of methane reductions from fossil fuels by 2030 (compared to 2020). The Pledge combines with the European Union's proposed Regulation on Methane Emissions Reduction,¹¹⁶ and the work of the International Methane Emissions Observatory, to promote corporate reporting of emissions based on the Oil and Gas Methane Partnership framework Version 2.0 (OGMP2) Gold Standard.

By September 2022, the Pledge had 122 country signatories, an increase of 17 since COP 26, having added important fossil fuel producing and exporting countries Egypt, Oman, Qatar, Trinidad and Tobago, and Uzbekistan, but still lacked some of the biggest global emitters including Algeria, Australia, Azerbaijan, China, India, Iran, Kazakhstan, Russia, South Africa, Turkmenistan and Venezuela. Although the European Union was a co-founder, seven member states (Austria, Czech Republic, Latvia, Lithuania, Poland, Romania, and Slovakia) have yet to sign individually. Equally problematic is that companies from most of the non-signatory countries are not among the 82 corporate members of the OGMP2 framework. The vast majority of members are European companies (the Algerian pipeline companies Medgaz and Empl, and China Gas Holdings are exceptions).¹¹⁷ A rough estimate is that in 2021, Pledge signatory countries accounted for 65 per cent of global crude oil and condensate production, 50 per cent of natural gas production, and 20 per cent of coal production.¹¹⁸

The absence of China is significant, as at COP 26 the US and China signed a Declaration on Enhancing Climate Action with specific emphasis on cooperating 'to develop additional measures to enhance methane emission control, at both the national and sub-national levels.'¹¹⁹ No further progress has been reported, probably due to general friction in political relations

¹¹⁴ <https://www.globalmethanepledge.org/>

¹¹⁵ IPCC (2022), Climate Change 2022, Mitigation of Climate Change. Working Group III Contribution to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change, SPM-37, Para C.4.5. <https://www.ipcc.ch/report/sixth-assessment-report-working-group-3/>

¹¹⁶ European Commission, Proposal for a Regulation of the European Parliament and of the Council on Methane Emissions Reduction in the Energy Sector and amending Regulation (EU) 2019/942, COM (2021) 805 final, Brussels, 15.12.2021.

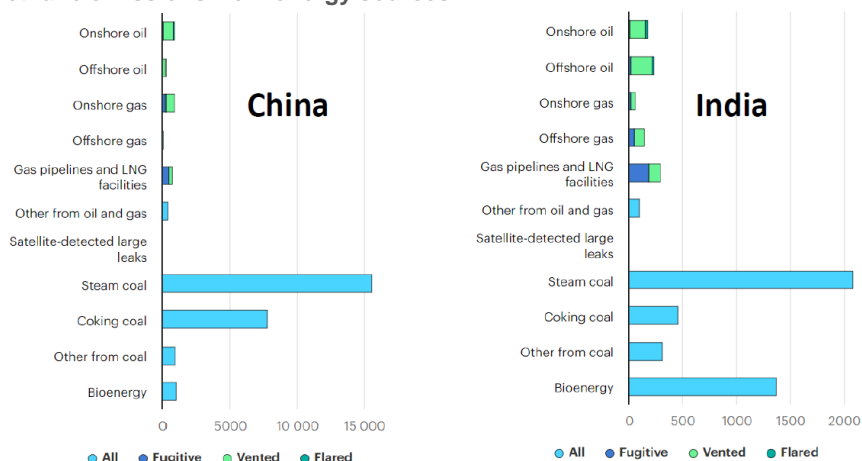
¹¹⁷ <https://www.ogmpartnership.com/partners>

¹¹⁸ BP Statistical Review of World Energy, 2022. [Statistical Review of World Energy 2022 \(bp.com\)](https://www.bp.com/content/dam/bp/pdf/statistical-review/bp-statistical-review-2022.pdf)

¹¹⁹ US Department of State (2021, November 10), U.S.-China Joint Glasgow Declaration on Enhancing Climate Action in the 2020s, Para 8, 1C.

connected with Taiwan. The International Energy Agency considers China a 'committed country' with respect to methane reduction, due to the Chinese Oil and Gas Methane Alliance.¹²⁰ Nearly half of China's emissions are from energy production, of which more than 80 per cent are coal-related, and this may account both for reluctance to sign and for the potential for US collaboration.¹²¹ Only 16 per cent of Indian emissions are from the energy sector (more than 60 per cent are from agriculture), but more than half of these are coal-related.¹²² Russian absence reflects political tensions with the US and Europe which worsened substantially with the Russian invasion of Ukraine. In relation to the Russian oil and gas sector, there is already regulation in place, with methane having been classed as a pollutant since the end of the Soviet era.

Chinese and Indian methane emissions from energy sources



Source: IEA Methane Tracker 2022.

The immediate ambition of the Pledge seemed to be limited by the Global Methane Pledge Energy Pathway, announced in June 2022, which committed \$59 million in dedicated funding and in-kind assistance: \$4 million for World Bank Global Gas Flaring Reduction Partnership flaring, \$5.5 million to support the Global Methane Initiative, \$9.5 million for the International Methane Emissions Observatory, and \$40 million from the Global Methane Hub for methane mitigation in the fossil fuel sector.¹²³ Given the size and urgency of the task, this does not seem a very large sum of money and seems intended to be mostly focused on signatories to the Pledge, such as Argentina and Nigeria, which have committed to present specific measures that will lead to the limitation of methane emissions from the oil and gas sector by COP 27. But many of the biggest emitters have not signed the Pledge, and political relations with major funding governments may prevent participation. It is not clear whether any institution has been tasked with bringing additional countries into the Pledge or what inducements have been or can be offered. Standards on methane emissions to be introduced in its proposed Methane Regulation will create some specific leverage for the EU on all countries which supply its member states with fossil fuels.

For some governments—especially those for which these emissions are related to a significant share of their GDP, in relation to either fossil fuels or agriculture—the consequences of signing the Pledge may have required more time to analyse, and there are hopes that at COP 27 more countries will come on board. The Pledge needs to be supported by all of the big emitters, with China, India, and Russia probably essential for any claim that it can be considered a truly global initiative.

As it stands, the Pledge is too general and needs specific commitments from national governments in relation to individual sectors such as energy. While legally binding commitments are probably unrealistic, agreement on specific national emissions

<https://www.state.gov/u-s-china-joint-glasgow-declaration-on-enhancing-climate-action-in-the-2020s/>

¹²⁰ International Energy Agency (2021), *Curtailing Methane Emissions from Fossil Fuel Operations*, 22. <https://www.iea.org/reports/curtailing-methane-emissions-from-fossil-fuel-operations>

¹²¹ International Energy Agency Methane Tracker 2022 Methane Tracker Data Explorer, Analysis, IEA. <https://www.iea.org/data-and-statistics/data-tools/methane-tracker-data-explorer>

¹²² Ibid.

¹²³ US Department of State (2022, June 17), 'U.S.-EU Joint Press Release on the Global Methane Pledge Energy Pathway'. [U.S.-EU Joint Press Release on the Global Methane Pledge Energy Pathway - United States Department of State](https://www.state.gov/u-s-eu-joint-press-release-on-the-global-methane-pledge-energy-pathway/)



reduction pledges in relation to their energy sectors would indicate that governments recognize the importance of methane and are willing to step up efforts to reduce emissions.

Failure to make progress at COP 27 in relation to additional signatories, specific national pledges with corporate as well as government support, and substantially increased financial commitments, risk the Pledge becoming one of many bold initiatives announced with great fanfare and subsequently largely forgotten. Given the importance and urgency of reducing greenhouse gas emissions, this would not be a good signal for progress on global climate action.

GREEN FINANCE FOR THE DEVELOPING WORLD—A KEY ISSUE FOR COP 27 NEGOTIATIONS

Alice Eliet-Doillet and Andrea Giulio Maino

Opportunities and challenges for scaling climate finance

The scale of the energy transition requires a sizable increase of investments in reducing the carbon intensity of the energy system and the energy intensity of individual economies.¹²⁴ The International Energy Agency (IEA) recently estimated that in a net-zero scenario, investments in the energy system need to increase from the current level of USD 1.5 trillion a year to USD 4.5–5.0 trillion a year between 2030 and 2050. Total investments range between USD 100 trillion and USD 150 trillion between 2020 and 2050.¹²⁵

Other estimates provided by the International Monetary Fund (IMF) range from USD 3 trillion to USD 6 trillion per year until 2050.¹²⁶ The total level of current investments, at USD 630 billion, is just a fraction of what is needed for the transition. With the total share of financial assets at USD 210 trillion, the main challenge that policymakers face is how to shape incentives to direct capital towards climate mitigation and adaption assets and projects.

Investments are needed across various economic sectors, with manufacturing and power sectors having the most urgent need to reduce their carbon footprint. The Intergovernmental Panel on Climate Change highlights that there has been a consistent expansion of policies related to mitigation with increase in investments in low-greenhouse-gas technologies and infrastructure.¹²⁷ However, the policies' coverage and climate finance flows are uneven across economic sectors and particularly across countries.¹²⁸

A sizable investment will be needed in middle- to low-income countries (MLICs).¹²⁹ MLICs as a group are characterized by an increase in GDP per capita and growing demand for energy, which will increase CO₂ emissions at least in the short to medium term to support their economic development.¹³⁰

¹²⁴ Here and in the rest of the paper, carbon intensity of the energy system is considered in the sense of the Kaya identity—carbon dioxide emissions per unit of energy consumed. Kaya, Y. and Yokoburi, K. (1997), *Environment, Energy, and Economy: Strategies for Sustainability*, United Nations University Press, ISBN 9280809113; Yamaji, M., and Nagata, K. (1993), 'A study on economic measures for CO₂ reduction in Japan', *Energy Policy*, 21:2, 123–132.

¹²⁵ IEA, 'Net Zero by 2050—A Roadmap for the Global Energy Sector', 2021, Paris, <https://www.iea.org/reports/net-zero-by-2050>.

¹²⁶ Georgieva K., Adrian T., Global Landscape of Climate Finance 2021, Climate Policy Initiative, IMF, August 2022, <https://www.imf.org/en/Blogs/Articles/2022/08/18/public-sector-must-play-major-role-in-catalyzing-private-climate-finance>

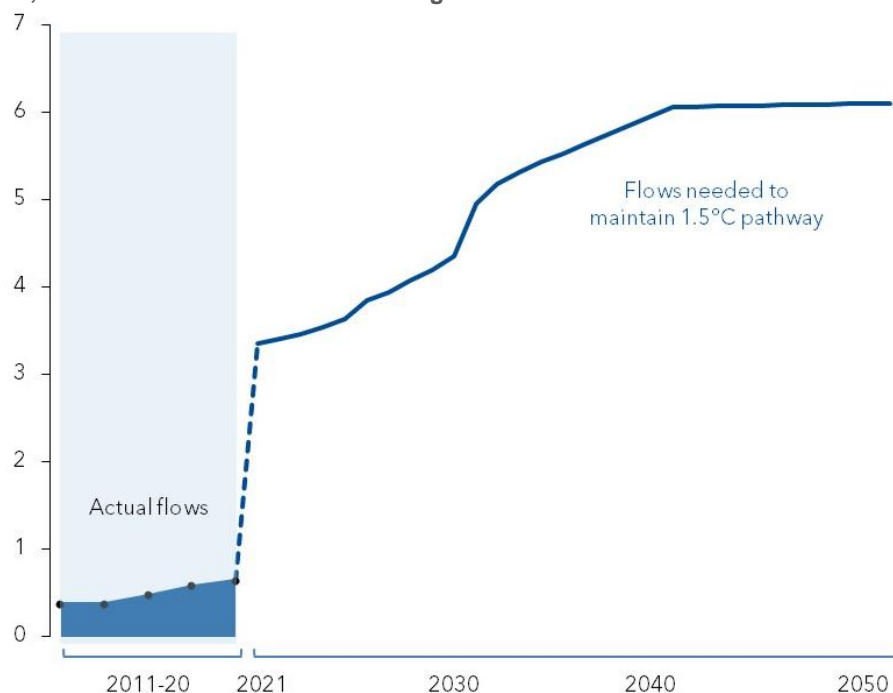
¹²⁷ IPCC, 2021: Summary for Policymakers. In: Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [Masson-Delmotte, V., P. Zhai, A. Pirani, S.L. Connors, C. Péan, S. Berger, N. Caud, Y. Chen, L. Goldfarb, M.I. Gomis, M. Huang, K. Leitzell, E. Lonnoy, J.B.R. Matthews, T.K. Maycock, T. Waterfield, O. Yelekçi, R. Yu, and B. Zhou (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, pp. 3–32, doi:10.1017/9781009157896.001. https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WGI_SPM.pdf

¹²⁸ IPCC, 2022: Summary for Policymakers. In: Climate Change 2022: Mitigation of Climate Change. Contribution of Working Group III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [P.R. Shukla, J. Skeea, R. Slade, A. Al Khourdajie, R. van Diemen, D. McCollum, M. Pathak, S. Some, P. Vyas, R. Fradera, M. Belkacemi, A. Hasija, G. Lisboa, S. Luz, J. Malley, (eds.)]. Cambridge University Press, Cambridge, UK and New York, NY, USA. doi: 10.1017/9781009157926.001, https://www.ipcc.ch/report/ar6/wg3/downloads/report/IPCC_AR6_WGIII_SPM.pdf

¹²⁹ In this report, 'MLIC' and 'developing country' are used interchangeably.

¹³⁰ The IEA has estimated that emissions in MLICs will increase by 5 Gt CO₂ by 2040 under a Stated Policy Scenario (STEPS) scenario,

Climate finance flows, actual and needed to limit warming to 1.5°C



Sources: Georgieva K., Adrian T., Global Landscape of Climate Finance 2021, Climate Policy Initiative, IMF, August 2022, <https://www.imf.org/en/Blogs/Articles/2022/08/18/public-sector-must-play-major-role-in-catalyzing-private-climate-finance>

Financing in both developed and developing economies will be originated by private and public investors. In that respect, innovative financing solutions able to reduce frictions and shape incentives for the channelling of capital towards the energy transition play an important role.

'Green' finance has emerged as an important solution in that respect. In particular, green bonds and sustainability-linked bonds (SLBs) have been growing considerably in the last few years. These instruments have supported companies to signal their commitment to decarbonization and enabled cheaper financing for environmentally beneficial investments. Also, they represent an instrument for investors, particularly institutional ones, to have an environmental, social, and governance impact.¹³¹ Particularly for developing economies, their use can not only signal commitment to decarbonization but also provide an internationally recognized instrument to attract foreign capital, thus reducing capital-market frictions in MLICs.

Beyond green bonds and SLBs, particularly for emerging economies, project finance plays an important role. The financial structure of project finance transactions makes it possible to limit the challenges of financing clean energy projects in MLICs. These projects are mostly characterized by a mismatch in currencies between the revenue-generating assets (typically in the local currency) and the debt repayment (typically in hard currencies). Also, most MLICs are still characterized by challenging institutional and governance fragilities which reduce the number of fundable projects.¹³² By allowing the 'tranching' of risks in debt structures with different seniorities, providing credit enhancing by multilateral development banks, and ring-fencing assets from their corporate sponsors, project finance can also support channelling capital by investors with different risk profiles.

highlighting the need for increased ambitions and investments in MLICs. The agency estimates that clean energy investments in MLICs need to increase four times from the current USD 150 billion a year to USD 600 (1,000) billion a year between 2030 and 2050 in a net-zero scenario.

¹³¹ For instance, institutional investments like environmental, social, and governance mandates have grown considerably in the last decade. As of 2020, sustainable investing represents more than 33 per cent of the \$51.4 trillion in US assets under management. Compared to 2017, sustainable and impact investing has increased by more than 42 per cent. US SIF Foundation (2020), *Report on US Sustainable, Responsible, and Impact Investing Trends*, Washington, DC: US SIF, <https://www.ussif.org/files/Trends%20Report%202020%20Executive%20Summary.pdf>.

¹³² Baker, R., and Benoit, P. (2022), *How Project Finance Can Advance the Clear Energy Transition in Developing Countries*, Oxford Institute for Energy Studies Working Paper.

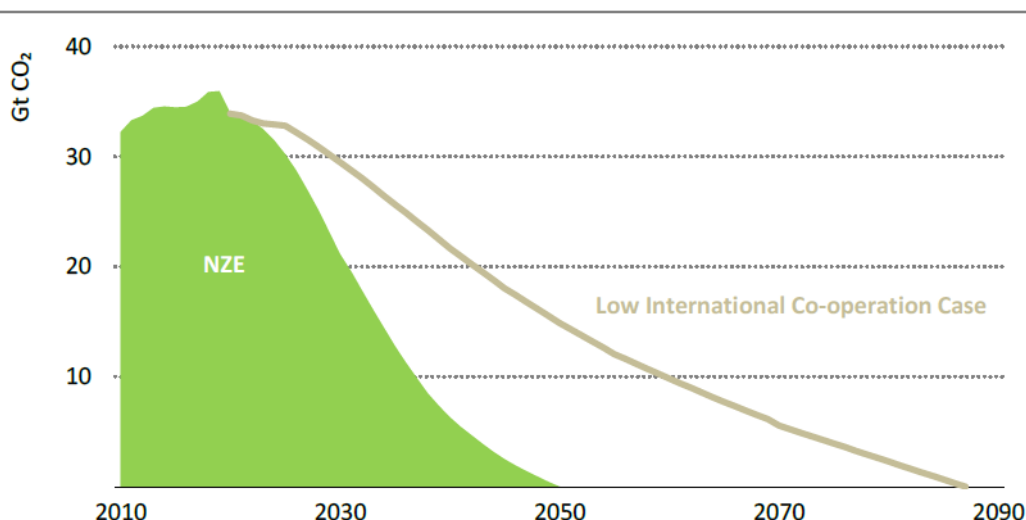
Historical patterns in economic development and carbon emissions mean that countries have different responsibilities, beyond current capabilities, in addressing the climate crisis. Based on the principle of ‘common but differentiated responsibilities’ in the United Nations Framework Convention on Climate Change, which acknowledges these differences, the consensus (at least in principle) is that developed economies carry a major responsibility in addressing the current climate crisis. This translates also to supporting developing economies and the most adversely affected countries in navigating the current climate crisis.

Parties to the Paris Agreement, during COP 15 in Copenhagen, publicly pledged their commitment to support the adaptation and mitigation efforts of developing and least developed countries to the amount of USD 100 billion a year by 2020.¹³³ The OECD is tracking the current flows of capital under this commitment.¹³⁴ At COP 26, signatories and private-led initiatives expressed their intention to ramp up the capital invested in climate action (mostly in the form of climate mitigation), yet a large investment gap remains. The emergence of blocks or interest groups among Paris Agreement (PA) parties are to some extent a signal of this tension, despite recent commitments, for instance by the Group of Seven (G7).¹³⁵

Another potential innovative financing solution, particularly for emerging markets, is the development of carbon markets, both voluntary and compliance-based as part of the Article 6 framework in the Paris Agreement. The International Emissions Trading Association estimates that capital flows to developing countries in the context of Article 6 can reach USD 1 trillion by 2050.¹³⁶

The development and implementation of the above measures hinges on public–private initiatives but also particularly on international cooperation between signatories of the PA. The IEA estimates that the costs and horizon at which it is possible to achieve a net-zero-scenario trajectory are highly dependent on successful cooperation at the international level.¹³⁷ In particular, achieving net zero might be delayed to as late as 2090 in the absence of cooperation.

Trajectory of emission reductions in the IEA net-zero and low-international-cooperation scenarios



Source: International Energy Agency (2021), Net Zero by 2050: A Roadmap for the Global Energy Sector. <https://www.iea.org/reports/net-zero-by-2050>

Developing countries are also particularly vulnerable to the multiple risks that will accompany the energy transition, which may cap their capacity to scale up financing. Several emerging-markets crises have occurred during interest rate increases in the US, inflationary periods, and particularly when the US dollar is strong.¹³⁸ Under these economic conditions, foreign-denominated

¹³³ UNFCCC secretariat, https://unstats.un.org/sdgs/tierIII-indicators/files/13.a.1_Background.pdf

¹³⁴ Organisation for Economic Co-operation and Development (2016), *2020 Projections of Climate Finance towards the USD 100 Billion Goal: Technical Note*, <https://www.oecd.org/environment/cc/Projecting%20Climate%20Change%202020%20WEB.pdf>.

¹³⁵ In June 2022, the G7 announced the establishment of a Climate Club. ‘G7 Statement on Climate Club’, <https://www.g7germany.de/resource/blob/974430/2057926/2a7cd9f10213a481924492942dd660a1/2022-06-28-g7-climate-club-data.pdf?download=1>; <https://www.consilium.europa.eu/media/57555/2022-06-28-leaders-communique-data.pdf>

¹³⁶ IETA, 2021, Geneva, <https://www.ieta.org/page-18192/11967121>

¹³⁷ IEA, 2021, <https://www.iea.org/reports/net-zero-by-2050>.

¹³⁸ For a discussion of risks related to fiscal capacity in BRICS countries, see Laan T., Maino, A., Boom and Bust: The fiscal implications of fossil



dollar borrowing becomes more expensive to sustain by developing economies.¹³⁹ This puts strains on project developers when seeking finance. A recent IMF Staff Climate Note focuses on mobilizing private climate financing in emerging and developing economies by exploring factors that can limit climate finance and what action policymakers can take to address them.¹⁴⁰

At COP 27, global leaders will confront the dire challenge of renewing commitments but also attempting to reinstate global action against climate change. The new world order, with its increased geopolitical fragmentation and unprecedented energy and food crises, is expected to set the tempo at which climate negotiations will unfold when world leaders gather in Egypt.

Against the backdrop of increased climate hazards and social and economic dislocations, COP 27 is expected to place a large emphasis on climate adaptation and climate finance. In a recent interview, Mahmoud Mohieldin, the United Nations climate change high-level champion for Egypt, said that in November 2022 at the COP 27 summit, delegates must focus on the topic of adapting life in a 'changing climate and grapple with finance for loss and damage given the increasing frequency of extreme weather events'.¹⁴¹ The Egyptian COP 27 president, Sameh Shoukry, also announced his intention to prioritize finance and mitigation in negotiations ahead of the actual conference in November.

COP 27 comes after the positive momentum of COP 26, where guidelines and the full implementation of the Paris Agreement were finalized, particularly the Article 6 Rulebook. Also, parties have agreed to come with updated and enhanced Nationally Determined Contributions. But as the energy transition gathers pace and momentum, countries and companies will need to scale up their investments in both mitigation and adaptation. Green financing can offer effective instruments to channel capital where it is most needed to scale up efforts.

In this direction, a recent G7 communiqué¹⁴² has highlighted the role of multilateral development banks (MDBs), development finance institutions (DFIs), and international initiatives in leading finance support for emerging economies. It calls for MDBs and DFIs to develop methodologies to enhance mobilization of private finance and regulatory reforms. It also recognizes the importance of resilient capital markets for mobilization of climate finance and supports the implementation of the G20 (Group of 20) Sustainable Finance Roadmap, the Just Energy Transition Partnerships,¹⁴³ further actions by the G7 Partnership for Global Infrastructure and Investment in its mobilization of USD 600 billion for climate investments, and the Joint Action Proposal of the MDB/DFI Expert Group on Infrastructure and Investments.

Unlocking climate finance will be a matter of addressing incentives for capital flows to be redirected towards climate-aligned projects and assets¹⁴⁴ and establishing functional procedures and collaborations between public and private players.

The state of 'green' financing in developing countries

Green bonds are debt instruments issued by firms in order to raise capital for financing 'green' projects and assets.¹⁴⁵ What differentiates them from conventional corporate bonds are both the bond structure and the unique type of 'use of proceeds'. The use-of-proceeds structure differs from the general-purpose-finance structure of conventional bonds in that funds are clearly earmarked for the project or asset they are directed at, as per the bond prospectus. In a typical green bond, proceeds are used exclusively to finance/refinance 'green' projects/assets, in line with established green bond frameworks and standards to which the green bond prospectus refers.

fuel phase-out in six large emerging economies, <https://www.iisd.org/publications/report/fossil-fuel-phase-out-briics-economies>.

¹³⁹ The energy transition will be also accompanied by a fiscal transition in most developing countries which are dependent on taxation of consumption and/or production of fossil fuels for their government revenues.

¹⁴⁰ Mobilizing Private Climate Financing in Emerging Market and Developing Economies, July 2022, Staff Climate Note No 2022/007, <https://www.imf.org/en/Publications/staff-climate-notes/Issues/2022/07/26/Mobilizing-Private-Climate-Financing-in-Emerging-Market-and-Developing-Economies-520585>; Georgieva K., Adrian T., Global Landscape of Climate Finance 2021, Climate Policy Initiative, IMF, August 2022, <https://blogs.imf.org/2022/08/18/public-sector-must-play-major-role-in-catalyzing-private-climate-finance/>

¹⁴¹ <https://www.theguardian.com/australia-news/2022/jul/13/cop27-summit-must-focus-on-how-world-will-adapt-to-climate-change-says-un-envoy>

¹⁴² 'G7 Leaders' Communiqué', Elmau, June 2022, <https://www.consilium.europa.eu/media/57555/2022-06-28-leaders-communique-data.pdf>

¹⁴³ UK COP26 Presidency, <https://ukcop26.org/six-month-update-on-progress-in-advancing-the-just-energy-transition-partnership-jetp/>

¹⁴⁴ Mobilizing Private Climate Financing in Emerging Market and Developing Economies, July 2022, Staff Climate Note No 2022/007, <https://www.imf.org/en/Publications/staff-climate-notes/Issues/2022/07/26/Mobilizing-Private-Climate-Financing-in-Emerging-Market-and-Developing-Economies-520585>

¹⁴⁵ The World Bank defines the green bond as 'a debt security that is issued to raise capital specifically to support climate related or environmental projects'—<https://openknowledge.worldbank.org/handle/10986/22791>.

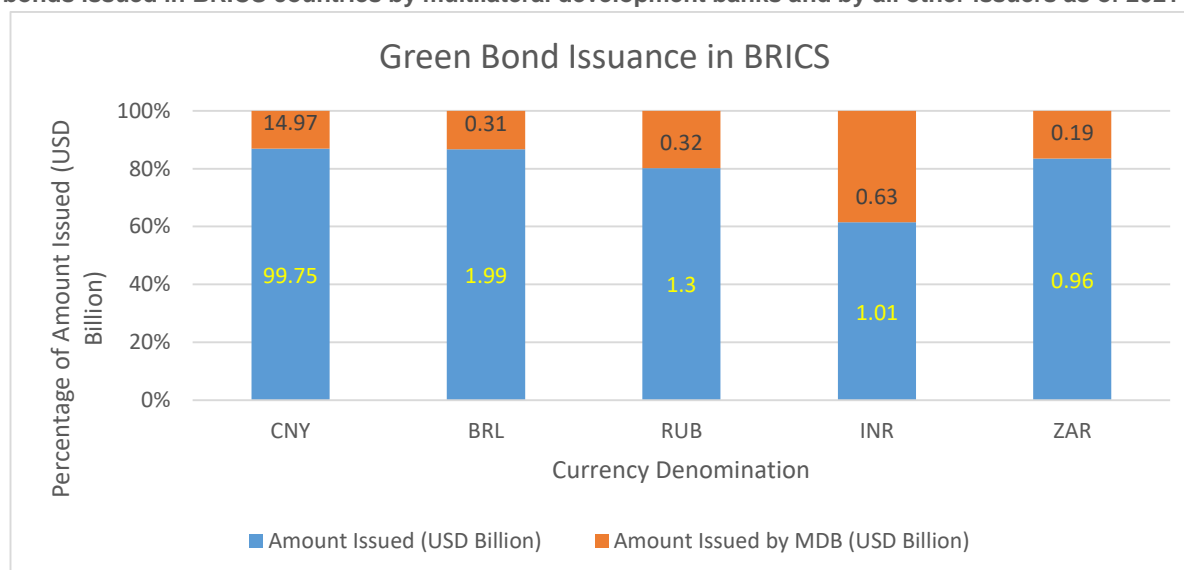
Social and sustainability bonds have a similar structure to green bonds but raise money for a mix of social and environmental projects and assets.¹⁴⁶

SLBs (sustainability-linked bonds), which have been compared to the use-of-proceeds approach of green bonds, provide an issuer-level financing instrument, with the objective of incentivizing and aligning issuers' climate objectives with financing terms and conditions. This alignment is achieved through transparent and regularly monitored key performance indicators and sustainability performance targets. Issuers are thereby committing explicitly (including in the bond documentation) to future improvements in sustainability outcome(s) within a predefined timeline. SLBs are a forward-looking performance-based instrument.

Since the inception of the green bond market in 2007, issuances have mostly concentrated on developed economies, particularly in the US and EU. Most green, social and sustainability bonds are issued in hard currencies such as the US dollar and Euro.

Recently, the green bond market has seen major growth in developing countries as well, with the BRICS countries (Brazil, Russia, India, China, and South Africa) representing the largest issuers group. In particular, China has been very active in the green bond market since its inception to the extent that the Chinese renminbi was the third largest currency of issuance as of 2021. The growth of the Chinese green bond market has received solid support from regulators and policymakers,¹⁴⁷ who have indicated that green bonds are important instruments to channel foreign and internal capital towards the energy transition. The figure below shows the state of the green bonds market as of 2021 in BRICS countries.

Green bonds issued in BRICS countries by multilateral development banks and by all other issuers as of 2021



Source: Bloomberg Fixed Income Database and author's calculations.

Development banks play an important role not only in supporting project finance in developing economies but also in supporting the adoption of green bonds. Within the BRICS countries, for example, the New Development Bank, a multilateral development bank established in 2015, reached a total issuance of green bonds of USD 450 million in 2021.

More generally, social and sustainability bonds and SLBs have been used by private entities and governments in developing countries to attract foreign and internal capital mainly for assets and projects with environmental benefits. As the energy transition gathers pace and investors' as well as consumers' awareness strengthens, these sustainability financing instruments are expected to gather positive momentum.

¹⁴⁶ Maino, A. (2021), *Financing the Energy Transition: The Role, Opportunities and Challenges of Green Bonds*, Oxford Institute for Energy Studies Research Paper.

¹⁴⁷ Dikau, S., and Volz, U. (2021), 'Central bank mandates, sustainability objectives and the promotion of green finance', *Ecological Economics*, 184, 107022, <https://doi.org/10.1016/j.ecolecon.2021.107022>.

With respect to SLBs, the government of Chile has recently issued the first sovereign SLBs with the objective of increasing the amount of renewable energy produced by 2030.¹⁴⁸ More generally, the SLB market has seen a strong growth among corporate issuers which have used SLBs to signal their commitments to the energy transition and at times to raise cheaper financing. While SLBs have seen major growth to date mostly in developed economies, they represent a promising sustainability financing instrument for developing countries as well.

SLBs issued by geographical region



Source: Bloomberg Fixed Income Database and Author's calculations.

Project finance also plays an important role in financing projects in developing countries and has been a successful financing model, particularly when supported by MDBs. According to a recent IMF report, blended finance as supported by MDBs can be part of this solution. 'Blending public and private sector finance is useful to de-risk these investments for private sector capital in general, through for example first loss investments or performance guarantees.'¹⁴⁹

Conclusions

As the energy transition gathers pace, developing countries will need to gear up investments in reducing the carbon intensity of their energy systems and the energy intensity of their economies. Governments will need to implement policies capable of addressing frictions for capital to flow into transition-aligned projects and assets. In order to raise the required financing, green, social and sustainability bonds and SLBs represent promising ways to attract sustainable investment, particularly in the form of foreign capital investment. Project finance has also proven successful in the past in financing projects in developing countries, particularly when supported by MDBs.¹⁵⁰

Countries are also at different stages of economic development and have different exposures to the physical risks related to climate hazards. This means that different policies and investment flows, particularly related to climate adaptation, will need to be established.

At COP 27, procedures and modalities for international cooperation on financing for adaptation are expected to be discussed, and there is hope for progress to be made in terms of advancing commitments and increasing international cooperation, in spite of the deterioration of the geopolitical environment.

¹⁴⁸ For a detailed description, see Maino, A. (2022), *Sustainability-Linked Bonds and Their Role in the Energy Transition*, Oxford Institute for Energy Studies Energy Insight, forthcoming.

¹⁴⁹ Mobilizing Private Climate Financing in Emerging Market and Developing Economies, July 2022, Staff Climate Note No 2022/007, <https://www.imf.org/en/Publications/staff-climate-notes/Issues/2022/07/26/Mobilizing-Private-Climate-Financing-in-Emerging-Market-and-Developing-Economies-520585>

¹⁵⁰ Baker, R., and Benoit, P. (2022), *How Project Finance Can Advance the Clear Energy Transition in Developing Countries*, Oxford Institute for Energy Studies Research Paper, 2022.



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