Foot on the gas?
Maintaining momentum for net-zero while responding to the war in Ukraine

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1. Introduction

This paper examines how recent world developments, and particularly Russia's large-scale war of aggression against Ukraine, are affecting policies and progress towards tackling climate change.

The overriding challenge is how to deliver affordable energy (especially during Europe's forthcoming winters) while both accelerating the transformations required to tackle climate change and maintaining satisfactory levels of income and employment. The massive disruption to natural gas supply and resulting strong political focus on energy security could potentially accelerate the transition away from fossil fuels in the coming years, especially as it comes at a time where sources of renewable electricity have become competitive with thermal power generation. However, it is essential that near-term policy responses, including those aimed at managing high energy prices and cost of living, do not run counter to the transition. Governments need to ensure that short-term deviations from net-zero paths that may be inevitable now do not lock in carbon for decades ahead.

The paper considers:

1. Policies already enacted or proposed and how they embody synergies and trade-offs, including between:
   - near-term changes in investment decisions to shore up energy security, e.g. investment in liquefied natural gas (LNG) supply and storage capacity;
   - fiscal priorities;
   - the need to achieve sustainable economic growth over the medium to long term while ensuring an equitable transition, managing disruption to employment.
2. What might be done to overcome, or at least ameliorate, some of these trade-offs.

Policy challenges before the war in Ukraine

Even before Russia's invasion of Ukraine, OECD economies collectively, together with many countries outside the OECD membership, faced a range of policy challenges. These included fundamental needs to:

- address global warming and consequent climate change;
- improve macroeconomic performance, both near- and longer-term;
- secure inclusive and equitably distributed growth, following several decades of rising inequality in many countries that have induced social and political stress;
- enhance resilience to unexpected shocks, such as COVID-19 and the resultant policy responses to limit its spread.

Each of these policy challenges is considered below.

Climate change and energy challenges before the war in Ukraine

Prior to the war in Ukraine, in the run-up to the COP26 climate conference in Glasgow, most countries had set themselves near- and longer-term greenhouse gas emissions targets, with many announcing goals for net-zero emissions at or around mid-century. There remains a significant gap between ambition and near-term implementation, however. Countries collectively are not yet on a path to meet the Paris Agreement objectives, even if nearer-term 2030 pledges under the Agreement are achieved in full.

The soundbite heading into COP26 was catchy: *"Cash, coal, cars and trees to keep the world to 1.5 degrees".* Agreements on each of these fronts were achieved, albeit with varying levels of participation by countries. Through the Glasgow Climate Pact, universal agreement was reached to increase climate ambition, including through a phase-down of coal and phase-out of fossil fuel subsidies. Nevertheless, action and outcomes have not matched the rhetoric. Emissions trajectories are still far off course, and increasingly severe impacts of climate change are already being experienced.

Energy profiles and energy investment also show a mixed picture. Fossil fuel use continues to be stubbornly consistent in its share of primary energy, and half of the countries that pledged to phase out coal at COP26 actually recorded growth in coal demand in 2021 (Bloomberg NEF, 2022[1]). Globally, coal generation jumped 8.5% in 2021. Moreover, most scenarios based on current and announced policies show continued heavy use of fossil fuels in energy generation, transport, and industrial processes for at least a decade ahead, threatening reduction of global emissions at the necessary pace.

That said, renewables and some clean-energy sectors have been growing very rapidly in recent years. Progress may not have been as rapid as necessary to meet mid-century net-zero targets, but the trajectory and – importantly – underlying cost dynamics of key technologies were trending generally in the right direction. For example, solar photovoltaic (PV), batteries and electric vehicles (EVs) were advancing strongly prior to the war in Ukraine. Wind and solar PV accounted for three quarters of newly installed global capacity in 2021. The International Energy Agency (IEA) estimated that, in 2021, spending on solar PV, batteries and EVs was growing at a rate consistent with reaching global net-zero emissions by 2050 (IEA, 2022[2]). This is only a small part of the overall energy investment landscape, however, which is still far from sufficient globally to achieve necessary transformations.

Moreover, in recent years the IEA has signalled an imbalance in energy investment globally when compared with shifts in demand (IEA, 2022[3]). While supply-side clean energy investment has been increasing, fossil-fuel based investment, including in upstream oil and gas, has been sluggish as producers reacted to low prices and anticipated climate-related changes to regulation. This was in the direction required for a transition towards net-zero. Demand has not followed suit, however. Thirst for fossil fuels continued strongly, including in the economic recovery after COVID-19, meaning that a systemic risk was building even before the war in Ukraine: years of low investment in fuel supply potentially leading to a shortfall in supply relative to robust demand growth, creating price spikes and market instability.

Despite these imbalances, the motive for decarbonisation and electrification has been increasingly driven by powerful economic and commercial forces.[1] Nevertheless, socioeconomic inertia (including vested interests, backward-looking institutions, and general resistance to change), and the need to electrify as much as possible and to invest in integrated connected infrastructure by upgrading power grids, threaten to stretch the transition out for longer than purely commercial considerations might warrant. Clear and effective policy is still essential to drive the transition at the speed required by climate science.

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[1] Commodity-based systems, such as those based on fossil fuels, are generally subject to diminishing returns to scale: once the cheapest reserves are exploited, fuels must be sourced from ever more remote locations. The technologies associated with distributing and burning these fuels change relatively slowly. They also generate externalities that are expensive and punctuated by periodic supply constraints and energy price spikes. By contrast, technology-based systems, such as those based on renewables and battery storage, are subject to increasing returns to scale: the more extensively they are deployed, the more their costs fall. This propagates a reinforcing dynamic whereby the shift to a new technology network becomes inexorable as it outcompetes on costs and on productivity.

Macroeconomic challenges prior to the war in Ukraine

Meanwhile, economic recovery post COVID-19 has proved fragile. By early 2022, GDP in only around half of the world's economies had reached or surpassed pre-pandemic levels.[2]

Before the war in Ukraine, some progress had been made on reducing a backlog of disrupted global supply lines and mounting inflation. In the United States, for example, survey-based analyses suggested that "upstream" price pressures might have begun to diminish as logistics issues began to be resolved. Manufacturers' order backlogs and lead-times for production material had apparently turned down from their 2021 peaks (Eslake, 2022[4]). Customer inventories were starting to be rebuilt.

No country is fully free of COVID-19-related disruptions, however. Supply disruptions persist, especially in China, where new COVID-19 lockdown restrictions based on the country's "zero-COVID" policies continue to impact manufacturing and distribution. More fundamentally, there is growing concern about productivity. In many countries, productivity (both labour productivity and the productivity of labour and capital taken together, i.e. "total-factor productivity") has been growing particularly slowly since the 2008 financial crisis, with signs of slowdown preceding the crisis. A key cause of this has been weak investment growth, despite continued historically low interest rates. There is increasing recognition that the current pace of investment, should it continue, risks proving insufficient to meet the requirements of ageing populations in general, and the requisite pace of decarbonisation in particular.[3]

Policy challenges as a consequence of the war in Ukraine

Russia's invasion of Ukraine has resulted in a number of immediate and longer-term policy challenges, including:

- developing a raft of new macroeconomic and energy policies as a direct response to the crisis;
- addressing the consequences for the social and political environment within countries;
- polarisation of international positions, making it more difficult to reach satisfactory multilateral agreements and to take co-ordinated international actions.

These emerging policy challenges and their relative alignment with longer-term climate and economic goals are discussed below.

Energy and macroeconomic outlook

The continued reduction in food and energy supplies from Russia and Ukraine due to sanctions and war-related supply disruptions has led to sudden and sharp increases in food and energy prices. Global food prices[4] surged by nearly 20% in the months following Russia's invasion of Ukraine, and have eased only somewhat since. European gas prices[5] have recently been about ten times above their average of the past five years, and price pressures are likely to remain for several quarters ahead given the constraints for Europe on accessing alternative sources of gas supply in the near horizon.

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2 Specifically, at the time of writing (August 2022), 38 of 54 countries for which seasonally-adjusted GDP estimates are available had surpassed their pre-pandemic GDP peaks.

3 Countries as diverse as the United States, China, Brazil, and India are all reporting fertility rates below replacement level. Over half of projected population growth in the coming 30 years will be in just eight countries (Goldin, 2022[37]).

4 Measured by the FAO Food Price Index.

5 Proxied by the ICE Dutch TTF Gas Futures.

These price increases have been responsible for the majority of the increase in headline inflation rates, which have reached levels not seen in most countries since the two great oil shocks of the 1970s and the inflation spike in 1988. Annualised consumer price index (CPI) inflation in OECD countries was over 10% in July 2022, its highest for over three decades.

Higher energy prices, together with restrictions to energy supplies, are bearing down on the level of activity of many economies, and hence of the world as a whole. Recent OECD projections for global GDP growth are around 3% in 2022 and 2.25% in 2023, a marked slowdown relative to expectations at the beginning of this year (OECD, 2022[5]). Notably, the US economy seems likely to be weaker than earlier envisaged, and there is now a distinct chance of a recession, particularly in Europe and the UK, and among a number of non-commodity-producing developing economies.

New energy policies

Widespread sanctions have been imposed on Russia in retaliation for its invasion of Ukraine. In parallel, many countries have taken urgent steps to develop new or modified energy policies. After a slow start, countries are increasingly focusing on demand-side policies to encourage or enforce reduced demand. Energy rationing, particularly of natural gas supply to industry, is being actively considered in some countries, particularly in Europe.

On the supply side, there have been significant policy changes regarding both fossil fuels and clean energy. The phase-down of coal promised at COP26 has been threatened, at least temporarily, as some countries turn to coal to shore up near-term energy security. As a result, coal consumption in Europe and the US is likely to accelerate this year (bp, 2022[6]). A rush to diversify gas supplies in Europe away from Russian pipelines has led to renewed investment in liquefied natural gas (LNG) terminals and pipelines – infrastructure that typically lasts for decades. At the same time, several countries have sought to ramp up deployment of clean energy through enhanced support programmes and streamlined planning processes.

New macroeconomic policies

Central banks are raising official interest rates in an effort to prevent the initial inflationary impulse of higher energy and food prices from setting off a broad-based price/wage spiral. Monetary policy is tightening in every major advanced economy (with the exception of Japan), as well as the majority of emerging market economies. Indeed, the number of central banks hiking interest rates by 50 basis points (0.5%) or more has risen to record levels.

Until very recently, fiscal policy was also being tightened in most countries. Measures of discretionary fiscal policy (as measured by changes in the cyclically adjusted budget position) indicate that since 2021, G7 economies were set to tighten their collective fiscal position by a substantial 5.2% of GDP, largely driven by the magnitude of the change in the US. This follows large fiscal expansions in many countries due to COVID-19 recovery and stimulus policies of a similar magnitude.

Since mid-2022, however, the situation has changed quickly and dramatically. Several countries, including across the EU and the UK, have introduced policies to offset a significant part of the effect of higher energy prices on users, both households and, in many cases, industry. At latest count, the size of the European package was some 2.2% of EU GDP, and larger still in the UK and Germany as a proportion of GDP.[6] In September 2022, the total across the EU and UK was estimated at EUR 500 billion.

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6 Data as of 21 September 2022. For more, see dataset: National policies to shield consumers from rising energy prices, Bruegel.

National social and political environment

Prior to the war in Ukraine, social and political considerations were becoming increasingly intertwined with national debates around climate change policies. Concerns centred around impacts on jobs dependent on fossil fuel industries, as well as on the distributional impacts of climate policies on poorer groups. Social reactions were visible, for example the Yellow Vest movement in France and similar protests in other countries.

Independent of geopolitical events, climate impacts are increasingly being felt around the world. These impacts, whether from extreme weather events or slower-onset changes such as more frequent droughts and rising sea levels, will more severely affect the poorest countries and sections of society. Without stronger action to reduce emissions and improve the saliency of adaptation to climate change, the physical impacts of climate change could themselves drive social disruption far greater than protest movements seen so far. Increased polarisation of societies, and even intergenerational clashes within communities, could prove more politically destabilising than climate policies themselves.

Nevertheless, the war in Ukraine has had a sudden and severe impact on energy prices, which shines a renewed spotlight on the distributional effects of climate policies. The impacts of higher costs of living are unequally distributed (Blake and Bulman, 2022[7]), disproportionately impacting people on low incomes – especially with respect to household energy – and leading to significant pockets of poverty in many OECD countries, and grave poverty in parts of the non-OECD world. Policies are being put in place to protect the poorest in many societies from increases in cost-of-living they could not otherwise bear; the design of these measures matters greatly. They can be generalised or precisely targeted, and more or less well-aligned with the objective of net-zero emissions, as described below.

International political environment

The international political environment has soured, with polarisation of OECD vis-à-vis major non-OECD economies over the war in Ukraine. Beyond the breakdown in relations between most OECD countries and Russia, the war in Ukraine has exacerbated problems in relationships with China as well as other non-OECD countries, including India and Indonesia.

Such tensions are affecting the ability to collaborate on climate change and clean energy. For example, China's cancelling of scheduled bilateral climate talks following US Speaker of the House Nancy Pelosi's visit to Taiwan makes it more difficult to hold international meetings on the energy transition itself, and to reach agreement on how any cost burden should be shared between countries.

This is playing into existing disagreements over burden sharing on climate ambition based on the UNFCCC principle of "common but differentiated responsibilities". A key point of contention has been the failure of developed countries to meet the pledge of providing or mobilising USD 100 billion of climate finance by 2020, as tracked by the OECD (OECD, 2022[8]). This further impacts trust among countries related to climate change collaboration, and remained a key point of contention at the interim Bonn Climate Change Conference in June 2022.

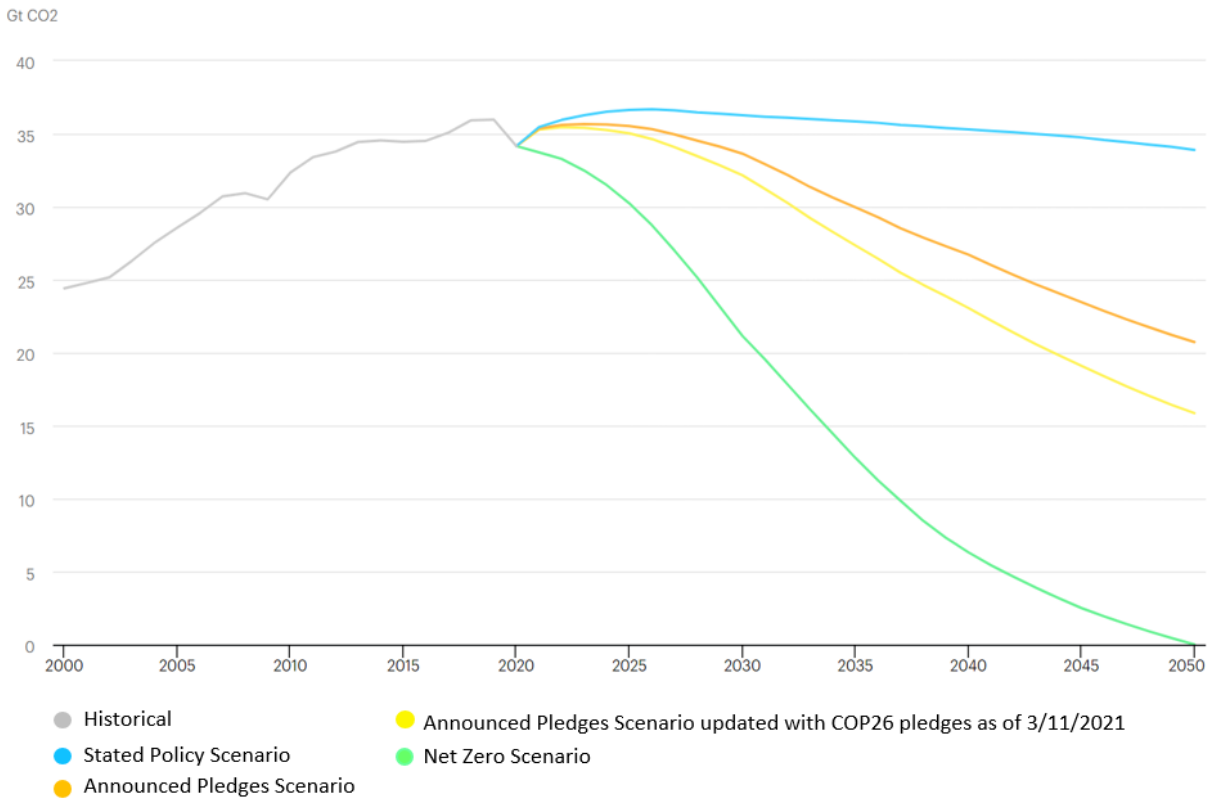
The difficult international political environment only makes the scale of the overall global climate change challenge more daunting. The Climate Action Tracker,[7] which tracks policy progress on climate change, says, in its latest assessment, "Without increased government action, the world will still emit twice the

[7] The Climate Action Tracker (CAT) is an independent scientific analysis that tracks government climate action and measures it against the globally agreed Paris Agreement aim of "*holding warming well below 2°C, and pursuing efforts to limit warming to 1.5°C*." A collaboration of two organisations, Climate Analytics and the NewClimate Institute, the CAT has been providing this independent analysis to policymakers since 2009. For more, see: https://climateactiontracker.org/about/.

greenhouse gas emissions in 2030 than is allowed under the 1.5°C limit of the Paris Agreement. The world is heading to a warming of 2.4°C with 2030 targets and even higher, 2.7°C, with current policies."

The IEA shows a 2.6 Gt difference in emissions between stated policies and announced pledges by 2030 (see Figure 1) (IEA, 2021[9]). This represents the "implementation gap" between announced net-zero pledges and the policy frameworks and specific measures they require. Even if these pledges were realised in full, there would be a 12 Gt "ambition gap" between the pledges and the 2050 net-zero pathway requirements necessary in 2030. The importance of ensuring that policies implemented in response to the current crisis accelerate action on climate, rather than derail it, could not be clearer.

Figure 1: CO_2 emissions in the *IEA World Energy Outlook 2021* scenarios, 2000-2050 (Gt CO_2)



Note: The **Net Zero Scenario** is a normative scenario that sets out a "narrow but achievable pathway for the global energy sector to achieve net-zero CO_2 emissions by 2050". The **Stated Policies Scenario** "reflects current policy settings…as well as those that have been announced by governments around the world". The **Announced Pledges Scenario** "assumes that all climate commitments made by governments around the world, including Nationally Determined Contributions (NDCs) and longer-term net-zero targets, will be met in full and on time". It was updated during COP26 to take new pledges into account.

Source: IEA 2021.

2. Synergies and trade-offs: near- and longer-term

Achieving longer-term climate and economic goals will depend on the extent to which macroeconomic and energy-related policies implemented in response to the Ukraine crisis are consistent with those aims.

Macroeconomic goals include securing a satisfactory growth of GDP, productivity, and living standards, while keeping inflation and the public debt in check.

Energy goals have at least three principal dimensions: environmental, affordability and security. The fundamental environmental goal is getting onto, and staying on, a path to achieving the Paris Agreement objectives on climate change (while also considering other environmental impacts such as air pollution and water stress). Discussions on climate policy have often been closely related to concerns about energy affordability, which in turn have tended to be linked, perhaps only implicitly, to an energy-security dimension. In the context of the war in Ukraine, energy affordability and security have grown enormously in perceived importance.

Some macroeconomic and energy-related policies enacted in response to near-term developments resulting from the war in Ukraine are indeed consistent with longer-term energy and macroeconomic aims – i.e. near- and longer-term aims are aligned. In other cases, however, there are important inconsistencies between evolving near-term and long-term objectives. This includes the risk of locking in fossil fuel infrastructure that could last decades, running counter to needed net-zero pathways, or creating stranded assets if forced into early retirement.

Where policies are not aligned, it is necessary to consider how best to bring them to an end as quickly as possible to limit the risk of their becoming entrenched in the longer term.

Broadly aligned energy policies

Despite the current crisis, most countries have not backtracked on their overall climate goals and ambitions. Many have stated aims of progressively phasing out fossil fuels and accelerating the transition towards clean energy while promoting and supporting energy efficiency. Moreover, the war in Ukraine has increased the desire of many countries to reduce dependency on imported fossil fuels systems and spur development of home-grown clean energy supply chains. A key example is the US Inflation Reduction Act (IRA), which, while not explicitly a climate or energy-transition policy, contains a range of measures and incentives designed both to reduce the demand for energy and to increase its supply from renewable sources.

Faced with the consequences of Russia's war on Ukraine, many near-term energy policies seek to accelerate the penetration of renewables, energy efficiency and other clean-energy technologies, thereby broadly aligning with longer-term energy goals.

Energy supply side

On the energy supply side, cases of policy changes that are broadly aligned with long-term goals include accelerating the scaling up of renewable electricity by supporting deployment of mature technologies, ramping up investment in energy innovation, and deployment of new technologies during the early stage of their development.

Ramped up policies for clean energy have also been oriented towards supporting new infrastructure, in particular power networks, storage, hydrogen, and initiating and accelerating new nuclear power programmes. The EU, for example, has recently announced plans to nearly double domestic green hydrogen production to 10 Mt, and to import an additional 10 Mt of renewable hydrogen from third countries by 2030, including through hydrogen-based compounds such as ammonia (European Commission, 2022[10]).

Some countries have initiated the re-starting, extension or postponed closure of nuclear plants, which have low GHG emissions but have historically been politically unpopular. For example, Germany's two remaining nuclear plants, due to be mothballed by the end of December 2022, are now to be kept "on standby" until mid-April 2023 to provide an additional contribution to the electricity grid if necessary (The Guardian, 2022[11]). Japan's government is currently reviewing nine nuclear reactors and considering whether to extend the operating licenses of their current nuclear power plants (Foreign Policy, 2022[12]).

Such changes are a direct consequence of the war in Ukraine and represent marked shifts in policy and in public opinion. In Germany, for example, surveys have shown a rapid decline public opposition to nuclear power (Foreign Policy, 2022[13]).

Energy supply policies also require a speeding up of enabling regulation, pricing, planning, and investment. Time-consuming legal processes are often cited as a major obstacle to rapid deployment of renewables (McWilliams et al., 2022[14]). In response, the EU and the UK, for example, have recently announced plans to simplify their permission policies on rooftop PV in order to promote self-consumption (Climate Action Tracker, 2022[15]). Likewise, the German government has published a green response package aimed at the expansion of solar and wind, pledging to make additional sites available for renewable energy projects and to remove bureaucratic barriers in order to accelerate planning and approval processes (McWilliams et al., 2022[14]).

Energy demand side

On the energy demand side, the vital role of energy efficiency has been recognised and points to the importance of changing behaviours and ramping up support schemes for domestic and industrial energy efficiency. For the very near term – in particular the coming northern hemisphere winters – this requires encouraging behavioural changes, for example car-free days, increased use of public transport, encouraging take-up of "active transport", reduced speed limits, and lowering thermostats, as suggested by the IEA (IEA, 2022[16])).

Several countries have announced programmes to encourage or enforce domestic demand reduction. The European Commission, for example, has asked all EU countries to make "best efforts" to reduce gas demand by 15% between 1 August 2022 and 31 March 2023 (Euronews, 2022[17]). In addition, Germany, Ireland, Italy, some states in the US, and New Zealand have announced temporary decreases in public transport fares (Climate Action Tracker, 2022[15]).

For the medium term, reducing fossil fuel energy demand also means accelerating the uptake of low-carbon mobility options, including electric vehicles, and rethinking transport networks to reduce the need for private cars. Japan has announced extensive policies to accelerate the electrification of its transport sector (Climate Action Tracker, 2022[15]). Most important of all, reducing fossil fuel energy demand requires the scaling-up of energy efficiency programmes, for example in:

- **Residential and commercial buildings,** through energy efficiency grants, insulation support, and tighter standards and regulations for new builds. Denmark, for instance, has announced a ban on the installation of new gas boilers, and the EU and the UK have pledged to significantly expand the installation of heat pumps.
- **Industry,** with regulations and incentives encouraging greater recycling and reuse of materials in circular production processes, as well as energy efficiency in industrial processes.
- **Transport,** for example with composite materials to reduce vehicle weight and improving operational efficiency in aviation through integrated air-traffic control.
- **Information and Communication Technology (ICT) products,** such as more efficient network infrastructure and data centres.
- **All sectors,** through a shift to electrification and responsive digital demand management.

On the whole, these supply and demand side policies are conducive to improved energy security, decarbonisation and future economic performance. Thus, such policies are well aligned with long-term objectives. Policy makers do not need to choose between addressing the present energy crisis and tackling climate change. They can do both.

Non-aligned energy policies

While a number of recent energy policies are broadly consistent with longer-term energy aims, there are a number of policy initiatives whose perceived near-term imperatives are not aligned with, and may even impede, longer-term objectives.

Energy supply side

On the energy supply side, cases include near-term diversification of oil, gas, and coal sources (including ramping up and investing in LNG infrastructure).

There are plans for new LNG terminals in Germany, the Netherlands, Italy, and Greece, which, if they all come on stream, could significantly increase Europe's LNG import capacity (Financial Times, 2022[18]). Given development lead-times, this Europe-wide rush to build new LNG import terminals will not deliver instantly and risks prolonging reliance on fossil-fuel energy supply beyond what is feasible for a net-zero emissions trajectory. It also increases the risk of creating stranded assets should demand for gas fall away before the expected lifetimes of terminals, as the net-zero transition gathers pace.

Some of this investment is focusing on more readily deployable floating storage and regasification units to meet near-term shortfalls in Europe, which will mostly rely on mopping up existing available cargoes. However, as countries look towards new longer-term contracts, extensive infrastructural investment in LNG export terminals will also be required.

In this regard, many European countries have entered new long-term contracts with alternative fossil fuel suppliers to replace Russian gas, thereby potentially locking in new dependencies for the longer term. For example, in 2022 the EU announced potential new LNG deals with the US, Qatar, Azerbaijan, Egypt, and Israel to increase its supplies (Financial Times, 2022[18]). The overall cost of imported LNG will need to cover more than regasification and storage infrastructure in importing countries: it must reflect the need for more expensive infrastructure upgrades to LNG terminals in exporting countries. As accountability for net-zero commitments intensifies, costing of the climate-change implications of methane leaks in the supply chain must also be taken into account.

In the near-term, meeting energy demands will require re-commissioning, extending the life of, or even investing in additional capacity in thermal fossil fuel plants, with the risk of locking in exposure to future risks of energy unaffordability and insecurity, and of growing damage from local air pollution as well as climate change. This effect was strong in mid-2022 due to it being a poor year for hydropower (due to droughts) and nuclear (due to heatwaves and extensive maintenance outages in France). Examples of thermal revival include Germany, which is delaying the closure of some coal- and oil-fired power plants, and Austria, where a retired coal power station is being renewed. The Netherlands is lifting its limit on power from coal, and France is preparing a coal plant as a reserve for the winter. While the immediate emissions impact of coal recommissioning in Europe may not be significant, it is important that their operation remains temporary (Ember, 2022[19]).

There are reports that European governments will spend at least EUR 50 billion on new and expanded fossil fuel infrastructure and supplies this winter (Financial Times, 2022[18]). This is a vastly higher sum than the originally proposed EUR 12 billion earmarked for new gas and oil infrastructure to wean the EU off Russian energy supplies by 2027 (in addition to about EUR 200 billion to be spent on renewable energy infrastructure) (European Commission, 2022[19]).

Further risk of locking in high carbon production comes from the granting of new exploration rights or permits, and initiating and accelerating new domestic oil and gas production infrastructure. The United States overturned the Biden administration's 2021 pledge to suspend new leases for oil and gas companies by allowing oil and gas drilling to resume on federal lands as part of the Inflation Reduction Act (Reuters, 2022[20]). The UK is also looking to expand licencing of North Sea oil and gas fields.

The current crisis also provides potential cover for rent-seeking behaviour by the fossil fuel sector, for example if actions that appear to be short-term contributions to alleviating energy supply problems are in fact attempts to lock in fossil fuel systems for the longer term. Overall, it is essential that governments take necessary steps to ensure that measures taken to ease immediate, urgent supply concerns are genuinely temporary and do not lock in supply over the longer term.

Energy demand side

Policies to reduce consumer energy costs near term (e.g. price caps, non-targeted reductions in excise duty, or policies that reintroduce fossil fuel subsidies) can encourage longer-term fossil fuel energy use. While wholesale natural gas prices in the EU were around ten times their average in the early months of 2022, demand had fallen by much less than this, with consumers shielded from price rises by existing national price-regulation systems and new government intervention and contract designs.

Reduced support for renewable energy investment funded through energy bills may curtail funds for the deployment of low carbon technologies and systems. For example, the UK has temporarily scrapped the "green levy" that typically accounted for around 8% of household energy bills (FT Adviser, 2022[21]).

Additionally, energy rationing, the most extreme demand-side measure, may impart short-term positive climate impacts by reducing greenhouse gas emissions, particularly from industrial sectors that are likely to be hardest hit, but is likely to be socially and economically disruptive and at odds with the longer-term policy agenda. On the other hand, energy rationing supported by extensive information campaigns to raise awareness and foster preparation may induce a cultural shift, with households and businesses realising that the compromises necessary to reduce demand are actually not as harmful as thought, may boost disposable income, and are worthwhile in the face of potential climate damages.

Aligned macroeconomic policies

There are a number of macroeconomic policy initiatives whose perceived near-term imperatives align with longer-term objectives. For example, on the energy supply side, government investment expenditure stands to boost short-term incomes and support future supply capacity. Measures to improve the resilience of fuel and material supply chains, including for critical minerals, could also have beneficial long-term productivity effects.

Non-aligned macroeconomic policies

There are a number of macroeconomic policy initiatives whose perceived near-term imperatives conflict with longer-term objectives, however.

Bearing down on inflation

Near-term action by monetary authorities to raise official interest rates, while a necessary component of policy effort to contain inflation, does not necessarily align with the longer-term aim of promoting strong investment needed for the green transition and sustainable economic growth. Failure to keep inflation at relatively low rates may itself create uncertainties and risks to medium-term economic stability that could also hamper investment.

Bearing down on public deficits and debt

Governments have been using income- and price-support measures to partly shield households and firms from some of the impacts of high-energy and other prices. Price support measures such as cuts in expenditure tax and fuel duty or price caps run counter to longer-term aims of transitioning away from fossil fuels, increasing energy security and reducing public deficits. Similarly, near-term actions by fiscal

authorities to provide income support to sections of society hardest hit by rising energy and food prices do not necessarily align with longer-run concerns to contain the size of the public debt. However, compared to price-support measures, income-support measures can be more easily targeted: their fiscal cost tends to be lower, and they also better preserve incentives to reduce energy demand.

In any case, enhanced perception of limited fiscal space is likely to limit public resources available to promote and deploy clean infrastructure.

Maximising the efficiency of government expenditure

A key question for governments is simply: where should scare resources be invested and prioritised? In an effort to protect consumers from high energy prices, some governments have opted for generalised tax reductions and other subsidies. Payment of subsidies to energy use are counterproductive to longer-term aims of increasing energy efficiency: temporary aid might be more efficiently provided as targeted income support (OECD, 2022[22]). Front-loading of some investment expenditures, e.g. in LNG terminals, risks their ultimately becoming stranded assets in a future low-carbon world.

Bearing down on energy demand and encouraging supply

Weakening existing climate change policy measures, such as watering down carbon pricing schemes to reduce perceived carbon leakage, risks damaging longer-term aims of greening economies and, for individual countries, reducing their international cost and price competitiveness. So does weakening of public investment in energy efficiency, renewables, and electricity grids because of spiralling energy costs and rapid inflation, even though such investment ultimately saves money and is generally paid for up-front through borrowing, higher taxes, or higher bills.

3. The future policy environment

Many of today's problems were revealed by, and to an extent stem from, recent and less recent crises, most notably the 2008 global financial crisis, the COVID-19 pandemic, and Russia's war of aggression in Ukraine.

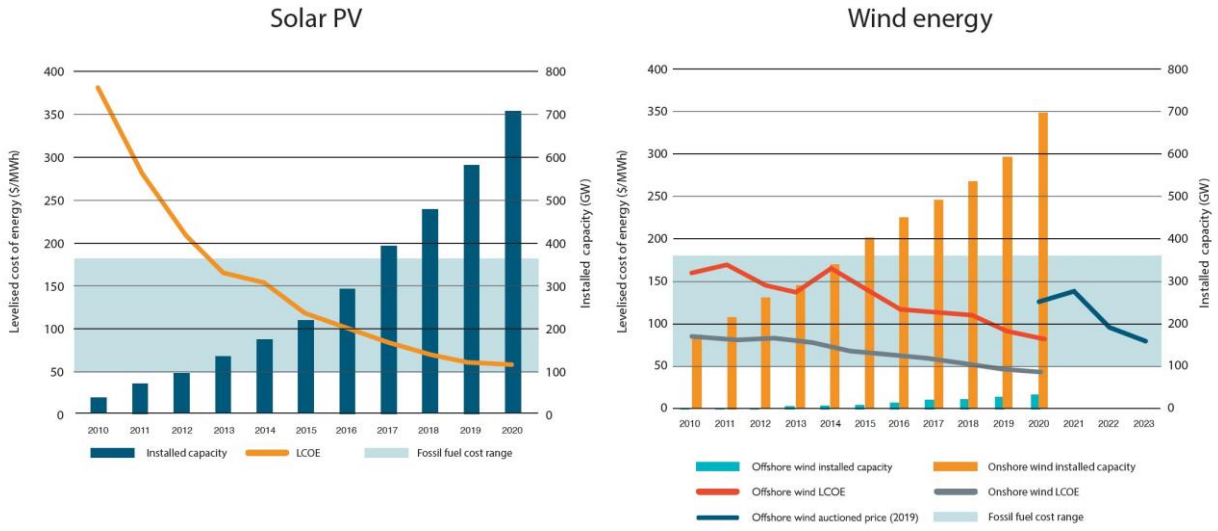
The specific nature of future crises cannot be foreseen with any accuracy. But a number of likely features of the world ahead can be identified and can be addressed and anticipated by policy makers, including through the use of strategic foresight (OECD, 2021[23]). Some of these features stand to be constructive for achievement of long-term goals such as tackling climate change. Others, however, will bring challenges that will need to be overcome when devising macroeconomic and energy policies appropriate for a future world. Policies made with an eye to meeting likely future conditions – with an element of "future-proofing" taken into account – may well serve also to increase energy security and resilience to unforeseen future shocks.

The likely future energy environment

Powerful economies of scale in innovation and production are almost certain to continue to lower costs of renewable and energy efficiency technologies, as well as to support infrastructure, as witnessed in the sharp reductions in the costs of wind and solar energy, lithium-ion batteries, EVs, and the production of hydrogen over the past decade. The cost of electricity from onshore wind fell by 15%, offshore wind by 13%, and solar PV by 13% in 2021 compared with 2020 (IRENA, 2022[24]). There is every reason why this should continue, although recent increases in technology costs and key material prices could slow the trend at least temporarily.

Over the past decade, the cost of wind energy has fallen by more than half, while that generated by solar PV has declined more than 90% (Figure 2) (EEIST, 2021[25]). The cost of lithium-ion batteries, vital for storing power that is generated intermittently, has also fallen by a factor of 9 (Nykvist, Sprei and Nilsson, 2019[26]). Today, both solar and wind are cost competitive relative to thermal power generation and are often the cheapest form of new generation capacity, even when accounting for the need to cover for variability.

Figure 2. The deployment and cost of key renewables



Source: (EEIST, 2021[25]).

Renewable power generation capacity added in 2021 is estimated to have saved around USD 55 billion in global energy costs in 2022. Similarly, record solar generation in the northern-hemisphere summer enabled the EU to avoid spending EUR 29 billion on gas imports in 2022 (Ember, 2022[28]). In the longer term, renewable and energy efficiency investments are likely to yield significant gains to capacity, productivity, and resilience.

The growth rate of global solar installations in 2022 will hit its highest level in a decade, with over 250 GW of capacity being installed compared to 182 GW in 2021. The supply chain for solar polysilicon – the semiconductor from which photovoltaic panels are made – is being constructed at a rate sufficient to decarbonise electricity well before 2050, though most of this capacity is in China (IEA, 2022[28]) (Bloomberg, 2022[22]).

This highlights that **the rapid growth of renewables and clean energy technologies is not without its own risks to future stability and resilience**. Without policy intervention, supply chains for clean energy technologies could create new supply bottlenecks and potential dependencies, including in the supply of critical minerals needed for several key clean energy technologies.

Returns to investment in clean technologies will likely remain substantial, from the perspective of both private investors and of national policymakers. Once clean and digital investment has been made, many low-carbon technologies will prove more resource- and labour-efficient than the fossil fuel systems they replace. For example, generating a megawatt of energy through wind and solar requires fewer jobs than through coal and gas. In turn, because green jobs will be more productive, the marginal product of labour in the sector stands to rise, and thereby so will wages, attracting more workers into better-paid employment (Zenghelis, 2021[30]).

Construction and deployment will create new jobs in low-carbon sectors, at least in the short-term. The IEA reports that more people are now employed in clean energy (including renewable energy, electric vehicles, energy efficiency measures, and nuclear power) than in fossil fuel sectors (IEA, 2022[31]). Nevertheless, short-run disruption means that workers in fossil-fuel-related sectors will need to be re-tooled and re-skilled if society is to effect a just transition whereby all benefit fully from the opportunities arising from a clean transition. There is an important role for governments to lead and steer the just transition through effective policies.

The design of electricity systems will need to catch up with the revolution in renewable energy. Analysts have for many years highlighted the need to design markets suitable for renewables-led power systems, breaking the linking of energy prices to wholesale gas and oil markets, with the most expensive generator setting prices.

The current crisis has spurred action in this regard. In July 2022, Ofgem, the energy regulator for Great Britain, has suggested splitting the wholesale market to delink power produced from renewables. Ofgem estimates that 80% of the increase in electricity prices has been attributable to soaring gas prices (Ofgem, 2022[32]). The President of the European Commission recently promised a "deep and comprehensive reform" that would "decouple the dominant influence of gas on the price of electricity" (European Commission, 2022[33]).

In a related move, the European Commission recently pointed out the inappropriateness of non-gas-burning power companies earning windfall profits simply as a consequence of the EU's marginal cost pricing principle. This has led to a proposal for a windfall tax on the profits of such companies, as well as a proposal that it be extended in some form to other fossil fuel groups (The Guardian, 2022[34]).

The likely future macroeconomic environment

Inflationary pressures are likely to ease in many countries, for a range of reasons. Monetary policy will continue to be tightened in most countries for some time, although it may take several years to bring inflation back down durably, and with no guarantee that rates will return to the 2% rate that many central banks had previously been targeting.

Overstretched supply chains are likely to ease progressively, helping to reduce inflation. Indeed, there are some signs that this is already happening. The broad structure of demand, particularly between goods on the one hand and services on the other, is returning towards normal as most countries move away from severe COVID-19 lockdown policies (with the exception of China). In addition, economies are adapting, as they always do given time, to residual changes in the structure of demand that appear to be permanent.

Staffing shortages faced by a number of sectors may start to ease as some workers return to the labour force after a temporary withdrawal, as they find their savings being depleted by fast-rising inflation and higher costs of living. This may push up involuntary unemployment, but contribute to easing inflationary pressures.

The nominal cost of capital will increase as central banks continue to raise official interest rates in order to contain, and then reduce, inflation. This will have some tendency to cause the future potential of new technologies to be economically discounted more heavily and therefore disfavoured in investment decisions.

Some clean energy technologies are likely to remain vulnerable to higher nominal interest rates for a period. They tend to be capital-intensive, with their full profit potential yet to be realised, meaning that future benefits are discounted more highly and carry less weight when assessing the business case. For example, power generation from wind and solar, while cost-effective, tends to be more capital-intensive than gas-fired generation, so are vulnerable to higher costs of capital. Other less mature sectors, including

green hydrogen, clean steel, cement, and clean aviation and shipping, while offering enormous potential opportunities, are not yet sufficiently cost effective to be viably scaled up as solutions without substantial policy support, in particular in a higher-cost-of-capital environment.

Real interest rates, however, are likely to remain low. Nominal interest rates typically fail to keep up with inflation when there is a sharp acceleration in the latter – the Korean War and the 1970s oil price episodes are archetypical cases. This is happening again now with the recent upsurge in inflation worldwide. However, nominal interest rates were failing to keep pace with inflation even before the recent upsurge: real interest rates have been at historic lows since the global financial crisis in 2008. The main reason for this, which has been discussed in an extensive body of literature on secular stagnation (Summers, 2016[35]), is that the long period of weak investment following 2008 resulted not only in weak productivity growth but also led to a surplus of desired saving over desired investment.

This basic situation – strong savings relative to investment – seems likely to endure, even if or when inflation returns to more customary levels, unless or until the world experiences its next major investment boom.

Demographic factors are also important, and the world is likely to continue to face issues that arise from the combination of slow aggregate productivity growth and ageing populations. Demographic conditions show little sign of reversing: average life expectancy after retirement is now approaching 20 years in the developed world. Such conditions do bring some benefits, however: they favour low inflation and low real interest rates, which enable central banks to ease up on interest rate increases and make public borrowing for investment comparatively affordable.

However, the risk that investment – including in the private sector – continues to be weak can endanger the growth of output and productivity needed both for an ageing population and to supply the infrastructure demands of the clean transition. Deficient investment is pernicious; it constrains the growth of earnings of those in work and thereby their ability to finance growing dependency needs, such as the need to supply employment opportunities, pensions, and support for illnesses of old age. Moreover, with real adjusted returns barely positive, this inhibits the markedly higher levels of savings required to fund pensions.

The **sustainability of the public debt,** in part undermined by slow growth resulting from insufficient investment, also stands to remain a perennial issue over the longer term (Zenghelis, Taylor and Stern, 2022[36]). Outcomes will depend in important part on the growth of productive capacity. It is the denominator, rather than the numerator, that largely drives debt/GDP sustainability.

The public sector will bear some of the direct cost of the low-carbon transition, at the very least regarding its own assets. In addition, governments need to plan for shifts in the tax base as they face a direct loss of energy tax revenues resulting from of the shift away from production and consumption of fossil fuels. While revenues from carbon pricing may be able to compensate for part of this, they too will be limited in the long term by the extent of their success in steering behaviour away from high-emissions activities.

Questions for discussion

Against this background, participants in the 43rd Round Table on Sustainable Development are invited to consider and discuss the three following questions:

- *To what extent are countries' policy responses to the current crisis taking us further off-track from longer-term objectives on climate change? What can be done in particular areas to avoid this?*
- *What can be done to limit impacts of the costs of the net-zero transition on households and businesses, especially given current high energy prices and rising costs of financing? Who should pay for these measures?*

- *Given that private sector investment is essential for the net-zero transition, what can policy makers do to keep investment flowing in the current economic climate, with rising costs of capital and heightened uncertainty?*

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