

GREEN SWAN 2021



COORDINATING FINANCE ON CLIMATE

Conference volume

August 2022

Conference co-organised by



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Conference agenda

Wednesday 2 June 2021

- 12:15–13:15 **Introduction – Why this conference?**
Luiz Pereira da Silva, Bank for International Settlements
- Opening panel – How in practice can the financial sector take immediate action against climate change-related risks?**
Moderator: Minouche Shafik, London School of Economics
Kristalina Georgieva, International Monetary Fund
François Villeroy de Galhau, Banque de France
Frank Elderson, ECB and NGFS
Agustín Carstens, Bank for International Settlements
- 13:15–13:45 **Mainstreaming climate risk management: what next?**
Mark Carney, Finance Adviser to the UK Prime Minister for COP26; UN Special Envoy on Climate Action and Finance
- 13:45–15:00 Parallel sessions
Panel A. Biodiversity: what does its loss imply for our society? How can we better assess and integrate potential risks?
Panel B. How do executives internally lead and manage the paradigm shift about climate change in their institutions?
Panel C. Do we take sufficient account of the redistributive impacts of climate change?
- 15:00–15:15 Break
- 15:15–15:45 **Climate finance risk**
Robert Engle, Michael Armellino Professor of Finance, NYU Stern School of Business
- 15:45–16:15 **Our climate crisis, the financial system and the sustainability revolution**
Al Gore, Chairman, Generation Investment Management
- 16:15–17:30 Parallel sessions
Panel D. What is the role of governments and IFIs in mitigating risks and coordinating the policy response to climate change?
Panel E. Climate change-related risks data and accounting: how are existing methods being implemented? What are the alternatives to the existing reporting methodologies?
Panel F. What is the true resilience of our financial systems to climate change risks with the buffers we currently have?
- 17:30–17:45 Break
- 17:45–18:00 **Climate risks, financial markets and central banks' risk management**
Jens Weidmann, Chair of the BIS Board of Directors and President of the Deutsche Bundesbank
- 18:00–18:30 **Climate change: our most global challenge**
Tao Zhang, Deputy Managing Director, International Monetary Fund

Thursday 3 June 2021

- 13:00–13:15 **Introduction – Green Swan conference**
Sylvie Goulard, Second Deputy Governor, Banque de France
- 13:15–13:45 **Special guest speech**
Mario Monti, President of Bocconi University; former Prime Minister of Italy
- 13:45–15:00 Parallel sessions

Panel G. How should financial stability, regulation and supervision be considered in the context of increasing climate-related risks?
Panel H. Measuring climate-related risks in macroeconomic and global terms: do we have the right mind set, tools and models?
Panel I. Do we have the right financial and insurance instruments to deal with the impact of climate change?
- 15:00–15:30 **Special guest speech**
Joseph Stiglitz, Professor, Columbia University
- 15:30–15:45 Break
- 15:45–16:15 **The embrace of the horizon: forcefully moving with the changing tide for climate action in financial sector policies**
Frank Elderson, Member of the Executive Board and Vice-Chair of the Supervisory Board, ECB; Chair, NGFS
- 16:15–17:30 Parallel sessions

Panel J. What are the methods and metrics currently being used to assess climate-related risks in investment decisions?
Panel K. What are the challenges to having ‘greener cities’ – and how to finance them?
Panel L. How is Green R&D doing? How critical is alternative energy financing?
- 17:30–18:00 **Climate change and the precautionary imperative**
Sarah Bloom Raskin, former Deputy Secretary, United States Treasury; former Governor, Federal Reserve Board
- 18:00–18:30 **Tackling climate change for real: progress and next steps**
Andrew Bailey, Governor, Bank of England

Friday 4 June 2021

- 08:30–09:00 **Special guest speech**
Laurent Fabius, former President of COP21 / Paris Agreement
- 09:00–10:15 Parallel sessions
Panel M. What are the policies currently considered by central banks, regulators and supervisors – and their challenges – to address climate change?
Panel N. How can innovations in market-based approaches using consumer carbon tracing influence consumers' lifestyle choices?
Panel O. Can we provide concrete green investment opportunities for the current abundance of savings? How to structure implied Temperature/1.5-degree Celsius Portfolios?
- 10:15–10:30 Break
- 10:30–11:00 **Developing carbon-market framework and improving multilateral governance for cross-border carbon emissions**
Zhou Xiaochuan, President, China Society for Finance and Banking; Vice Chairman, Boao Forum for Asia; former Governor, People's Bank of China
- 11:00–12:15 Parallel sessions
Panel P. How can central banks, supervisors and regulators help to mobilise and coordinate with other actors (Treasuries, private sector) in the fight against climate change?
Panel Q. How are new investments adapting to integrate biodiversity loss risks? How are the impacts of these investment measured?
Panel R. How can Development Banks address the massively increased financing needs for green projects? What kind of innovative solutions can be developed?
- 12:15–12:30 Break
- 12:30–13:00 **Economic leadership for transformation in a critical decade: managing risks and fostering investment**
Nicholas Stern, IG Patel Professor of Economics and Government and Chair of the Grantham Research Institute on Climate Change and the Environment, London School of Economics
- 13:00–14:45 **Concluding panel – Central banks and climate change: how to manage expectations, balance actions and communication and contribute to coordinate with other important actors?**
Moderator: Gillian Tett, Financial Times
Agustín Carstens, Bank for International Settlements
Christine Lagarde, European Central Bank
Jerome Powell, Federal Reserve Board of Governors
François Villeroy de Galhau, Banque de France; NGFS
Yi Gang, People's Bank of China
- 14:45–15:00 **Main messages of the conference**
Luiz Pereira da Silva, Deputy General Manager, Bank for International Settlements
- 15:00–15:30 **The conference messages in light of the G20 Presidency programme**
Ignazio Visco, Governor, Bank of Italy; G20 Presidency

Introduction – Why this conference?

Luiz Pereira da Silva

Deputy General Manager, Bank for International Settlements

Hello everyone. Good morning, good afternoon and good evening. I am Luiz Pereira da Silva at the Bank for International Settlements (BIS). On behalf of the BIS, the Banque de France, the International Monetary Fund and the Network for Greening the Financial System (NGFS), it's my pleasure to welcome you to this 2021 Green Swan Conference.

A few housekeeping rules first: The conference is broadcasted live on the BIS YouTube channel, and the recordings of all the panels of each day will be available on the BIS website after they finish.

This is a unique conference on “How in practice can the financial sector take immediate action against climate change-related risks?” It is about coordinating finance to fight climate change. Central banks are doing their part and effectively playing their own specific role.

But let me explain why this conference is unique and what you should expect. First, **addressing climate risk requires coordination**. Why? Because there is no silver bullet. There is no single agent in the economy, nor one unique policy instrument, that can solve the challenge of global warming.

This conference is already an example of coordination. We have gathered here today policymakers, the community of central banks and regulators in Europe, Asia, Africa and the Americas as well as with international financial institutions and development banks. This is one of the roles of the BIS. We have also brought together investors, asset managers, insurance and commercial banks, innovators, researchers in academia, engineers, consumers and, of course, *you* in the audience. That's because reducing emissions is a behavioural change that all of us need to do in a coordinated way. So, I'd like to thank all of you for your participation in this conference.

Second, why **coordinate on finance**? Because the financial sector played a critical role in financing the innovations of the industrial revolution in the 19th century, and a similar role is probably needed now, in the 21st century, to move to a net-zero carbon economy.

Third, **awareness of climate risk is rising**, with two shifts in mindset on risk and time dimensions. On the risk dimension, we labelled climate change as a “green swan”. Why? Because the best science today says that it is an event that is certain to happen if we don't act. Climate change is not a rare, distant tail in a probability distribution curve. I'm sure you've seen increasingly more frequent extreme weather events; and Covid-19 has links with climate and the loss of biodiversity.

Next, we are running out of time. Acting now is necessary to avoid going over our remaining carbon budget. According, again, to science, we have about eight to 10 years to curb our current annual emission level. So, from a purely risk perspective, to wait and see, hoping that things will improve by themselves, is too risky.

As a consequence, and fourth, with mounting risk and lack of time, this conference is also about **practical concrete steps** for the financial sector. We will discuss carbon pricing, for sure, but also prudential rules, accounting standards, better disclosure and monitoring of exposures and risks, and green global taxonomy – especially important for financial markets developed around green investments. We will also discuss a carbon budget management approach. How can the financial sector, in practice, contribute to the government's commitments to net-zero emissions of greenhouse gases? How, for example, to mobilise capital markets toward net zero? How to align portfolios to 1.5 degrees? We will pay attention to the distributional consequences of climate change: we know that poor countries are hit most by climate change, and so are poor households in rich economies. Finally, we will discuss how to grow in a more sustainable way, greening the recovery from Covid: more green investment, R&D, green

infrastructure, alternative technologies – this is, by the way, what the US, Europe and Asia are proposing with their current recovery plans. And after discussing all these issues, we will make the proceedings available as a public good.

This year, 2021, offers a huge opportunity with a rare alignment of goodwill: COP15 on biodiversity, COP26 on climate, and new, committed G7 and G20 presidencies. So let me now pass the floor to Minouche Shafik, Director of the London School of Economics and Political Science and former Deputy Governor of the Bank of England, who will be the moderator of our first panel. Minouche, the floor is yours. Thank you very much.

Opening panel – How in practice can the financial sector take immediate action against climate change-related risks?

Moderator: Minouche Shafik, Director, London School of Economics

Panellists: Kristalina Georgieva, Managing Director, International Monetary Fund

François Villeroy de Galhau, Governor, Banque de France

Frank Elderson, Member of the Executive Board and Vice-Chair of the Supervisory Board, ECB; Chair, NGFS

Agustín Carstens, General Manager, Bank for International Settlements

Minouche Shafik

Thank you so much, Luiz, for that. It's a real pleasure to be here today introducing at this panel.

Sometimes it's good to remember how far we've come. Seven years ago, Mark Carney gave a speech at Lloyds of London, the heart of the global insurance industry, arguing that climate change posed serious financial stability risks.¹ And at the time, there was an uproar.

Never mind that the speech focused on core central bank issues like the value of financial assets, risk management and issues around managing third-party liabilities. *The Daily Telegraph*, one of the newspapers here in the UK, had a headline which said, "Who put Mark Carney in charge of climate policy?" and followed up with a tweet: "What next? The war on Syria? Come to think of it, why not put the Bank of England in charge of everything?" Those in the fossil fuel sector were particularly alarmed about the argument around stranded assets, and what that might do to their balance sheets and those of their creditors.

Fast forward to May 2021: I recently chaired an event at the London School of Economics on Net-Zero Central Banking, and what was striking was the scope of activities across every major central bank and financial regulator around climate risks.² This ranged from prudential regulations and stress testing to exploring implications for monetary policy and asset purchases. Mark had certainly given central bankers and financial regulators something to talk about, and they were doing it with gusto. And this event is a great example of just that.

What's clear is that **the debate has moved on** from whether central banks had any role to play to what their appropriate contribution should be, given their mandates. In many countries, that mandate includes supporting governments' wider economic policies, which in many places includes addressing climate change. And of course, we do need to worry about mandate creep. But there does seem to be a clear consensus around the financial stability agenda and the role of prudential authorities in making sure banks and insurance companies account for climate change properly, and managers manage the risks actively. There is probably more debate to be had around monetary policy and asset purchases, and we will do some of that today, no doubt.

Central banks and financial regulators are also well aware that they are not *the* answer to climate change, as Luiz has noted. Fiscal policy, public and private investment, regulation and education all have important roles to play. But central banks can contribute in their area of core competence, including prudential rules, disclosure, monitoring of risks, proper accounting standards, stress testing and so on. Perhaps one of the most important contributions is around **clarifying the rules of the road** so that others

¹ www.bankofengland.co.uk/speech/2015/breaking-the-tragedy-of-the-horizon-climate-change-and-financial-stability

² www.lse.ac.uk/granthaminstitute/events/net-zero-central-banking-a-new-phase-in-greening-the-financial-system/

can do their part. For example, we're in the midst of a period of great innovation around ESG investing – environment, social and governance investing. But the thousands of flowers that have bloomed in the ESG garden probably need a bit of weeding.

I saw this first-hand when we tried to buy offsets to make LSE the first university in the UK to be carbon-neutral. We discovered an offset market that's a bit like the Wild West. And without good advisors, we risked inadvertently engaging in greenwashing.

Similarly, when exploring issuing a green bond, I was shocked at what a poor environmental standard was required to qualify for that label. We may have reached the limit of a voluntary approach that relies on pressure from investors and consumers, and it may be time for financial regulators to mandate standards so that private actors can do their part to achieve environmental goals.

Today, we have four leading figures who are grappling with these issues in their respective organisations and will shape the trajectory the world will take. Fortunately, they all need no introduction, so I'm going to save time to hear more from them. I'll ask each of them to speak for about eight minutes, and hopefully there'll be time at the end for some discussion.

We'll start with Kristalina Georgieva, the Managing Director of the IMF, who will talk about how the IMF can bring climate change more squarely into its work on surveillance, technical assistance and programmes. She'll be followed by François Villeroy de Galhau, Governor of the Banque de France, who will discuss what he thinks is the most impactful tool that central banks have in their hands to tackle climate change. After that, we will hear from Frank Elderson of the ECB and Chair of the Network for Greening the Financial System. Frank will answer the question: the NGFS has evolved from just eight members three years ago to more than 100 members and observers today; what are the main lessons from that experience? And finally, we'll hear from Agustín Carstens, General Manager of the BIS, on how he sees the relationship between policymakers and central banks on climate change.

I'll also ask all speakers to say something about what they're expecting from this conference, so let's turn it over first to Kristalina.

Kristalina Georgieva

Thank you very much, Minouche. It is fantastic that our organisations came together with this incredible panel and conference.

Before we get to answering your question, I want to remind the audience that you were Deputy Managing Director of the IMF. And you were there when the question of whether climate is relevant for macroeconomic stability was first asked.

Today, we recognise fully that dealing with climate change is critical for the economy and it is critical for financial stability. That should not be news to us. The Panic of 1857 was caused by, among other things, a climate event – a hurricane that sank a boat carrying gold.

We have seen climate affecting different types of financial products and, more importantly, over time we have recognised that we are talking about a systemic issue. Climate is, for sure, a factor today and it will be even more so tomorrow. This means that we have to move forward on integrating climate into the work of each and every organisation, especially those that are dealing with policy decisions that affect the viability of our economies and the financial sector. So, to put it simply – move the transition to the new climate economy forward. Bring emissions down and resilience up.

So, how does that translate into the work of the Fund? We have a very important role to play with the two types of assessments we are mandated to carry out regularly.

The first one is known as Article IV consultations. This is an annual or biennial engagement with each member of the IMF to look at their macro policies and come up with recommendations. We have

now integrated climate into these assessments – with a decision from our Board and shareholders. And what impressed me tremendously was that, while there are some differences around the parameters of integrating climate into these annual policy consultations, there is no disagreement whatsoever that it must be done.

How do we approach it? We first look at mitigation policies in countries that are significant emitters. We have already engaged with about 30 countries, among them the United Kingdom, Canada, Germany, Korea and the United States. It will soon be featured in our China and India assessments. We are going to cover all of the top 20 emitters within two years.

When we engage with countries on mitigation policies, our top priority is to help them shape the incentive environment for public and private investments and consumer behaviour – to change and shift to low carbon intensity – and first and foremost that requires concentrating on pricing carbon. This is not an easy topic, but our research shows that if we do not move to pricing carbon – and do it fast, with forward guidance on how the trajectory of carbon prices will go upwards – we are not going to meet the goals of the Paris Agreement. Therefore, how we go about pricing carbon in different country situations, and at what level we price it, is a top-of-mind priority.

We are looking at three ways: (i) tax, the most efficient way to do it; (ii) trade, which has taken off and is quite popular; and (iii) the regulatory equivalency of pricing carbon; in other words, a sort of shadow carbon price based on regulation. Why are we taking these three possible ways forward? Because we want the biggest tent in order to bring everybody in and move on this significantly over the next few years.

We do not have time to waste. Today, we have 21.5 per cent of carbon emissions being covered by tax or trade – we don't have the exact number for the regulatory equivalency – and it has jumped by five percentage points in just this last year. So, we are on the right track, but we have a long way to go.

But there isn't just mitigation to consider. For many countries, a much more troubling factor is the criticality of climate shocks. Therefore, we are looking into vulnerability to climate shocks, and what can be done with policies to address this vulnerability – in other words, policies for resilience. We look at fiscal buffers, public spending on adaptation, new insurance products, social protection and how all of this together can build more resilient societies. And, by the way, investing can help, and education is an investment in resilience. Finally, we have a lot of work to do on just transition, within countries and across countries.

That takes me to the second pillar in our assessment: IMF surveillance of the financial sector, the Financial Sector Assessment Programs (FSAPs). This is now also being done with a goal to reach an intensity of 12 to 14 countries per year over the medium term. We have already covered climate risks in one out of five past Assessments, and our objective – again, with the support of the membership – is to go for full coverage.

Here, we are looking at two types of risks: physical risks and transition risks. Physical risk is a simple concept: when there is a shock that does damage, it translates into impact on the balance sheets of businesses and, of course, on the balance sheets of banks. Much more complicated is the transition risk. This would play out over time, and it will demonstrate itself as we move towards lower carbon intensity, but we need to look into this risk today. How are "dirty" assets going to evolve? How will their value decline? Will they be replaced by others? How we integrate this is a question we are wrestling with together with our partners at central banks and in the Network for Greening the Financial System.

To give you examples of what that means in practice, in highly vulnerable countries, we zero in on financial stability risks linked to climate shocks; we did this in Jamaica. For advanced economies, we have covered natural catastrophic risks through insurance stress testing. And as we move forward, we are building this in a comprehensive manner.

Just to give you two examples of the new generation of FSAPs where climate risks are much more present, in the Philippines, we looked at how low-lying islands that are hit by typhoons can manage this

risk and how the authorities can model future storms, and the impact of these storms on bank capital. In Norway, a major oil exporter, we looked at the transition risks and how carbon price increases would affect banks' credit exposure.

So, when we look into the future, you ask us what this conference should do. I think it needs to **build more consensus on three topics:**

One, how we can go about enhanced stress-testing. Two, how to ensure supervisory frameworks appropriately manage the full range of climate risks. Three, how to narrow the scope for greenwashing by coming up with a smaller set of credible frameworks and standards for integrating climate-related risks.

The good news is that green investment is going up. So far this year, 140 financial institutions have invested \$203 billion in bonds and loans in green projects, in comparison with 189 billion in hydrocarbon businesses. The bad news is we have not yet found a uniformity of standards; 200 frameworks is a little too much to handle. We have to narrow this down and accept that mandatory reporting can only be done when we have commonalities of standardised disclosure and accepted frameworks.

So, we have work to do, all of us. At the Fund, we take this extremely seriously. Count on us. Thank you.

François Villeroy de Galhau

Ladies and Gentlemen, this Green Swan 2021 Global Virtual Conference co-sponsored by the Banque de France, the BIS, the IMF and the NGFS should have taken place in Paris, birthplace of the Climate Agreement and of the NGFS, but it is my pleasure to welcome you online.

Central banks' commitment to the climate cause may seem obvious today, but few issues have seen such a rapid and massive change. My generation changed its mind. *I* changed my mind. Many of us now share the imperative of Hans Jonas: "In your present choices, include the future wholeness of Man among the objects of your will".³ In Amsterdam three years ago, for the inaugural Conference of the NGFS, I referred to greening finance as our "new frontier for the 21st century". Today, the challenge could almost look inverted: we have gone from the risk of "doing too little, too late" to the criticism, by some, of "too many doing too much". No: (i) we are not doing too much, and (ii) we are never too many.

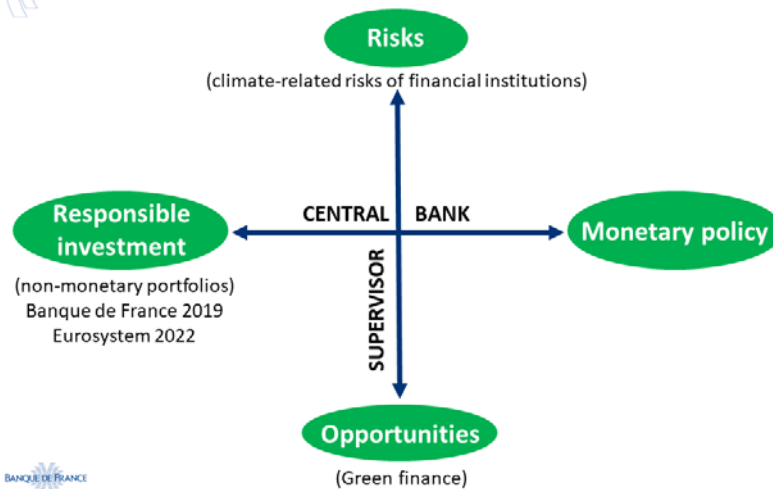
But before starting, I would like to draw two useful and cautious lessons from the above-mentioned criticisms. First, we central bankers and supervisors cannot do everything by ourselves; we are not the only green game in town. Nothing will replace an appropriate carbon price. Second, we are acting in the very name of our mandate: our consideration for climate change is neither an abuse of our mission, nor a mere militant conviction, and we will act with the same technical credibility and professionalism as we do in our traditional domains.

Not "too much": what it is our duty to do

In a somewhat "proliferating" environment, let me suggest some clarification with a two-dimensional quadrant.

³ See H Jonas, *The imperative of responsibility: in search of an ethics for the technological age*, 1984.

Our missions: what we can do and must do

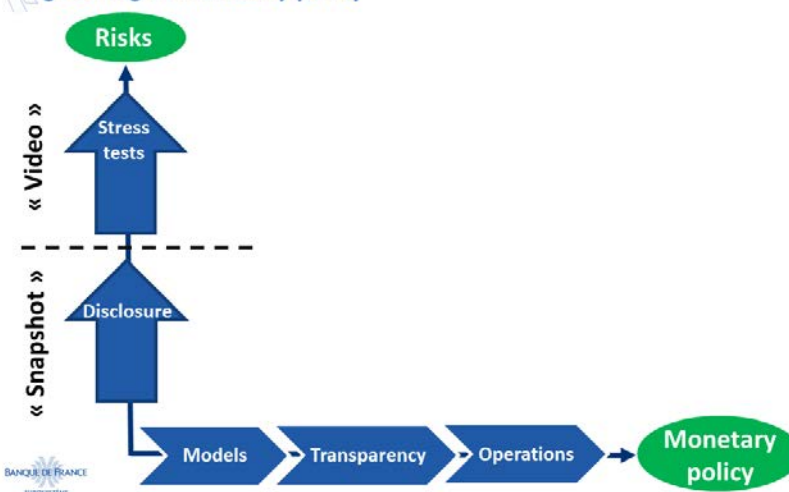


The vertical axis – the most obvious one – relates to our missions as **supervisors** and includes both climate-related risks for financial institutions and opportunities linked to green finance. The horizontal axis relates to our missions as **central bankers** and includes responsible investment of our non-monetary portfolio and monetary policy. For many central banks, implementing responsible investment strategies has numerous benefits: central banks can then practice what they preach as supervisors, protect their own balance sheets and contribute to financing the green economy.

Since 2019, the Banque de France has been the first Eurosystem central bank to publish a yearly, dedicated report on our responsible investment policy.⁴ And we turn our words into action: the Banque de France is completely exiting coal by 2024. As regards green finance, climate change creates opportunities for investors: the expected transition to a lower-carbon economy is estimated to require around \$1 trillion in investments a year.

I will now focus on the top right of the quadrant: climate-related risks of financial institutions and the greening of monetary policy. These are the two “key battlefields”. Regarding **climate-related risks**, there are two essential levers for winning the battle: (i) disclosure of present data and their standardisation (the “snapshot” of the risks); and (ii) forward-looking assessments – the stress tests (the “video”).

The two « key battlefields »: climate-related risks and the greening of monetary policy



⁴ See Banque de France (Bank of France), *Responsible Investment Report 2019*, June 2020.

Disclosure will help markets to appropriately price climate-related risks and ensure efficient allocation of capital. That is why disclosure should become mandatory, at least as a first step for financial institutions, as it is already in France, and for large corporates. Here too, the EU leads by example, having decided on standardised mandatory disclosure from next year onwards.

Nevertheless, because of data gaps and a continued lack of clear transition policies, assessing individual or sectoral exposure to climate risks remains a thorny issue, as highlighted in the latest NGFS report on bridging data gaps published last week.⁵ Hence, setting up an ambitious international reporting framework for climate-related financial disclosure is another key priority. This means achieving a common framework – basic, but already significant – for all jurisdictions, with the option of being more ambitious for those who want to.

In addition, we should bring on board the “double materiality” promoted by the European Commission, ie consider both the risks that affect the reporting entity itself and the impact it has on the environment through its activity, and also encourage broad coverage of ESG topics not limited to climate change. In this respect, the IFRS initiative should not be self-sufficient, as it could neglect the S and G dimensions and such key standards are public goods which require “co-construction” with political authorities. Corporations, whether financial or non-financial, that proclaim themselves “net zero by 2050” should also be able to disclose and provide a clear pathway, a strategy for achieving this goal, to make sure their commitment is credible.

On **stress tests**, forward-looking assessments with scenario-based climate risk analysis will play a key role. Last month, the French ACPR published the first climate pilot exercise in the world that covers both the banking and insurance sectors. The exercise was of an unprecedented nature due to the long time horizon (30 years), the active participation of financial institutions themselves, and the inclusion of both physical and transition risks. Two lessons can already be drawn: these stress tests are possible, and the risks are better controlled if the transition is orderly and begins early. However, we are still in the middle of the journey towards completing our methodology. The ACPR urges all supervisors to initiate their own exercise. Learning by doing is better than waiting for the perfect solution before taking any action!

I now turn to the last part of the quadrant. **Greening monetary policy** is still the hottest issue. This is no fashion, it is an imperative.⁶ Long-term shocks related to climate change are potentially difficult for central banks to manage because of their **stagflationary** nature, as they may result in both upward pressure on prices and a slowdown in activity. But climate change also has short-term effects on prices. Part of the recent increase in energy prices in the euro area was linked to higher electricity prices in Spain due to unusually cold weather and to a carbon surcharge on prices of liquid fuels and gas in Germany. What’s more, as is stated in the NGFS report on monetary policy from March, “central banks ought to be aware of climate risks that could threaten the integrity of their balance sheets”.⁷ Let’s face it: the ECB’s balance sheet is “exposed” to climate risk through the securities it purchases and the assets pledged as collateral by banks, to an extent that is not sufficiently taken into account.

How might we concretely reduce this exposure? Next fall, we will decide with Christine Lagarde – whose strong commitment I want to praise – and the Governing Council on the conclusions of our Strategy Review. To contribute to this debate, I strongly hope the ECB will be the first central bank to decide on the three following steps:

⁵ Network for Greening the Financial System, *Progress report on bridging data gaps*, 26 May 2021.

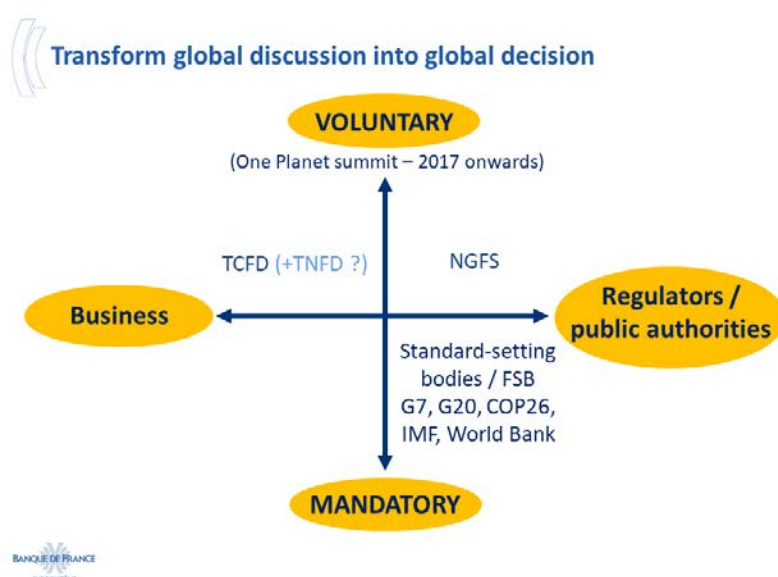
⁶ F Villeroy de Galhau, “The role of central banks in the greening of the economy”, 11 February 2021.

⁷ Network for Greening the Financial System, *Adapting central bank operations to a hotter world: reviewing some options*, 24 March 2021.

- Forecast, and therefore, **model**: This dimension of economic research is often overlooked. It is nevertheless crucial to grasp complex interdependencies between physical and economic phenomena across sectors, countries and time horizons.
- Disclose: impose **transparency** requirements, including on counterparties.
- Incorporate climate risk into our **operations** on corporates (on both asset purchases and collateral policies).

Not “too many”: how to transform global discussion into global action

In less than four years, the NGFS has grown from eight to almost 100 members, but there will never be too many of us. This increasing number nevertheless raises the challenge of working efficiently together at the international level. We must definitely transform global discussion into global decision and, at the end of the day, global action.



We have functioned with voluntary and expanding coalitions like the NGFS, or the TCFD for business. And while Europe was a key player at the core of this coalition, from the very beginning, our colleagues from China, Mexico and Singapore were around the table. Now, with the new administration in the United States, “mandatory” bodies enter the stage. Standard-setting bodies, international organisations and international fora have now put sustainable finance as their top priority. In this context, the NGFS is actively requested and involved in the new international climate roadmap of the G20 and the FSB.

To achieve this goal, we have to build on **the best assets of our network**: its agility, its technical competence as a “knowledge hub”, and, if I may, the relentless efforts of its Chair, my colleague Frank Elderson, and the Banque de France’s commitment to its global Secretariat. A team of 14 people from the Banque de France forms the backbone of the Secretariat, strongly backed by our new Climate Change Centre chaired by Nathalie Aufauvre. Given the NGFS’ extending reach and deepening work, secondments from other NGFS members would be most welcome to contribute to the dynamism of the Network, through one-year stays on site in Paris or flexible options including remote work. And we intend to strengthen our efforts to communicate and disseminate the work of the NGFS among our membership and beyond.

We have increased means and still **many avenues to explore**. If I had to stress only two tasks where our whole global community needs the NGFS, they would be the following:

- **Climate-related economic scenarios**. We released a first wave in July 2020, and we will update them next week. I read some unfounded doubts on them, but NGFS works with the best partner

research institutes, publishes a range of plausible and differentiated futures – not intended as a central forecast – and will regularly incorporate the development of scientific evidence. This provides, as a common public good for COP26, the best reliable framework for financial risk assessment.

- Data disclosure and **stress-test methodologies**, in order to measure the climate-related risks of financial institutions more and more precisely and credibly. It is a prerequisite before possibly deciding about additional capital requirements. For these tasks, believe me: we at NGFS are ready to roll up our sleeves, and we still have the enthusiasm of pioneers.

In conclusion, acceleration has been the name of the game since 2017. Still, we should further accelerate in 2021. We have an exceptional political alignment, with major international milestones: the COP26, of course, but also a G7 summit in June, a G20 conference in July in Venice and a G20 summit in October in Rome. It is time for all policymakers – us included – to be up to Hans Jonas' requirement, for the future wholeness of Man. Thank you for your attention.

Frank Elderson

Thank you so much, Minouche. And thank you, François, for your nice words. It's a great pleasure and honour to be co-hosting this conference. Luiz, compliments for bringing all this together and it's a great pleasure to be on this panel with some great friends. We are all sitting in different places in the world, but we are doing this side by side and together with the same conviction.

Indeed, the Central Bank and Supervisor Network for Greening the Financial System was launched in December 2017 on the initiative of the Banque de France and with eight members representing, at that time, 30% of global economic activity. Now, the NGFS has evolved, and I'm going to be very specific about the numbers. We have evolved into a network of 90 members, and actually, this morning, I welcomed the 91st member. So, we have 91 members at the moment and growing, and 14 observers, which include the IMF and the BIS, covering five continents, around 85% of global emissions, 88% of the global economy, and all global systemically important banks. And we continue to expand in coverage, in reach and, most importantly, in terms of our activities, which know no taboos and cover all core missions of central banks and supervisors.

When the NGFS published its first comprehensive report in April 2019, it clearly acknowledged the climate crisis as a driver of financial risk, bringing climate issues squarely within the mandates of central banks and supervisors. In that same report, six non-binding recommendations were issued, aimed at inspiring central banks and supervisors in their policy agenda. Since then, the focus of our work has been on following up on these recommendations and helping NGFS members act in line with the tagline of this conference, always within their mandates.

Now, our network can only be as strong as the community supporting its work, and that is why I want to take the opportunity to express my heartfelt gratitude for all the continued commitment of NGFS members and observers to the work of the NGFS; in particular, for all the efforts and technical expertise that has been provided. I'm very pleased to see how everyone has progressed in integrating climate-related and environmental risks into their day-to-day work. Indeed, a truly global response to the climate crisis from central banks and supervisors is only possible when the work of the NGFS is leveraged within each jurisdiction. I'm therefore delighted that we continue to welcome new members from around the world.

The last 15 months have been extraordinary for all of us in many, many ways, and the global pandemic has had a tremendous impact on our personal and professional lives. Yet I'm very proud that, even under these challenging circumstances, NGFS members did not lose sight of the urgency and the seriousness of the climate and environmental crises. Not only did we stay on track, but we even doubled down on our efforts. We realised that recovery from the pandemic would ultimately arrive and we realised

that this recovery would provide a huge opportunity to accelerate the greening of the economy that is so urgently needed to address the ongoing climate and environmental crises. I could speak for hours about the specific activities currently ongoing in the NGFS that contribute to this purpose.

This conference is an important event to take stock of ongoing work at the many institutions that are now undertaking action to address climate-related and environmental risks. However, the main message I want to convey in this opening panel is that **we should not stop short at just taking stock**.

In the book that was co-authored by Luiz, which lies at the foundation of this very conference, the authors referred to five Cs for central banks and supervisors to pursue: contribute to coordination to combat climate change. These five Cs resonate clearly within the NGFS, and they leave no room for a sixth if it is the C of complacency.

Now, the figure that I want you to keep in mind in this context is not so much the three and a half years of work of the NGFS. The figure I want you to keep in mind is five years – five years by which the linear trend estimate for global temperatures passing the 1.5-degree Celsius threshold has moved closer in time since the NGFS was founded, from an estimate of December 2038 back when the NGFS was founded, to an estimate of March 2034 today. And these are time-varying linear trend estimates that are very conveniently provided by an application on the website of the EU's Earth Observation Programme, Copernicus.

I should underline that these are not projections like the ones that have been produced by the IPCC. They are simple, linear trend extrapolations that do not incorporate policy commitments and measures put in place. Yet they are illustrative of what can happen if recent trends are not turned around. And to me, the message is clear. In terms of time, **we are still at risk of losing ground more quickly than we can cover it**. Our work is not done. As long as the trend in global temperature increases is not turning around convincingly, there is a continued need to further green the financial system.

In its first few years of existence, the NGFS has managed to explode out of the starting block. But we are aware that what we have started is a marathon, not a sprint. However, we must run this marathon at ten seconds per 100 meters, all 40-plus kilometres long. So, we are running this marathon and we are running it against a clock that is picking up speed.

Looking ahead, the NGFS will continue to expand its efforts on climate scenarios, supervisory practices, monetary policy, and sustainable and responsible investment practices, and we will take steps to bridge data gaps where we face them. And we will be inspired by the many discussions in this conference to complement, accelerate and coordinate our work.

The conviction of the NGFS and its full membership is clear. We must act. We must act *now*, with an urgency commensurate with the speed at which the climate crisis is unfolding, and we must step up our game. There is no place to hide. And as I have said earlier, there is no Plan B because there is no Planet B. And in view of the daunting challenges of the climate crisis, we need to remind ourselves every step of the way not just to look back at what we have already achieved, but rather to keep on asking ourselves: are we doing enough? And if we are not, how we can further speed and scale up, and then *do that*.

I invite all of you to raise these important questions in the context of this conference, to the speakers and the discussions, to all the viewers and to ourselves, and to everyone in all of our home institutions. Thank you.

Agustín Carstens

As General Manager of the BIS, let me welcome all of you to this conference. I would like to acknowledge the effective partnership with the Banque de France, the International Monetary Fund and the NGFS in organising this impressive event. The enthusiastic response from all of you – coming from a wide spectrum of sectors and regions – is a testament to the fact that the topic of climate change is of critical relevance.

As Minouche Shafik mentioned in her brilliant introductory remarks, it has been seven years since Mark Carney gave his seminal speech at Lloyd's of London, where he argued that climate change posed serious financial stability risks. Since then, central banks have increasingly improved their ability to recognise climate-related issues, while also being mindful of the scope of their roles and mandates.

While the climate crisis is not the sole or the primary responsibility of central banks and financial authorities to solve, given the nature of the problem itself, the central banking community increasingly recognises that taking action against climate change is paramount, and that doing so requires a significant amount of coordination across and within jurisdictions and sectors. There is no "silver bullet", and no single country or organisation can be successful alone. Climate-related financial risks are both local and global; they require countries to work together, especially now that over 100 governments expressed commitment to a net-zero carbon approach.

To address the key financial aspects related to a potential solution for the climate crisis, the essential players are:

- treasuries, because of their primary responsibility for carbon pricing, their role as investors in green infrastructure and the support they provide to research on sustainable policies;
- international institutions like the IMF – and here Kristalina Georgieva has delivered a powerful message of commitment;
- development banks, because they can leverage financing costs for transition and mitigation;
- firms, commercial banks, insurance companies, regulators, standard-setters and ratings agencies to ensure consistency with net-zero commitments; and
- central banks and supervisors, at the individual level and as a group, as they work together through the NGFS.

The BIS has also been doing its part. We used the "black swan" image of the 2007–09 Great Financial Crisis to coin a new "green swan" concept: a series of severe climate events that are bound to happen because they are the result of our greenhouse gas emissions warming the globe's average temperature. We are seeing these events with greater frequency. Therefore, addressing these risks as soon as possible and in a coordinated fashion is the best way to preserve financial stability.

In addition, we have contributed to developing a green bond database for the NGFS to monitor market developments. Like many of you, we are incorporating sustainability criteria into our pension fund and other investments. We are offering green bond funds to central banks to facilitate diversification of their international reserves.

We are also working with other central banks in our BIS Innovation Hub on how to use new financial technology to foster "green finance". For example, we are developing a prototype for the introduction of tokenised green bonds in small denominations, giving greater access to retail investors. This project integrates real-time tracking and disclosure of green output for investors, showcasing technologies that can be used to reduce greenwashing and increase transparency.

And in the runup to the 26th United Nations Climate Change Conference of the Parties (COP26), the BIS will deliver a dedicated portal, run by our Financial Stability Institute, for training on climate risks. I am pleased that the BIS will soon launch the Climate Training Alliance with the NGFS, the International Association of Insurance Supervisors and the Sustainable Insurance Forum.

Not least, the BIS is actively involved in the widely recognised work of the NGFS, working together with the central banking and supervisory community on a wide range of relevant climate change-related issues. Working with the Banque de France, one of our contributions has been to help frame climate change issues for the central banking community as a new systemic risk issue. The severe physical and transition risks of global warming fall squarely within the financial stability mandate of most central banks.

At the same time, we should be hard-nosed about what we are trying to achieve, and not get swept up by the sense of enthusiasm. Minouche asked each of us what we are expecting from this conference. Looking at the impressive agenda, we will hear about:

- development of new macro models, new risk metrics, new climate-related stress tests and new scenarios for 1.5 degrees Celsius (potential future temperature increase) for the real and financial sectors;
- elaboration of the scope and role of macroprudential tools and how to achieve the right balance with monetary policy;
- advancements in financial knowledge to accelerate adaptation and transition towards a net-zero goal;
- improvements to disclosure and accounting standards; and
- progress in the taxonomy of green investments.

All of this is excellent, but we will need to be able to go from general approaches to specific solutions. For me, the last points on disclosure and taxonomy are particularly urgent in order to strengthen the integrity of markets being created around green finance.

Let me explain: investors are increasingly looking for investments with environmental benefits, and financial markets have responded by offering new products. The amount of outstanding bonds with a green label has surpassed the \$1 trillion mark and stood at nearly \$1.2 trillion at end-2020.⁸ Investments in funds with Environmental, Social and Governance (ESG) mandates have reached \$38 trillion on some measure – a quarter of the global total.⁹

However, green labels and ESG ratings are often not sufficiently clear on the promised environmental benefits and offer little assurance that benefits will materialise. Part of the problem derives from the fact that these labels are based on inputs, which are easy to verify, rather than how well they are aligned with outputs or concrete outcomes, which are harder to verify. Further, such labels and ratings are seldom aligned with high-level policy goals such as the transition to a low-carbon economy. BIS research has shown that labelling bonds as “green” does not necessarily imply that issuers are carbon efficient or reduce emissions over time. ESG ratings have fairly low correlations across different providers, reflecting the variety of different inputs that providers use to arrive at their ESG ratings. Similar results on the potential confusion around ESG ratings, which opens up the possibility of greenwashing, are shown by the work of the Organisation for Economic Co-operation and Development, the IMF and academics.

Financial markets can make an important contribution to help with the transition to a low-carbon economy and protect our planet. Policymakers need to enable investors by enhancing market transparency and deter greenwashing in three ways:

- develop taxonomies for climate transition and align them with high-level goals such as the Paris Agreement;
- develop standards that enable investors to understand exactly which environmental benefits can be delivered by assets labelled as “green”; and
- develop certification and verification processes that confirm that promised environmental benefits are actually achieved.

⁸ BIS calculations, based on data from Climate Bonds Initiative, Dealogic and Environmental Finance Bond Database.

⁹ A Diab and G Martin Adams, “ESG assets may hit \$53 trillion by 2025, a third of global AUM”, Bloomberg, 23 February 2021, www.bloomberg.com/professional/blog/esg-assets-may-hit-53-trillion-by-2025-a-third-of-global-aum/.

A structural change in financial markets is underway and is happening fast. Therefore, we urgently need to ensure market transparency and integrity in this transition. If we want to avoid a green bubble, we need to act now. Thank you very much.

Mainstreaming climate risk management: what next?

Mark Carney

Finance Adviser to the UK Prime Minister for COP26; UN Special Envoy on Climate Action and Finance

Thank you very much, Irene, for that very generous introduction. And I must say, I am very reassured that there are people like you who are taking up the reins on this critical issue, and congratulations on your new role at the heart of central banking at the ECB.

I'd also like to thank the BIS, the Banque de France, De Nederlandsche Bank, the IMF and the NGFS for hosting this timely event. It really is a testament to the power of central bank cooperation that so many of us are gathered virtually today and over the next few days, and we are gathered with such purpose, which as the title of the conference indicates, is to address a Green Swan, a known risk with enormous consequence.

I want to begin by asking you for a moment to think of another animal in the water: shark. Because just outside of Oxford, there is a terraced house where a man had installed several decades ago a sculpture of a giant shark attacking his roof. This was triggered by the Chernobyl disaster, and it displayed his feelings of impotence and anger and desperation at how challenges from abroad could quickly become local. Over the years, I've often thought about that shark because it isn't just nuclear fallout that spreads across borders. As we know as central bankers, it's financial instability; as we have learned as citizens in the last 18 months, it's pathogens; and as this group has been seized with, it includes climate chaos.

Now of course, we can't just withdraw from the world and hope that sharks won't attack. Covid won't be over anywhere until it is over everywhere. We can't self-isolate from climate change.

Central banks know that by working together we can build a more resilient financial system – one that is more resilient, for example, to cyber attacks, one that drives efficiencies in cross-border payments so that the digital revolution can safely benefit all. And by working together, central banks can help tackle the risks associated with climate change.

By recognising the growing physical risks from climate change if the world doesn't act, as well as the dangers of a climate Minsky moment if the world acts but acts suddenly and too late, central banks are helping to create a financial system that can not only manage but also enable the transition to net zero.

I'd argue you are laying the very foundations of the global financial system that can mainstream climate risk management. As a result of your efforts in recent years, public demands and growing political resolve in the private financial sector, banks, asset managers, asset owners, insurers – in fact, financial institutions like those representing over \$70 trillion of assets – are committing to the gold standard of net-zero targets and transition plans through the Glasgow Financial Alliance for Net Zero, or GFANZ.

The progress in recent years has been extraordinary, and I'd argue that in any other endeavour in central banking – and virtually in any other area – this would be a cause for celebration and reflection. However, given the imperatives of climate change, it must serve as the foundation for even greater determination because, since the Paris Agreement five and a half years ago, the frequency of extreme weather events has intensified. The dangers of the two-degree world have become more apparent. The carbon budget has continued to be consumed and the prospect of climate tipping points has only increased. In other words, the physical risks from climate change are still growing remorselessly.

In short, the issue is as urgent as when it was first engaged several years ago.

More positively, another tipping point may be underway. In the past few years, in response to growing physical risks, mounting public pressure and the improving economics of many climate solutions,

governments have newfound resolve. Almost 130 have now committed to net-zero targets, such that, last month, the IEA found that country objectives – objectives, not policies – are consistent with the 2.1-degree world, with the objective of COP26 being to keep the 1.5-degree target within reach.

Transition risk is also growing. Commercial opportunities from addressing climate change are exploding. So, it's now essential to realise our objective for COP26, namely, that every financial decision takes climate change into account. To that end, let me highlight what I view as some of the most important priorities for central banks in order to help mainstream climate risk management.

The first, as François Villeroy de Galhau emphasised today, is to **secure mandatory disclosure by companies of climate risk** based on the TCFD recommendations. The private sector has been doing its part. Voluntary adoption of the TCFD is accelerating, with over 1,500 firms with market capitalisation of over \$17 trillion now reporting against the TCFD recommendations that were launched less than three years ago.

Many central banks have followed suit and are now disclosing and managing their own climate exposures. By COP26, all major jurisdictions should adopt pathways to comprehensive, comparable climate disclosure based on the TCFD. This includes legislative disclosure, such as in the UK and the EU. It includes regimes led by security regulators such as in Japan and, potentially, the United States. And for global coverage, it includes the adoption of new sustainability reporting standards that should be developed and adopted by the IFRS.

The second priority is to leverage the growing expertise in the NGFS to **build climate risk management skills amongst the central banking and supervisory communities and in the private sector**. Managing climate risks requires assessing the strategic resilience of firms to both physical and transition risks through scenario analysis. This, as my colleague Sarah Breeden has said, is fiendishly complicated. Data is still sparse in some areas. Methodologies are new. Interdependencies are multiple. And the future paths of climate risks themselves are, by their very nature, highly uncertain.

We know that climate risks are different from conventional financial risks. They are economy-wide, affecting every consumer and every business in every sector. They are global. They are longer-term, going beyond the usual three- to five-year planning horizon for most businesses. They are unprecedented by definition, so past data is not a good indicator of future outcomes. And they're complex. They need to be sized from the bottom up. It's not enough to just have top-down macro models.

Now, rather than being overwhelmed by these complexities, authorities have stepped up. From its eight founding central banks and supervisors, the NGFS has grown to over 90 members, which represent countries responsible for over 80% of the world's emissions and which oversee 100% of the world's global systemically important financial institutions, or G-SIFIs.

The NGFS is the place to share knowledge, to refine and improve the approach to climate risk management. To this end, the BIS, the NGFS, the IAIS and the Sustainable Insurance Forum are launching, today, a new centralised training platform for central banks and supervisors. The central banks' and supervisors' Climate Training Alliance, or CTA, will help build capacity in central banks and supervisors, improving the efficiency, effectiveness and accessibility of climate risk training and knowledge sharing amongst them. It will provide training on supervision of climate risks, climate scenario analysis and how to reflect climate in collateral management. We hope that it will be up and running by COP26.

This development reinforces my third priority, which is to **mainstream the use of scenarios in climate risk management and, in parallel, to ramp up climate stress testing**. The NGFS scenarios were co-designed with the world's leading climate scientists to capture the possible business impact of the different types of climate risk that could materialise over the next 30 years. Any business in any sector can and should use these models as a baseline to test strategic resilience. And because modelling the impacts of climate change is a new field, the models are being updated regularly to reflect the latest science and to incorporate feedback from users.

The latest iteration of the NGFS scenarios expands scenario modelling to explore further dimensions of the risks. It improves regional coverage and sectoral granularity, calculates probabilistic losses from acute climate impacts, expands the set of macroeconomic outputs and improves the NGFS' climate scenario database and portal.¹ Importantly, the second iteration also includes an additional scenario, a net-zero scenario that reflects the national net-zero commitments that have been made to date.

This underscores an important point: at a minimum, boards and risk managers should know what their exposure is if countries achieve their objectives of tackling climate change. We cannot have financial institutions fail if society succeeds. To avoid that possibility, 21 central banks have committed to climate-related stress tests, with three quarters using the NGFS scenarios in their assessments. And 23 central banks and supervisors have issued or plan to issue guidance to firms on their expectations of climate risk management and scenario analysis. These initiatives will allow supervisors to size risks across the financial system and explore possible systemic risks and interactions. By stretching horizons, firms will better manage future risks today.

To help drive consistency and to increase uptake, for COP26 we are promoting the use of the NGFS scenarios across the financial sector and the corporate sector through initiatives such as the Race to Zero. We are also encouraging the supporting financial market infrastructure, such as credit rating agencies, data providers and consultancies, to use the NGFS scenarios as a baseline for their assessments of strategic resilience.

My fourth priority is for **central banks to further improve the management of climate risks in their own operations while respecting their mandates**. This starts with measurement and transparency, and it goes beyond the minimum of TCFD disclosure. For example, last year the Bank of England published a measure of the impact of its investments on the climate, suggesting that the Corporate Bond Purchase Scheme, which purchases a representative cross-section of the UK corporate bond market, is aligned to a 3.5-degree temperature increase.

Following a change in its remit last year, the Bank of England has now committed to more actively managing assets to reflect the government's net-zero goal. The Bank recently issued a discussion paper on how to green their asset portfolio. This is a first for central banking, but given that 126 countries have committed to net zero, my instinct is that many central banks will follow.

As the Bank of England sets out, there are really four options. The first is to set targets for emissions in the portfolio to help shape future investment decisions and provide accountability. The second is to introduce a form of eligibility assessment or scheme that is based on, for example, whether companies make TCFD disclosures while they are still voluntary, or whether they have net-zero transition plans, or more fundamentally, whether their activities and their plans are compatible with reaching net zero. The third option is to tilt the portfolio to favour issuers that are performing strongly on climate change based on a scorecard of different climate factors such as current emission intensity, past efforts to decarbonise and forward-looking metrics. Finally, there could be escalating eligibility requirements over time, making it clear that firms not on the path must act or face the consequences of not accessing the scheme in the future.

This leads to a range of decisions. For example, should the targets be based on the carbon intensity of the portfolio, or a more forward-looking methodology of implied temperature rise, a metric which converts future emissions in the portfolio into estimated temperature increases? Consideration should be also given to how eligibility should be assessed in the absence of prolific TCFD reporting or a coherent framework to assess what constitutes a credible sector transition.

These questions go to a much larger issue, which is the architecture of transition finance. In this respect, the central bank community can draw on the body of work that is being undertaken as part of the

¹ www.ngfs.net/ngfs-scenarios-portal/

COP26 Private Finance Strategy. In particular, the TCFD has undertaken an extensive review of different methodologies for portfolio alignment with a view to issuing guidance on how to strengthen these measures and to create a more harmonised and comparable approach. The TCFD will issue its consultation next week, and I would encourage all of the financial sector to engage with this process ahead of final guidance being issued in October just ahead of COP26. In my judgment, these efforts can help define critical portfolio alignment technology for what the world needs, namely financing the transition to a net-zero world rather than simply divesting to green portfolios. We need to distinguish and invest in companies that have plans for the transition.

Back in the days of the Wild West, the US outlaw John Dillinger used to say that the reason he robbed banks was because that's where the money is. To get to net zero, financial institutions need to go to where the emissions are in order to provide capital for companies that have plans to get them down and on track in the race to zero. In this respect, it will be essential to incorporate the progress that the Race to Zero, the Science Based Targets Initiative and the Transition Pathway Initiative are making in converging around the gold standard for corporate net-zero transition plans and sectoral transitions needed to achieve our temperature goals.

My fifth priority is to **embed the voluntary approaches developed to date into the formal international architecture**. To achieve a truly coordinated global approach, the baton needs to be passed from the leadership shown by national authorities, collaborating on a best-efforts basis, to international standards setters such as the BCBS, the FSB, the IAIS and, of course, the IMF. Recent progress in this regard is encouraging – I mentioned that at the start. Last month, the IAIS published supervisory guidance for insurance supervisors. The Basel Committee is investigating the extent to which climate-related financial risks can be addressed within the existing Basel framework for banks. It is identifying potential gaps in the current framework and considering possible measures to address them. The FSB will present a roadmap to the G20 in July, which will set out their proposed work to address data gaps in assessing financial risks; promoting high quality, consistent disclosures; and monitoring vulnerabilities across the financial system. And the IMF is increasingly including analysis of climate risks in its bilateral surveillance, such as Article IV and FSAP reviews, and in its multilateral surveillance reports. We need more of the same on this front on an accelerated timetable.

Finally, we need to **broaden these climate risk management approaches to all corners of the financial system**. In particular, multilateral development banks need to fully align their portfolios with net zero and invest to help countries manage climate-related risks. This includes identifying and rapidly scaling blended finance projects that have proved a success in developing and emerging countries.

To conclude, climate risk management has come leaps and bounds since Paris. We have a better understanding of how these risks could materialise. We have the tools and the methodologies to measure and, to an increasing extent, manage these risks. And crucially, we have the will and expertise of the best in the private and public sectors. Now, we must maintain momentum and mainstream best practice.

Markets are still under-pricing climate risks, in part because of inadequate data, in part because of underdeveloped risk management practices, and in part because commitments by governments to enact the policies necessary to achieve the Paris goals are not yet fully transparent or fully credible. By pursuing the agenda I've outlined today, central banks can help solve the first two issues, and because of the resolve of central banks and the growing commitment of the private sector, as evidenced by the \$70 trillion committed to date under GFANZ, governments can have the confidence that the transition can be financed. They can redouble their climate policy commitments. And with time, it will be safe to go back in the water.

Thank you very much for your attention, and thank you for everything you are doing.

Q&A

You have set out multiple top priorities, but if you have to choose one, what would be the ultimate action that we really need to take now?

I think we need to push over the line mandatory TCFD disclosure in the various paths. But let me include in that what we expect under TCFD, particularly for financial institutions. It is the core elements of the metrics, the risk management, the governance, all of those pillars of TCFD, but it is *critically* the scenario analysis that comes with TCFD: the forward-looking. And within that scenario analysis, it is critical using the NGFS scenarios, which by definition include one on success, ie when countries are actually putting in place the policies and we move on this path to 1.5 degrees.

For some financial institutions today, for some companies today who have not been planning for this world, success is failure. In other words, they are not well positioned for success in moving towards the climate outcomes that we all want. They need to know that now and they need to adjust going forward. That's why, if I could have one thing, I would have the TCFD disclosure in all of its respects, and having that mandatory, having it comprehensive and consistent, particularly in the financial sector. But I want more than one.

You mentioned in the beginning that a lot of progress has been made and we don't have time to celebrate yet. When will this day come? What will we need to be able to celebrate?

Well, you know, it's interesting. I almost feel that we will have to remind ourselves to celebrate.

I recall, at an important conference, being asked a question with François Villeroy de Galhau and Frank Elderson who leads the NGFS. And the question was: what would we look like in 2050? Not we personally, but what would the system look like and what would we be celebrating? And the first point we all made – although it's easier for Frank – was that we all hope to be around in 2050 in order to look back and reflect. And I think the thing I took from the discussion was that, in 2050, success will look like this: it's so mainstream – it's so part of the nature of finance, financial risk management, but also managing the opportunities and seizing the opportunities around climate – that it's second nature. So, it is not niche, it is not a particular expertise; it is as much a part of decision-making as credit risk management as well as interest rate risk and operational risk management. That's why we have set up the objective for COP26 that every financial decision takes climate change into account, that it's just part of good financial management. So, to bring that back to your question, I think we will know we are successful when we forget to talk about it specifically because it's just part of what we do absolutely every day.

Climate finance risk

Robert Engle

Michael Armellino Professor of Management and Financial Services, New York University Stern School of Business

Thank you very much, Irene. It's great to be with you today. It's great to have a chance to join all the eminent speakers at this conference, which is on a very important topic, and I'm looking forward to telling you a little bit about the research we're doing at the Volatility and Risk Institute at NYU. We've been focused on new versions of risk, and that's the topic for today. What is the risk that is posed to us by climate change?

I want to talk about climate finance risk. What we know is that science has pretty much agreed that the world is warming. Economics is struggling to say exactly what the consequences of this will be, but we expect lower productivity, population migration and stranded assets, such as fossil fuels – and we haven't paid so much attention to this, but other stranded assets are likely to be capital and land. We can foresee global conflicts, reductions in the quality of life and, in the worst possible cases, the end of our species. But all of this is due to arrive a long time in the future, if at all.

Interestingly, however, in spite of the long horizon, we are seeing this already showing up in asset prices. That is the reason for the conference here: asset prices reflect forward-looking behaviour. They reflect long-term forecasts of cash flows, so changes in the long-term prospects of cash flows and productivity affect asset prices today. We are experiencing that, and we want to know how to harness that, use it, measure the risk and proceed.

Do financial markets reflect climate risks and rewards?

Do financial markets really reflect climate risks and rewards? Basically, this is not a yes or no question. The question is, what is the market view on climate factors? I think the market does reflect climate factors, but it's perhaps more optimistic that they are going to be smaller than the scientific view is. So, one of the things that we can expect as we go forward is that, as the market learns and the science learns, and as individuals learn more about the consequences of climate change, that's going to reprice assets, and we expect our investment strategies and public policy to take into account the arrival of new information about climate change.

It's well known by this audience that we often think about climate as having at least two risks. One is the physical risk that we always talk about at warmer temperatures: rising sea levels, droughts, floods and so forth. These are the causes of the economic damage that we're focusing on. But a second risk is one that, in a sense, we create ourselves. That is, if we try to reduce the rate at which the climate is warming, we incur costs of transitions to a low-carbon economy, and the rate at which this happens depends a lot on government and policy and, to some extent, the financial sector. And that's what we're going to talk about here. Sometimes these risks reinforce each other, and sometimes they go in the opposite direction. For example, when the US pulled out of the Paris Agreement, it actually reduced our transition risk, but it increased physical risk. Other kinds of news events make them both increase: for example, scientific evidence that the climate is changing faster than people expected makes both risks go up.

So, two general solutions are being discussed all the time. One is adaptation. This is relatively uncontroversial because this says that individuals and governments and corporations should optimally respond to the climate change that we see. Adaptation is not controversial because it corresponds exactly to standard economic and cost-benefit analysis – what are the costs and benefits of changing to respond

to climate change? It is still not widely applied because – I think – the view is that maybe we don't have to do this yet, but I think the answer is that we *do* have to do it now.

The second solution, of course, is mitigation, which is to try to do something to slow the rate of climate change. This is something in which firms and governments and individuals have to somehow collectively reduce emissions and therefore reduce damage. It's controversial; it creates winners and losers, costs and benefits – and that's a key topic for any kind of climate policy.

Strategies for investors

What do investors do, faced with this dilemma? Some investors invest for impact, some invest for charitable – what I might call “planetary” – goals, and some invest to hedge climate risk. This is the objective I'd like to talk about today: can you form an investment portfolio that will do especially well if the climate is worse than the market thinks it's going to be?

The advantage of this is that it gives you some insurance that if the climate turns out to be worse than we expected, your portfolio will actually outperform. It also has the benefit of making the cost of capital lower for companies that are prepared for climate change, and higher for companies that are not prepared or are resisting climate change. So, it works in the direction that you might think; it's a fairly clear objective function for forming a portfolio.

What does asset pricing theory tell us about this kind of climate hedge portfolio? First of all, climate risk is a pervasive factor. It's probably under-priced and probably not included in most asset pricing models. Therefore, firms that are exposed to climate risk should be less desirable because they are riskier. A less desirable asset would have a lower price in equilibrium. Bolton and Kacperczyk show that this is, in fact, true:¹ assets which are more exposed to climate change do trade at a lower price. But the consequence of a lower price is that the returns are actually higher. In order to induce investors to hold these risky assets, you have to give them a higher risk premium and higher expected returns. So, investors willing to bear this risk can expect higher returns. By the same token, investors who want to insure against this risk will expect to have lower returns and a negative risk premium. So, the alpha of a climate hedge portfolio would generally be negative. This is sort of pessimistic information for people who are following this kind of investment strategy, and it may be a hard sell for portfolio managers who recognise this.

But there is another important side to this, which is: how does the market learn about climate change? Well, if there's news that climate change is going to be more severe than the market expects – and this might include a lot of news about climate change because the market is, perhaps, under-pricing it – then climate hedge portfolios will actually rise in value because both the long and the short positions would likely appreciate. So, if the climate ultimately turns out to be worse than the market currently expects it to be, then these portfolios would have accumulation of appreciations, which would more than offset these negative alphas. Consequently, the basic idea is that, when there is little climate news, you might expect negative risk premiums in the market. When there is a lot of news, you might expect assets to be repriced, and these hedge portfolios should have a positive alpha. This gives us a way of determining both the effectiveness of a hedge portfolio and how to design them in the first place.

¹ P Bolton and M Kacperczyk, “Do investors care about carbon risk?”, *Journal of Financial Economics*, 2021, vol 142, issue 2, pp 517–49.

How to build climate hedge portfolios

So, what are the strategies for designing them? Well, one strategy is to do fundamental analysis: combine ESG data with financial data to form portfolios – here is exactly where we wish we had better disclosure, so we had better ESG data. Even if we have great ESG data, it’s still not exactly clear how we should form these kinds of portfolios.

There are some assets which are very closely tied to climate change. A good example of this is carbon emission certificates, the certificate that allows you to pollute with CO₂. These are priced in a way that should reflect the seriousness of climate change, and now, Markit has created an index of these global emissions certificates and KRBN is an ETF which trades these things. I’m happy to say that the Volatility and Risk Institute has helped in bringing KRBN to market, and it’s an interesting thing to look at.

The other approach is to be statistical: to look at, when there is news about climate change, which assets go up and which assets go down. Can you hold these going forward and therefore capture the eventual climate change found in the news?

How do we construct portfolios? Well, it may be a long, uphill trek. In an RFS paper I worked on with Stefano Giglio, Bryan Kelly, Heebum Lee and Johannes Stroebel,² we sought portfolios that go up – exactly as I said – when there is bad climate news, and short stocks that go down on this news. We create factor-mimicking portfolios based on news series extracted from a textual analysis of the Wall Street Journal. This is an interesting strategy for creating these kinds of statistical portfolios. But there are lots and lots of alternative funds out there; in fact, Wall Street is falling all over itself to produce sustainable, climate-oriented portfolios for investors, and they’re trying to find portfolios that do what I’m saying.

How successful are these portfolios? Well, if you look in 2019 at the one-year, three-year, five-year, exponentially weighted and maximum time period categories, looking at the alpha, you see that these alphas are, on average, really negative in almost all of these categories. However, if you look today, you see that, at least for the short horizon, the alphas are positive. This corresponds to my news story. We’re seeing a lot more climate awareness now, and the market is presumably responding to that and pricing, at least in the short run, these alphas with positive values, even though the longer-horizon alphas are negative.

178 candidate climate portfolios, evaluated daily

Today: June 1, 2021

Alpha Table	1Y	3Y	5Y	EW	Max
All	4.78	-0.94	-1.70	-0.17	-1.50
Fossil Fuel Free	4.94	0.53	-1.35	0.12	-1.62
Low Carbon	0.88	-2.78	-3.18	-2.08	-1.94
Low Environmental Risk	-3.83	-5.43	-4.97	-5.01	-1.80
Sustainability Mandate	4.91	-0.74	-1.82	-0.46	-2.13
Sustainable Sector	14.63	5.99	2.68	4.06	-3.01

October 31, 2019

Average FF Alpha by Window Length					
Category	1Y	3Y	5Y	EW	Max
Alternative Energy	14.65	-4.32	-10.89	-4.94	-20.00
Fossil Fuel Free	-7.63	-5.88	-6.59	-5.77	-4.77
High Environmental Score	-9.07	-7.58	-8.02	-7.27	-4.02
International Sustainable	-4.24	-4.72	-7.78	-5.55	-6.09
Low Carbon	-8.83	-6.66	-6.89	-6.27	-4.65

These figures get updated every day on V-LAB. So, if you go to the V-LAB website (<https://vlab.stern.nyu.edu/climate>), you’ll be able to see the latest figures.

What we really would like to do would be to form climate hedge portfolios and use these to price assets. One that has been proposed by Bob Litterman is [a short position in] a “stranded asset portfolio”:

² See R Engle, S Giglio, B Kelly, H Lee and J Stroebel, “Hedging climate change news”, *The Review of Financial Studies*, 2020, vol 33, no 3, pp 1184–216.

basically, long the S&P and short an ETF on coal firms and short the rest of the energy sector. But this turns out not to be sufficient to price all climate assets because it doesn't include physical risk, in particular, and may not include a lot of other factors that are important in climate analysis. So, Gianluca De Nard and Bryan Kelly and I have created another factor-mimicking portfolio, which starts with the best of Wall Street. It looks at the portfolios of publicly available climate funds, the same ones that are in this table, but it creates dynamic portfolios; they're long-only portfolios. They're designed to minimise the variance but maximise the correlation with climate news, after taking out the effect of standard investment factors and the stranded asset portfolio. You hold this portfolio for one month and then recalculate.

We're going to look at out-of-sample performance of this portfolio. Here are the three Fama-French factors (MKTFACTOR, HMLFACTOR, SMBFACTOR), the stranded asset portfolio (CCSA) and an oil return (ROIL). And this is the news series (CTAG) that we're using; you see it has a coefficient which is really quite significant in the period of 2001 to 2021. If you look at the alpha of this portfolio, then we replace the news with a constant term (C) and we see that it's significant and positive. So, this is a positive alpha over the sample period. Its annualised value is about six.

Out-of-sample Factor Mimicking Portfolio = Y

Alpha = 6.36

Dependent Variable: Y Method: Least Squares Date: 04/29/21 Time: 17:40 Sample: 6/19/2001 1/29/2021 Included observations: 4906					Dependent Variable: Y-RFDAILY Method: Least Squares Date: 04/29/21 Time: 17:40 Sample: 6/19/2001 1/29/2021 Included observations: 4906				
Variable	Coefficient	Std. Error	t-Statistic	Prob.	Variable	Coefficient	Std. Error	t-Statistic	Prob.
CTAG	3.563940	0.909091	3.920334	0.0001	C	0.025245	0.009822	2.570151	0.0102
CCSA	-0.045706	0.008340	-5.480290	0.0000	CCSA	-0.045364	0.008345	-5.436063	0.0000
MKTFACTOR	0.822586	0.008822	93.24557	0.0000	MKTFACTOR	0.822630	0.008828	93.18319	0.0000
HMLFACTOR	-0.019272	0.010035	-1.920564	0.0548	HMLFACTOR	-0.019856	0.010039	-1.977853	0.0480
SMBFACTOR	0.093933	0.008066	11.64510	0.0000	SMBFACTOR	0.094077	0.008071	11.65587	0.0000
ROIL	0.014059	0.004829	2.911472	0.0036	ROIL	0.013964	0.004832	2.889858	0.0039
R-squared	0.710392	Mean dependent var	0.050950		R-squared	0.710067	Mean dependent var	0.045747	

However, it turns out that if you look at the performance of this portfolio in 2020, it has an alpha of almost 70%, and the stranded asset portfolio had an alpha of almost 30%. So, these results complement industry research by Morningstar, BlackRock and others that suggest that climate-sensitive portfolios did extremely well in 2020. That is, the pandemic was actually a good time for climate hedge portfolios, surprisingly.

Why is that? Well, for one thing, there is a close similarity between the effects of climate change and the effects of Covid-19. One way to say this is: we saw transition risk occurring – transition risk in action – as people stopped commuting, as they stopped flying so much and as the use of fossil fuels collapsed – and the price collapsed even more because of the supply, due to Russia and Saudi Arabia competing for market share. So, we have winners, which is the technology sector that helped us provide goods and services and transportation without using so much fossil fuel. We also seem to have a fair amount of physical risk.

If you want to think about how big a transition this is, ask yourself what kind of carbon tax it would take to get *everybody* locked down. It would be *astronomical* in price. So, we have witnessed transition risk at a rate which is more extreme than any kind of policy that has been proposed.

You can also see this if you look just at sector results. You can see that, in 2020 (ret20), the energy sector (xle) had the worst return and technology (xlk) had the highest return. In fact, the energy sector had

the lowest return and the highest volatility (vol20). That's what we're talking about here. It also has the highest volatility this year (vol21), but it has a positive return.

Sector returns and volatilities, 2018–2021

	ret21	vol21	ret20	vol20	ret19	vol19	ret18	vol18
xlb	1.59	21.57	18.62	38.56	21.62	15.67	-16.11	19.17
xlc	5.88	19.81	23.83	33.44	27.04	16.42	-18.49	22.33
xle	23.94	36.01	-39.56	61.16	11.10	18.99	-20.11	22.30
xlf	9.17	22.82	-1.75	45.52	27.67	15.51	-13.99	19.62
xli	2.30	18.37	10.35	39.77	25.53	15.59	-14.21	19.10
xlk	0.51	21.67	36.20	40.38	40.45	18.08	-1.69	23.37
xlp	-6.35	11.45	9.63	27.86	24.24	10.73	-8.42	14.52
xlre	2.11	17.17	-2.21	40.49	25.22	12.62	-2.42	16.29
xlu	-7.17	18.87	0.51	38.49	23.06	11.39	3.86	15.18
xlv	-0.73	13.59	12.48	30.52	18.61	13.36	6.09	17.56
xly	0.23	22.34	25.95	34.10	24.99	14.06	1.57	19.35

Red is the lowest return / highest volatility for each year. Green is the highest return for each year.

If you look further back over the past, the energy sector got the lowest return and the highest volatility in most of the last seven years. So, it's not like transition risk just happened a year ago. It's been going on, and we are seeing the repricing of these energy assets.

Sector returns and volatilities, 2013–2017

	ret17	vol17	ret16	vol16	ret15	vol15	ret14	vol14	ret13	vol13
xlb	21.52	10.41	15.53	17.83	-9.09	18.49	6.94	14.12	23.10	14.37
xlc	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
xle	-0.89	13.29	24.71	24.60	-24.20	24.89	-9.08	18.48	23.31	14.30
xlf	19.88	13.07	20.22	18.70	-1.79	17.62	14.02	12.86	30.40	14.32
xli	21.49	9.19	18.24	14.70	-4.42	16.08	9.86	13.72	34.04	12.94
xlk	29.46	10.40	13.99	15.34	5.32	17.75	16.42	12.65	23.30	11.53
xlp	12.21	7.64	4.86	11.81	6.65	13.81	14.60	9.64	23.36	11.34
xlre	10.16	9.41	2.72	17.64	4.27	17.02	NA	NA	NA	NA
xlu	11.38	9.76	14.91	15.84	-5.05	17.11	25.27	13.54	12.28	12.31
xlv	19.70	8.73	-2.80	15.26	6.61	18.32	22.42	14.38	34.65	12.14
xly	20.56	8.11	5.80	14.48	9.44	16.38	9.04	13.19	35.58	12.60

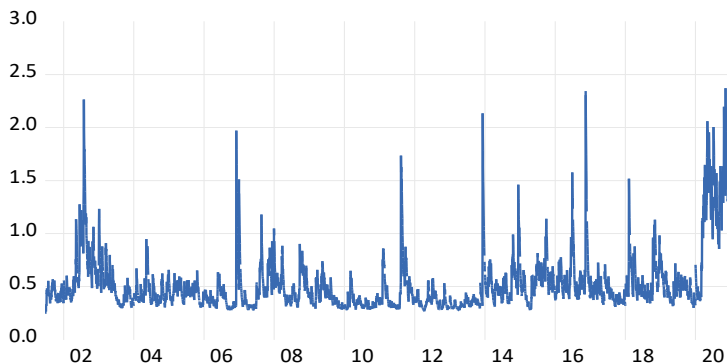
Red is the lowest return / highest volatility for each year. Green is the highest return for each year.

Using climate factors

What do we use these climate factors for? Well, we could invest in them directly. We could invest in portfolios that have a high beta on these funds to achieve similar performance. We can measure the risk of climate change by looking at the volatility of these hedge portfolios; it tells you how fast they're moving. And we can use them to stress test banks by examining the impact of movements in these hedge portfolios.

Let me show you the volatility of this factor-mimicking portfolio that we did. I'm using a GARCH model for this, which gives you a way of measuring the volatility over time, and since that is the volatility of the new information about climate, you can see it goes up and down over time but, most dramatically, it's been rising at the end. So, we see that climate change is happening faster now than it has over the last two decades, and we see this is an elevated risk. Maybe it's an elevated *awareness* of risk, but in any case, it is elevated in this portfolio.

Conditional standard deviation



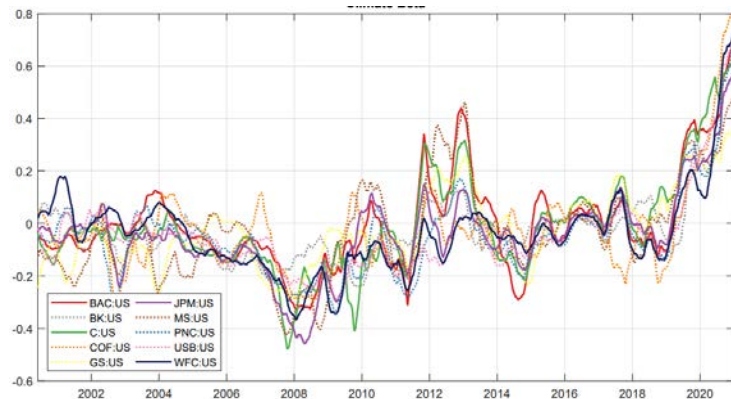
The final thing I want to talk about is stress tests. Why should central banks do stress tests? Because banks hold a lot of climate-sensitive assets and they may have taken more risk than they think. In other words, risk management may not effectively be predicting climate risks. So that is a lot like what happened in the financial crisis, when they didn't accurately predict the risk of mortgages. But more than that, if many banks are exposed, even if they have good risk management individually, there's potential for systemic risk and another financial crisis. Finally, if we expect government to make policies that are going to mitigate climate change, and if these policies actually impact the fossil fuel sector as we would expect, we don't want the policy to be causing a financial crisis. So, you don't want the banks to be arguing against mitigation policy because their portfolios are too exposed.

How are we going to do this? We're going to try to look at a climate beta for the bank stocks, and we're going to allow this climate beta to change over time, just as we allow the factor-mimicking portfolio to change over time. And then we're going to calculate a measure of capital shortfall in a climate stress scenario, called CRISK for systemic climate risk, which is done the same sort of way we calculate SRISK for systemic risk due to market failures.³

Here's the climate risk factor we're going to look at: we're going to look at the six-month return of the stranded asset portfolio over the last 20 years. To define stress, we ask: what is the worst case that we saw over this period? Let's look at something which is roughly the worst one per cent in the historical return of this stranded asset portfolio. Now we're going to regress stock returns for the large banks on a market return and on this climate factor, and get a beta which is time-varying. It's time-varying because volatilities are varying, correlations are varying and, in general, betas are varying.

If you look at the estimates for US banks, the climate beta is actually negative for a lot of this period, but it's really been rising at the end of the sample period.

Climate beta for US banks



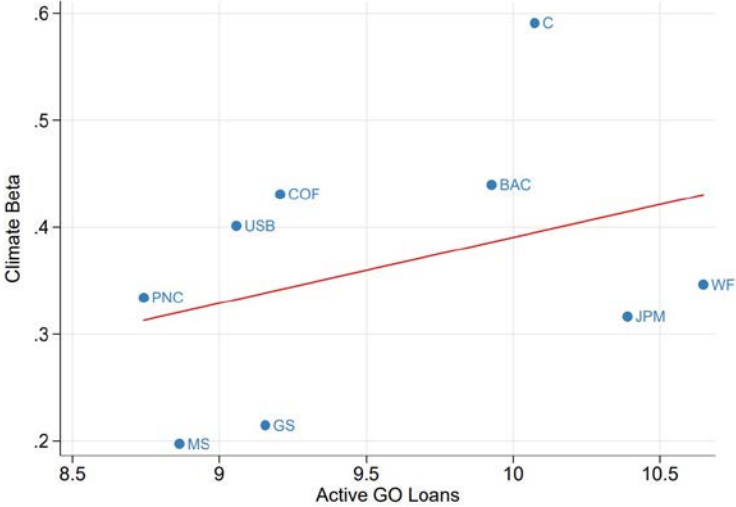
³ See H Jung, R Engle and R Berner, "Climate stress testing", Federal Reserve Bank of New York, *Staff Report*, 2021, no 977.

If you do the same thing for UK banks, the betas are positive for most of the sample period; there is some dispersion across banks, which should depend on their holdings of climate-sensitive assets, at least if the market is sufficiently aware of what the banks are holding. The same can be done for French banks. We're doing this for financial institutions all over the world, and pretty soon you'll be able to see this on V-LAB, just like you see SRISK on V-LAB.

Climate beta for UK banks



If you look at the holdings of US banks and relate their holdings at the end of the sample period (Q2 2020) to the climate beta, you see the climate betas are higher when there are more active gas and oil company loans on their books.



And finally, how big are the calculated CRISK numbers, which are a function of the size and leverage of a bank as well as its climate beta? I'm going to give you two examples. The highest one in France is BNP Paribas; the CRISK today (in excess of \$160bn) is actually bigger than the SRISK (around \$120bn). If you look at the most exposed UK bank, Barclays, the CRISK (around \$130bn) is also higher than the SRISK today (around \$80bn).

So, this is an issue that, from this methodology, looks like it's important. Central banks all over the world are trying to figure out how to do this, and I think this kind of market-based stress test is potentially an interesting alternative approach or complementary approach to understanding the risks that banks face.

Is this enough?

In conclusion, we have shown strategies for more efficient portfolios and climate stress tests, but I'd like to ask the question: is it enough? Is it enough to use more efficient strategies for investment portfolios and for climate stress tests and all the other things that we're talking about today in climate finance? I think the answer is that most of what we're talking about is really adaptation. How do we get risk managers and banks and regulators to adapt to what we think of as the risks – the *real* risks – of climate change?

But that doesn't give us the mitigation that we're likely to need. It doesn't give us a way of dealing with free riders who are going to pollute and aren't going to contribute to the transition. It doesn't give us a way of having assets priced based on the fundamental risks, rather than just the risks without taking an account of climate emissions. So, I think there are lots of initiatives that can be put in place here, but it's important to recognise that what we're doing – what I'm talking about here – is adaptation, and it is a very important part of adjusting to climate change, but it's only the first step. We have to do the mitigation, too.

Financial markets will effectively mitigate climate change only if we have the price or regulation of carbon so that the risk and return are corrected for emission externalities, so we need to give the proper signals to the market and then let the financial sector do its magic. That's what I hope will come out of various policy decisions and regulatory decisions that are made going forward. I think net zero is part of this; when I say "effectively price or regulate carbon", I think that net-zero initiatives are important ways to regulate carbon emissions. However, though this produces a shadow price of carbon, it's not the same as an actual tax.

Here are three of my grandsons, looking out over this peaceful lake. But they're worried. What's in their future? If we can tell them that both these problems, adaptation and mitigation, are solved, they'll be very happy. Thank you.

Q&A

What would be the one thing that we need to do next in order to coordinate the fight against climate change?

I think that governments are committing voluntarily through the Paris Accord and the upcoming COP, but governments need to be able to enforce their objectives. I think we are going to see necessary race-to-net-zero commitments. I think voluntary action is not going to be enough; I want to see governments all over the world enforcing net-zero requirements and paths to net zero. I think it's a time when there is a lot of enthusiasm for doing this, and I think it might be an easier sell to the public sector than selling a tax. So, that's my first step.

Our climate crisis, the financial system and the Sustainability Revolution

Al Gore

Chairman, Generation Investment Management

Thank you so much, Luiz, for those very kind words of introduction, and may I say it's a genuine pleasure to speak at this Green Swan Conference today. Thank you very much for inviting me. In fact, I'm genuinely honoured to share this stage with such a distinguished group of leaders who are working at the intersection of finance and sustainability, and I'm very encouraged by the enthusiasm of this audience to engage further on these issues and help mobilise the financial community to take action. Congratulations to the BIS for its leadership in organising this event.

I'm here today to discuss the climate crisis and the financial system and the Sustainability Revolution. In doing so, I'll speak from the perspective of my own work, first as an advocate for solving the climate crisis, and second as an investor, as Chairman of Generation Investment Management, a firm I co-founded with David Blood and five other valued partners back in 2004. We're headquartered in London and San Francisco, and our \$37 billion in assets are invested over listed and private equities, and we are dedicated to long-term investing that fully integrates sustainability into everything that we do.

Everyone attending this conference knows that, today, activist and investor are not two different roles. For a growing number, these roles have become two intertwined threads of work. Indeed, the climate crisis now requires the attention of every investor and every participant in the financial system, because it both poses financial risks and presents investment opportunities of such extraordinary magnitude that working to mitigate the climate crisis is not only consistent with fiduciary duty; in many ways, it *is* our fiduciary duty.

So, today, I want to talk to you about three things. First, the critical nature of the climate crisis, including how we have gotten to where we are today and why action to solve this crisis has been delayed for so long. Second, I want to talk about the role of investors in addressing the climate crisis and how the asset management sector is starting to play the role demanded of it. And third, I'll talk about the feedback loop between these two in an age of impending radical transparency. More about that later.

The climate crisis and the emerging Sustainability Revolution

You wouldn't be here if you didn't already know that there is critical work to be done, but it's important to take a moment to reflect on the scale and scope of the challenge that humanity faces. As you're keenly aware, we're already seeing catastrophic impacts that are continuing to worsen faster than we have begun implementing solutions.

It's difficult for any of us. I've worked on it a long time; it's difficult for me to fully understand the truly unprecedented nature of this threat. For example, just to start with some basic facts, our sky seems like a vast and limitless expanse when we look up from the ground, but in truth it's an extremely thin shell surrounding our planet. If you could drive an automobile straight up into the air at autobahn speeds, you would reach the top of the sky in about five minutes. It's very thin, and yet every day we continue to spew 162 million tons of man-made global warming pollution into that thin shell of atmosphere as if it were an open sewer. On average, each of those molecules of pollution stay in the sky for around 100 years. The math is very complicated and above my pay grade, but the scientists say 100 years, on average, is about right.

All the extra heat energy trapped by the accumulated greenhouse gas pollution is equal to the energy that would be released by 600,000 Hiroshima-class atomic bombs exploding on the Earth every

single day. The consequences of this extraordinary extra amount of heat energy are, of course, all around us. We're seeing stronger storms, bigger downpours, more destructive floods and mudslides, deeper and longer droughts, crop failures, strengthening wildfires, spreading tropical diseases, melting ice and consequent sea level rise, acidification of the oceans, the sixth great extinction and much more.

In my own country, after record-breaking wildfires in the western United States last year, we're gearing up for yet another intense fire season. We're in the midst of what people in the southwest called the millennium drought. It's gone on for more than 20 years now, and the fire season this year has already begun early. And scientists are already warning us: it could be one of our worst ever. We all hope not.

Likewise, hurricane season in the Atlantic Ocean officially started yesterday, but the first named storm of the season has already come and gone. Last month, the National Oceanic and Atmospheric Administration issued a report outlining the new normal for weather in the United States, and their updates are anything but normal.

Since the turn of the last century, average temperatures in the United States have increased 1.7 degrees Fahrenheit, and in some regions that has already made droughts far more likely. In others, it means heavier and more frequent precipitation and flooding. Weather-related impacts of the climate crisis risk lives as well as livelihoods, and the scale of these impacts is increasing each and every year. Recently, Munich Re released figures showing that economic costs to the US due to climate catastrophes in 2020 were nearly double the costs suffered one year earlier in 2019.

Europe is also feeling its share of impacts. Eleven of its 12 hottest years ever recorded have all occurred after 2000. Climate scientists have confirmed that 2020 was the warmest year on record for Europe as a whole and the warmest for the world as well. Two heat waves in the summer of 2019 broke records across the continent and posed dangerous and tragic threats to human health. That year, nearly 1,500 people died in France due to heat-related illness, and just last October, France and Italy saw record downpours of more than half a metre of rainfall in 24 hours, resulting in massive flooding that totalled over \$3 billion in damages.

In total, extreme weather disasters cost the global economy \$2.5 trillion in the last decade, an increase of almost \$1 trillion over the losses of the preceding decade. The human and economic toll of inaction rises each and every day.

We also know that CO pollution from the burning of fossil fuels is even more directly putting lives at risk. Each year, air pollution kills nearly nine million people around the world, not to mention the fact that this particular air pollution from the burning of fossil fuels is now known to be a pre-existing condition that raises the death rate from Covid-19. So, the need to act has never been more urgent.

Now, here is the good news: I think we have finally reached the long-awaited tipping point where we will have the political will needed to finally turn the tide of this crisis. The climate conference in Glasgow this fall will be a critical milestone.

While we are seeing momentum shift in the right direction, as of today, pledges from nations and the private sector do not bring us anywhere close to keeping global temperature rise below 1.5 degrees Celsius. Many are making pledges to reach net-zero emissions by 2050, but it's action in this decade that's critical to keeping the 1.5-degree Celsius target within reach while also prioritising real reductions in their own operations instead of simply relying on offsets, which are often not reliable.

Despite our collective slow progress to take the increasing risks of the climate crisis seriously, I personally have an abundance of hope that we will be able to meet the moment, build a sustainable future and avert the worst potential impacts of the climate crisis, partly because we are now in the early stages of a Sustainability Revolution driven in part by machine learning, artificial intelligence, the Internet of Things and astonishing advances in biotechnology. This Sustainability Revolution has the potential to completely reshape the world for the better by transforming our relationship to businesses, to the environment and to one another.

The Sustainability Revolution has the scale and impact of the Industrial Revolution, coupled with the speed of the Digital Revolution. It's giving many executive teams the ability to manage electrons, atoms, molecules, genes, proteins and more with the same proficiency that IT companies have demonstrated in their management of bits of information.

Many argue that the shift towards sustainability also represents the biggest and best investment opportunity in all of history. This is true for both governments and businesses. Investments in sustainability can not only forge a greener and cleaner energy future; they are likely to produce extraordinary and sustainable economic growth and improve the health and wellbeing of communities around the globe.

As of late, I've been thinking often of a quotation from the late economist Rudi Dornbusch, known as Dornbusch's Law. He said things take longer to happen than you think they will, and then they happen faster than you thought they could. As an illustration of Dornbusch's Law, just take a look at the way the market has shifted towards sustainability. Renewable energy is one incredible example. Last year, 90% of all newly installed electricity generation worldwide was from wind and solar. In the decade ahead, the International Energy Agency is projecting that that percentage will rise to 95%, and many local, regional, and national jurisdictions are now mandating that renewables soon provide 100% of their electricity.

In many geographies, the ever-increasing cost advantages of clean energy plus batteries are leading to the replacement and early retirement of existing coal and gas facilities that have decades of useful lifetime remaining. They're no longer competitive. Countries like Bangladesh and Vietnam have recently begun cancelling their plans to build new coal plants and are instead moving to clean energy. Major funders of coal production see the writing on the wall, and some are backing away. A little over a month ago, South Korea announced that they are going to end the funding for new coal plants overseas – a welcomed pledge. And just a few weeks ago, the Asian Development Bank announced in a draft policy statement that they will end financing for coal mining and oil and gas production and exploration.

Around the globe, the market has been transformed with dizzying speed. In 2014, just one year before the Paris Agreement was reached, solar and wind were cheaper sources of electricity than new coal and gas plants in only one per cent of the world. But now, just six years later, solar and wind are the cheapest sources of new electricity in more than two thirds of the world, and in the next five years they'll be cheaper in virtually 100% of the world.

The role of investors: engagement, investment and innovation

The incredible opportunity of the Sustainability Revolution brings me to the second topic that I wanted to discuss with you today, and that is the role of investors. For too long, climate action and a shift towards sustainability have been seen by many in the private sector as the sole purview of governments. Businesses have adapted to policy decisions made by public officials but have too frequently hesitated to take a proactive approach. Fortunately, that trend is now changing, as more and more people around the globe have awakened to the urgency of the climate crisis and the reality that all investing has impact for good or ill.

The evidence of the economic damage that would be caused if we do not hold warming to 1.5 degrees Celsius is now clear. Similarly, evidence of the economic benefits of the transition gets clearer by the day. Indeed, private sector companies, investors, banks and asset managers have a critical role to play in solidifying the trend toward sustainability, and the evidence is clear that doing so will have extraordinary benefits. Just last month, the International Energy Agency estimated that 25 million net additional jobs would be created in the next nine years alone if we follow a pathway toward net-zero emissions by 2050. These jobs are not only the result of new activities and investment in clean energy; they also come from spending on more efficient appliances, electric and other advanced vehicles, building retrofits and energy-efficient construction. The IEA also estimated that, if we were to pursue a net-zero pathway, total annual energy investment would surge to \$5 trillion per year by 2030. This adds an extra

0.4 percentage points a year to annual global GDP growth, based on the IEA's joint analysis with the International Monetary Fund.

While economic growth is always a priority, the benefit of harnessing this Sustainability Revolution in the near term is even more significant as the world emerges from the Covid-19 crisis. The IEA estimates that global GDP would be four per cent higher in 2030 on a net-zero pathway than it would be based on current trends. The IEA's work shows that the transformation of our economy to net-zero emissions in the 2040s by way of a just transition is not only what our climate balance requires; it is the rational economic choice as well. It would deliver the best financial outcomes for governments and investors.

And the financial system is finally beginning to take hold of this, as you heard from my good friend Mark Carney earlier. Mark has done a tremendous job in establishing the Glasgow Financial Alliance for Net Zero, of which we at Generation are proud to be a part. We're also pleased to have played a part, alongside many others, in the creation of the Net Zero Asset Managers initiative. This is the vehicle by which asset managers can join the Race to Zero, a framework run by the UN Framework Convention on Climate Change to drive net-zero commitments from non-governmental actors in the run-up to this year's climate negotiations in Glasgow.

The way in which this initiative has grown is nothing short of phenomenal. In September of last year, seven asset managers joined Generation around a virtual convening table to discuss the creation of a net-zero commitment for asset managers. In December, the initiative launched with 30 founding signatories from around the world, with a combined \$9 trillion of assets under management. Today, the initiative has 87 signatories with a combined \$37 trillion of assets under management, and it will grow further before COP26 and beyond COP26.

Our vision for the financial system, which I know is shared by Mark and many attendees at this conference, is to see, by 2025, commitments by all asset managers, asset owners, insurance companies and banks to a 2050 or sooner net-zero target, with robust portfolio alignment reporting. At Generation, our commitment as part of this initiative means that we have pledged to align all of the investment portfolios we manage for our clients with net-zero emissions by no later than 2040.

But what does committing to net zero really mean for investors? Well, we're learning fast, and so are companies. Take a look at last week's astonishing events in the oil and gas industry. On the same day, ExxonMobil and Chevron, America's two largest publicly traded oil and gas companies, were handed significant defeats in their business-as-usual approach to fossil fuel investment. At Exxon, shareholders voted to elect at least two – the vote count is still going on – new directors from an activist slate in order to reset the company strategy that continues to prioritise fossil fuel development over renewables. At Chevron's shareholders meeting, more than 60% voted in favour of a proposal to substantially reduce emissions from the company's energy products in the medium, short and long term; not just Scope 1 but Scope 1, 2 and 3. Meanwhile, in the Netherlands, a Dutch court ruled that Shell must align its operations with the Paris Climate Agreement and reduce its emissions by 45% by 2030.

So, this is one of those moments when things happen faster than we thought they could: three turning-point moments for the oil and gas industry happening all on the same day and influenced by the intersection of activism and investing. When an investor thinks about how they can commit their business to help shift the global economy to net-zero emissions, it means they must help steward the assets in their portfolios to a net-zero future and take action if our agents – company boards, in the case of listed equity investments – defy this imperative.

Committing to net zero also means allocating capital to the transition. We do this every day at Generation in both our listed and private equity strategies, searching out the companies we believe will thrive in a sustainable future. Those that will thrive are the businesses that are providing products and services consistent with a low-carbon, prosperous, equitable, healthy and safe society; businesses whose

current earnings do not borrow from their future earnings; businesses that will thrive by directly meeting some of the world's challenges and playing a system-positive role.

In addition to redoubling their commitment to climate stewardship, investors also need to innovate. To play our part in this, Generation is launching Just Climate, a new investment business dedicated to climate-led investing. Its ambition is to identify, catalyse and invest in solutions that will help achieve net zero and limit warming to 1.5 degrees via a just transition. Just Climate will develop a new climate-led investment framework to facilitate necessary investments which may not be made under a traditional, finance-first model. While impact-led, the new framework will target appropriate, not concessionary, returns.

Just Climate expects to launch investment platforms which will invest globally in energy, transport, industry and buildings, as well as natural climate solutions, food, agriculture and oceans. Its long-term ambition is to be avoiding or removing one gigaton of greenhouse gases per year by 2030, through its own investments as well as by catalysing the investments of others. We are evangelical about the imperative to reimagine our relationship with nature. Generation has committed to working with others to achieve deforestation-free supply chains by 2025.

But if I am to sum up the role of all financial system actors who have capital to deploy, it is this: engagement, investment and innovation. Engagement, investment and innovation are the keys to capital allocations playing their part in the race to net zero.

This decade is unquestionably the most important of our careers. The world needs and deserves leadership from the financial sector; we need to raise ambition. We need to be comfortable being uncomfortable. We need to change what people think is possible to change. But most importantly, we need a relentless commitment to action.

The age of radical transparency

Finally, I'd like to turn to my third and final theme, and that is the age of radical transparency. It would be a grave mistake for anyone in the financial sector to think that the operating environment for the financial sector in this critical decade ahead for tackling the climate crisis will be the same as that of the years that have come before, the years in which we delayed action. Those were the years of "other things to do", the years of "not our problem". They were the years of being unaccountable.

Now, we're entering the age of radical transparency. We're already in a world of whirlwind electronic communication, of cries for social justice spreading like wildfire, as we saw in the Black Lives Matter movement, which has put racial justice on the agenda of every board in Corporate America and in boardrooms around the globe. Someone said, after the murder of George Floyd in Minneapolis in my country, "Are these kinds of things happening more frequently?" And the answer was no – they're just being filmed now.

That's a hallmark of accountability and transparency, and it's becoming radical transparency because we're now also entering a world in which the entities responsible for emitting an endless stream of greenhouse gas pollution, and their investors, will be held to account. The era of financial regulators turning a blind eye to the environmental threats that increase risk and cause financial and humanitarian harm is coming to a close. The European Union is moving forward with strong steps to encourage companies to disclose climate-related information. In the United States, the Securities and Exchange Commission has announced new steps to crack down on greenwashing, helping to ensure that climate pledges are not just words, but include concrete plans of action.

The financial sector has a particularly interesting role to play in terms of accountability in meeting climate goals. Banks, insurers and other financial entities can shine a light on the risk of investing in companies or products that are unsustainable through transparent and clear assessment criteria for their

investments. Accountability and transparency will be critical if we are to rise up to meet the challenge presented to us by the climate crisis.

Just as technology is playing a role in facilitating the shift to a sustainable economy, it will also play a key role in delivering accountability. All too often, business leaders, board members and now even heads of state lack the information they need to develop their emissions reduction plans. Regularly updated data on emissions at the country, province and asset levels are either incomplete, self-reported with varying degrees of reliability, out of date or, in some cases, simply nonexistent. And if you cannot determine the scope of the problem, you're likely not going to do well in defining the solution.

Soon, governments, business leaders and advocates for decarbonisation will have a new tool to help create a baseline for emissions targets, measure progress and gauge impact. Climate Trace, a global coalition of small AI-based technology companies and NGOs, will release a comprehensive inventory, fuelled by artificial intelligence from multiple existing satellite constellations and voluminous internet data streams, that will identify every significant source of greenhouse gas emissions in the world.

The resulting new era of radical transparency will have a profound impact on the world's ability to hold polluters accountable to their governments, to investors, to their supply chain partners, to NGOs and to the people of every nation. In an age of radical transparency, there will be nowhere to hide for financial market participants who are not part of the fight of our lifetimes.

We are now in the midst of the most critical year, in the most critical decade of action in our lifetimes. It is incumbent upon all of us to rethink our roles in ushering in the promise of a sustainable future, in identifying the reasons why we need to act, coupled with the tools we have at our disposal to drive change. I'm certain that each of you can serve as change makers and, in doing so, you can help create a more prosperous, equitable and sustainable future.

Thank you so much for your time. Thank you for your work. It has never been more important. Thank you.

Climate risks, financial markets and central banks' risk management

Jens Weidmann

Chair of the BIS Board of Directors and President of the Deutsche Bundesbank

Introduction

Ladies and gentlemen, it's a great pleasure for me to speak at the "Green Swan 2021" global virtual conference. Tackling the climate crisis is one of the greatest challenges of our time and requires changes throughout the economy. Its urgency increases with every minute that passes.

The economist John Kenneth Galbraith wrote, "In economics, unlike fiction and the theater, there is no harm in a premature disclosure of the plot: it is to see the changes just mentioned and others as an interlocked whole".¹ Since I am an economist too, and neither a novelist nor a dramatist, there is no reason not to disclose the plot of my speech – all the more so, as disclosure plays an important role in it.

First, I would like to give you, in my capacity as BIS Chairman of the Board of Directors, a brief overview of the BIS's activities in this field.² Then I will explain why transparency matters when it comes to greening the financial system and managing climate change-related risks. And finally, I will elaborate on what a central bank, and specifically the Eurosystem, should do to protect its balance sheet from climate-related financial risks.

Greening the financial system – the role of the BIS

As regards the greening of the financial system and the support of central banks in addressing climate-related risks, the BIS has done pioneering work. Its climate change- and green finance-related activities span a variety of business areas. Its analytical work comprises conceptual considerations regarding the role of central banks as well as policy-oriented research output or statistics-related efforts. The latter means, for example, detecting and closing data gaps in the field of sustainable finance – an important task, which is carried out by the BIS's Irving Fisher Committee.

BIS economists are also increasingly active in research on climate-related issues. Just one of a number of valuable contributions is *The green swan*, a joint publication with Banque de France.³ Last year, it attracted a great deal of attention, not least because of its thought-provoking title, but mainly due to its profound analysis of new challenges.

Climate-related financial risks have been on the agenda of several BIS meetings, starting in 2016 when central bank governors talked with guest speaker Lord Nicholas Stern. Since 2018, the BIS has participated in the Network for Greening the Financial System, the global alliance of central banks and supervisory authorities advocating a greener financial system.

The Bank's activities in the field of policy and regulatory issues concern BIS-based standard-setting bodies like the Basel Committee. Furthermore, staff contribute to the climate-related work of hosted associations like the Financial Stability Board and the International Association of Insurance Supervisors.

¹ See J Galbraith, *The new industrial state*, Hamish Hamilton, London, 1967.

² For an overview of the Bundesbank's activities, see J Weidmann, "Introductory comments at the press conference to present the annual accounts", 3 March 2021.

³ See P Bolton, M Després, L Pereira da Silva, F Samama and R Svartzman, *The green swan: central banking and financial stability in the age of climate change*, Bank for International Settlements and Banque de France, 2020.

In its role as a provider of financial services to central banks, the BIS has launched two green bond funds, one of which is denominated in US dollars and the other, in euros. With these investment vehicles, the BIS is helping central banks incorporate environmental objectives into the management of their own funds and supporting the development of green finance.

Managing climate-related financial risks and enhancing transparency

Ladies and gentlemen, when it comes to decarbonising our economies, carbon pricing is certainly the key tool, giving important incentives to consumers, producers, inventors and investors. Yet it may not suffice to drive the necessary transition to net zero on its own – the high speed required to limit global warming to the Paris targets may necessitate additional measures.⁴ The financial system has a pivotal role to play in this regard, as it will have to channel trillions of dollars or euros into private investments needed to transform the economy.

Without a doubt, financial market participants form expectations on both factors – the likely pathway of carbon prices and additional measures – to gauge the implications for asset prices. However, these expectations are conditional on the information available. Thus, in terms of channelling financial means to their most efficient uses, sufficient information can be regarded as a precondition for the needed reallocation of resources towards a greener economy.

The dynamic growth of green finance in the last few years has demonstrated how eager private investors are to decarbonise their portfolios. However, greening the financial system goes beyond strengthening the market segment of green finance. Both climate change and the transition to net zero may cause financial risks, especially for companies in the real economy. By extension, these climate-related financial risks will also affect the financial actors that provide those companies with funds. It is thus in the interest of banks, insurers and other investors to recognise climate-related financial risks and to adjust their risk management properly. This, in turn, could help companies manage their underlying climate risks. Indeed, a survey among institutional investors even found that most of them had already actively approached their portfolio companies on the issue of climate risks; only 16% had not taken any action.⁵

However, a different survey painted a bleaker picture of financial institutions worldwide, as only a quarter of respondents reported on the emissions they finance. For these institutions, their financed emissions were (on average) hundreds of times larger than their operational emissions. As many respondents did not analyse the climate impact of their portfolios at all, this may suggest an underestimation of climate risks.⁶ Investors still lack a clear view of how exposed many companies are to climate risks and how they handle those risks. What is needed is comprehensive disclosure of consistent, comparable and reliable climate-related information.

The Task Force for Climate-Related Financial Disclosures (TCFD) already offers a framework for companies to disclose important climate-related information voluntarily, and it may be encouraging to see that support for the TCFD recommendations has grown substantially in recent years. Unfortunately, the disclosure of aligned information is still low. Last year's Status Report found that, in each category, only a minority of the reviewed companies disclosed information consistent with TCFD recommendations.⁷ Moreover, having analysed reports from TCFD-supporting firms, researchers concluded that "firms cherry-

⁴ See German Council of Economic Experts, *Setting out for a new climate policy*, Special Report, 2019 and J Green, "Does carbon pricing reduce emissions? A review of ex-post analyses", *Environmental Research Letters*, vol 16, no 4, 2021.

⁵ See P Krueger, Z Sautner and L Starks, "The importance of climate risks for institutional investors", *Review of Financial Studies*, vol 33, 2020, pp 1067–111.

⁶ CDP, "The time to green finance", *Financial Services Disclosure Report 2020*, 2021.

⁷ See Task Force for Climate-related Financial Disclosures, *2020 Status Report*, 2020.

pick to report primarily non-material climate risk information”.⁸ This sobering finding should not come as a surprise. Disclosure has characteristics of a public good and may therefore be riddled with free-rider problems.⁹ Thus, a voluntary approach may not provide the optimum quantity and quality of information from an aggregate point of view.¹⁰

Given the experiences gained thus far, governments’ current initiatives for moving toward mandatory climate-related disclosures are a step in the right direction. In this context, we should acknowledge that, globally, even basic information is still lacking. According to calculations by Bundesbank staff, only 15% of all stock market-listed companies disclosed their greenhouse gas emissions in 2019.

Considering the urgency of the matter, we could prioritise and fast-track filling in the information gaps on basic metrics: first things first. In my view, one *core* element would be to establish mandatory reporting of greenhouse gas emissions along a common – ideally, global – standard. Such *mandatory* reporting might pave the way for further harmonised disclosure rules to follow.

More granular and precise information will help all organisations to incorporate climate-related financial risks into their risk management and, more broadly, to improve their decision-making. Improved informational efficiency will help them protect their balance sheets from risks that may have been neglected so far. What’s more, mandatory climate risk disclosure will not only improve financial risk management but may also promote the green transition. In fact, several studies have shown that mandatory disclosure of climate risks can lead to considerable reductions in carbon emissions.¹¹ Ralph Waldo Emerson might have already known one reason why: in the 19th century, the American philosopher keenly observed that, just as streetlights were the best nocturnal police, so the universe protected itself by pitiless publicity.¹²

What central banks can and should do

Establishing mandatory disclosure standards falls under the remit of standard-setters and policymakers.

The lines of responsibility separating central banks and politicians should not be blurred. We need to be clear about what central banks can and cannot do. With respect to the Eurosystem and its mandate, I have repeatedly highlighted the limits of monetary policy.¹³ Governments and parliaments have both the democratic legitimacy and the tools to steer our economies to net zero. And although loose monetary policy and low interest rates stimulate investment spending, the Eurosystem will have to tighten the ropes again if required to maintain price stability. This will include scaling back our asset purchases or

⁸ See J Bingler, M Kraus and M Leippold, “Cheap talk and cherry-picking: what ClimateBert has to say on corporate climate risk disclosures”, 2021.

⁹ See J Caruana, “Financial stability and risk disclosure”, speech given on 9 December 2011.

¹⁰ See A Admati and P Pfleiderer, “Forcing firms to talk: financial disclosure regulation and externalities”, *Review of Financial Studies*, vol 13, 2000, pp 479–519.

¹¹ See B Downar, J Ernstberger, S Reichelstein, S Schwenen and A Zaklan, “The impact of carbon disclosure mandates on emissions and financial operating performance”, *DIW Discussion Paper*, no 1875, 2020; V Jouvenot and P Krueger, “Mandatory corporate carbon disclosure: evidence from a natural experiment”, *Working Paper*, 2020; S Tomar, “Greenhouse gas disclosure and emissions benchmarking”, *SMU Cox School of Business Research Paper*, no 19-17, 2021; J-S Mésonnier and B Nguyen, “Showing off cleaner hands: mandatory climate-related disclosure by financial institutions and the financing of fossil energy”, *Banque de France Working Paper*, no 800, 2021.

¹² See R Emerson, *The conduct of life*, Smith, Elder and Company, London, 1860.

¹³ See J Weidmann, “What role should central banks play in combating climate change?”, speech given on 25 January 2021; J Weidmann, “Combating climate change – What central banks can and cannot do”, speech given on 20 November 2020; J Weidmann, “Central banks cannot solve climate change on their own”, guest contribution published in *The Financial Times*, 19 November 2020.

portfolios for monetary policy purposes, whereas the political need to promote the transition to net zero will not simply vanish.

However, climate change and climate action can affect inflation, output and interest rates. Thus, central banks have to understand the implications for price stability and monetary policy and have to expand their analytical toolkit accordingly.

Moreover, central banks can play an important part in supporting the greening of the financial system. In their role as supervisors and guardians of financial stability, central banks can help ensure that financial institutions adequately incorporate climate-related financial risks into their risk management.

But that is not enough. Just like the portfolios of private financial institutions, climate-related financial risks can affect the asset holdings of central banks, too. Their balance sheets – and thus their ability to maintain price stability – might be impaired. Central banks' risk management should therefore incorporate climate-related financial risks adequately, including those arising from monetary policy operations like corporate bond purchases.

Therefore, the Eurosystem has a legitimate interest in making climate-related risks more transparent. That is why I have recommended that, in future, the Eurosystem should only purchase securities or accept them as collateral if their issuers meet certain climate-related reporting obligations. Moreover, we should only use ratings that adequately and transparently reflect climate-related financial risks.¹⁴

In the end, these two measures could change the composition of our monetary policy portfolios – always under the premise that those bond holdings are needed for price stability. But the measures cannot be introduced immediately: issuers need time to provide the necessary information, and only once rating agencies have the relevant information will they be able to adjust their assessment procedures. Moreover, rating agencies may struggle with the multi-decade time horizon of climate-related risks that reach beyond their standard time horizons.

If no adequate solution can be found here, the Eurosystem would have to adopt alternative measures to properly incorporate climate-related financial risks into its risk management, for example by limiting the maturities or the amount of corporate bonds of certain sectors and issuers in the Eurosystem's monetary policy portfolio. Such risk-oriented tilting should not be confused with suggestions to steer the behaviour of companies and financial institutions for political reasons. And even if we decided to limit the maturities or the amount of corporate bonds as described, we would still need an appropriate and transparent yardstick for climate-related financial risks.

It is therefore all the more important to improve the information base through reporting obligations for issuers and standards for ratings. In this way, the Eurosystem would not only protect its balance sheets; we would also help enhance the market transparency of climate-related risks, thereby acting as a catalyst for other initiatives and the greening of the financial system. This would contribute to the fight against climate change without overstressing the Eurosystem's mandate. However, this contribution can be no substitute for ambitious and urgent action from policymakers and standard-setters.

Conclusion

Ladies and gentlemen, there is a strong case for mandatory climate-related disclosures. More and better information will help companies and financial institutions improve their risk management and their decision-making more generally. This is also a precondition for a green transition that leverages the power of financial markets. Thank you very much.

¹⁴ See J Weidmann, "Introductory comments at the press conference to present the annual accounts", Deutsche Bundesbank, 28 February 2020.

Climate change – our most global challenge

Tao Zhang

Deputy Managing Director, International Monetary Fund

Introduction

Good afternoon. I would like to thank our co-organisers, the BIS, the Banque de France, the NGFS and my colleagues at the IMF, as well as everyone attending this important conference.

This past year and a half has been filled with challenges and, at times, displays of unprecedented resilience. Each of us has been touched in one way or another by the pandemic and economic lockdowns. But if there's one silver lining to this dark cloud, it is that people now realise how fragile our existence on this planet can be. There is now renewed emphasis on the threat posed by climate change, as well as on the need to take urgent action.

In my remarks today, I want to first lay out what I will call a "globalist view", emphasising that climate change is our most global challenge. Then, I'll discuss different climate policy instruments that governments have at their disposal, and I'll conclude with a discussion of how domestic policy can be supported internationally.

A globalist view

Let me start with what we're facing globally today – namely, fighting the pandemic. As the IMF's Managing Director, Kristalina Georgieva, likes to say, the pandemic won't be over anywhere until it's over everywhere. The virus does not respect borders.

Borders are even more irrelevant, however, when it comes to climate change. The national origin of greenhouse gas emissions makes absolutely no difference in terms of their impact. We all share the same atmosphere. The externality here is perfect and complete.

So, how should we address this most global challenge? I'd like to suggest a few principles. First, **we must work together**. Of course, people already recognise this – that's why we had the Paris Agreement, which has given us a global architecture under which to move forward, and that's why we'll soon have COP26. Indeed, it is exactly the same reason why we're gathering in this conference. But despite these important steps, we may need to go further to achieve a fully global outlook in our thinking. This means that we should collectively assess where and when it makes sense to abate emissions, and we should also collectively decide how to deal with any economic costs that this mitigation effort may bring. Indeed, we may not have much of a choice in front of us – the entire world, after all, will need to get to net-zero emissions, and sooner rather than later. But to the extent that there are decisions to make, we should make them together.

Second, **we must look for win-win opportunities**, and we can succeed if we work together. In decades and centuries past, of course, industrialisation and development were unavoidably accompanied by greenhouse gas emissions. But if we infer from this that reducing emissions today will inexorably lead to economic contraction, we are taking far too narrow a view. In the 21st century, we are not condemned to tread the same path and make the same mistakes that our predecessors did, and we must lean forward to achieve win-win opportunities. Indeed, good mitigation policy can often largely pay for itself, and combating climate change may actually further development, rather than hindering it. The evidence is quite strong that the trade-off between the economy and climate is much smaller than people think.

Why is this? First, we have modern technologies and an economic structure tilted more toward services that make production less dependent on fossil fuels. Furthermore, to the extent that we introduce climate policies, these themselves will induce additional technological change into clean-energy sectors of the future, with major positive spillovers to growth.

Second, cutting coal, diesel and other fossil fuel usage often yields substantial local co-benefits such as less air pollution and improved health, and these directly boost economic outcomes, as well as other, broader measures of welfare. These co-benefits are particularly important in developing countries, and especially among the poor in these economies.

Third, carbon pricing can yield substantial revenues, and these can be used to reduce other, more distortionary taxes, to finance productive investment – including green investment – and also to support individuals adversely affected by climate policies.

In our World Economic Outlook report last October, we showed that a policy package including a rising carbon tax and a front-loaded green investment stimulus could actually boost growth and create millions of jobs over the medium term, all while effectively reducing emissions and protecting the vulnerable. Does this picture look too rosy? Well, we shouldn't take win-win opportunities for granted. Achieving them in practice will take a lot of smart thinking and adept implementation. Along the way, some countries and population groups may face a wide range of economic costs.

This then leads to my third point, which is that **we must be fair in order to succeed**. To start with, defining what's fair is often very tricky, and it's easy for people to end up pointing fingers at one another. Some observers look at today's large emitters and say that they need to shoulder much of the responsibility for global mitigation. Others focus instead on cumulative historical emissions and identify another set of countries as the main culprits. In the same way, while much of the debate centres on total emissions (whether historical, current or prospective), others emphasise emissions per dollar of GDP. Yet others focus on emissions per capita, reflecting, perhaps, a view on each individual's intrinsic rights to use nature's resources.

I don't want to wade into this debate. But I do believe that we need to acknowledge these different perspectives – they were all represented at the Paris negotiating table, and they continue to inform the ongoing debate.

Nonetheless, we must recognise that poorer countries want – indeed, demand – the right to pursue their own development trajectories. We also have to factor the need to protect the poor and vulnerable – wherever they are – into any global solutions we come up with.

I strongly believe that, as we move forward, we need to respect these principles – working together, looking for win-wins and being fair. Fortunately, the Paris agreement already gives us a framework to deal with these issues: advanced countries are expected to pledge more stringent near-term mitigation, accompanied by a commitment to provide \$100 billion per year to support climate action in developing economies.

Choice of policy instruments

Let's now move to the role of national policies and how to choose policy instruments to combat climate change. Let me begin by emphasising that, in choosing policy instruments, there is no one-size-fits-all solution or silver bullet. The journey in front of us is unprecedented, and we must be humble. We have already seen countries pursue different policy approaches, reflecting their specific circumstances and preferences.

This conference is focused on the financial sector, and rightly so. The financial sector certainly has an important role to play, both in mobilising the green finance that the world will need, and in making itself resilient to the physical and transition risks from climate change. Many speakers today have already shared their insights on these important issues, and many others will do so during the rest of the

conference. For example, there are important steps that regulators and supervisors need to take, in terms of improving the availability of data, developing common taxonomies, improving the disclosure of climate information and developing methodologies to quantify climate risks.

But let me be perhaps slightly provocative and say that **none of this will work effectively unless the government creates an enabling environment**. Without the fundamental incentives in place that only governments can introduce, people and firms – including those in the financial sector – simply will not fundamentally change their behaviour and move away from carbon-intensive activities.

When economists think about which government policies can most effectively enable a pro-climate orientation, carbon pricing immediately comes to mind. Regulatory approaches certainly have their place, though economic theory would tell us they are less flexible and less efficient than market-based approaches. Sectoral policies, feebates, and a host of other tools also have a role, but charges on carbon content are believed to be the most effective and efficient instrument, providing incentives to reduce energy use as well as to shift to cleaner fuels and to direct investment toward clean technologies, all while generating much-needed revenues.

Carbon pricing can be implemented in different ways. One possibility, of course, is a carbon tax, which can provide more certainty over emissions prices and thus help mobilise investment. Carbon taxes are also relatively straightforward to administer: they can be built into existing road and fuel taxes, and similar charges can be applied to other petroleum products, coal and natural gas. Carbon tax revenues also accrue directly to finance ministries, which are used to handling these flows as well as the budget.

Emission trading systems are another example. They can mimic the advantages of carbon taxes, but allowances would need to be auctioned (in order to generate revenues), price stability mechanisms like price floors would be needed, and, in general, the administrative requirements may be more onerous than with a tax. Trading systems have been implemented in, for example, the European Union and Korea, although they have so far focused on the power and industrial sectors, and China will launch a nationwide scheme this month, based on a tradable performance standard.

Role of the international community

We see a wide range of policy instruments on the table. But no matter what policy instruments are chosen, it can be difficult for any one nation to aggressively decarbonise on its own. The international community can play an important role in helping to coordinate governments' actions globally. Here I'd like to emphasise three aspects in particular.

First, we at the IMF believe that **a differentiated international carbon price floor could complement and reinforce the Paris Agreement**. This would cover all emissions and could begin with, for example, the G20 and the European Union. Simultaneous action to scale up carbon pricing would be the most effective way to address countries' concerns about industrial competitiveness, which could arise if they were to act unilaterally. The price floor could be differentiated to account for countries' different levels of development, and it could be designed to also accommodate ambitious regulatory approaches that may not impose an explicit price on carbon but do imply a shadow price.

We believe the price floor would reduce the need for unilaterally imposed border carbon adjustments, which only price emissions in trade flows – typically a small proportion of total emissions. Border adjustments also need careful design to contain administrative costs; for example, by limiting their coverage to energy-intensive, trade-exposed industries, and they need to navigate legal risks under the rules of the World Trade Organization.

The international community can play a second critical role by **mobilising climate finance and technology transfers**. These can incentivise increased climate ambition among recipient countries and reduce the need for either differentiated price floors or border carbon adjustments.

Of course, climate finance can take a number of forms. Perhaps the simplest and most straightforward mechanism would be outright grant and loan assistance, as well as technology transfers. I want to emphasise that this is not a matter of charity. The \$100 billion commitment was a critical part of the Paris Agreement – a way of allowing the world to take advantage of its least-cost mitigation opportunities, many of which exist in developing economies, and an important tool to ensure equitable burden-sharing. The question now is whether the world will step up and meet this commitment.

Offsetting is another proposed vehicle for climate finance. With voluntary corporate offsets, those with cheap mitigation opportunities exercise them, and those without can pay instead. Offsetting applied at the level of the sovereign may also have a role to play. Verifying the additionality of abatement paid for by offsets could be a challenge, but it is one that many are working to address.

Debt-for-climate swaps are yet another possible form of climate finance and something that we are collaborating on with the World Bank, though it remains to be seen how large a role they will play. These are just a few examples, but whatever the precise modality, the transfer of both financial resources and needed technologies from richer countries to poorer is of critical importance in the fight against climate change.

Finally, let me mention the contribution that international organisations can make. Through their **analysis, policy advice, and technical assistance**, these organisations can elevate the effectiveness of their member countries' policies to fight climate change, harness momentum for climate action and further raise awareness of climate issues. Through their convening power, they can also help promote policy coordination across countries.

At the IMF, we are representing our near-universal membership to ensure solutions work for all countries. We are mainstreaming climate issues into our surveillance and other operational activities, while remaining true to our mandate, and we are leveraging external expertise through our close collaboration with other institutions, including the World Bank, BIS and others. We are also exploring whether members with strong external positions would consider channelling a portion of their potential new allocation of Special Drawing Rights, or "SDRs", to members with financing needs, including for green purposes.

Conclusion

Let me conclude by saying that we are at a critical moment. Actions we take during the next five or 10 years will determine whether we will succeed in keeping global temperatures from rising more than two degrees. I am actually quite optimistic, as there are ways to decarbonise that should also be good for growth and jobs, if we do things right. Each of us has our role to play – governments, the international community, and the private and financial sectors, too. But we need to play those roles together, in a complementary fashion. Now, more than ever, we need to join together to address climate change, our most global challenge. Thank you.

Green Swan conference

Sylvie Goulard

Second Deputy Governor, Banque de France

I would like to thank all the organisers of this Green Swan conference, and especially Luiz Awazu Pereira da Silva from the BIS. Luiz has been the soul of the organising team we set up some months ago with the authors of *The green swan* – Patrick Bolton, Morgan Després, Luiz Pereira da Silva, Frédéric Samama and Romain Svartzman¹ – to whom I wish to pay tribute.

As *The green swan* was published in January 2020, we were living in a pre-Covid world. The authors warned of the severe risks associated with climate change and of “other human-caused environmental degradation such as the loss of biodiversity”.

The title of *The green swan* is a play on the concept of Nassim Nicholas Taleb’s *The black swan*,² ie events affecting the financial sector that are unexpected, of a large magnitude and which can be only explained afterwards, with analogies as well as differences:

- **It is quite certain that climate events will occur even if we don’t know when and how.**
- They could be **even worse than the ones caused by black swans**, because climate change and many of its impacts are largely irreversible.
- **No single agent (household, firm, financial institution or government) can hedge against these risks on their own.** This means that managing green swans requires an unprecedented level of cooperation.

As the recent IEA report³ stresses, “the global pathway to net-zero emissions (...) requires all governments to significantly strengthen and then successfully implement their energy and climate policies. Commitments made to date fall short of what is required”.

Meanwhile, the world has been hit by the Covid-19 health crisis. This is a crisis that is due to lack of prevention, unpreparedness at national levels and flaws in international cooperation. This is a crisis that has forced governments to lock down hundreds of millions of people and has stopped or reduced economic activity. This is a crisis with huge macroeconomic costs, which has forced governments to provide substantial fiscal support and central banks to intervene with bold monetary policies in order to preserve favourable financing conditions.

As regards climate change and the environment, scientists as well as the authors of *The green swan* try to explain to us what could happen if we don’t act. On the health front, we experienced “skin in the game” what an unexpected, severe, global crisis can be, because we did not collectively act on time.

In advanced economies, thanks to vaccinations, we are seeing some light at the end of the tunnel. This is a relief. However, other crises could occur; there is no vaccine against climate change and environmental risks. This tangible experience makes *The green swan* even more interesting to read and to meditate upon now than when it was published.

At the end of summer 2020, when we began – at our modest deputy level – to launch this conference, we were convinced that the message of *The green swan* was worth spreading, but we were far

¹ I thank Romain Svartzman for his assistance in preparing these remarks.

² See N Taleb, *The black swan: the impact of the highly improbable*, Random House, 2007.

³ See International Energy Agency (IEA), *Net zero by 2050: a roadmap for the global energy sector*, 2021, www.iea.org/reports/net-zero-by-2050.

from sure that it would attract such a prestigious set of speakers. This was before the new momentum we are experiencing thanks to the political shift in the United States, and before the ambitious Italian G20 and UK G7 presidencies.

Now, only a few months later, the context is quite different. Governments are more aware than ever before that they need to act, to anticipate; there is more appetite for multilateral cooperation and the private sector is making many commitments to net-zero emissions. However, a number of questions arise that we cannot easily answer. Three of them seem particularly important:

- Should we focus on climate change or broaden the scope?
- How can we make sure that public policies are consistent?
- How to thrive within limits?

Allow me to develop these points.

Beyond climate?

The Charter of the NGFS,⁴ adopted in December 2017, states that the network aims, in particular, to “contribute to the development of **environment and climate** risk management”.

It is key to consider how ecological crises are in fact multiple and interconnected. For instance, the 2019 UN *Global assessment report on biodiversity and ecosystem services*⁵ reminds us that human activity caused a catastrophic decline in Earth’s biodiversity (eg the current rate of extinction of species is between 100 and 1,000 times higher than the reference rate of the past million years). More recently, *The Dasgupta review*⁶ in the UK states how severe the risks linked to biodiversity loss are and how complex the interactions between human actions and nature are.

The scientific community actually tells us that these ecological risks are interconnected and should not be addressed in silo. For example, the concept of One Health developed by several international organisations suggests that human, animal and environmental health are interconnected and can only be addressed jointly. In his final declaration at the Global Health Summit in Rome on 21 May 2021, Prime Minister Mario Draghi stated:⁷

“The Rome Declaration rightly emphasises the importance of pursuing a One Health approach – and here I’m coming to climate – to preserve human, animal and environmental safety. **This is the key priority of Italy’s G20 presidency.**”

The Scientific Expert Panel has stated how most infectious diseases are caused by pathogens that are derived from animals. Their emergence is largely driven by deforestation, wildlife exploitation and other human activities. Effective environmental action can help to defend animal welfare and ultimately mitigate the risk of new health threats. When pursuing a common strategy to prevent future pandemics, we must uphold our commitment to limit environmental damage and tackle the climate crisis. The Sustainable Development Goals offer a useful set of targets to achieve this overarching objective, starting with the COP26 conference, that – as I think I said before – we are co-chairing with the United Kingdom.”

⁴ See Network for Greening the Financial System, *Charter of the Central Banks and Supervisors Network for Greening the Financial System*, www.ngfs.net/sites/default/files/media/2020/09/03/ngfs_charter_final.pdf.

⁵ See Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services, *The global assessment report on biodiversity and ecosystem services*, 2019, ipbes.net/global-assessment.

⁶ See P Dasgupta, *The economics of biodiversity: the Dasgupta review*, HM Treasury, 2021, www.gov.uk/government/publications/final-report-the-economics-of-biodiversity-the-dasgupta-review.

⁷ See M Draghi, closing address to the Global Health Summit, www.governo.it/node/16923.

As regards health aspects, I am sure that Mario Monti, chair of the Pan-European Commission on Health and Sustainable Development launched by the WHO/Europe,⁸ who had already made several proposals in March 2021, will go into more depth when he takes the floor.

The scientific community estimates that 60% of known infectious diseases and up to 75% of new or emerging infectious diseases are zoonotic in origin.⁹ Hence, Covid-19 (regardless of its origins, which have not yet been confirmed) should be considered **a clear warning of what could happen if we fail to act on biodiversity loss**.¹⁰ It is therefore very promising to see that this conference has organised two panels on the question of biodiversity and the financial system. This is in line with the growing acknowledgment that biodiversity-related risks could also pose a threat to financial stability.

The OECD¹¹ and the Dutch Central Bank (DNB)¹² have already published reports on biodiversity-related financial risks; the NGFS¹³ has started to work on this question as well. Last January, the One Planet Summit organised by President Macron focused on biodiversity. And very soon, the Taskforce on Nature-Related Financial Disclosures (TNFD) launched by NGOs, industry and several international organisations alongside governments, including that of France, will certainly further contribute to mainstreaming the issue of biodiversity-related financial risks.

However, central banks do not have a silver bullet to resolve questions such as climate change or biodiversity loss; for example, they cannot decide on possible carbon pricing or carbon adjustment taxes and they are unable to provide all the necessary incentives to foster innovation or to boost research. As François Villeroy de Galhau stated yesterday, their action cannot be a substitute for policy measures taken by governments, but they can contribute to identifying risks, channelling capital towards activities that are less exposed to environmental risks and mobilising the financial sector. “No action” is not an option.

Central banks also have to take into account the impact that these structural changes will have on price stability. Energy and food prices, for example, can be heavily impacted by climate change and biodiversity loss, both inland and in coastal regions.

Should we choose a holistic or a sequential approach? Some challenge the order of priorities, by arguing that climate change is already complex enough. They do not want to include biodiversity or health issues, as they fear that this will be seen as mission creep or that it would overload their staff. These serious concerns are understandable. Nevertheless, as we just stressed, connections exist between climate change and loss of biodiversity and health, and this can encourage synergies.

Furthermore, the pandemic has created a sense of urgency on health-related risks. During a session at the Atlanta Fed on 18 May 2021, Larry Summers stated, “The central banking community has to date been roughly 50 to 100 times more focused on issues of climate finance than on issues of pandemic finance and of readiness to deal with the next pandemic when it comes”. The scientific community is telling us that potential emergence of new pandemics and climate change have a common cause: the massive

⁸ See the WHO/Europe webpage for the Pan-European Commission on Health and Sustainable Development, www.euro.who.int/en/health-topics/health-policy/european-programme-of-work/pan-european-commission-on-health-and-sustainable-development.

⁹ See S Salyer, et al, “Prioritizing zoonoses for global health capacity building – themes from One Health zoonotic disease workshops in 7 countries, 2014–2016”, *Emerging Infectious Diseases*, December 2017, vol 23 (Suppl 1), pp S55–64.

¹⁰ See, for example, P Bolton, et al, “Penser la stabilité financière à l’ère des risques écologiques globaux – Vers de nouveaux arbitrages entre efficacité et résilience des systèmes complexes”, *Revue d’Economie Financière*, 2020, no 138, pp 41–54.

¹¹ See Organisation for Economic Co-operation and Development, *Biodiversity, natural capital and the economy: a policy guide for finance, economic and environment ministers*, 2021, www.oecd.org/environment/biodiversity-natural-capital-and-the-economy-1a1ae114-en.htm.

¹² See De Nederlandsche Bank, *Indebted to nature – exploring biodiversity risks for the Dutch financial sector*, 2020.

¹³ See the NGFS press release, www.ngfs.net/en/communique-de-presse/ngfs-and-inspire-launch-joint-research-project-biodiversity-and-financial-stability.

and unprecedented degradation of natural habitats by human activities.¹⁴ That is why, in my opinion, all these issues are not different chapters of a book we can read one after the other, but rather alerts popping up simultaneously on our screens, which we have to acknowledge through a holistic analytical framework.

The green swan sums up well the dilemma for central banks: they cannot ignore the issue and they have the power – and even the responsibility – to contribute to the low-carbon transition and a more sustainable economy within the scope of their mandates, but they cannot solve these problems on their own, either. That is why coordination and coherence of public policies matter, as do new private-public partnerships.

Coherence and coordination

If central banks are to safeguard financial stability in the age of climate change, they will need to coordinate their actions with measures to be implemented by other players such as finance ministries or specialised government agencies. *The green swan* explores three dimensions of this coordination:

- the interactions between monetary and prudential policies and fiscal policies;
- how central banks can facilitate the international monetary and financial coordination needed on climate change; and
- how central banks can contribute to promoting values and behaviours that are particularly important for the low-carbon transition, such as long-termism.

For example, climate change is now on the agendas of the G7 and the G20 Finance Tracks, where representatives of finance ministries and central banks work together. New forms of cooperation between the public and the private sector, such as on the very important topic of disclosure, have also emerged:

- The TCFD for climate-related disclosure, tasked by the FSB (finance ministries and central banks) but privately led; the work of the TCFD is now taken into account by public authorities and standard-setting bodies at the global level (IFRS) as well as in the EU (EU Commission/EFRA).
- The TNFD, a private-led initiative that brings together industry, NGOs, international organisations and public authorities, aiming to develop a nature-related disclosure.

As Mark Carney stressed yesterday, disclosure should be a priority, and his goal for the COP26 is to make the TCFD framework mandatory.

In the speech we have already quoted, Mario Draghi also insisted upon the need to foster the cooperation of public and private institutions and keep trade open and fair in order to reap the benefits of private innovation:

“International cooperation should not be limited to the official sector. Global trade is just as important and much has been said about this. The pandemic has shown us how collaboration between companies is paramount to foster innovation and boost production of essential medical goods.”

In a nutshell, the changes required by transition are not only changes in policies within the existing institutional or societal framework; they require us to transform the frameworks themselves. This is very challenging. So is the need to rethink our perception of what abundance is.

¹⁴ See, for instance, the call for action issued by Nobel Prize Laureates and other experts: Agre, et al, “Our planet, our future: an urgent call for action”, 2021, www.nationalacademies.org/news/2021/04/nobel-prize-laureates-and-other-experts-issue-urgent-call-for-action-after-our-planet-our-future-summit.

Within boundaries

Some scientists, in particular Johan Rockström and his colleagues,¹⁵ have developed the concept of planetary boundaries to refer to nine Earth system processes (including climate- and biodiversity-related processes) that are vital to life on Earth. Human activity is contributing to crossing the boundaries within which these systems can maintain a safe operating space for humanity, and this could have disastrous consequences. **This means that the task of our generation is to invent a new model to live – and live well – within these planetary boundaries, or within ecological limits.** To be clear, living and thriving within limits is, as such, an immense challenge.

I would therefore like to elaborate on the relationship between economic growth and ecological limits, as it has profound ramifications, including for central banks. A growing body of literature, including a recent academic paper in *Nature Communications*,¹⁶ suggests that it may be difficult to reconcile an ambitious mitigation of climate change with unlimited economic growth. Professor Dasgupta argues that this tension between economic growth and ecological goals becomes even more evident if we take into account ecological disruptions other than climate change, such as biodiversity loss. In his words, “our economic possibilities are circumscribed [...] by the Earth-System’s workings”.

In order to make progress in the face of such challenges, we must diffuse many of the passionate and intransigent positions that often dominate in public debates. Let me mention two pitfalls we must avoid:

- Thinking that *it is too late and we are doomed*, or that *we should stop doing everything we do: travelling, innovating, creating and so on*. Living within limits doesn’t mean that we won’t keep investing in innovation or that some economic sectors won’t keep growing. In fact, some sectors, such as renewable energy, *must* grow if we are to meet this century’s formidable ecological challenges.
- Believing that *technological innovations and breakthroughs will eventually solve all our problems, and we will not have to profoundly change the way we live*. Some technologies may not materialise quickly enough to prevent uncontrollable and irreversible environmental changes from happening, and solutions that do not rely strictly on technology may also be needed. In terms of the climate challenge, for instance, reducing energy demand is critical to achieving ambitious mitigation.

Therefore, even though technological innovation is crucial given the magnitude of the task upon us, **we will also need to learn frugality** – for instance by limiting superfluous or conspicuous consumption – as recommended in Pope Francis’ Encyclical, for example, or – if you prefer – a form of **self-restraint** as emphasised by Professor Dasgupta in his review on the economics of biodiversity.

Moreover, while technological innovations will still be crucial to decrease our use of energy and resources, they may not always lead to more production and growth. Widespread use of electric bikes for urban transportation, for example, could reduce our dependency on individual cars in urban areas, but by the same token it could also dampen growth prospects in the automobile sector. Likewise, technology makes it possible to organise various meetings online rather than have participants travel thousands of kilometres, but a diffusion of such norms could also translate into less growth. My point here is not to be exhaustive, but rather to show that framing the debate in simplistic ways (eg by opposing techno-utopians to techno-pessimists, or proponents of “degrowth” to proponents of “green growth”) is not constructive.

¹⁵ See J Rockström, et al, “Planetary boundaries: exploring the safe operating space for humanity”, *Ecology and Society*, 2009, vol 14, no 2, art 32.

¹⁶ See L Keyßer and M Lenzen, “1.5°C degrowth scenarios suggest the need for new mitigation pathways”, *Nature Communications*, 2021, vol 12, doi.org/10.1038/s41467-021-22884-9.

Lastly, given the well-known limitations of GDP as a measure of wellbeing, it is also important to bear in mind that the definition of growth itself is bound to evolve in the future. For instance, as recently stressed by Professor Nicholas Stern and co-authors in an IMF working paper,¹⁷ we should move from a “flow-centred focus on GDP” to a “stock-centred focus on a broad definition of capital” and “the conceptual framework used by policymakers must treat planetary boundaries – notably climate overshoot – as a hard constraint”. They also propose establishing an annual carbon budget at the national level, which would be binding. In short, if we are to hold a serious discussion about what an ecological transition means for central banks, including the impact it will have on output and other key macroeconomic variables, we need to be able to engage in a responsible and scientific manner on these difficult questions, rather than sweeping them under the rug.

Finally, I would like to state that living and thriving within ecological limits is also about coming to terms with our own limits as human beings and acknowledging our own mistakes. In an age of rampant ecological destruction and rising socioeconomic inequalities, we – policymakers, central bankers, economists and so on – should also acknowledge the limits of the analytical frameworks and policy proposals that we have been using.

In this context, *The green swan* reminds us that ecological risks – including but not limited to climate change – are so complex that we will never be able to accurately measure them, meaning that we should learn by doing. **After centuries of economic development, during which we did not care so much about the limits of the Earth, its resources and its ability to absorb pollutions such as carbon emissions, it is time to pause and think about what we have done.**

In ancient mythology, Prometheus, who stole fire from the Gods – ie encouraged energy consumption – is severely punished for eternity. Without envisaging such a punishment, we should react positively and decisively to the warnings we are receiving from scientists and from the authors of *The green swan*. Three underlying messages are enshrined in *The green swan*: (i) acknowledging our multiple ecological crises beyond climate change; (ii) cooperating and coordinating our actions; and (iii) learning to live and thrive within limits. **It is not only a topic for today’s conference but a challenge for each of us, for our societies and democracies, and for the financial system in the long run.**

Thank you for your attention.

¹⁷ See A Bhattacharya, M Ivanyna, W Oman, and N Stern, “Climate action to unlock the inclusive growth story of the 21st century”, *IMF Working Paper*, 2021, no 21/147.

Special guest speech

Mario Monti

President of Bocconi University; former Prime Minister of Italy

Thank you, Madame Goulard, for that generous introduction – which, however, due to your modesty, omits the greatest claim to fame for me, namely to have co-authored a book with you on democracy in Europe.

It is an honour to take part in this really unique conference, and I'm very grateful to the BIS, the Banque de France, the IMF and the NGFS. Before I begin my remarks, I must declare not a conflict of interest, but rather a complementarity of perspectives. Why? Well, among those invited to deliver special guest speeches at this conference, I am certainly the one who is the most peripheral, if not extraneous, to the core of this conference, both in terms of thematic competence and in terms of institutional positioning in the system. Unluckily for me, I'm not one of you – key members and leaders of the financial system.

However, perhaps this allows me to have a more detached perspective. And with this vantage point, I would like to say that I am genuinely very impressed by what all of you, the organising entities and the community working – globally, now – on linking climate change and the financial system, have been achieving, bringing this so deeply into operational aspects. So, this is a genuine admiration that I wanted to express. Coming from the outside – so much outside that I have to confess that in 2015, when Mark Carney delivered his visionary statement, I did not read it immediately; it did not hit me immediately. However, I have now been able to see to what extent it really was seminal and visionary.

Now, why do I speak of a complementarity of perspectives? Because I have two points of attack on the topic at hand during these days, based on both my older and more recent activity. I have long been a student of the financial environment in the sense of regulation, supervision and monetary policy, and I was even Commissioner for Financial Services in Brussels. And now, more recently, as Sylvie kindly mentioned, I have been asked to chair a Pan-European Commission on Health and Sustainable Development. So, let me say a couple of things coming from these two points of view.

A financial environment perspective

With regard to the financial environment, I know that – and it would be surprising if the opposite were true – there are a variety of degrees of enthusiasm among the community of central bankers and supervisors on whether, how and to what extent their already extremely hard-to-pursue mandate should be enriched, complicated, made more human or made more problematic by taking responsibility for directing the instrument that they have – that you have in your hands – towards climate change issues. If I were in their position, I wouldn't hesitate so much, and I know that most of them – most of you – are not hesitating.

I remember at least a couple of instances over the years in which those responsible for the financial environment did – maybe inadvertently – something which would have given rise to – if seen transparently and clearly – greater systemic problems than are maybe entailed today in taking care of climate change.

Why? Well, I have two cases in mind, one of which I studied in the 1980s specifically with regard to Italy, though it did apply at that time to many countries: the financial repression of the credit and financial system that was put in place by parliaments and governments, with the active involvement of central banks and supervisory authorities as well. It was demonstrated that the – probably unintended – collateral side effect of the entire battery of constraints on the financial behaviour of individuals, households, companies, banks and other financial intermediaries was a massive subsidy given to national

governments in the form of greater ease in placing growing amounts of public debt, at lower interest rates than a less-constrained market would have implied. So, that was a phase in which there was a slightly schizophrenic attitude, objectively speaking, between monetary authorities, which were rightly and consistently urging governments and parliaments to contain the public sector deficit so as to limit the obnoxious phenomenon of crowding out private investment conducive to growth.

On one hand, there was this strong advocacy for more orthodox behaviour in terms of public finance, but on the other hand, there was day after day de facto “accommodation” – that was the term used – through constraints placed upon other actors, the beneficiary of which was the government. That may not necessarily be a bad thing, but I was convinced at that time and learned over the years in different positions that there was a dangerous spillover into political systems, because those deciding on the size of the deficit in government and in parliament saw the political cost of doing that somewhat reduced – sometimes significantly reduced – by the elimination of financial attrition upon financing the huge deficit and debt.

A more recent instance – this is more debatable; no historical judgments have been pronounced and this is a matter currently being analysed and reviewed by many central banks in the world, not only in Europe – is the very long, at this point, phase of massive monetary accommodation that emerged in most countries or systems of countries more or less after 2015: QE or other labels. That too, in my view, will have certainly had some beneficial effects in terms of the economy, but, through a different mechanism, also certainly reduced the incentive for political systems in countries which still needed to contain their public finances to do so. Then came the pandemic and that created special circumstances.

So, I mention these two historical precedents to indicate that, in my view, it is *less* extraneous to the philosophy, the mandate and the spirit of central banking and financial supervision to do what you are now doing more and more forcefully and with instruments that are more sophisticated – to use the financial environment to reduce the threat of climate change – than implementing a monetary or a regulatory policy that was in fact making it more difficult to achieve an objective *closer* to the concerns of central bankers and financial supervisors (ie public finance) than climate change is.

Now, let me abandon the perspective which I am sure – due to the simplification with which I had to deliver it on this occasion – will have generated some raised eyebrows, and let me turn to health.

A health perspective

Here I would like to second the suggestion given by Sylvie in her opening remarks that climate change and health are really very intimately linked. It would not be for me to provide the scientific evidence; you are all familiar with the link between climate change, a reduction of biodiversity, health, pandemics, etc. I think it is really fascinating to try and examine both by analogy because of the possible synergies between what the financial system does in terms of the fight against climate change and what it might do more forcefully in order to also take care of a different aspect within One Health, ie human health.

As was mentioned already by Sylvie, One Health is defined as a vision of health which embraces the health of humans, the health of animals and the health of the planet. It is extremely difficult to make sure that public policies fight in favour of human health globally unless the fight is put in the context of the One Health approach. And here, again, Sylvie is proving to be a driving force; this tends to happen to her wherever she does work in the Pan-European Commission on Health and Sustainable Development, which I coordinate. We have already formulated a number of proposals, which I won't review now in full, but which draw inspiration from the work that you are all conducting, particularly the NGFS. We will articulate better in our final report, to be delivered by September, what changes could be introduced in financial systems to make them more conducive to a strong contribution to better global health.

Here I would like to use my few remaining minutes to dwell on one of our proposals, which has already been formulated in a Call to Action document that we published in mid-March,¹ where we deal with how to create an appropriate proximity and familiarity between those who work in health and those who work in finance. What we presented on the particular occasion to which Sylvia alluded, the Global Health summit in Rome in June, was the following consideration:

The Global Health Summit was a great opportunity, at the initiative of the Italian Presidency of the G20 and of the President of the European Commission, to move the agenda for better governance of global health forward.

As you might imagine, if I have been asked by the WHO/Europe to chair this Commission on Health and Sustainable Development, it is not a commission of scientists or of health experts. We do have them in our Commission, and very remarkable ones, but it is also composed of economists, former heads of governments or heads of states. There is more than one person who, like Sylvie, has had experience with central banks. And our mandate is really to provide suggestions on how to reconsider policy priorities in light of the pandemic – so, how to re-engineer the interfaces between health policies, finance policies, market policies, foreign policies and so on and so forth.

We therefore devote particular attention to the interface between health policy and financial policy, in a broad sense. We are very interested in drawing lessons from the segment of One Health that is more advanced – thanks to you all – in developing this interaction with finance, ie climate change. We try to do the same – in a complementary way – for the interface between health and finance.

We have been very inspired by the experience at the G20 more or less 10 years ago, with the establishment of the Financial Stability Board. What happened at that time? You know this much better than I do. A fundamental public good – key for our societies and for our economies – was disrupted. That public good was financial stability. Quite promptly and forcefully, the G20 set in motion the Financial Stability Board, first chaired by Mario Draghi, then by Mark Carney and then by others who are doing very good work on it. From that high-level political piloting came a series of principles which have been inspiring legislations, reconsiderations of supervisory policies, etc in many jurisdictions. And that clearly helped avoid – at least for now, though I'm more confident than that – another calamitous financial crisis.

Now, what happened with the pandemic? Another fundamental public good has broken down, but we normally recognise the fundamentality and the nature of public goods only when they break down. The pandemic has been a breakdown in another fundamental public good: public health. Of course, a whole series of responses have been given or are in the process of being given by WHO and many other institutions, in a very forceful and rather well-coordinated manner. But we should ask the question of how we could recreate some of the conditions that worked so well in the case of the other public good, financial stability, which had become financial instability.

Our idea – which I am glad to say seems to be gaining ground in different contexts, such as the G20, the G7 and various circles – is that a strengthened WHO – better financed, made more independent, given the instruments to be better able to call countries to transparency and to implementation of what the WHO says – should be at the centre of the system more than ever. But it would be advantageous to those who care about health, from individual health ministers to the WHO itself, to have a more permanent familiarity and proximity with finance ministers, with central banks, with supervisors and with heads of government.

I remember my experience in one of those roles, as prime minister in Italy during the financial crisis itself. At that time, but subsequently as well, health minister was not a central position in the Council of Ministers. We need to make health policy a very high-priority topic on the agenda of finance ministers as well, not just health ministers, and heads of governments. This seems very easy now – they already *are*

¹ www.euro.who.int/_data/assets/pdf_file/0010/495856/Pan-European-Commission-Call-to-action-eng.pdf.

doing this. They – even heads of government – spend much of their time on this part of their agenda. But let's hope that the pandemic is not here to stay too long.

What happens if, in one year or so, other – let's hope not catastrophic – events attract the attention of heads of government even more than the pandemic does now? The momentum there now would be lost. The very much that remains to be done to put our health systems in better shape so that there aren't such devastating pandemics or other global health crises in the future will require *prolonged* high-level attention, not just for one year. So, our idea is that a global health board should be created at the G20, composed in a way which would see a fundamental role there for the WHO and for the other international organisations which deal with health, as well as for those which deal with finance. This would establish the proximity of the health filière and the finance filière, and – why not? – probably central banks as well.

This would then provide a high-level political impulsion to the world of health, without any prejudice – on the contrary – to the more institutionalised and more universalistic entities like the WHO. For example, it has been proposed by an independent panel that the UN set up a global health threats council elected by all Member States, etc.

But from where would one draw the political impulsion and the continuity of attention? We believe that, even for the WHO and the world of health, it would be very advantageous to try to have this continuous proximity with the world of finance and maybe extrapolate our remarks, our reflections of today, into the longer-term future. Because financial stability and public health are two fundamental global public goods, but they aren't the only ones – certainly, climate and the environment is a fundamental one as well.

Why not? One day, one could conceive of a global One Health board at the G20, which would permanently give finance, climate change and health more proximity and familiarity. And there would be a personality wide-ranging enough and imaginative enough to be able to chair such a body. One such personality has taken the floor at this conference already, yesterday. Thank you very much for your attention.

Special guest speech

Joseph Stiglitz

Professor, Columbia University

It's a real pleasure to be able to share some of my thoughts. I would like to speak particularly from the perspective of an economic theorist; I thought that was perhaps the most important contribution that I could make.

I want to emphasise the key role of the financial sector in allocating capital. But the problem in the allocation of capital is that social returns often differ from private returns – for instance, there is systemic risk giving rise to what are called “macroeconomic externalities”, recessions and bailouts. Another example is that the social benefits of lending to SMEs and marginalised groups is much greater than the private benefit, and that's why the United States and many other central banks have embraced a broader view of their responsibilities – that they need to be concerned about lending to these groups that have not had access in the past, or lending to sectors that have had deficient access to capital. The important point is that one has to use all the tools at one's disposal to achieve society's multiple social objectives.

The disparities between social and private returns are especially large in a world with imperfect and asymmetric information and incomplete risk markets. That was the subject of the research for which I was awarded the Nobel Prize. Those imperfections lead to credit rationing and financial market imperfections. The implication of this is that, in general, market allocations are not efficient; they're not constrained Pareto-optimal. There are particularly important allocation failures in the presence of *other* market failures, and among those other market failures are externalities, both negative and positive. There will be too much capital allocated to sectors where there are negative externalities and too little where there are positive externalities. And, of course, climate change is the quintessential example of an area where there are very large negative externalities.

Governments' roles in addressing market failures

When there are these kinds of market failures, government action is required. That explains the large role that government plays in the financial sector. It plays a number of different roles, and all of these can be seen through the lens of these market failures. I'm going to refer particularly to some of these roles in connection with climate change.

There's a role in lending. Actually, governments in most countries have very large lending programmes. That's why there are development banks and green banks. Already in the United States, we've established green banks in New York State, and there is a widespread movement to establish more green development banks in various states and various countries. Having been Chief Economist at the World Bank, I can attest to the value, the role, the importance of these kinds of institutions. They have a long-term perspective, unlike many commercial banks, whose perspective tends to be very short-term. Globally, one of the recently established banks, the New Development Bank organised by the BRICS, has played a particularly important role in green lending.

Then there's the regulatory role, the discouragement of harm that is sometimes done by financial institutions: discrimination, market manipulation and excessive risk-taking like that associated with the 2008 crisis. While regulations can help discourage harm, they can also encourage good things. An example is Community Reinvestment Act (CRA) lending, trying to encourage lending to underserved groups, or SME lending, trying to encourage lending to small and medium-sized enterprises. Because assessing the full risk of, say, carbon lending may be difficult, it may be best to prescribe certain types of lending – for

instance, for fossil fuel development – at least for government-insured banks. Of course, doing so is not only consistent with prudential behaviour; it's also consistent with broader societal goals.

There are some further roles of government, like providing insurance – most governments today provide deposit insurance. In providing deposit insurance, one has to set differential rates according to risk, and one aspect of setting those differential rates has to be climate risk, which I'll come to in a bit.

Finally, a very important role is disclosure. Markets can't function well without good information, but market incentives to disclose relevant information are far from perfect, far from adequate. We need disclosure requirements to ensure information is provided on a comparable basis. Here, what's important is disclosure of both the physical risk, sometimes called "damage risk", and the transition risk, the risk of changes in prices going forward. I'll come to that in a bit. I want to emphasise that we need to have that kind of disclosure across the board – that means not only for publicly listed companies, but also for banks. And that disclosure has to be disclosure of the risk of the loan portfolio of the banks. That means that if banks are going to lend, the corporations to whom they lend have to disclose their risks. It's through that mechanism that we can get much broader disclosure within our society.

Market failures in climate change

The market failures in climate change are particularly consequential. Obviously, it's an existential issue today, but from an economic point of view, something which is scarce is treated as a free – or now, nearly free – good. Not surprisingly, that results in excessive emissions and insufficient innovation, and it imposes excessive risk on society.

One of my concerns – and I'll come to that more extensively – is that the appropriately calculated social cost of carbon, sometimes called SCC, used very widely in the United States and in some other countries for policy, is markedly higher than the prices imposed almost everywhere. Relatedly, the prices currently being used – in Europe and in the United States – will not achieve the climate goals on which the international community has agreed, ie the 1.5 to two degrees centigrade. What we need, then, is a much higher price of carbon.

One of the first executive orders of the Biden administration concerned revisiting the social cost of carbon that had been used under earlier administrations. In the interim, they did revise the price substantially upward, but the problem is that it's not enough. If that price were the basis of actions taken by the private and public sector, it would result in an increase in temperature of 3.5 to four degrees centigrade. That has profound implications because it suggests a kind of incoherence in policy, a lack of policy credibility, and that in turn has some important implications, to which I'll turn in a bit.

What was the explanation for using such a low social cost of carbon? Well, it was based on badly flawed, highly aggregated benefit-cost integrated assessment models, as opposed to integrated assessment models based on how to achieve the globally accepted goals of 1.5 to two degrees. This brings a whole set of problems; the damage functions don't adequately reflect the full range of damages, the nonlinearities or the tipping points. Most importantly, they don't reflect the huge risks associated with climate change. They don't adequately reflect either intragenerational or intergenerational welfare; in particular, future generations' well-being is discounted in an ethically unacceptable way. They don't reflect the full range of market failures. They don't adequately integrate the financial system – the subject of the discussions here. So, it was on the basis of that flawed model, which had disproportionate influence in the United States in particular, that the lower prices of social cost of carbon were adopted. That in turn means that the policies that will be adopted will come nowhere near meeting the goals of 1.5 to two degrees centigrade.

More than just carbon prices

Prices are important for guiding resource allocations, but I want to emphasise that achieving climate goals requires a much more comprehensive agenda. One needs higher prices to achieve the target of carbon neutrality by 2050, but one also needs high levels of public investment and strong regulations. These can be efficient and easy to implement. In fact, it's sometimes easier to have good regulations, such as no fossil fuel electric generating plants or no fossil fuel oil-based cars, than having a pricing system.

So, one needs a comprehensive package of policies and a price level that makes it possible to succeed in the goal of 1.5 to two degrees – obviously sensitive to the level of public investment and the nature of the regulations. That's important, because the overall package has to be sensitive to intra- and intergenerational impacts and risks. A properly designed package can be much more sensitive to these intra- and intergenerational impacts and distributive impacts and respond more effectively to the overwhelming risks associated with climate change.

I want to emphasise that not only does there have to be a comprehensive package; there has to be policy credibility. The reason for this is very simple: expectations shape investment decisions. The investment decisions that are going to affect emissions in 2050 are being made today, so one has to convince investors that there are consistent, credible policies on climate that will be maintained for the future. Policy credibility is thus key to shaping expectations.

Unfortunately, the current policy frameworks may not suffice. They may actually *undermine* credibility. I already mentioned one aspect of this: the excessively low social cost of carbon. Another one is that we have insufficiently comprehensive policies. We aren't making enough public investments, including in R&D, and so far, there are inadequate risk assessments, inadequate disclosures of the relevant risks. The United States Securities and Exchange Commission appeared to be going forward in requiring more disclosures, and that is obviously very important for the financial sector's resource allocations. The point is, if policies are not credible, they won't trigger the reallocation of capital that sets the system towards a new equilibrium that is consistent with climate change.

The climate mitigation scenarios developed by the financial authorities and the NGFS have provided financial actors with future trajectories for low- and high-carbon activities that help set expectations. Unfortunately, financial actors' expectations can generate self-fulfilling and self-defeating equilibria, and that means there are alternative possible outcomes. It's possible to have disorderly transitions even when there are good premises for an orderly one. Thus, it is key to account for expectations in the scenarios. Now, as I've said, the outcomes depend on the credibility of economic policies, which shape risk perceptions and financial regulation, which can enhance the likelihood that risk perception is adjusted in line with economic policies.

Regulators' and central banks' role in assessing and managing risks

Finally, I want to emphasise that regulators and central banks have a particularly important role in managing and assessing risks. In an economy with a high level of inter-dependencies, such as our economy, attention has to focus on systemic risks.

We saw that in 2008; the failure of one financial institution led to a systemic crisis. In the case of carbon, the risks are even greater. Remember that the 2008 crisis originated in one part of the economy, in the real estate sector – and in one part of the real estate sector, the subprime. There was a problem with mispricing risks – mispricing mortgages – in that small part of the global financial system. But here, we're talking about the risks associated with carbon and fossil fuels. The prices today are out of line with what they will be once reasonable carbon prices are put in place. Those reasonable carbon prices, as I've said, are going to be much higher than current prices. And that means that the value of fossil-fuel assets will come down, and potentially do so very dramatically and very quickly. That, in turn, imposes enormous

amounts of transition risks, and those risks are systemic. They lie not only in the fossil fuel companies, but in the companies that lend to the fossil fuel companies, that own shares in fossil fuel companies, and trade with the fossil fuel companies. It is a much larger systemic risk, and that's one of the reasons why it is imperative that one approach the problem from the perspective of systemic risk.

In the case of climate change, there is also not only this transition risk, but there's also a high level of physical risks – risks associated with rising sea levels, all the kinds of physical risks and large-scale damage that have been experienced in the United States. In some recent years, those have been 1.5 per cent of GDP or more. Obviously, that imposes risk to the insurance industry and to many other parts of the economy. The good news is that we do have the tools to assess those risks. They're already available. We engage in climate stress testing, for instance, and those tools will be developed further.

I want to emphasise that this is well within the purview of the traditional role of central banks in risk assessment and risk management. So, this is not changing the role of central banks and regulators; this is just a new task that they have to face if we're going to achieve financial stability.

Conclusion

Finally, let me conclude by emphasising that without the appropriate allocation of capital, we won't be able to achieve our climate goals. We can't get climate-aligned allocation of capital without finance fulfilling its essential role. However, finance won't be able to fulfil its role without appropriate risk assessment in line with the scientific evidence on physical risks, transition risks and mitigation pathways.

As I've emphasised, appropriate risk assessment requires financial regulation to demand disclosure and stress testing and credible economic policies that set expectations for low- and high-carbon assets for the coming decades. And the economic policies that have to be part of that kind of credible economic strategy going forward entail not just carbon taxes, but also regulations to stop fossil fuel subsidies and public investments in low-carbon infrastructures. Absent all of these, financial markets are likely to impose unacceptable financial, macroeconomic and environmental risks on society.

The financial sector and financial regulators face an enormous challenge. It is a new lens through which we have to see financial stability. If they rise to the challenge, our climate goals will be much more easily met. If they fail, it is almost inevitable that we will fail in achieving our climate goals. Thank you.

The embrace of the horizon: forcefully moving with the changing tide for climate action in financial sector policies

Frank Elderson

Member of the Executive Board and Vice-Chair of the Supervisory Board, ECB; Chair, NGFS

Many thanks to the organisers for inviting me to address this conference with so many distinguished speakers. I am truly honoured to have the opportunity to speak at this important event and to discuss the immediate action the financial sector can and should take in the light of the ongoing climate crisis.

Allow me to start with one disclaimer: as an Executive Board member of the European Central Bank, I am also a member of its Governing Council. Today is the first day of what we call the “quiet period” leading up to next week’s monetary policy meeting of the ECB. Against this backdrop, I want to emphasise that nothing I say today has any bearing on the deliberations of the Governing Council.

Instead, in the true spirit of this conference, I would like to talk about swans. Let me tell you a brief story about the Bewick’s swan. This swan has its breeding grounds in the Russian tundra and spends its winters in north-west Europe. Until around 50 years ago, it would typically spend winter in Ireland, the United Kingdom and the Netherlands. However, research published last year by the Netherlands Institute of Ecology has shown that the Bewick swan’s wintering area has since shifted eastwards by around 600–700 kilometres.¹ This move coincided with a similar eastward shift of the line across Europe that marks where the temperature is around five degrees Celsius in winter. This is just one specific example of how climate change is having an impact on our ecosystem, one specific example of how climate change is affecting the incidence and distribution of swans, and one specific example that the change is real.

The green swan

Today, we are not talking about the Bewick’s swan, but rather the “green swan”, by which we mean potential, systemic financial crises that stem from climate-related risks. This concept takes its name from the theory of the black swan, which is a metaphor for unexpected events that have a wide-ranging impact on society and which can only be explained in hindsight. The black swan phenomenon was brilliantly described by Nassim Nicholas Taleb² just before the world became engulfed by the global financial crisis in 2008. That crisis was a wake-up call for policymakers across the globe to take tail events seriously in their analysis and setting of policies. It is the reason why the sense of urgency about how to deal with possible *green* swan events resonates loud and clear in the minds of central bankers and supervisors.

The green swan, the book at the heart of today’s conference, was released in January 2020³ just a few weeks before another major event that has had such a tremendous impact on our daily lives for more than a year now: the coronavirus (Covid-19) pandemic. On top of its wide-ranging human and economic implications, the pandemic has forewarned us of the scale of the effort required to prevent green swan events from materialising. The reduction in greenhouse gas emissions in 2020 was less than what will be required every year until 2030 and beyond. And this reduction must be achieved through structural change rather than the human and economic disruption caused by lockdowns. To put it plainly:

¹ See R Nuijten, K Wood, T Haitjema, E Rees and B Nolet, “Concurrent shifts in wintering distribution and phenology in migratory swans: individual and generational effects”, *Global Change Biology*, vol 26, no 8, 2020, pp 4263–75.

² See N Taleb, *The black swan: the impact of the highly improbable*, Penguin Books, 2007.

³ See P Bolton, M Després, L Pereira da Silva, F Samama and R Svartzman, *The green swan: central banking and financial stability in the age of climate change*, Bank for International Settlements and Banque de France, 2020.

in order to avoid falling prey to Mark Carney's "tragedy of the horizon",⁴ we must acknowledge that the horizon for climate action is now.

Turning tide

In these dire circumstances, and faced with these daunting prospects and challenges, the call to pursue the required structural changes is mounting. More and more countries have made a commitment to achieve net-zero emissions by 2050 at the latest. More and more of these countries are now translating these commitments into legislation and concrete action plans, and more and more countries are stepping up their earlier commitments. On 21 May, the G7 made a commitment to keep the target of limiting the increase in global warming to 1.5 degrees Celsius within reach. The tide is truly turning towards climate action, and the flow is gathering force.

This is also reflected in the work programmes of multiple international organisations. Under the Italian Presidency, the G20 has made climate action a key priority and an integral part of the recovery from the pandemic. More specifically, it has re-established the Sustainable Finance Study Group and upgraded it to a working group expected to report on any major gaps or barriers to mobilising sustainable finance before the end of the year. In parallel, the Financial Stability Board is working on ways to promote consistent, high-quality climate disclosures in line with the recommendations of the Task Force on Climate-Related Financial Disclosures. It is also continuing to work on data requirements and gaps that are crucial for assessing the financial stability risks posed by climate change. The FSB will report to the G20 on both issues in July.

In the meantime, the International Financial Reporting Standards Foundation (IFRS) is moving ahead with a proposal to set up an international sustainability standards board to deliver the first consistent, single set of global norms for climate-related company disclosures. The Foundation's proposals have received widespread support from, among others, the International Organization of Securities Commissions. At the same time, it is essential that the IFRS work not fall short of current investors' need and international best practices. In that context, the Foundation's work can take inspiration from and should leave sufficient room for the European Commission's proposal for a Corporate Sustainability Reporting Directive. The Commission's proposal includes transposition of the Directive into national law by EU Member States by December 2022 in order to ensure it is applicable for the fiscal year beginning 1 January 2023.

With all these activities and numerous initiatives from non-governmental organisations,⁵ the green finance landscape is quickly becoming crowded. As everyone has a vital role to play in addressing the climate crisis, this is clearly a welcome development, yet it also requires enhanced coordination among different stakeholders to (i) ensure that ongoing work can build upon work being carried out elsewhere without anyone having to reinvent the wheel; (ii) ensure that workstreams are sufficiently complementary; and (iii) identify potential perspectives that are being left unaddressed – blind spots from which a green swan could emerge.

Following this conference and the G20 meeting in July, the COP26 summit taking place in Glasgow in November will be a key event for taking stock of the many initiatives currently under way. It will also be an important milestone for assessing the progress being made to meet the objectives of the Paris Agreement, as well as a catalyst for accelerating the actions required to ensure that commitments are kept within reach.

⁴ See M Carney, "Breaking the tragedy of the horizon", speech at Lloyd's of London, 29 September 2015.

⁵ Ahead of this conference, Reclaim Finance, Positive Money, the Climate Safe Lending Network (CSL), the New Economics Foundation (NEF), Re:Common, Greenpeace, BankTrack and Public Citizen published a note entitled "The green swan toolkit: four priorities to ensure financial stability in the age of climate change", which sets out four areas of progress to prevent green swans from materialising.

Role of central banks and supervisors

In this crowded field, central banks and supervisors are also increasingly showing their resolve and dedication to help – within their mandate – integrate the effects of the climate crisis into the exercise of their tasks. They have done so individually, but also collectively as part of the Network for Greening the Financial System (NGFS), which I have been proudly chairing since its inception in December 2017. Back then, the eight founding members represented 30% of global economic activity. Now, the NGFS has evolved into a network of 91 members and 14 observers covering five continents, around 85% of global emissions, 88% of the global economy and all global systemically important banks. And it continues to expand its coverage, reach and range of activities, which know no taboos and cover all the core missions of central banks and supervisors – microprudential, macroprudential and monetary policy.

NGFS activities

Let me outline some of the ongoing activities of the NGFS that contribute to taking immediate action to deal with climate-related risks. I will base this discussion on what the book *The green swan* refers to as two “epistemological breaks” that central banks and supervisors need to consider – two ways to radically revisit conventional thinking and attitudes towards policy action, two paths to do justice to the exceptional nature of the climate crisis, and two avenues for immediate action.

The first proposed break refers to the importance of taking a forward-looking approach in the analysis and management of climate-related risks. This differs from traditional approaches to risk, which typically use historical regularities to project possible future outcomes and are ill-suited for identifying the possible emergence of black or green swans.

To close this gap, the NGFS has published macro-financial scenarios on the potential long-term consequences of the climate crisis and climate policies. Next week, under the leadership of the Bank of England’s Sarah Breen, the NGFS will publish new vintages of the scenarios that were first released in June 2020. These scenarios provide a framework for analysing the impact of physical and transition risks under different climate policy assumptions. While they have been developed for use by central banks and supervisors, they may also be useful for governments, academia and private sector entities. With these scenarios, the NGFS provides – and intends to regularly update – an important public good for all stakeholders, public and private, to help them engage in forward-looking climate-risk analysis under a common and consistent global reference framework.

While they are an important piece of the puzzle, scenarios alone cannot mitigate climate-related risks. Scenarios need to be developed into stress-testing methodologies for assessing risks and vulnerabilities on an ongoing basis. This is the type of analysis and policy assessment that is central banks’ and supervisors’ bread and butter for so many other sources of risks.⁶ Thanks to the shared experiences of its wide-ranging membership and its collaboration with academia, the NGFS is uniquely placed for its work on climate scenarios and stress testing to feed into and inform the broader international policy agenda.

Given the deep uncertainty with respect to climate change and climate policies, we need to continuously evaluate the impact of physical and transition risks. Collecting consistent and comparable climate data linked to economic activities is vital. In March 2020, the NGFS established a workstream dedicated to mapping data gaps more systemically and proposing ways to bridge them. An interim report published last week lays the groundwork for a comprehensive stocktake of the various stakeholders’ data needs, objectives and activities across the financial sector.⁷ In a nutshell, the report concludes that better

⁶ The ECB is among the NGFS members that are currently finalising an economy-wide stress test; see also L de Guindos, “Shining a light on climate risk: the ECB’s economy-wide climate stress test”, blog post, March 2021.

⁷ See NGFS, “Progress report on bridging data gaps”, *NGFS Technical Document*, May 2021.

data does not simply mean *more* data. Both the public and the private sectors need high-quality, granular, reliable and comparable data.

At the same time, we cannot afford to wait. And the report indeed concludes that we don't need to wait. We already have significant scope for drawing on available data and building on existing approaches to improve our awareness, analysis and assessment of climate-related financial risks. The NGFS interim report provides important input for the Financial Stability Board's report to the G20 on data gaps. A final NGFS report, which focuses on how to effectively bridge remaining data gaps and takes on board the Financial Stability Board's report to the G20, is expected by the end of the year. We will use the knowledge and expertise gathered from bridging data gaps to evaluate and update the forward-looking scenarios under consideration.

The green swan advocated a second paradigm shift. Central banks and supervisors must be more proactive to be able to fulfil their mandate while avoiding the "tragedy of the horizon". Here, the NGFS has clearly taken the lead. Since its inception, the NGFS has acknowledged that the climate crisis is a driver of financial risks, putting it squarely within the mandates of central banks and supervisors. Along with research partner INSPIRE, the NGFS will soon publish an outline of a research proposal on the financial stability risks of biodiversity loss.⁸ To avoid overlooking green swans, we urgently need to move beyond climate-related risks and better understand the materiality of the risks posed to the financial sector by environmental degradation.⁹

Governments clearly bear primary responsibility for addressing the climate and environmental crises we are facing. While central banks and supervisors should not, of course, overstep their mandate, there is also a legal risk of being sued for *failing* to act and comply with legal obligations. In recent years, we have observed a steep increase in climate-related and environmental litigation, which has been successful more often than before. Most examples have so far involved litigation against non-financial corporates¹⁰ and governments.¹¹ However, central banks and supervisors can also become exposed to this kind of litigation risk, as can the financial institutions that they supervise.¹² The implications of these legal risks for the conduct of policy and for the stability of the financial system also need to be considered by central banks and supervisors.¹³

With the strong conviction that central banks and supervisors not only can, but *must* take into account climate-related and environmental risks and act urgently to fulfil their mandate, the NGFS seeks out ways to inspire its membership, to push the frontier and act as a trailblazer. Specifically, the network is now thoroughly analysing progress in supervisory practices in the field of climate-related and environmental risks. A progress report detailing the results of the analysis is expected to be published ahead of COP26. Preliminary results show that more supervisors have clarified how existing legal

⁸ See also "NGFS and INSPIRE launch a joint research project on 'Biodiversity and Financial Stability'", NGFS press release, 6 April 2021.

⁹ De Nederlandsche Bank recently examined the material exposures of Dutch financial institutions to risks stemming from biodiversity loss. According to its report, Dutch financial institutions have provided €510 billion in finance worldwide to companies that are highly dependent on ecosystem services, with €28 billion exposed to products that depend on pollination alone. De Nederlandsche Bank, "Indebted to nature – exploring biodiversity risks for the Dutch financial sector", June 2020.

¹⁰ Last week, a court in the Netherlands ordered Royal Dutch Shell to make deeper and faster cuts in carbon dioxide emissions than it had planned.

¹¹ In 2019, the Supreme Court in the Netherlands held that the Dutch State was under an obligation to reduce greenhouse gas emissions. More recently, the German Constitutional Court issued a ruling that in essence held that the German Federal Climate Change Act did not go far enough.

¹² Recently, the non-governmental organisation ClientEarth filed a claim against the National Bank of Belgium.

¹³ In his speech on the tragedy of the horizon, Mark Carney was already referring to liability risks for financial stability in addition to physical and transition risks (see reference in footnote 4).

requirements will be applied in the context of climate-related and environmental risks.¹⁴ This will guide supervisory dialogue on these matters in the future. It should be recognised that both supervisors and financial institutions are in the early stages of the journey towards sound management of climate-related and environmental risks. Therefore, it is to be expected that guidance will be refined and the bar will be set higher over time as expertise and regulations develop and capabilities improve.¹⁵ However, setting expectations is an important step given the need to urgently start integrating climate-related and environmental risks in financial institutions' decision-making and risk management processes.

On the monetary policy side, the NGFS has explored ways in which central banks can incorporate climate-related risks into their monetary policy implementation frameworks. A report published in March identified nine high-level options covering credit policies, collateral frameworks and asset purchases.¹⁶ It is up to individual central banks to explore what combination of actions to take under their mandate and in their specific legal context. Even so, the full membership of the NGFS sent a clear message by collectively rallying behind the insight that climate change has implications for the conduct of monetary policy.

The NGFS has focused extensively on providing practical guides for central banks and supervisors on building their capacity to act. As our collective knowledge is evolving apace, this guidance will need to be updated continuously. That is why I am very pleased to inform you that the NGFS is currently exploring how it can help build capacity within the central banking and supervisory communities and is considering developing training initiatives in cooperation with some other key stakeholders. We will announce progress on this soon.

Moving with the tide

Let me conclude. There are different ways to approach a swan. In the context of traditional financial crises, there has been a lively academic debate about whether central banks should "lean against the wind", to mitigate the risks of a crisis, or focus instead on cleaning up afterwards. In my view, a similar discussion is obsolete in the context of green swans, for at least three reasons. First, the cataclysmic and irreversible nature of green swan events imply that cleaning up afterwards is simply not an option. Once certain thresholds have been passed, the current, delicate status quo of our ecosphere can no longer be restored. Second, as the NGFS has demonstrated beyond doubt, climate action is fully consistent with the mandates of central banks and supervisors. From where we currently stand, the risk of doing too little, too late is significantly larger than the risk of central banks and supervisors overstepping their mandate. Third, and maybe most importantly, when it comes to climate policy, headwinds are turning into tailwinds. In other words, central banks and supervisors can benefit from the changing tide that is turning strongly in favour of climate action, as underlined by increasing commitments made by governments.

However, commitment alone is not enough to address the climate and environmental emergency that we face. We must show resolve. The NGFS was established as a coalition of the willing, it has become a coalition of the committed, and it will set out to be a coalition of those who deliver. To quote Nassim

¹⁴ In November 2020, the ECB published its "Guide on climate-related and environmental risks". Building on the NGFS "Guide for supervisors", it communicates the ECB's understanding of a prudent approach to managing such risks to banks, markets and the wider public, with the aim of raising banks' awareness and preparedness for managing them. The Guide outlines the ECB's supervisory expectations for how climate and environmental risks should be embedded in all relevant bank processes, from banks' risk management frameworks to their governance structures, risk appetite, business model and strategy, and, importantly, their reporting and disclosures.

¹⁵ Recently, a Task Force on Climate-Related Financial Risks operating under the Basel Committee on Banking Supervision looked into the effects of physical and transition risks on banks. This task force concluded that climate-related risks can be captured in risk categories that are already used by financial institutions and reflected in the Basel Framework, for example credit risk, market risk, liquidity risk and operational risk. However, it also concluded that we still need an enhanced toolbox that can better measure climate risks.

¹⁶ See NGFS, "Adapting central bank operations to a hotter world: reviewing some options", *NGFS Technical Document*, March 2021.

Nicholas Taleb in his black swan masterpiece, "History and societies do not crawl. They make jumps". Let's act on that lesson in addressing green swans. Let's jump. And let's move forcefully with the tide towards climate and environmental action. Let's move by urgently and fully addressing the profound consequences of the advent of green swans, thereby stopping the eastward shift of the Bewick's swans' hibernation grounds. The horizon for action is now. Let the word 'horizon' henceforward never again be associated with the word 'tragedy'. Let us look forward to the horizon and seize the opportunity of the horizon. Let us embrace the horizon.

Climate change and the precautionary imperative

Sarah Bloom Raskin

Former Deputy Secretary, United States Treasury; former Governor, Federal Reserve Board

Thank you, Frédéric, for that kind introduction. It is a pleasure to be joining the Green Swan Conference today.

In the midst of one of the largest economic transformations in world history, the Green Swan Conference is providing a place for us to virtually assemble to assess progress and chart the course ahead. I'm reminded of something said by Archimedes, the Greek mathematician: "Give me a place to stand, and I shall move the Earth".

Here we are in that place. Many of us have now experienced two economic crises in but one lifetime. We have witnessed and managed the effects of the global financial crisis of 2007, and we have witnessed and managed the effects of the global pandemic of 2020. In fewer than 20 years, there have now been two global crashes – albeit different, but nonetheless two more significant economic calamities than some people have experienced in a lifetime. Indeed, in both crises, the world's economies were overtaken by what has been understood to be a tail risk, a set of events believed to be of low probability but high destruction. This last crisis in particular – the pandemic and its ensuing pain and suffering – underscored the fact that there are risks that had not been sufficiently prepared for.

Indeed, one can see the United States' inability to prepare for climate change, not unlike its inability to prepare for a hidden virus that created a public health emergency with profound effects on the economy, jobs – indeed, the entire common good. If we take nothing else from the global financial crisis and from the continuing effects of the pandemic, it should be that our collective wellbeing is at risk of serious disruption from climate change.

This threat, which is both looming larger and larger every day and with us right now, presents central banks and other financial, prudential and market regulators with the imperative to act in a precautionary manner. Embedding a precautionary imperative into the work of central banks and other financial, market and prudential regulators will require a two-pronged approach: (i) preparing the financial system to weather climate change effects that can't be eliminated by markets, and (ii) incentivising a rapid, orderly and just transition away from high-emission finance and investments.

Why climate change justifies a precautionary approach

But let's back up for a minute and ask ourselves whether and why any approach – let alone a two-pronged one – is even necessary. After all, in the United States at least, we are seeing the emergence of a markets-first, private sector-heavy approach. Financial regulation is an afterthought – a nice-to-have, but not a must-have. The going-in assumption is that markets will fix the climate and that the use of financial regulation may or may not come later. In other words, a precautionary approach to the use of financial regulatory tools is not assumed.

So, let's ask: is there a justification for tilting towards a precautionary approach? And then, what might it look like for US financial regulatory agencies to embed a precautionary approach into their work?

Let's start with the justification for a tilt in the approach of financial regulation. Historically speaking, early interventions by US financial regulatory agencies ahead of full-blown manifestations of risk are few and far between. Typically, US financial regulatory agencies are slow to bring their tools to the workbench. Nearly all significant regulatory reforms have occurred after the risk has overflowed, after the fact of the crisis or catastrophe. Prompt corrective action was enacted *after* the savings and loan crisis.

Derivatives reform came *after* the financial crisis. The typical political view of the US has been: if it's not broken, don't fix it – and certainly don't think of it as broken unless it's a really big, splintered mess with hundreds of pieces everywhere and a gigantic disaster. This wait-and-see philosophy makes little sense in the context of a risk that, if unabated, continues to introduce unplanned-for and exceedingly high costs to the economy and society.

Unquestionably, unabated climate change is introducing unplanned-for and exceedingly high costs. These costs range from the early and easily quantifiable short-term ones to the harder-to-quantify but altogether real medium-term and long-term ones. The obvious short-term costs are the costs to clear and repair the destruction from wildfires and hurricanes or rebuild property that has been damaged by sea-level rise. The less obvious – but no less real – costs are those associated with the effects of more drought and more extreme heat on agriculture and on labour productivity. Even less obvious and less noted, where little – if any – quantification yet exists, are the costs associated with strains on public and private infrastructure, increased levels of illness and disease, more frequent migration patterns, disputes – some of which will be violent – over scarce resources, and political instability.

Navigating a treacherous passageway

Can markets alone take care of these costs from climate change while government stays on the sidelines? Probably not. Consider it this way, with a navigational metaphor. Now, I'm no sailor, but I read an account of some sailors that bring a supreme maritime challenge to mind. Up off the coast of British Columbia, there are two powerful sets of currents that are very close to each other and nearly intersect. One powerful set of currents is called the Strait of Georgia, and the other set of currents that is very close and also very powerful is the Queen Charlotte Strait. Although the straits produce vortexes that will spin you under, there lies between the two of them a single narrow passage. Traversing the straits without becoming subject to the vortexes is exceedingly challenging because of the instability and narrowness of this single passage that exists between them. Any wrong move can throw your boat into one or the other of these powerful and dangerous currents and vortexes. The only way to manoeuvre through this passage between the two straits is to have instruments like rudders of the most sensitive kind, and someone who can deploy these instruments and rudders in such a way that a glide path is created for safe passage.

Manoeuvring through the unpredictability and costliness of weather-related events is not unlike this exceptional maritime challenge. One set of currents is the historically established and foundational carbon-based economy. The other set of currents is the to-be-realised, aspirational, future, resilient economy that we need to glide towards in order to avoid the costs that arise from 1.5-degree increases in temperature. Right now, it is as if we are in between these currents, attempting to manoeuvre away from the destructive and costly forces that our carbon-based economy is creating while heading towards the regenerative and beneficial systems associated with a more durable future state of an economy.

This is the treacherous passageway we are navigating, trying to neither stay too long in the carbon-based systems nor veer too quickly towards resilient systems that have yet to be scaled to provide for the world's demand. We need skill to do this. We need coordination. We can't just place down the rudders and the navigational instruments and assume that the boat will take care of its own manoeuvring.

This skill and coordination are what smartly crafted financial, prudential and market regulation does. Smartly crafted regulation is the rudder that gets us through this passageway, through this transition. We need it the way we need a rudder – to help us transition to a net-zero economy in the most stable and least dangerous way possible.

Don't assume a smooth ride

The default assumption of many central banks and financial, prudential and market regulators is that there will be a relatively smooth transition. The default assumption is one of taking the hands off the rudder, or

of using a poor rudder or a rudder that is not equipped to the job at hand. This default assumption needs examining. It needs examining because the costs associated with inaction suggest that a smooth transition to a clean energy economy will not occur with the default setting – in other words, the current setting – of the tools being deployed by prudential, financial and market regulators.

In addition, if the world is in fact in the midst of one of the most massive and comprehensive economic transformations in history, then sharp market effects are going to become par for the course. Markets don't perfectly match underlying economic realities. In 2021 alone, we have already seen three big market moves in the US that have had nothing to do with the climate transition: (i) the sudden January surge in yields, (ii) the February retail investor uprising focused on retailer GameStop, and (iii) the March demise of a little-known family office called Archegos that inflicted about \$10 billion in known losses on banks. In each of these instances, there were sharp market moves.

Indeed, market forces are messy – sometimes ahead, sometimes behind. In the context of the climate transition, markets will be adjusting to targets and various policy goals. As they do so, they will have the potential to create significant and unpredictable economic instability, panics and fire sales, with all the costs associated thereto. We are likely to see abrupt and sudden shocks as we see markets work their way towards a revaluing of assets – both emission assets and renewable assets. When particular net-zero targets are announced, they will need to be met. Meeting them will mean that, somewhere along the way, there will by necessity be a devaluation of fossil-fuel and other high-emission assets. The introduction of specific milestones could help, because without them, the timing and magnitude will be unpredictable and uncertain. It will be a crazy ride.

How financial regulators can help navigate the transition

Finally, how are financial regulators supposed to handle this crazy ride? The most prudent course of action is to adopt a precautionary imperative. This means preparing the financial system to weather those aspects of climate risk that can't be hedged. Financial firms will need to be the first observers of and responders to what they have in their portfolios. When they look under their own hoods to see the vulnerabilities in their portfolios, they will need guidance as to how to price or value what they find. Without any sort of regulatory or accounting guidance, without any reference to a standardised, credible framework, they will be that ship trying to navigate without a rudder. They will be lost at sea.

Financial regulators, together with financial auditors and standard-setting bodies, need to help financial firms mitigate climate-related threats by stepping forward and incentivising a rapid, orderly and just transition away from high-emission assets. They can do this in various ways, for example by considering whether high-emission assets will require limits in order to keep them from creating unsafe and unsound conditions for the financial institution that holds them. One can imagine portfolio limits or concentration limits that assist the financial firm in checking their exposure to potential losses and costs.

In addition to their prudential and supervisory responsibilities, central banks will also need to be prepared to react to the effect of sharp shocks in the oil and gas industry, potentially large insolvencies of major firms and potential demands for bailouts or nationalisation efforts, especially if the shock occurs at a time when oil and gas needs to keep flowing because it's still needed.

Let me close this way: climate change has put the financial system on a difficult path – looming climate catastrophe on one side and the economic transformation required to fend it off on the other, such that grave harm from one or the other is nearly certain, at least in the absence of careful management by financial regulators. This careful management is a task that is necessary now, not when catastrophe has already occurred.

Market forces are now in play that are moving the economy to one less dangerous to our well-being – one that is better for us, that produces durable benefits in terms of health, economic well-being

and inclusive prosperity. These market forces need precautionary and selective amplification from central banks and financial, market and prudential regulatory agencies.

Thank you for your time and attention, and I look forward to your questions.

Q&A

What about stress testing? Is that the right tool for a precautionary imperative as you so eloquently described?

Stress testing is exactly one of the rudders, one of the financial regulatory tools that regulators – in particular, central banks – have at their disposal. The use of a stress test is an important tool. Now, you hear a lot of discussion saying things like the scenarios are too hard; there are too many; we don't know for sure what, in essence, such a scenario might look like. I think that we need to move beyond that. I think we need to bypass those concerns because there are several already known scenarios that can be tested, that can be used, that can be hypothesised and that we can imagine the central banks beginning to use, as they are using already on your side of the pond, and which essentially will hypothesise what, in essence, a significant climate event might look like for a financial firm. Stress tests have the potential, when they're crafted well, to actually work very well as important tools.

In your view, is there something that we have learned from the financial crisis of 2007 and 2008 that we can use for this very specific crisis ahead of us – is there something specific that we can translate from one crisis to the next?

Yes. I think, clearly, we learned that stress tests were tools that could actually be very effective in mitigating the length and duration of a financial crisis. Now, to do that, they need to be credible, right? So, we did learn that they needed to be credible; they needed to hypothesise adverse conditions that could actually happen. I think the credibility piece is very important here; there needs to be a sense that the adverse scenarios that are being hypothesised are, in essence, scenarios that could occur. And we know that in climate there are many that could occur, so I don't think that should be too challenging.

You talked about the fact that corporates could face some severe shocks, and in order to avoid nationalisations and so on, should we explore new capital buffers for corporates, or new capital structures like the contingent capital we have for banks? Is that something that regulators should explore for all the sectors at risk with climate change?

That is a concept that I would say does not have much traction on this side of the pond. The idea of capital buffers is a concept that has applied to the financial system – and not the entire financial system, I should say, really primarily banks and federally insured deposit institutions. This idea of capital buffers is not one that you see even across the entire financial sector in the US. Your question goes to whether this idea of capital buffers should apply corporate-wide, and that, I think, is something that is a very interesting idea. The prospects of achieving something like that are probably not on the near-term horizon here.

We hear a lot about commitments to net zero around the planet from asset owners, asset managers and so on representing tens of trillions of dollars of capital. How do you see the US on that track regarding these commitments, compared with the rest of the world?

It's terrific to have these commitments. I think that the fact of the commitments is really a huge step forward, and a lot of credit goes to the institutions and their stakeholders who are driving the need for making those commitments.

The commitments, it turns out, are really just the first step here, because there has to be a way to measure progress against those commitments. There have to be milestones. There has to be some kind of

standard by which progress is measured. That piece is still not in place, and I would urge for there to be work done on that. It would help, by the way, with the issue that I'm talking about, the issue of this potential for great market instability, because without those commitments or milestones, what is going to happen is that there's going to be either early or late recognition of whether a particular firm is meeting those commitments, and those recognitions have the potential to be market-moving events.

So, milestones should be a win-win. This should be something that firms are looking for in order to smooth potential volatility, and we want milestones in order for these commitments to have some real meaning, because without them, I think they are just that: mere commitments.

Tackling climate for real: progress and next steps

Andrew Bailey

Governor, Bank of England

It is a pleasure to be participating today, at such a unique event.

Over recent decades, our global economic system has faced multiple shocks, or swan events, ranging from the Covid-19 pandemic to the global financial crisis of 2007/08. But if we turn our eye to the future, we can see another swan lurking in the reeds, and it's green. That green swan is why we are here today: the threat posed to our economies and our financial system by climate change.

Central banks, regulators and policymakers came together in the aftermath of the financial crisis to reform the system so that it could better weather future shocks. Like before, we must come together again to address the threat of climate change. But unlike before, we cannot wait until the aftermath to do so.

Earlier this week, on 1 June, I spoke about the role central banks have to play on climate change and that, far from representing an entirely new objective, the Bank of England's work in this space sits firmly within the bounds of our mission to maintain monetary and financial stability.¹ We have an important role to play, but it is governments, businesses, investors, and individuals that have the most difficult and impactful decisions to make in driving the transition to a net-zero economy.

Today, I want to build on those remarks to reflect on central banks' climate-related work to date, and to consider how it will need to evolve if we are going to continue to meet our remit. I will address this by talking about three main areas of our work: (i) improving the understanding of climate-related financial risks across the financial system and macroeconomy; (ii) developing and embedding climate risk management in the financial firms that we regulate; and (iii) seeking to achieve best practice through our operations as a central bank.

Understanding climate-related risks

I will begin with our work to understand climate risks across the broader financial system and the macroeconomy. The Network for Greening the Financial System (NGFS) has continued its pioneering work in this space through the publication of climate scenarios that provide a common starting point for analysing risks to the system,² and the latest version of these scenarios is due to be published soon. The scenarios bring together the financial and economic impacts of different temperature and climate policy pathways – a critical input for firms and policymakers to understand the future impact of the decisions they are making today. Scenario analysis makes it possible to address questions like, "how resilient is this business/this financial system/this set of policies to each climate scenario?"

Accordingly, the Bank continues to be a strong advocate of the NGFS's work, and in 2019 we announced our intention to assess the resilience of individual banks, insurers and the wider UK financial system to different climate scenarios through a Climate Biennial Exploratory Scenario exercise (CBES). I am pleased to say that this exercise, which draws on the NGFS scenarios, will launch next week on 8 June.

The CBES will involve the UK's largest banks and insurers and explore three different climate scenarios, testing different combinations of physical and transition risks over a 30-year period. It is an

¹ See A Bailey, "Tackling climate for real: the role of central banks", speech, June 2021, www.bankofengland.co.uk/speech/2021/june/andrew-bailey-reuters-events-global-responsible-business-2021.

² See NGFS website, www.ngfs.net/en/publications/ngfs-climate-scenarios.

important tool to size financial exposures, to understand how different bank and insurance business models will be affected and how they might respond, and finally, to help improve firms' risk management practices through the process of carrying out the exercise.

Firms should use the design of the CBES and the underlying NGFS scenarios to inform their own scenario analysis, build their understanding of the climate risks they face and enhance their climate risk management capabilities. I hope it will act as a catalyst, increasing firms' knowledge of the risks they face and incentivising them to take steps to address these risks. In turn, this will require firms' clients in the real economy to improve *their* understanding of how climate change and the transition to a net-zero economy could impact their businesses and operations.

Lessons learned from the CBES will also be shared with the NGFS as part of the collaborative approach taken by central banks, and on that note, I want to commend the ACPR's recent publication of its own ambitious scenario exercise for the French financial system.³

Through both its scenario work in the NGFS and its internal analysis, the Bank has developed a clearer understanding of where climate knowledge gaps persist and what these might mean for our objectives. For example, there is particular value in deepening our understanding of the macroeconomic implications of climate change and the pathways to net zero. It is for governments to set out a pathway to net zero and the policy levers that will be used to deliver it, but as central banks, we will need to understand any implications of the transition for the economic outlook and our potential policy responses.

The NGFS has started to explore this, but more work will be needed as the impacts of climate change and the transition to net zero start to come into sharper relief. At the Bank, the Monetary Policy Committee (MPC) recently had its first informal discussion on the macroeconomics of climate change, and climate is an increasingly important part of G7 discussions between central banks and finance ministries.

But more work and discussion is needed. Specifically, there is particular value in (i) further integrating climate and macro modelling; (ii) understanding and sizing related transmission channels; (iii) going beyond the aggregate impacts to understand sectoral implications; and (iv) assessing how the transition might affect the demand and supply sides of the economy. What is increasingly clear is that the effects of climate change and the transition to a net-zero economy will manifest over time – so analysis needs to span the short, medium and long term in order to fully capture these effects.

Embedding climate risk management in financial firms

Let me now turn to how we are embedding climate risk management in the financial firms that we regulate. We have worked to deepen our understanding of risks to the financial system and build resilience to climate change both at the macro- and microprudential level.

At the microprudential level, the good progress that regulators have made through climate-focused fora, such as the NGFS and Sustainable Insurance Forum (SIF), has catalysed work across international standard-setting bodies and other authorities, including the Basel Committee on Banking Supervision (BCBS) and the Financial Stability Board (FSB). On that note, I welcome the FSB taking a more strategic and central role on climate-related financial risks across the wider financial system.

In the UK, the Prudential Regulation Authority (PRA) set out supervisory expectations for banks and insurers regarding management of the financial risks from climate change back in April 2019.⁴ We

³ See ACPR, "A first assessment of financial risks stemming from climate change: the main results of the 2020 climate pilot exercise", 4 May 2021, acpr.banque-france.fr/en/main-results-2020-climate-pilot-exercise.

⁴ See Bank of England, "Enhancing banks' and insurers' approaches to managing the financial risks from climate change", *Supervisory Statement*, no 3/19, April 2019, www.bankofengland.co.uk/prudential-regulation/publication/2019/enhancing-banks-and-insurers-approaches-to-managing-the-financial-risks-from-climate-change-ss.

have provided further guidance for firms on these expectations and have set an ambitious deadline for firms to embed them by the end of this year.⁵

Of all the building blocks required to manage effectively climate-related risks, climate disclosure is among the most essential – not only for transparency and for risk management purposes, but also to facilitate the flow of capital towards investments that are consistent with an orderly economy-wide transition to net zero. Consequently, it is also integral to the UK's legislative commitment to reach net-zero emissions by 2050. For these reasons, the Bank has long supported the FSB's Task Force on Climate-Related Financial Disclosures (TCFD),⁶ and has worked with the UK Government and regulators to progress further and implement mandatory disclosure requirements across the UK economy by 2025.⁷

But climate change is a global issue, which no nation can solve alone. We cannot diversify away from our exposure to the planet. Therefore, information disclosed by firms across jurisdictions needs to be consistent and comparable in order to be useful in driving decisions. That points to the need for further international collaboration on consistent approaches to disclosure requirements; for example, the work of the IFRS's proposed International Sustainability Standards Board can serve as a useful minimum baseline.

Looking ahead, we need to ensure these initiatives are not only delivered, but also built upon. To illustrate this, I believe there are some key areas of work we will all need to address over the coming period. For example, quantitative mapping of the carbon intensity of firms or activities to financial risks and losses remains relatively unexplored. This is understandable – it is a complex area; data remain scarce, scenario analysis is still in its infancy and, worldwide, government climate policies do not yet fully internalise the cost of emissions.

As I noted earlier this week, the biggest component of the journey to net zero is the delivery of clear, sector-level climate policy pathways by governments. Central banks cannot and should not try to fill any gaps in that space through their micro- and macroprudential actions – we are not here to deliver carbon pricing. However, we should use these tools to fulfil our role in important areas such as those I am covering today.

Achieving best practice for own operations

The final area I want to explore is the importance of central banks practicing what we preach by seeking to achieve best practice through our own operations. We hold ourselves to the same high standards that we expect of the firms we regulate. Consequently, we need to ensure that, wherever possible, our own financial operations, such as the financial asset portfolios we hold, and our own physical operations, such as emissions from our buildings and printing banknotes, conform to best practice in the measurement, management and mitigation of climate risks. **In line with this, I can confirm today that the Bank is committing to reduce emissions from our physical operations so they will be consistent with net zero by 2050 at the latest.**

In the spirit of transparency, last year we published a TCFD-aligned climate-related financial disclosure.⁸ The most challenging aspect of this report was the inclusion of an analysis of the emissions associated with a monetary policy portfolio – a first for a central bank. In our forthcoming report for 2021,

⁵ See S Woods, "Managing climate-related financial risk – thematic feedback from the PRA's review of firms' SS3/19 plans and clarifications of expectations", letter to chief executive officers of all PRA-regulated firms, July 2020, www.bankofengland.co.uk/prudential-regulation/letter/2020/managing-the-financial-risks-from-climate-change.

⁶ See TCFD website, www.fsb-tcfcd.org.

⁷ See "UK joint regulator and government TCFD taskforce: interim report and roadmap", November 2020, www.gov.uk/government/publications/uk-joint-regulator-and-government-tcf-d-taskforce-interim-report-and-roadmap.

⁸ See Bank of England, *The Bank of England's climate-related financial disclosure 2020*, June 2020, www.bankofengland.co.uk/prudential-regulation/publication/2020/climate-related-financial-disclosure-2019-20.

which will be published in the next few weeks, we have sought to build on last year's content to provide additional context and analysis.

In March 2020, I outlined our intention to assess ways that our holdings of corporate bonds could be adjusted to take the climate impact of issuers into account while still meeting our monetary policy objectives.⁹ Last month, we set out in a Discussion Paper our proposals for "greening" our Corporate Bond Purchase Scheme (CBPS).¹⁰ There is no template for a comprehensive framework for greening an asset portfolio held for monetary policy purposes. We know that outreach and engagement is critical in getting this right, so we are currently seeking feedback on our proposed framework. Over the coming weeks, we are keen to hear from a range of experts and stakeholders to inform our next steps.

The need for us to act in this space was clear and unambiguous. First, there is increasingly persuasive evidence that emissions, and so climate risks, are systematically under-priced in financial markets. This means that continuing to replicate the structure of the sterling corporate bond market, without taking explicit account of the climate impact of bond issuers, is no longer a truly "market neutral" approach. Second, the remit of the MPC was updated in March of this year to clarify that, subject to achieving price stability, the Committee should support the transition to net zero as part of the government's economic strategy.¹¹

The CBPS will remain a monetary policy tool, with its overall target stock of assets set by the MPC in order to achieve its primary inflation objective. However, starting in the fourth quarter of this year, we intend to modify our approach to the composition of assets that we buy, in order to take climate considerations into account.

Our approach will be guided by three principles. First, we will look to incentivise companies to take decisive actions which contribute to an orderly transition of the overall UK economy to net zero. Second, given the relatively small scale of the CBPS in the context of capital markets, we will seek to influence the thinking of other, larger investors, as well as learn from them. Thirdly, our requirements of firms will become more demanding over time, including as improvements in data and metrics allow us to more precisely monitor climate behaviour, and further sharpen the incentives we set. The Discussion Paper sets out how we intend to operationalise these principles and incentivise firms to put in place and abide by credible plans to reduce emissions over time.

Conclusion: we have come far but have further to go

As I have outlined, we have come far, but have further to go. When it comes to climate change, we cannot stand still. We need to continue to be bold and learn from our work so far in order to deepen our understanding and inform future actions. Greater ambition and cooperation is still needed, including wider adoption of best practices. For this reason, in addition to evolving our domestic work, we also need to evolve our collective approaches.

This year presents central banks, regulators and policymakers with a unique opportunity to do this, and I have been encouraged by the progress we have made in the G7 and G20 in the build-up to COP26. Under the UK's presidency, the G7 has started meaningful discussions on the role of finance ministries and central banks in the transition to net zero. Under Italy's presidency, the G20, through the

⁹ See committees.parliament.uk/work/73/appointment-of-andrew-bailey-as-governor-of-the-bank-of-england/publications/.

¹⁰ See A Hauser, "It's not easy being green – but that shouldn't stop us: how central banks can use their monetary policy portfolios to support orderly transition to net zero", speech, www.bankofengland.co.uk/speech/2021/may/andrew-hauser-speech-to-launch-discussion-paper-at-bloomberg-investing-for-net-zero and Bank of England, "Options for greening the Bank of England's Corporate Bond Purchase Scheme", *Discussion Paper*, May 2021, www.bankofengland.co.uk/paper/2021/options-for-greening-the-bank-of-englands-corporate-bond-purchase-scheme.

¹¹ See "MPC Remit statement and letter and FPC Remit letter", March 2021, www.bankofengland.co.uk/news/2021/march/mpc-remit-statement-and-letter-and-fpc-remit-letter.

Sustainable Finance Working Group and the FSB, is developing climate-focused roadmaps to coordinate and galvanise international work. These fora allow us to share experiences and develop common best practice. Listening and learning about how others are thinking about the potential macroeconomic, macroprudential and microprudential implications will be important for that.

In addition, this year COP26 has an ambitious agenda that spans all of the areas that I have spoken about today – in particular, establishing a better understanding of best practice and fostering greater technical cooperation. The Glasgow Financial Alliance for Net Zero (GFANZ)¹² initiative will do this by bringing together over 160 firms – responsible for assets in excess of \$70 trillion – for the first time. Such technical collaboration and cooperation is no less important among central banks and supervisors. The NGFS, with the scope of its membership, is key to that exchange of knowledge. The Bank has widely shared what we have learnt, and we will continue to do so.¹³ The creation of the Central Banks' and Supervisors' Climate Training Alliance (CTA) will also further support technical cooperation and assistance on climate risks.

Let me conclude. In spite of the Covid-19 pandemic, central banks have continued to make progress in responding to climate change, but we know there is still work to be done. The next stage of our journey will require us to deepen our analysis, evolve our approaches and further our collaboration. The coming year will be critical for all of us on this journey, in allowing us to better convert climate change risks into something that we can tackle for real.

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Q&A

If you could suggest just one thing to coordinate the fight against climate change, what would that be?

I think the most immediate thing is the whole question of getting a disclosure standard agreed and getting a commitment to disclosure. In a sense, that's the foundation of so much that we want to do, ie getting an accurate and consistent understanding of what we are dealing with. That will allow us to then set targets, measure and assess what is actually done. Another key building block in there is carbon pricing. This is not for central banks – it *has* to be in the political domain and it has to be worked through. But without pricing, we get externality, as economists would say. Building up the pricing piece, on the foundation of disclosure, is going to be much more difficult. Those are just very key building blocks for this year. We are doing a huge amount of work on scenarios; they will be much more effective if we can apply them into a well-founded landscape.

¹² See "New Financial Alliance for Net Zero Emissions Launches", UNFCCC, April 2021, unfccc.int/news/new-financial-alliance-for-net-zero-emissions-launches.

¹³ See Centre for Central Banking Studies website, www.bankofengland.co.uk/ccbs.

Special guest speech

Laurent Fabius

Former President of COP21 / Paris Agreement

Dear friends and colleagues, ladies and gentlemen, I'm honoured to participate in this Green Swan 2021 conference. I will present three series of comments on the importance, possibilities and duties of the financial sector in the fight against climate warming. My comments will stem mainly from my experience with the Paris Agreement of the COP21, which I had the honour to prepare and to chair.

The climate challenge: achieving the 1.5-degree limit is critical

First, I will start with a very quick description of the situation of climate change itself, and I will summarise by saying that, in spite of many excellent initiatives to combat it and in spite of a growing awareness of the importance of the problem, we are far from meeting the necessary goals.

Five years ago, the Paris Agreement raised high hopes. Since that moment, excellent actions and greater awareness have materialised. But today, the overall climate situation is – let's be honest – very critical. Scientific reports show that if we continue the present trend, we risk reaching a warming of three or four degrees, maybe more, by the end of this century, which would be a real catastrophe. The Paris Agreement has set a maximum of 1.5 or two degrees, agreed at that time by every single country in the world.

During our discussions in 2015, we often wavered between the objective of 1.5 or two degrees. The text of the agreement includes both figures. Personally, during the negotiation I insisted on 1.5 degrees because this is often the difference, for certain territories, between life and death.

Since Paris, considerable scientific work has been done on this issue, showing that this 0.5-degree difference has an enormous impact on the consequences of climate warming. Therefore, I think that now that we better understand the real consequences of the two figures, 1.5 degrees must be the limit in our programmes, objectives and actions.

Climate disruption not only leads to increased violence of extreme climate events; we all know that it affects the level of the oceans and their acidification, as well as the situation of lands, forests, agriculture and so on. In 2020, a record number of more than 30 million people were driven from their homes because of climate change. This number is going to rise in the coming years. The fact is that today, one percent of the world is an unliveable hot zone, and within 50 years, this portion could grow to up to around 20 percent.

The more we learn about environmental phenomena and about their consequences, the more we realise that they are interdependent. For instance, it is not climate on the one hand and biodiversity on the other; the two are largely interconnected. The very nature of climate disruption is transdisciplinary, trans-generational and trans-national. On this issue there are no space frontiers or time frontiers. Climate change ultimately affects everyone's life.

The global effects of climate change on health are multiple and they are devastating. The Covid-19 pandemic is the most recent sign of the links between global warming, deforestation and human health. The WHO estimates that more than four million people die prematurely each year due to air pollution, mainly related to the use of fossil fuels.

It is not, as we sometimes say, the existence of our planet Earth that climate disruption calls into question; it is the possibility and conditions of life and humanity that are threatened. We must not forget that, for more than 99% of its history, our planet has lived without humankind. As a famous French

anthropologist, Claude Lévi-Strauss, wrote, “The world began without man, and it is possible it will complete itself without him”.

However, we know what the solutions to avoid such destiny are. The priority of actions is now well known: develop green and efficient energy, move away from coal, increase renewables; develop clean transport (electric vehicles, aviation, naval); construct green buildings (energy efficiency, material efficiency, net-zero energy); develop nature-based solutions (biodiversity, agriculture, waste); invest in research and development, innovate, stimulate economic circularity, mitigation and adaptation, encourage decarbonisation technologies.

From all these viewpoints, impressive and innovative changes have already taken place, making renewables more and more competitive compared with traditional CO₂-emitting means.

And we must never forget to develop solidarity and social justice, because there is no possible move in the right direction without these social and just transitions. The future depends largely on our common actions, particularly for some regions, populations and developing countries. Let us never forget that the climate change issue is always a social issue, too, and each of these necessary achievements needs finance and has an impact on finance. This was my first series of comments.

The role of finance

In that context – and this is my second series of comments – finance is key. Green finance is making progress, but not enough and not quickly enough.

In Paris in 2015, the financial sector was essential for the success of the Agreement. We already knew that finance was one of the most important issues in the fight against climate change, at all levels – individually and collectively, for public and private sectors, and at domestic and international scales. And from the beginning of the COP negotiations, and personally as a former Minister of Finance, I insisted on the necessity of involving the finance ministers and public and private financial actors more generally. Their participation was decisive. And today, the conclusion drawn in 2015 is more valid than ever. Climate change is massively impacted by financial activities, and the reverse is equally true. Companies that do not take into account climate data, climate risks and the necessity of an ecological transition will be put out of the market. There will be no controlling climate change without profound financial transformations – this is a central focus for future events and decisions, especially for the next G7 and G20 meetings and mainly for the next COP26 in Glasgow.

During the Paris negotiations, we worked with various public and private financial actors to ensure that financial data was reasonably clarified and did not derail the agreement. The importance of finance was voiced particularly by developing countries. They insisted – rightly – on the importance of the yearly transfer of a minimum of \$100 billion from developed countries to developing ones by 2020. This was a longstanding commitment, but at the time it had not been implemented. This figure is a minimum which should be enhanced before 2025.

Since then, the development of new tools and the mobilisation of the financial community has been central, and I want to pay tribute to that movement. Innovative and sometimes spectacular initiatives and practices have been multiplying. This involves both investing more in green activities and disinvesting from polluting sectors or companies. To be efficient and inclusive, the pro-climate strategy requires massive and multifaceted funding. Increasingly, large private funds are investing in green finance, which is both environmentally friendly and profitable. This movement should be welcome and encouraged. By the same token, central banks and public banks have also moved forward in a very positive way.

But – let's be honest – there are still too many examples of inaction or greenwashing. The coal and oil majors in particular are not acting fast enough. Many of the largest companies in the coal, oil and gas sector continue to invest heavily in fossil fuels, delivering only a minority share in renewable energy. As for public and private banks, central banks, sovereign funds, financial institutions and insurance

companies, most have understood the need for change and are moving in that direction. Yet, some of them remain committed to financing, for instance, carbon-emitting projects.

The recent and very courageous report by the IEA shows how urgently and profoundly indispensable the shift in energy investments is. Though renewables are dominating inflows of capital for new power generation capacity, the global energy sector is off track to deliver net zero in 2050. Transparent and accurate data are essential to set targets and to ensure that companies' emissions commitments are met. The climate stress tests that have recently been carried out show the importance – as well as the difficulties – of genuine climate transparency.

Financial transparency is necessary for many reasons, particularly because of the need for economic safety, the need for a level playing field and the necessity of combatting tax evasion. Financial transparency is improving, but the process is rather long and slow.

Today, we need to fight against climate change for many reasons – firstly, because humanity cannot withstand the present climate trend. However, this move is a race against time, and therefore we must act in a much quicker and broader way for financial transparency, which implies new public and private rules and reports for all activities and countries. The consequences are and will be considerable all across the financial board, but climate transparency is, for all financial activities, the next frontier.

Three avenues to promote green investments

My third series of comments deals with the fact that, to promote green finance, I want to insist particularly on three pursuits. First, **public actors must play a more active role**. In terms of numbers, there is much more private money than public money, but public money remains indispensable, particularly in order to finance adaptation needs in addition to mitigation and ecological transitions in many regions. Let us not forget, for instance, that when Germany decided to phase out coal by 2040, they decided to accompany this with an effort of €40 billion for regional, social and training needs, which shows – and this is only one instance – the size of the financial efforts that are necessary.

States and international organisations are increasingly conditioning their financial support on ecological commitments, and this is a very good move. State resources directed at the Covid recovery are supposed to accelerate action against the climate crisis. But on this issue, too, let's be honest and face facts: among G20 members, reports show that only a quarter, including France, the UK, Germany and South Korea, have already devoted a significant part of their spending to green transition measures. This is not enough. Therefore, a new effort must be made by G20 members – which, by the way, are the larger polluters in the world – in the domain of ecological transition.

International organisations and intergovernmental platforms, including the UN, G7, G20, IMF, World Bank, OECD and many others, are actively exploring the field of green finance. But this takes time – it's difficult – and, very often, *too much time* in a domain where we have no time.

When taking over the IMF, our friend Kristalina Georgieva indicated that she wanted to integrate climate risk into the IMF's economic analysis. Likewise, Christine Lagarde announced the gradual change in ECB investment to reduce its carbon assets. The European Investment Bank committed itself to aligning all its activities with the goals and principles of the Paris Agreement. Many other positive examples can be cited. The European Union is now also moving in that direction, by attempting to establish a taxonomy of sustainable economic activity in Europe. However, questions remain that are not easy to resolve but which must be answered: what about gas? What about nuclear? And so on and so forth.

Private actors must take decisive actions towards greener finance, too. Major banks are committing to no longer granting financing either to coal-fired power stations or to companies that derive significantly from coal. But the horizon is still distant, and it does not apply to all countries, bearing in mind that, broadly speaking, the main problem lies in coal – specifically, coal in Asia.

Taking into account the choices of consumers, many are also introducing green bonuses for their clients to encourage them to engage in less carbon-intensive activities. That's going in the right direction, but, once more, we need to go quicker in this direction.

This year, the Banque de France made official the creation of a Climate Change Centre. It will lead and strengthen the institution's action in favour of the environment. In particular, it will play a coordinating role and provide the permanent secretariat of the Network of Central Banks and Supervisors for Greening the Financial System. Other central banks are acting the same way, which is extremely positive.

Environment, social and governance ratings are being developed and are increasingly taken into account by rating agencies and long-term investors, wealth funds and pension funds. And on this issue, the movement is positive, too. Positive actions are being taken by many companies. Corporations and managers are increasingly aware of the value of green financing not only in order to protect the environment, but also to avoid the physical risk of asset destruction due to natural disasters, the financial risk of missing out on the energy transition and the risk of legal liability for their action or inaction.

We hear some people say that, from their viewpoint, the Paris Agreement, which is now used as the basic reference, is definitely an interesting text, but it is very general and not really legally binding. I know it is a complex legal matter and the situation is not the same in all countries. However, as the current chair of the French constitutional court, I would like to draw your attention to the fact that, throughout the world, **jurisdictions are increasingly making the Paris Agreement hard law for states as well as for companies**. In 2019, in what is called the Urgenda case, the Dutch Supreme Court referred to the Paris Agreement when it ordered the Dutch state to reduce greenhouse gas emissions by at least 25% by the end of 2020. In April 2021, the German Constitutional Court ordered the government to strengthen climate legislation before the end of next year to protect future generations. The German government did it within two weeks. Recently, the Australian court decided that the government has a duty to protect young people from climate crisis. And last week, the Dutch court ordered Royal Dutch Shell to drastically deepen its planned greenhouse gas emission cuts.

More and more actors, public and private, are *legally* required to implement the Paris Agreement. Various jurisdictions are deciding more and more on environmental cases related to governmental rules as well as to companies' activities and programmes, taking into consideration what we could call "judicial control of environmental trajectory", not to mention efforts towards building an international global pact for the environment which could harmonise and clarify, on an international scale, the rights and duties of all sectors with regard to the environment.

Another comment is that **putting a price on carbon is essential**. This is an important question I want to raise briefly. It is a tricky and highly debatable question, but for me, if I'm honest, setting a price for carbon is an extremely useful tool insofar as this price takes into account the negative externalities involved in carbon emission. This can take, as we all know, various technical forms. To be effective, such a price should be set at a level that discourages producers from resorting to fossil fuel and that encourages producers and consumers in favour of new energies. And something that is very important is that it has to be accompanied by social policies to avoid negative effects.

In order to avoid distorting international competition to the detriment of countries that use this tool, many people think that it must be associated as much as possible with a carbon border adjustment mechanism, what we call CBAM. That would prevent carbon leakage and combat environmental dumping. There is a growing interest in this approach, especially in Europe, but there is no international agreement at this time, and we must be aware of the stronger positions and differences on this issue.

I believe putting a price on carbon emissions is important. But I also know that, at present, there is no common approach on the question of the CBAM, and I think we must take care not to spoil the necessary present and future international discussions and agreements about these important topics by making unilateral decisions. We must also insist on a possible fruitful approach, which would look at this sector by sector – cement, steel and so on.

It is a very complex issue and we cannot deal with it in two minutes, but I want to draw your attention to the fact that it is becoming more and more central as the carbon price per ton increases. In Europe, we know that prices have recently more than doubled, to above €50 per ton, compared with pre-pandemic levels. Let's pay attention to this very important issue and let's bear in mind, referring again to the Paris Agreement, that agreement, cooperation and coordination between the EU, China and the US is decisive. On this issue, to the extent that it is possible, we must try to get an agreement.

The institution of the COPs

In conclusion, the coming months are decisive. In the coming months, important summits will take place: the G7 and G20 meetings, COP26 on climate change in Glasgow, and COP15 on biological diversity in Kunming, as well as an important meeting in Marseille in September. These events must converge towards decisions.

Many comments, sometimes critical ones, deal with the process of the famous COPs as an institution. COPs are sometimes said to be tedious, costly and not fruitful enough. We must acknowledge that it is true that they are not perfect. I personally believe that some improvements may be brought to this important UN institution, and I will make a few suggestions in a minute. It is true, too, that some COPs are more successful than others. This being said, I believe that in order to master such a crucial and worldwide phenomenon as climate change, we need the institution of the COPs.

Why? First, because in facing a vital worldwide danger, we need a worldwide response. And COPs play that role, which cannot be filled by other fora such as the G7, G20 or any specific coalition, whatever their real importance may be. Second, we cannot achieve the necessary climate results if only the volunteers are gathering together; we need everybody on board. We need peer pressure. We need multidisciplinary action and, sometimes, a name-and-shame approach. This is true of the role of the COPs. The hopes and fears raised by the Glasgow COP26 next November are an eloquent demonstration of the utility of COPs.

Still, there are probably some improvements that could be made. First, COPs have to take place in person, be very carefully prepared and, at the very least, be attended by the real political leaders of the different countries. COPs are made to deliver decisions; they need a strong political backing, which implies those requirements. This may be one of the challenges of the Glasgow COP26 – everybody must be involved.

Second, COPs must concentrate on commitments, actual results and evaluation of their achievements. Finance and financial actors, both public and private, must be closely involved in preparing and running the COPs.

Third, all domains must be brought into the COPs including some new, important domains. For instance, education and training for sustainable development, which are decisive in long- and short-term perspectives, must be brought into the COPs. And this is the idea of the UNESCO, too.

Also – and this could be new and important – sectors like the military must be included because they represent – from an economic, scientific and strategic perspective – an important issue for combating climate change. Because at the end of the day, climate change is an issue of security, of peace or war. I want to remind you that the famous IPCC – the scientific core of research about climate – has been awarded the Nobel Prize not for Chemistry or Physics, but for Peace, because this is a question of peace as well.

Fourth, a programme, at least in broad terms, must be established for future COPs, let's say from 2021 to 2025, in order to clearly define the needs, the expectations, and what must be delivered and when. If we do that, and if we do that *together* – public and private actors, present and future generations, scientists and researchers, civil and military society, governments, NGOs, local authorities, financial actors, all of us together – then I think we can deliver.

Recently, long-term carbon neutrality goals for 2050–60 have been announced by more and more governments, corporations and financial actors. This is excellent from the perspective of a low-carbon society, but, if we are facing facts, what about short-term decisions, and particularly the famous NDC (nationally determined contribution)? As the UN Secretary General rightly says, from this viewpoint we are far from achieving the necessary objectives. We are far from making the necessary short-term decisions in line with this long-term goal.

The risk in focusing mainly on the destination is that we ignore the pathway. We must thus reconcile the various horizons and act quickly and strongly in an internationally coordinated effort. In the near term, 2030–50, we need clear public objectives and evaluations. It is the challenge of the COP26 in Glasgow to *really* implement the Paris Agreement. Therefore, my two keywords are implementation and urgency. Clearly, finance plays a decisive role. In other words, this is not the time for business as usual.

Q&A

In terms of coordination, what is the concrete action you would pick or suggest to fight climate change?

Well, I have said many times that **we need everybody on board**. There is no worldwide government; there is no government of the world. For some people, this is the dream... but we have to act in reality. We must use the present institutions, and you have heard what I said about COPs. It's obvious that the G7 and G20 play a very important role, and I am delighted that the IMF and the different central banks are working together more and more.

The main idea is to avoid working in silos because, by definition, the climate problem is an interdisciplinary problem. I am a realistic man, and I'm not saying that we can find a new organisation tomorrow, knowing the difficulties of the present institutions. But let's make them work in a more collective way. For instance, as far as the theme of this meeting is concerned, let's never forget the financial aspect.

I said that I had been in charge of the Ministry of Economy and Finance, and served as Prime Minister, too. And there is a tendency, with some key problems, to separate the financial approach and the financial people who are in charge from the rest of the more specific problem. This is a mistake. We have to have **a two-way process**, with sectorial actors taking into account financial actors and the other way around. This is developing now and that's very interesting. Financial actors, public or private, at the international, national or local levels, taking the more general problem into account. If we don't do it for humanistic reasons, let's do it for efficiency reasons, because – let's be clear – if we in the financial domain and, more generally, in the economic domain, do not act in terms of fighting against climate warming, we should be out of the market.

Developing carbon market framework and improving multilateral governance for cross-border carbon emissions

Zhou Xiaochuan

President, China Society for Finance and Banking; Vice Chairman, Boao Forum for Asia; former Governor, People's Bank of China

Thank you, Ms Forde. It is my great pleasure to participate in the Green Swan Conference. I am going to use my time to talk about some domestic issues in China, as well as international issues, regarding climate change and carbon emissions. I know this is a very important topic and we need to have very good and deep discussions in order to have policy designs and proposals.

Some internal discussions in China

To begin, let me talk a little bit about developments and internal discussions on carbon emissions in China, which are important given that China now accounts for almost one third of global carbon emissions, according to some statistics. So, whether China can find the right way to meet its own targets and contribute to global climate action goals is very important.

Firstly, I would like to say that, according to my observation, one domestic discussion in China is about **whether we need to depend mainly on market forces or on administrative measures to cut carbon emissions**. Most people say that we need to fully utilise market mechanisms, in particular, to provide good incentives for everybody to join the efforts to cut emissions. Traditionally, people with a central planning mentality would draw a comprehensive roadmap and then divide up the tasks for different departments, different enterprises and different localities to fulfil.

So, one of the discussions is that, if we would like to emphasise the market function, we need to speed up setting out a clear roadmap to reach China's 30/60 targets. These ambitious targets were announced by President Xi Jinping, but we weren't prepared well enough for that in terms of planning, data collection, measurement and verification. Therefore, the related authorities in China need to accelerate their work in drawing up a clear roadmap regarding how to reach the 30/60 targets, not only with regard to total emissions caps, but also in terms of major sectors. Now, Chinese authorities are working on a roadmap for 24 sectors. It is our hope that this kind of roadmap will come out as soon as possible so the market can clearly understand what we are going to do and how we will set tasks for ourselves. One of the important issues is that the carbon market price relies heavily on this roadmap, especially the caps in terms of carbon dioxide and GHG.

The second issue hotly discussed in China is **whether the carbon market needs to be used mainly to adjust supply and demand for the short term or temporarily, or to guide and incentivise investment for relatively longer terms**. Although short-term adjustment on supply and demand is important in that it provides signals, the low elasticity of carbon emissions, in terms of production and consumption, makes it impossible to change or cut a lot of emissions in a short period of time. So, we have to depend a lot on the investment side to encourage investment in new R&D, new equipment and new technology, and to anticipate that we could have a much higher capacity to cut emissions in the future. With regard to designing the carbon market framework, there may be two groups of opinions. One group proposes a market functioning mainly as a short-term supply-demand adjustment vehicle, while the other puts a lot of emphasis on the investment side. My personal opinion is that we must focus on the investment side.

The third issue is related to **how to set up the Chinese carbon market**. One opinion holds that we might have a marginal quota or incremental quota assigned to producers who may have additional carbon emissions, and gradually expand the quota allocation. But in the beginning, a very large part of the quotas would be free, ie zero price, because of the need to transition. Another opinion is that we need to allocate a quota to negative-quota creators, ie those who have less emissions or may have a carbon sink. We are now working on those 24 sectors and dividing up the quotas along the roadmap, so each activity with lower emissions than the roadmap trend can be assigned negative quotas to sell in the market to those that have higher emissions and need to buy quotas. This kind of allocation may be more effective and have a better incentive function to encourage carbon emission-cutting activities.

The fourth issue is that **we need some intertemporal instruments to manage the risks associated with investing in new technology and R&D**. We need carbon markets to have more financial characteristics, which can produce the risk management function.

Above are the main issues under discussion in China which may draw your attention. International discussions are very helpful for China to embark on the right track in setting up its own carbon market and to mitigate potential costly risks and mistakes arising during the process.

International issues

Finally, I would like to touch on some of the international issues which have also recently been discussed in China. One is CBAM, the cross-border adjustment mechanism to equalise the carbon price in imported goods with the carbon price that domestic producers pay. People may have different opinions on this. Many Chinese scholars worry about trade protectionism, trade wars and other phenomena. But if we do decide to have a CBAM, we also need to consider that, for the long run, carbon emissions and climate change very much depend on activities in developing countries. And developed countries have already committed to providing a large amount of financial support to developing countries to cut emissions.

Then, if we have the adjustment tax, in my opinion, this kind of tax income ought to be used to support carbon reduction in developing countries and in the exporting countries. One channel is to use this money to set up a fund to buy carbon quotas in developing countries' carbon markets. Another is to allow developing countries' companies to sell their negative quotas in developed countries' carbon markets, which I think can help us finally reach net-zero emissions.

Eventually, all countries' carbon markets should be connected to each other and have a very similar carbon price. But, in the initial stages, we could consider practices like that of China setting up stock market connections between Shanghai and Hong Kong, between Shanghai and London, and between Shanghai and Frankfurt. This kind of market connection can be controllable. It provides a kind of channel to gradually reach the same carbon price, and, in the meantime, to provide some kind of financial support and technology transfer from developed countries to developing countries.

One more issue I once discussed on another occasion is that, to show the international determination and consensus on carbon emissions, we need to find a reasonable solution for carbon emissions by international ships and airlines. For cross-border transportation, one solution is that the EU or others may levy taxes or fees for carbon emission. Another is to try to set up an international fund, which may reduce frictions and contribute to funding or investing in global decarbonisation activities. This is also a kind of multilateral solution.

I'll stop here. Thank you very much for your attention. I hope to see the great success of the Green Swan Conference, and I would like to see if there are any questions for further discussion. Thank you.

Q&A

If you have to suggest just one thing to coordinate the fight against climate change, what would that be?

Internationally, there are many issues. I think, for China, which contributes to one third of global carbon emissions, and for some of the other large developing countries, they need to set up their emissions caps as soon as possible. And based on the caps, they need to set up their roadmaps as soon as possible. This is a demonstration of consensus and determination, and also can generate real delivery of strong ambitious activities in developing countries to deal with climate change.

The carbon border adjustment tax is a controversial issue and the European Commission may soon put this on its legislative agenda. How can other countries prepare themselves for it?

I don't know very much about the discussion everywhere, but I think I can elaborate on what kind of discussion there is in China. Several years ago, when the adjustment tax idea was created, Chinese negotiators were quite resistant to this kind of idea, partly because, at that time, trade protectionism was developing, and partly because, during the global financial crisis, many advanced economies had fiscal balance problems. They needed to spend money to bail out troubled financial institutions and to rescue their economies. So their fiscal deficit and the public debt-to-GDP ratio were soaring.

People were worried that they would use cross-border adjustment tax incomes to help balance their budget. You need to have something to finance the budget deficits. But in terms of climate change, we need to mobilise a very large amount of funds to invest in the technology, the transformation, new equipment, and new R&D to reach net-zero emissions.

I think the consensus is that if we have any kind of domestic carbon tax or quota trading income or international adjustment tax, all incoming money should be used for cutting emissions. We suggest that all of this money should be used for this purpose, especially in terms of buying emissions quotas from those with negative quotas, and then money can automatically flow to carbon emission reduction activities under the new R&D and with the new equipment. Although this may not go precisely to exporting countries for tackling global climate change, the funds can flow from importing countries to developing countries, especially those with labour-intensive, energy-intensive and emission-intensive exports. I think this kind of flow is the correct way to go. Even though we still need to do some technical policy designing before we can achieve that, the idea shows the international consensus and international ambition to do a good job.

Economic leadership for transformation in a critical decade: managing risks and fostering investment

Nicholas Stern

IG Patel Professor of Economics and Government and Chair of the Grantham Research Institute on Climate Change and the Environment, London School of Economics

Very many thanks to all those who have organised this special event, and particularly to Luiz Awazu Pereira da Silva. It is a privilege to be involved; the subject is of such importance and the participants are of great distinction and at centre stage in the economic decision-making that will shape our future.

Fundamental economic change: scale, urgency and opportunity – a critical decade

There are three parts to what I shall say. The first concerns scale, urgency and opportunity. This really is a decisive decade for humankind, one which requires strong decisions and committed leadership. This will happen through the fostering of investment and innovation of the right scale and kind, together with management of the risks associated with the process of change, which many people have spoken about over the last three days. I will focus my attention particularly on investment and innovation. If we invest strongly and well, we can create the growth story of the 21st century; if we get it wrong, we sentence future generations to a grim fate.

We have to reduce our emissions very fast, starting now. We are currently way off the path that can deliver the Paris target of “well below 2°C”,¹ and much further off the 1.5°C that we now see as the target we should set. We have not been at 3°C – we are heading for more than that, on our current emissions paths² – for about 3 million years, and at that time sea levels were 10 to 20 metres higher than now. If we get anywhere near that, hundreds of millions – perhaps billions – of people would have to move, with grave and long-lasting consequences, including widespread conflict. The stakes we are playing for are immense. The changes we have to make are very large. That’s what I want to focus on: the changes we have to make.

We are not starting in a good place. **We have just experienced a difficult decade**, with slowing growth, stresses on social cohesion, faltering internationalism and great pressure on the climate and on biodiversity. Then the Covid crisis broke out, with all its tragic loss of human life and economic stress, particularly around debt in developing countries.

We have to create an economic recovery and a different form of growth at the same time. In order to do that, we will have to have to work together. We must start with internationalism around tackling the virus, as a matter of common humanity and managing global risk, and we need this same spirit of internationalism to tackle climate change. If we fail in managing the recovery well, there could be a real lost decade for development.

Investment must be the driver for recovering from Covid and tackling climate change. It must be in all forms of capital: physical, natural, human and social. It will be mostly from the private sector and its mobilisation requires the right kind of incentives, but public investment will also have a crucial role. This investment can create opportunities in terms of employment, carry great health and social benefits – particularly in terms of stopping air pollution, which kills many millions per annum – and create cities

¹ This refers to the increase in average global surface temperatures above those of the late 19th century.

² Based on “current” policies as of June 2021, prior to COP26.

where we can move and breathe, economies which are much more efficient and ecosystems which are robust and fruitful. Our task is to draw that investment through, urgently and at scale.

There are two kinds of mistakes that we could make. First, we could drive recovery from Covid through a consumption boom, another Roaring '20s just like 100 years ago. Second, we could confuse fiscal responsibility with premature austerity, and that would give us another incarnation of the last decade. Fiscal responsibility is crucial, but here it means getting growth going and increasing revenues as growth picks up, in a way that does not choke it off.

As we seek to foster this investment, we must recognise how fast many of the **technologies** that we need have already moved. For much of the power sector, around-the-clock renewables are already cheaper in most countries of the world than fossil fuel-based systems, even without carbon prices or subsidies. That probably covers a quarter of emissions already, and a similar cost advantage could apply to two thirds or three quarters of emissions by 2030.³ Of course, we do also want carbon prices to give the right incentives to drive change.

In generating investment and change we should focus on four key systems: energy, cities, transport and land use; managing those systems will be vital. In many countries, these systems actually work rather badly, with waste, barriers to investment and pollution. We can and must manage those systems much better. We are fortunate that digital and AI are moving so quickly; that will help us enormously.

In half a century of work on public policy and economic development, I have never seen a moment where **internationalism** is more important than it is now. There are quadruple wins here. First, as we learn from Keynes, if we manage demand well, then increasing demand in all countries offers employment opportunities for all. Second, setting common growth expectations, in terms of both the strength of growth and the direction of growth, will give innovators and investors confidence in the direction of demand for new methods and technologies. Third, if we move together, discovery and learning by doing will move to scale, and cost reductions will be much stronger. Fourth, climate and biodiversity are global public goods, so acting internationally together – including, of course, on the virus – is extremely important. These few arguments are unusually strong given where we are now, and they apply over and above all the correct stories we tell our undergraduates about gains from trade.

If we manage all of this well, we will generate **the growth story of this century**. We will sharpen supply and boost demand in the next few years. We have a Schumpeterian story of innovation and creative growth in the medium term that has already started, and we know that there is no high-carbon growth story; it self-destructs. This is an enormous opportunity. This is not a narrow story of extra cost for cleaner methods. It is a story of getting the right kind of investment going. That investment has to happen if we want to manage climate and create a new form of growth; but it is investment with very high returns. Much of what we need in terms of technology is already with us.

Managing the risks associated with fundamental economic change

There has been a strong and necessary focus on management of risks during much of the three days of this conference, so I will not spend much time on this here. That should not imply that it is anything other than crucially important to us. We now recognise that **the climate is macro-critical** in terms of the magnitude of physical risks and in terms of transition risks. There is also a legal risk from inaction. A high court in Germany ruled against the government for not moving fast enough, and a high court in the Netherlands similarly ruled against Shell.

I teach at a university, and young people – quite rightly – think very hard about where they want to work. Because of this, pressure is also coming from employees, customers and shareholders. Inaction

³ Systemiq, *The Paris effect: how the climate agreement is reshaping the global economy*, December 2020.

from firms is a risky strategy: the evidence shows that those who behave irresponsibly in relation to the environment perform less well under conventional measures.⁴

The physical risks and impacts are of a kind I have already described. They involve not just the disruption of a hurricane – bad though that might be – but, over the more medium term, mass movements of people, conflicts and direct impacts on lives, livelihoods and productivity in so many places. This is thus a story of macro-criticality. On the positive side, the necessary investment and innovation will drive productivity and growth, with strong, broad economic and social reform.

As we change economic structures and technologies, **there is risk to be managed** in the labour market as well, with dislocation and stranded jobs. As with other risks, this calls for public policy. There is also dislocation in terms of changing relative prices; that will require public policy too. The justice of transition is not simply a question of justice, important though that is; it is also a question of political economy because, as we have already experienced, if this is not handled well, there will be opposition to the changes.

This conference has – rightly – focused on the financial system and its ability to foster and deal with change. The importance of the Task Force on Climate-Related Financial Disclosures has been emphasised, as has the importance of stress testing. We must be able to measure where firms and financial institutions are heading and work to **align financial institutions with the future economy**, including consistency with the Paris Agreement.

The story we are telling here and the kinds of change we need also require **a change in the way we do economics**. Our models – macro, structural or micro – are not currently dealing with a system with a given structure which will not change very much. The whole point here is that we *must* change structures very strongly and rapidly. Of course, some of this rapid change will come from factors beyond action on climate change, for example digital, AI, robotics and quite a bit of post-pandemic behaviour change. We cannot address the issue productively by modelling and thinking as if structures are fixed. Our task is to change them for a purpose.

The standard macro models that we use in central banks and in finance institutions around the world are far too narrow to address the kinds of challenges we now face. They usually have exogenous growth, only modest shocks, and then they automatically return to equilibrium. Is that the world that we can be confident we live in? Indeed, we are actually looking for very strong structural change; we have to move beyond the narrowness of those models.

The same is true of the micro aspects of public policy, where I have spent much of my research and professional career. Policy problems are often expressed in terms of comparative equilibrium, where time does not matter; we compare equilibria in relation to two possible policy responses. That is something we have to move beyond; both time and the dynamics of structural change, including endogenous technologies and behaviours, are of the essence.

There are many market failures and indeed important absent markets of crucial relevance (see below). All too often, we examine just one failure at a time. Different combinations of market failures pose different needs for – and barriers to – change. We have to put the dynamics of structural change, endogenous technologies and behaviours, and market failures together. That is the challenge to us, as economists, because that is the way this set of problems present themselves. Fortunately, we have a very rich subject that includes behavioural economics, institutional economics, system dynamics and political economy. We can bring a lot to the table. But we have to bring it together, in a way that we have not done enough of up to now. We cannot do this in one optimal model; we need many.

Here, I would like to address a special plea to our friends at the central banks. There is a remarkable collection of very well-trained and talented economists working in our central banks. They are

⁴ See C Flammer, "Corporate social responsibility and shareholder reaction: the environmental awareness of investors", *Academy of Management Journal*, vol 56, no 3, 2013, pp 758–81.

often rather better qualified in terms of economics – PhDs in economics, and so on – than you find in finance ministries, wise and worthy though these public servants are. So, at this time of needing a very close look at economics in real time, one would hope the researchers at the central banks have a big role to play.

As ever, we have to act and research at the same time. That means bringing several perspectives and models to the table as well as sound judgement. The problem of acting quickly with limited knowledge is particularly pressing here. This is therefore a moment where we have to up our game as economists, across the board. Given the audience here, and that there are so many good economists at central banks, these institutions will be very important places for that to happen. We must look to our universities and research institutes as well.

Fostering investment and innovation

How do we accelerate and strengthen the investments and innovations we need to make? The first thing to think about is **magnitude**. We have just published a report for the G7,⁵ which LSE colleagues and I prepared at the request of UK Prime Minister Boris Johnson, where we try to describe how much extra investment there should be for the transformation we need. This is not the place to go into details, but the ballpark for the world – except for China, where it is a question of composition rather than quantity of investment – is that we have to increase investment by a couple of percentage points of GDP. That would, in many countries, take us back to where we were 20 or 30 years ago. This investment should be seen as part of the story of restoring growth and productivity, and the suggested increase is perfectly feasible.

Another way of looking at it is to look at the gaps in infrastructure spending around the world, in terms of what is necessary to support the development and growth that we have seen and which we seek (for example, in the Sustainable Development Goals). Again, you find gaps of two or three percentage points of GDP. And if you look at what we need to do – as shown in the recent International Energy Agency report⁶ or the report from the Energy Transition Commission⁷ – in terms of the investments necessary to make the system change we need in order to tackle climate change, then we again come up with similar numbers. These are arguments which mutually reinforce and overlap; they are not additive. We live in a world with plenty of savings and plenty of investment opportunities; the policy challenge is to draw investment possibilities through to real investment programmes and get the right kind of finance in the right place at the right time. That is the core challenge of public policy for action on climate change.

So, how do we **draw through and finance investment** in this world, which has both the potential investment opportunities and the available savings? First, we need a very clear, strong sense of direction, to give confidence to investors embarking on new initiatives, particularly where there are many absent markets. Such absences include markets for new technologies and long-run markets for carbon prices. Expectations around a clear sense of direction will be critical to drive investment forward. Secondly, there should be an investment climate that inspires confidence. That means the regulatory structures, the ability to get things done, getting governments to support and not get in the way, and the right kind of policies, which I will turn to in a moment. We need the capacity to build pipelines for – and execute – projects. All of this is going to make collaboration between central banks, governments, the private sector and, for many countries, the multilateral and domestic development banks critical.

⁵ N Stern, *G7 leadership for sustainable resilient and inclusive economic recovery and growth: an independent report requested by the UK Prime Minister for the G7*, London School of Economics, June 2021.

⁶ International Energy Agency, *Net zero by 2050: a roadmap for the global energy sector*, May 2021.

⁷ Energy Transitions Commission, *Making clean electrification possible: 30 years to electrify the global economy*, April 2021.

The following analysis is particularly for my microeconomist friends. What kinds of **policies to tackle market failures** and draw through the right kind of investment are we talking about here? I suggest focusing on six big market failures (see Table 1), which are of crucial relevance.

Six market imperfections relevant to tackling climate change			Table 1
Market Failure	Description	Policy Options	
Greenhouse gases (GHGs)	Negative externality because of the damage that emissions inflict on others	Carbon tax, cap and trade, regulation of GHG emissions (standards)	
Research, development and deployment (RD&D)	Supporting innovation and dissemination	Tax breaks, support for demonstration/deployment, publicly funded research	
Imperfection in risk/capital markets	Imperfect information, assessment of risks, and understanding of new projects/technologies	Risk sharing/reduction through guarantees, long-term contracts, convening power for co-financing	
Networks	Coordination of multiple supporting networks and systems	Investment in infrastructure to support integration of new technologies in electricity grids, public transport, broadband, recycling, city planning	
Information	Lack of awareness of technologies, actions or support	Labelling and information requirements on cars, domestic appliances, and products more generally; awareness of options	
Co-benefits	Consideration of benefits beyond market rewards	Valuing ecosystems and biodiversity, recognising impacts on health	

Number one – and firmly number one – is the negative externality from greenhouse gases (GHGs). We need a carbon price, and a strong one, in some shape or form. Joe Stiglitz and I and others have argued that, by 2030, that carbon price should be around \$100 per tonne of CO₂, rising strongly towards that starting now.⁸ Yet carbon pricing cannot be the only way of dealing with the GHG failure. The scale and urgency necessary, together with increasing returns to scale and risk in new investments, mean that regulation and standards can have powerful effects and are not necessarily less efficient than carbon pricing, as I have recognised.

However, GHGs do not constitute the only relevant market failure. The other five market failures set out in Table 1 are critical, starting with RD&D. We know about the market failure associated with the publicness of ideas – and public benefits from the use of discoveries that reduce emissions – and here we have urgency and the dangers of delay. Tackling imperfections in risk and capital markets will also be vital when investment is so important. There is a great deal we can do in terms of organising finances in the right way to reduce, share and manage risks. Development banking will be important.

So much of this is about networks: there are networks in electricity grids, public transport, recycling, broadband, in the structure of cities and so on, where public action, regulations and design are critical to getting these networks going and functioning well. Information will be extremely important, both for consumers and producers.

The last one, co-benefits, is a rather flat word, but the issues are vital. They concern air pollution, our ecosystems and our biodiversity. Out of the total number of deaths in the world each year, which is around 50-60 million, we are probably killing some ten million people a year through air pollution – some

⁸ See N Stern, J Stiglitz et al, *Report of the high-level commission on carbon prices*, World Bank, May 2017; N Stern and J Stiglitz, "The social cost of carbon, risk, distribution, market failures: an alternative approach", *NBER Working Paper*, no 28472, 2021.

inside and some outside the home. That is a huge phenomenon. A lot of this air pollution is associated with burning fossil fuels. The pollution is to land, water and oceans as well.

So, we have these six big market failures. What are the solutions? The first is carbon pricing. But not only carbon pricing; many of these market failures will require regulation, design, networking and other policies. It is a mistake that many economists make to say that there is one overwhelming solution: "carbon pricing". That is weak economics, for all the reasons I have described. It is often weak political economy too, and a one-dimensional focus – important though the instrument is – can slow action.

In making policy, we must be predictably flexible. We are going to learn a lot along the way, which will require us to adjust policies; we must do this in a way that people can predict and understand. For example, if a programme supports the diffusion of solar power, then we should say that as the cost of solar power comes down and as it is diffused more in the economy, we will adjust support. That predictable flexibility gives confidence for investors while building in learning. A track record of sudden doing and undoing will be taken as precedent for other areas. Central bank governors and monetary policy committees know all about predictable flexibility in monetary policy; we need it in micro as well.

Now to **innovation**: there is so much that we can do to expand and draw through the use of technologies we already know about. To do this, we have to understand and tackle obstacles. For example, offshore wind is now extremely competitive with other forms of generating electricity, but we need a well-functioning grid structure and storage and transmission in order to enable the very fast expansion we need.

We can use digital and AI to manage the major systems – energy, transport, cities and land – much better than we currently do. Some sectors are harder to take to zero emissions than others, including steel, cement, plastic, and air and sea transport. We do need to invest strongly in research and innovation there. As we saw with Covid vaccines, advanced market commitment can be important. A lot of that research will be done by universities, research institutions and the private sector working together. In drawing through innovation, regulation, standards and design will be very important. The story of LED lightbulbs is instructive; they came through very quickly when we decided to regulate out the incandescent lightbulb. A lot of change will come via consumer behaviour as well, in which public discussion and information can play a crucial role. Of course, a strong carbon price can be of great help in pulling through innovation, but these other instruments and approaches will be very important as well. We are under great time pressure to act, and we must marshal a range of approaches, policies and instruments.

Finance is critical in terms of reducing, sharing, and managing risk. Mark Carney and others have been in the vanguard of action with respect to shifting the whole private sector, as discussed at this conference over the last two or three days. That will constitute a crucial agent of change and it can move quickly and at scale. Also of great importance – and highly complementary to change in the private sector – will be raising the level of international public finance. Multilateral development banks (MDBs) can help with policies to reduce and manage risk and by taking on the kinds of risk that are particularly difficult for the private sector, for example the early-stage risks in infrastructure implementation. These flows will be a central issue for commitments at COP26 in Glasgow in November 2021.

The MDBs will be still more effective if they work better together as a group, particularly on policy and capacities, and use their balance sheets and expertise more strongly as a group. But as we press them to scale up, we must recognise the consequence that they will hit capital constraints earlier. The challenge is not only to scale up quickly, but to grow over the coming decade. They will need greater capacity to do so.

As we examine and discuss the challenges of managing risk, promoting investment and innovation, and delivering a new model of growth in this absolutely critical period in world history, we understand that rising to these challenges will not be easy. But **we have some advantages**. We have no shortage of global saving. We have remarkable technical change, even on the back of rather modest policy; it could be faster still with good policy. We do have the Paris Agreement and other international

understandings, some of which are starting to be enforced in the courts. And we have well-informed young people in the world who are rightly demanding action. We really can make these changes, foster the investment and innovation, and achieve a much more attractive form of development. Clarity from economic leaders and their organisations on the urgency and scale of action and on how to achieve change will be of vital importance in turning what can and should be done into what will be done.

Thank you all very much.

Q&A

If you have to suggest just one thing to coordinate the fight against climate change, what would that be?

It isn't a problem with just one thing. You are trying to change the structure of production and foster investment right across the world. So I am going to take three things. The first is the price of carbon; you've got to get the incentives right. There are a number of policies that I emphasise, regulation as well, but let me put emphasis on the policy incentive side of carbon pricing. On the confidence side, since investment is about confidence and expectations, the second piece is to have clear plans and credible commitments from governments around the world – and a collaborative commitment from governments. And the third is that you've got to enable that investment; that means strong finance. There is a special role at this moment in history for the multilateral development banks, as there was when they were created in the crucial period after the Second World War, where we understood that we needed internationalism and investment, particularly in infrastructure. This is such a moment.

How do you think the finance ministries and central banks could work together on this?

I was in the UK finance ministry as a civil servant for three years. And I have been very close to friends in central banks, including through the Bank of France and the NGFS, where I still work closely together with Sylvie Goulard and others. So I do think that this is a moment where central banks and ministries of finance have to work together. *All* moments, if you like, are moments where they have to work together. But this is one of particular importance because the big public policy decision-makers are trying to foster change. It's not simply just maintaining stability; they must at the same time foster change. The biggest responsibility lies with the ministries of finance and economics where that public policy is set. What we must avoid is shoving it all onto central banks. In the past 15 or 20 years, there has seen quite a lot of shoving of responsibility onto central banks. Ministers of finance *must* step up and take that responsibility. But at the same time, the central bank should be arm in arm.

Concluding panel – Central banks and climate change: how to manage expectations, balance actions and communication and contribute to coordinate with other important actors?

Moderator: Gillian Tett, Chair of the editorial board and Editor-at-large (US), Financial Times

Panellists: Agustín Carstens, General Manager, Bank for International Settlements

Christine Lagarde, President, European Central Bank

Jerome Powell, Chair, Federal Reserve Board of Governors

François Villeroy de Galhau, Governor, Banque de France

Yi Gang, Governor, People's Bank of China

Gillian Tett

It's a great honour to be moderating this panel, which comes at the end of a couple of remarkable days of discussion about how climate change challenges are changing the financial system. And this panel, entitled "Central banks and climate change: how to manage expectations, balance actions and communication and contribute to coordinate with other important actors" is really intended to be the grand finale, throwing the debate forward particularly ahead of the G20 and G7 meetings coming up.

It's a historic panel for two reasons. Firstly, I think – and maybe one of you can correct me if I'm wrong – it's the first time that we've had the governor of the central bank of China on the same panel with the governors of the Federal Reserve, the European Central Bank, the French central bank and, of course, Agustín. Maybe I'm wrong, but I can't see, from a quick Google search, a time when this has happened before, so this indicates the importance of collaboration and coordination.

It also comes at a historic moment given the degree to which central banks are getting involved in the challenges raised by climate change in a way that, frankly, would have seemed completely unimaginable just five years ago, never mind 15 or 20 years ago, when central banking was seen as being all about money and inflation and things like that.

So, we have a lot of questions to drill down into around what this means for the financial system, for governments and for central banks. We obviously have a fantastic panel and I am not going to waste time by introducing them, because they are clearly known to everybody. We also have the scope for asking what this means in terms of the private sector and what central banks are expecting to do – or not do – in the coming months in relation to the banks, insurance companies and other financial actors that they supervise.

I am going to start with Christine Lagarde from the European Central Bank. Given that we have the G7 and G20 meetings coming up and the spotlight is very much now on the central banks in relation to the battle against climate change, I'd like to start by asking you: to what degree do you think the European Central Bank has a **mandate to be fighting climate change**? Should you be leading policy change or just trying to prepare the financial system for this? How far do you see this really feeding into the European Central Bank's **monetary policy operations**, particularly given that we had these remarkable comments yesterday from Jens Weidmann from the Deutsche Bundesbank, apparently accepting the idea of forms of "green QE", to put it crudely, and how do you see this changing your financial stability oversight operations across the European Union at the moment?

Christine Lagarde

Thank you so much, Gillian. It's really lovely to be here with you all – with you in particular, Gillian, but all my colleagues and friends as well. On this occasion, I would like to really thank the BIS, the Banque de France, the IMF and the NGFS for putting this together and bringing all these experts and non-experts together under the leadership of all of you moderators. Of course, there are lots of experts on the panel now.

Gillian, I would like to start by quoting a sentence which actually triggered my decision at some stage to leave the private sector and to join the public sector, which was a sentence that was pronounced by President Chirac back in 2002 at the Johannesburg fourth Earth Summit. He said, "Our house is burning, and we are looking away".

To me, that was a critical moment and it encouraged me to drop the very comfortable life I had as a member of the private sector to join the public sector. And to your point, our planet is burning, and we central bankers could look down on our mandate and pretend that it is for others to act and that we should simply be followers – I don't think so.

I'm saying that because I believe that if we did, we would be failing on our mandate and we would be missing in action. Now, why do I say we would be failing on our mandate? Because we would be failing on our mandate if we did not account for climate change when it comes to understanding and measuring inflation. Clearly, greater economic volatility has an impact on inflation. We would be failing on our mandate if we did not see that climate change could impair monetary policy transmission because it is likely to induce financial instability if it is not taken into account. We would be failing on our mandate if we did not measure the impact that climate change has on the assets that we hold, on the assets that we buy and on the collaterals that we have in stock.

In contrast, I think we are squarely in our mandate when we alert key players in the economy – and I would be happy to come back to this; there is a GIGA climate test that I would like to say a few words about later on if you allow me and come back to me. We are also squarely in our mandate when we guide banks on climate-related risks as well as environmental risks, and when we conduct supervisory stress tests in 2022. We are squarely in our mandate when we incorporate climate change-related sustainable and responsible investment principles into our non-monetary policy portfolio across the Eurosystem. We are squarely in our mandate when we include climate change and environmental risks and impact in our strategy review and draw full consequences of it, in the form of a roadmap that I hope we will adopt. We are squarely in our mandate when we upgrade our models, which we are doing already, and we are squarely in our mandate when we run our climate change centre, which will soon be headed by a new recruit who will be joining on 15 June, Irene Heemskerk.

So, in other words, we have to commit now, we have to deliver fast, and we have to implement decisively.

Gillian Tett

Well, thank you very much indeed, Madame Lagarde. I should explain at the beginning that we are going to split the panel discussion into two parts. The first part is going to be primarily about the public sector and what they could or should do. The second part will be looking more at the private sector. So, I will come back later and talk to you about the stress test questions and what you are expecting to see from the private sector in the second half.

Just to pick up on that issue about the **mandate** of the European Central Bank **in terms of monetary policy**, I'm curious: we did have this really quite striking intervention from the Bundesbank yesterday, which had previously indicated unease about introducing green policies into bond-buying programmes and other forms of QE. Given that we now appear to have the Bundesbank involved or

supporting this stance, do you expect this to accelerate and to bring any meaningful changes in how the ECB acts going forward?

I am also curious about the issue of **inflation** and how you are or are not modelling this, because we had a fascinating piece that's about to be published on the FT platform *Moral Money*, from Larry Fink of BlackRock, suggesting that climate change is going to make it much harder to measure inflationary pressures going forward, or to anticipate them, and could essentially accelerate them – including not just climate change but the transition for climate change as well. I am curious about your reflections on that as well.

Christine Lagarde

On your first question, Gillian, my hope is very much that we will have a broad consensus on the part of all the members of the Governing Council that climate change has to be taken into account; it has to be factored in throughout the whole range of our activities, whether it is in terms of modelling – and I will come back to your question on inflation – or whether it is about the monetary policy framework or the purchase programmes that we have – and obviously, one thinks of the corporate bond purchase programmes. We need to – and hopefully we will, collectively as a group – deliberately take that into account.

We also obviously need to be served by good data, good disclosure and appropriate common standards. I am delighted that the Commission is moving extremely fast, because I hope that the data that they will provide, the non-financial disclosure requirements that will apply to the financial statement of 2023 for most corporate accounts in Europe, will help us a great deal in actually tailoring – without any regard to the size of what we do; I don't think this is the point – the kind of decisions that we make in relation to all of that. Not to forget supervision, which I regard slightly separately because the SSM is a little bit separate from the central bank side of the ECB, but it will have an impact there as well.

On the measure of inflation, I think that our teams are working really hard to gain an appreciation of the impact. It really is a question of, in a way, discounting a risk that is often foreseen as being 30 years away, and making sure that we can characterise it and identify it in the sort of three-year projections that we are used to and which determine the medium term, which we do take into account. There are a lot of heavy hitters in the modelling world who are looking at that, but I am sure that we will be able to do that. I think that it will actually be far more difficult to factor in the impact that the environmental, governance and social aspects of the ESG commitments will have on inflation going forward, than that of climate change *stricto sensu*. I am sure we will get there.

Gillian Tett

Right. Thank you. I would like to turn to Governor Yi Gang now; I am very curious to hear your views on this. The People's Bank of China was a founding member of the NGFS. You gave a highly referenced speech about two months ago where you laid down China's policy towards this from a central banking perspective. In that speech, you mentioned that you were supporting the European Union in its green taxonomy and appeared to echo many of the thoughts that Madame Lagarde has just shared as well. Can you tell us what you are doing at the People's Bank of China to fight climate change, and do you think you have a mandate to do that?

Yi Gang

Thank you, Gillian. I think that right now, at the People's Bank of China, the most important thing we are doing is to tell the general public how important green finance and climate change risk is. We would like to have households, the general public, firms and enterprises, and also ordinary people understand the

very deep implications of climate change, so that everybody feels the urgency to do something, whether it be changing their production style or changing their lifestyle to reduce carbon emissions.

Aside from the very technical things that the central bank can do in green finance, we spend a lot of time doing general public education on this urgency. As Christine Lagarde just said, our planet is in danger; it's on fire. I think that's very important. Once the general public, firms, enterprises and the media understand the urgency, they will very much support carbon reduction, whether by changing their production mode or their lifestyle to reduce carbon emissions.

In this regard, we are cooperating very closely with the international community, especially the central bank community, in the G20 framework. Together with the Bank of France, we jointly established the NGFS. I think the climate change issue requires international cooperation. We would like to cooperate with the central bank community and the financial community to design the financial tools to help the green transition. Thank you.

Gillian Tett

Thank you very much, indeed. Is the People's Bank of China introducing climate change issues into your **modelling for economic scenarios** for the future and how you assess **future inflation pressures and economic trends**?

Yi Gang

The transition can create a lot of inflationary pressure from the demand side and the supply side. It can also change the inflation picture in the future because, in the past, most carbon emission was free. Now, we are trying to have a quota and restrict carbon emissions. There is a premium on green energy, so there needs to be a model on the green premium and on how to encourage people to use green energy instead of traditional fossil fuel energy. That would change our inflation forecast and picture.

In terms of economic modelling, our primary task is to try to have a smooth transition, which means, given what you have right now, for example coal power generating facilities and traditional fossil fuel transmission and power generating facilities, how do you make a transition from this to a green energy network and a green energy production mode? That is very complicated. For example, you have to figure out what the trajectory or parameters would be, given that you already have a lot of bank loans and financial assets in those traditional facilities, and then you need to restrict and gradually reduce traditional energy emissions and, at the same time, gradually build up the clean energy system. In all these operations, you need a model calculation and design for a smooth trajectory. Meanwhile, the central bank has to look at what the impact on inflation, on price pressure, would be. That is what we are doing.

Gillian Tett

Thank you. Certainly, the comments by Larry Fink of BlackRock which have just gone up on the FT website, about how climate will intersect with inflation, are very thought-provoking. But one other question before I turn to Governor Powell: as you say, Yi Gang, the People's Bank of China was indeed a founding member of the NGFS; it's a sign of the **collaboration between different central banks**. We are at a time of great geopolitical challenges, when collaboration is not always the key theme of international events. Do you hope that climate could be one area where, say, America and China can work together along with the European Union?

Yi Gang

[pause] I thought this question was addressed to Governor Powell.

Gillian Tett

I am going to address that question to Governor Powell then. I will come back and ask you later.

Governor Powell, I am going to ask that question to you. Are you hoping that climate is one area where the US can work with China and the European Union at a time when that's not always the main theme of other international relations right now?

Jerome Powell

Well, if you will permit me, let me begin by saying thank you for having me here, Gillian. Also, thanks to the BIS, the Banque de France, the IMF and the NGFS for sponsoring this terrific conference.

I will answer that question directly and then turn it back to you. So, I guess the answer to that would be yes. In fact, we are co-chairing the Sustainable Finance Working Group of the G20. The Treasury Department is co-chairing that with, I believe, the People's Bank of China. So, to the extent there will be collaboration there, the Federal Reserve will be playing a supporting role, consistent with our mandate in that working group.

Remember, though, that the overall response of the United States government to climate change, and particularly as it relates to collaborating with other nations, is not a question for the Federal Reserve; it's really a question for the government.

Gillian Tett

I understand completely. So, tell us then what the Federal Reserve is doing on the climate change front, because you obviously have a mandate which is different from that of other regions, most notably Europe. You also have emerged from the last few years, where you had an overarching government that took a very different **approach towards climate change challenges** under the last administration. So, what is the Fed's approach at the moment? The Biden administration has indicated it wants to play catch up and even try to lead in the fight against climate change. How is that impacting what the Federal Reserve is doing? Do you have a **mandate** to take the same kind of measures to fight climate change that Christine Lagarde has been talking about in the European Union? And to what degree are you embedding it in your own **modelling** about where the economy is going? Do you see any future path for incorporating it in, say, monetary policy?

Jerome Powell

Sure. I would like to start by saying that there is no doubt that climate change poses profound challenges for the global economy and increased uncertainty for the financial system. Significant challenges lie ahead for all of us. What is needed is a sustained global response, which will require bold steps and decades of sustained effort by national authorities, international groups and the private sector. In the United States, our society's overall response to addressing climate change will have to come from elected officials who have sought and received a mandate from the voters. The impact of climate change will be far reaching; it will bring challenges – and opportunities – as the economy evolves and adapts, and it is essential that there be a broad and durable public consensus to support our society's broad response to climate change.

You asked about the Fed. The role of central banks will vary across countries, as you suggested, depending on a lot of factors, including particularly our statutory mandates and the scope of our responsibilities. At the Fed, we see our role as an important one that is tied tightly to our existing mandates.

Our mandate hasn't changed; we haven't been assigned a role in setting overall policy and we don't have a secondary mandate to support the economic policy of the government, as many European central banks do, so we view climate-related financial risk as a risk that falls under our existing mandates relating to bank supervision and financial stability. What we are doing at a high level is we are undertaking a broad plan of careful analysis, significant public engagement and great transparency regarding our role in addressing climate-related financial risks.

You asked particularly about monetary policy, and I guess I would address that like this: there is no question that climate change has the potential to affect the structure of the economy over time. For example, people have mentioned inflation, but it is deeper than that; it can affect the industrial organisation of the economy, labour market dynamics, productivity and the financial sector. Over time, all of those things can affect employment, inflation and interest rates. Anything that can affect the outlook of the economy can, in principle, affect monetary policy, so climate change would certainly qualify as that. I would say, though, that today climate change is not something that we directly consider in setting monetary policy. We are quite actively exploring exactly what climate change's implications are for our supervisory, regulatory and financial stability responsibilities, which I can say more about if that would be desirable.

Gillian Tett

Well, I think I'd be curious to know more about that. I would be curious to know what you are expecting the private sector to do, and perhaps we can come back to that in the second part.

So, you don't think you have a mandate to act as a cheerleader to awaken public consciousness about climate change issues in the way that Governor Yi Gang has described his role at the moment within China? You don't think you have that role within America?

Jerome Powell

I guess I would say it this way: central banks clearly can play an important role in building data and analysis to understand the macroeconomic consequences of climate change, to quantify the risk to the financial system through scenario analysis, for example, and to ensure the resiliency of the financial sector to climate change. We will communicate all of that publicly. But we are not and we do not seek to be climate policymakers as such.

We have a very specific mandate and precious independence, which we think serves the public well and has served the public well. I think we should avoid trying to fill in public policy where governments haven't done so yet; that is not up to us. Nonetheless, I do think our work can indirectly help educate the public on what is going on and also, I would think, inform other parts of the government in the actions that they are assigned to assess.

Gillian Tett

Right. Just one other last quick question before I turn to Governor François Villeroy de Galhau.

Mark Carney said earlier in the conference that there is a need to create **new training and awareness amongst regulators and central bankers**. Essentially, he is calling for central bankers to be sent back to school to learn about climate issues and how this impacts them. Given that the Federal Reserve is now a member of the NGFS, which it wasn't a year ago, do you anticipate that you are going to

have to have retraining inside the Federal Reserve as well, in terms of how to imagine these issues impacting the core monetary policy mandate that you have?

Jerome Powell

I actually think all of us, all central banks and international organisations, are building institutional capacity. By the way, so are all of the major financial institutions. They are building internal intellectual capital, human capital, to learn how to assess the risks and, ultimately, how to manage them, how to disclose them, all of those things. And we are certainly doing that at the Fed.

I would just take a second and give a lot of credit to the NGFS for what it has done in helping us all build intellectual capital and institutional capability around stress scenarios and in many other respects. So yes, we are engaged in that activity and others are as well.

Gillian Tett

Well, that is a very nice way to lead to Governor François Villeroy de Galhau from the Banque de France, who, of course, has been at the forefront of a lot of these moves by the NGFS to build intellectual capital. Congratulations on this very interesting conference that the Banque de France has worked with the BIS to really push forward.

Speaking from either the Banque de France's perspective or from the NGFS's perspective, since you essentially have both hats on today, to what degree do you think that central banks should have a **mandate to look at climate change issues**? Do you think it is an essential component of central banking today? And speaking on behalf of the NGFS, do you think that enough is being done at the moment to explore how this affects **monetary policy** questions going forward? I will come back to financial supervision and the privacy sector in a moment.

François Villeroy de Galhau

Thank you very much Gillian, including for your kind words. Let me start with the question of the mandate and echo Christine Lagarde's strong personal introduction. Let me be frank about this: our generation changed its mind on this issue. *I* changed my mind. So, retraining, as you said, is underway.

But then it raised the opposite question, so to say, from some sceptics, saying, "aren't you mixing your personal feelings and your collective and legal mandate?" This is a question about mission creep. In my opinion, definitely not. Let me explain why: I think our climate change action is in full compliance with our mandate. I agree with Jay that we shouldn't be the only green game in town, and it is important that we don't overpromise. Having said that, look at supervisors; this is probably the most obvious. Our mandate is financial stability, and nobody can contest that climate change could affect financial stability. There are climate-related risks.

It is still, perhaps, less obvious for monetary policy, with our central banker's hat on. But here, I am completely convinced that this has a strong link with our primary mandate, which is price stability. It has a link with our secondary mandate in the case of the Eurosystem environment. But let me stick to the primary mandate of price stability.

Again, nobody contests that climate change has long-term effects on inflation, and you mentioned Larry Fink; but it has also already had short-term effects. Let me give you a very simple example: part of the recent increase in energy prices in the euro area at the start of this year was linked to higher electricity prices in Spain due to the cold weather, as well as to the introduction of a new surcharge on gas and fossil energies in Germany. So, it is already happening now.

I don't want to comment on the statements by my friend and colleague Jens Weidmann yesterday, but they are welcome, and they are probably explained by this very simple constatation: it is linked to our primary mandate.

Now, about the NGFS and how we can help: it was created in Paris three and a half years ago, the global secretariat is provided by the Banque de France in Paris, and we are really very proud of this collective success. Jay, may I especially thank the Federal Reserve for joining last December; it was a game-changer.

I'd like to mention one promising development about climate scenarios, and one question that you raised about monetary policy. With regard to climate-related scenarios, they are a key proposal from the NGFS, a common foundation. We released the first wave in July last year, 2020; and let me inform you that we will publish an update next Monday. So, it's coming very soon.

I read some unfounded doubts on these scenarios. Let me be precise: the NGFS works on these climate-related scenarios – which are of the essence, obviously, because they link physical risk and economic consequences in the long run – with the best partner research institutes, five of them across Europe and the US. We publish a *range* of plausible and different futures, with six different scenarios – from “orderly transition” to what we call “hothouse world” – to be published on Monday. And we will regularly incorporate the development of scientific evidence. We don't pretend to be publishing a central forecast because there is no such thing at present. But the scenarios will be very useful for central banks and supervisors alike across the world.

One last word about monetary policy – and this is probably the hottest issue at present, still more debated. Following what Christine said, I clearly hope that the ECB can be a pioneer in this field with our strategy review, to be published probably next autumn. To give *my* personal feeling – it's probably not very far off from the ECB president's, but it's only my personal word – I strongly hope that we will be the first central bank to decide on three decisive steps on monetary policy. I insist on the word “decide”, there could be some delay for implementation: to decide in principle on, first, forecasting and economic modelling – Christine Lagarde has insisted on that. Economic modelling of climate is sometimes a bit overlooked, but it is crucial. And our scenarios by the NGFS will help. Second, disclosing and imposing transparency requirements also on our counterparties. Last but not least, incorporating climate risk into our operations and our operations on corporates, be they on asset purchases or on collateral policies.

I think these steps are possible; they are not yet decided, but I strongly hope we can be pioneers in this field. And again, this is in full compliance with our mandate. To conclude with this, Gillian, it is not only legitimate to act; I am convinced it is a *duty* to act ourselves.

Gillian Tett

Thank you very much, indeed, for that rousing call to arms. And just to clarify, I will come back later and ask exactly what everyone is asking the private sector to do, but you are in the camp of people who would argue that there needs to be, say, **mandatory TCFD reporting by the private sector** as one of these key steps. Do you expect that to come later this year?

François Villeroy de Galhau

We had the opportunity to discuss this issue some days ago in the FT. I strongly hope it will come by COP26. I cannot guarantee it. In the French case, it has been mandatory for financial institutions for five years already. For the European Union, it will be mandatory, with standardised requirements, from next year onwards for financial institutions and large, significant corporates. There are such trends in other jurisdictions, so we will see. But let me say that, at the least, it is a realistic aim for COP26, and it could be

a decisive one. It will raise another question that we will probably discuss later, standardisation, which is a still more tricky issue.

Gillian Tett

I want to come back to that later and also ask Governor Powell and Governor Yi Gang whether they think that they will be following in the same path or not – or rather, whether their governments will be following in the same path or not.

I would like to draw you out a bit more about the comments from Jens Weidmann yesterday, about essentially accepting that there is a need to embed green issues into monetary policy and quantitative easing. Do you expect that it is going to accelerate the pace at which the European Central Bank decarbonises its portfolio? To what degree do you see that as part of an effort to actively use monetary policy to really support green initiatives going forward?

François Villeroy de Galhau

Even if I could speak German, I would not want to speak on behalf of my German colleague. But let me only say that these comments appear to be welcome because – again – climate change is part of our price stability mandate, the primary one; they are logical and they are welcome.

Gillian Tett

One last question before I turn to Agustín: how essential is it that we get some kind of global coordinated position on not so much carbon tax, but on **carbon price**? And do central banks have a role to play in that respect?

François Villeroy de Galhau

I highly wish for it, and most economists do. If we have no carbon price – in whatever form; carbon tax or carbon permits – we will miss something absolutely key. But this is clearly beyond our remit as central banks. It is up to our governments and international coordination. Here again, we are all aware around this table that we cannot be the only ones. We have to do everything we *can* do, but we cannot do everything.

Can I quote a famous American founding father, Benjamin Franklin? I love this sentence. Jay, you may correct me regarding American culture and history: “There are many roads to success, but only one sure road to failure; and that is to try to please everyone else”. We cannot replace everyone. There are very strong expectations for central banks, but we should not overpromise. A carbon price is badly needed. Our action – however necessary or powerful it is – cannot replace this more difficult part of the agenda.

Gillian Tett

Thank you. I will come back and, again, I would be curious to know the thoughts on carbon prices from the perspective of both the Federal Reserve and the People’s Bank of China.

François Villeroy de Galhau

Here again, if I may add one piece of information, Gillian, though you are aware of it: here, Europe lies ahead because we already have a system of carbon permits, ETS, which is a first step – but not a final one – towards a necessary carbon price.

Gillian Tett

Thank you. I would now like to talk to Agustín Carstens from the Bank for International Settlements, who is in the happy position of being the only person on the panel who does not have to answer to politicians and does not have to answer to the public and voters, or actually run monetary policy himself – although, of course, you did previously, in Mexico, so you have had plenty of experience with that. And Mexico is one of those countries which is in a very interesting position right now, policy-wise, in terms of climate policies.

From your position of overseeing the system, trying to herd cats in the central banking world, how do you evaluate what is going on right now? Because it is a **quite remarkable shift from where central banking was just five years ago**.

Agustín Carstens

Thank you very much, Gillian. Well, to be sure, I have very demanding and very politically well-oriented bosses, and I have four of them here on the panel with me. In any case, it is great to have them as bosses, and we try to do our best here at the BIS to facilitate and complement whatever they are doing.

From a central banking point of view, I celebrate – and I think this has been confirmed in this conference – that we have made or completed the transition from questioning whether central banks should be involved, or why central banks should be involved, to slowly going through to the next step, which is how to do it.

There are many different dimensions in which central banks should be involved in this. They obviously encompass the whole range of what you have been talking about, from monetary policy to financial regulation and supervision, and even a little bit of what Yi Gang is doing in China, of giving guidance or facilitating the debate with society. Of course, each central bank has its own mandate, has its own limits.

I also want to say that this is a progression in central banking. In many of the debates that have been out there, the change that should be expected is probably not as strong as it appears. For example, this debate of monetary policy and climate change – I mean, at the end of the day, climate change, as François has said about Spain and electricity, happens constantly. I come from a country – I was Governor there for eight years – where we had probably the most hurricanes in the world. In the time I was Governor, the number of hurricanes increased dramatically. Given the geography of Mexico, we get hurricanes from the Pacific and from the Atlantic, and sometimes at the same time. We even had an event where we had two hurricanes and an earthquake, although the earthquake was not necessarily related to climate change.

Now, of course, we central banks need to deal with the circumstances. A clear manifestation of climate change is that it changes relative prices. Basically, it affects some sectors, it affects certain commodities and it affects certain services, and what central banks have to do is to prevent precisely those relative price changes from affecting the dynamics of inflation. We also need to ensure that the price system is working adequately and that it can send signals to the real sector in order for it to reallocate resources, because at the end of the day, what is needed with climate change is a massive reallocation of resources in order for economies to be better prepared for what is coming.

What I think is really a game changer is the fact that now there is a clear consensus that this type of phenomena will be with us for a while and will not disappear. Therefore, in terms of monetary policy and planning our activities ahead, it is important to start incorporating them into the types of scenarios that monetary policy and central banks will have to face as we move into the future.

Many of these events are unpredictable, but then there are other aspects that are more predictable. Of course, we need to support investigation; we need to support the research. And hopefully, what can also happen as a result of this collective action is that the price signals and the research that is done really mobilise changes in resource allocation so as to mitigate the impact of global climate change. I think this is essential. And again, this is something that central banks have been doing and will continue to do.

Of course, it is a major change, the fact that this is sort of a permanent shock and that it will be coming in the future. I am sure that central banks will address this within their mandates or in the interpretation on their mandates, basically echoing the demands of their own societies, as we have been seeing.

Going back to this aspect of reallocation of resources, the financial system will play a key role. At the end of the day, that is the main function of the financial sector: how to use savings today for investment and to move those resources into the future. Meanwhile, industrial capacity and services can be generated. It would be unconscionable to think that we should not incorporate climate change into this process. Why? Because it will affect the need for resource reallocation and it therefore goes to the heart – the essence – of financial markets. So, we need to act in consequence.

There are many issues that have been discussed – and opinions that I share – about data and about disclosure, but I would say that what we need at the end of the day is to have integral markets in order for them to do the job adequately, markets that are transparent. And even think about contingent markets that do not exist today.

I see that here at the BIS; as you say, Gillian, we have the benefit of seeing the bullfights from the stands, even though bullfights are not very ecological, I have to say. Nevertheless, with the benefit of being in the stands and not being in the in the bullfighting ring, I see that very good things are happening, and we at the BIS try to identify where the gaps are or where we can really support this process because I think it is essential.

Gillian Tett

I am going to ask you in a second about supporting the process, but before I do, given that you are a spectator and not in the bullring, do you ever worry that the shift towards climate finance issues and climate issues may end up in any way creating a **public backlash** against central banks or undermining their credibility amongst politicians in some areas? I mean, we have already seen, say, in America that large parts of the political spectrum don't think that central banks should be talking about this kind of thing. Are you concerned about a backlash issue?

Agustín Carstens

Well, at this stage, I am more concerned about, as Christine mentioned, being missing in action. The fact that we are having this debate right now is a testament to the importance of the issue, and it is a testament that society is demanding that public officials mind this issue.

At this stage, I think we still have a lot to contribute in framing the problem and finding solutions. The real trick will be to find the adequate balance of where central banks fit in. As many of my colleagues have said, we cannot do everything. As a matter of fact, our guiding principle should be that we should do whatever the instruments we have at hand allow us to do. If we overpromise, saying we will solve certain

problems, but we don't have the instruments to address them, that would be wrong. The debate I see among central bankers is precisely how to establish the right commitments, taking into account the instruments that are granted to them. That is the adequate relationship that needs to be preserved.

Gillian Tett

Just to turn to the question about the private sector and the financial stability mandate, which everybody on the panel agrees that they have and perhaps everyone agrees is the most immediate area where climate change issues do impact what central banks do, do you at the BIS support the call for **mandatory TCFD reporting**? And from your perspective, do you think that financial institutions around the world are ready for that?

Agustín Carstens

In principle, I would say yes to the first question. The main ingredient of financial markets is information. As my colleagues have been saying, we are dealing with a very difficult topic at hand, and the more we know, the better we will be able to do our job. We cannot do all the research, we cannot do all the forecasting that François mentioned, if we don't have adequate information. In trying for a transparent and integral market, we also need to be able to link the characteristics, for example, of a bond with the final objective. The final objective is how the firm in which you are investing is going to undertake actions that will affect climate change. That link needs to be established in order to have transparent, trustworthy markets, and that requires a lot of information. So, I think that the more we have, the better the structure, the better it is; this would also provide a level playing field.

And in the private sector I see a lot of enthusiasm. In many different aspects, there has been a very interesting push by the private sector, even, in some respects, inviting the public sector to do more. And I think we are moving in that direction. What is important is to establish a virtuous cycle interaction between the private and public sectors, and I am very hopeful that this virtuous circle will come along soon.

Gillian Tett

Thank you. I am going to ask you a quick question before I turn to François, which I will also ask to François. You talk about the need to have a level playing field in the private sector, and yet what we have at the moment is a European Union moving along with the green taxonomy, which is essentially a top-down system created by governments, and then we also have the American ecosystem, moving towards a slightly different system, more of a bottom-up type of framework. Are you concerned about fragmentation in reporting standards? Do you think it is possible to get a coordinated **reporting and transparency approach**? Does that worry you given that you are looking at the entire central banking world and financial system?

Agustín Carstens

I think the key, to answer your question, is cooperation. As a matter of fact, we are very used to doing that. Think, for example, about the Basel core principles for banking supervision, among others. One of the key motivators for those is precisely to establish a level playing field. So, I think that we need to agree on those, and I am sure that between the different fora of interaction – the G20, the FSB, even the Basel Committee and, of course, with the help of the NGFS – we have different instances of coordination that at some point would pan out with at least these minimum standards, so that we can claim that there is a fair

amount of level playing field without really inhibiting or prohibiting countries from moving further in any direction, as is happening today with financial regulation.

Gillian Tett

So you would like a “**Green Basel Accord**”, would you?

Agustín Carstens

Well, it would be great.

Gillian Tett

One problem with the Basel Accord was that no sooner had it come out than all of the financial sector started arbitraging it in various creative ways and started creating all kinds of “innovation” in the financial system.

I would like to ask you, Governor Villeroy, whether you think that it matters that the EU has its **green taxonomy**; this is its flagship, people are very proud of it, and the People’s Bank of China indicated its support for it a couple of months ago, and yet, certainly America does not appear to be minded to adopt it anytime soon. Does this matter?

François Villeroy de Galhau

Let me first say that I couldn’t agree more with what Agustín said about the key importance of data. Yi Gang also said it earlier; if we don’t have data, we won’t succeed in any of the avenues we mentioned today.

I will not repeat what I said about mandatory disclosure, but next comes the issue of standardisation, which you just mentioned and which would be the following step – and probably a necessary one. I wouldn’t exaggerate the difference between a European approach, which would be top-down, and an American approach, which would be bottom-up. Obviously, the European authorities listen to private actors, and I am sure that the American decision is also subject to public debate and decision.

Having said that, we will need to achieve a common framework, and here is where the difficulty starts, obviously. It could be basic but significant for all jurisdictions, with the possibility to be more ambitious for those who want to be. But it should be significant; let me insist on that. It *should* bring on board the double materiality promoted by the European Commission, which, as you know, considers both the risk that affects the entity as well as the entity’s impact on its environment. And it should encourage broad coverage of the ESG topic, not just the E but also the S and the G.

In this regard, there is the IFRS initiative. It is welcome, but this alone should not be sufficient as it could neglect the S and G dimensions. As such, key standards are public goods, clearly, which require co-construction – I know that President Lagarde likes this word; so do I – with political authorities. So, I don’t know if it will be a new Basel agreement, or the next Paris one, or the Washington agreement; wherever it is, it will be a difficult task, but I am confident that with co-construction, we can achieve it.

May I end with one word about another very powerful tool with the private sector, which is stress testing? When we have disclosure, and standardised disclosure, we will have what I could call the “snapshots” of risk; these are the present exposures. But stress tests could provide us with the “video” of risk, the forward-looking analysis of climate-related risks. This is also more important because we all know that climate-related risks are long run.

Along with the French supervisor, the ACPR, we have run a very innovative and unprecedented exercise with banks and insurance companies. It has already provided very positive lessons, including the active bottom-up participation of financial institutions. It still raises many methodological questions, so my appeal – or my invitation – to supervisors worldwide within the NGFS would be to start the exercise and to learn the lessons. We should not wait to have a perfect methodology on stress testing before implementing some first actions.

Having said that, if we can have this measurement of climate-related risks with disclosure and with stress tests, then we will have the question of climate-related capital requirements. But having a good measure of these climate-related risks, an adequate measure, is a prerequisite before thinking of possible additional capital requirements.

Gillian Tett

As I understand it, François, you are one of the first central banks, if not *the* first central bank to do such an extensive **stress test exercise**. What did that show in terms of the readiness of the French financial system? How big were the disparities between insurance companies and banks?

François Villeroy de Galhau

Perhaps three quick lessons: first, we were positively surprised by the active involvement of financial institutions themselves. It was a voluntary participation, and all important banks and insurance companies took part. Second, the very clear lesson is that transition risks are more important than physical risks – at least in Europe, due to our climate situation – and the more orderly the transition is, the more limited the risk will be. This is where our NGFS scenarios to be published next Monday are very important. So, we should start the transition, including the increase of carbon prices as early as possible. The third lesson is that financial institutions are clearly at different stages. To give you an obvious example, some stick to what I could call a “static approach”, ie they suppose that their sectoral exposures will be the same in 30 years as they are today; and then the risk is higher. But some are already taking a dynamic approach, saying, looking at the climate-related risk, I will shift my exposures to less exposed sectors. This is a very promising tool, not only for us to measure the risk, but also for them to change their strategy.

Here, we are only at the start of the methodological journey. But looking at what we have done in the last 18 months in the NGFS, I am very confident that, by the end of next year, we in the NGFS can deliver perhaps not a harmonised methodology, but a very operational methodology and tools for all supervisors using this stress test. And this will be another decisive game changer.

Gillian Tett

That seems like a good moment to bring Chairman Powell in and ask, does the Federal Reserve plan to conduct **climate stress tests** anytime soon? And will you embrace the NGFS’s methodology for looking at these issues? Earlier, we heard Agustín talking about hurricanes and how that had changed debate; I very keenly remember the Dallas Fed coming out quite unexpectedly a couple of years ago, during the Trump administration, and saying that events like the Houston weather incidents had created a need to start looking at climate risks. So, when even the Dallas Fed is saying this in terms of evaluating financial sector risks, you know the mood is changing. Will the Fed follow the French central bank and others in doing climate change stress tests?

Jerome Powell

We have not made a decision on what to do about climate scenario analysis and I am not going to be announcing one here today, but I will say that what is apparent is that, if you look across central banks and, actually, at what large, regulated financial institutions are doing, climate scenario analysis is emerging as one of the principal tools for assessing the risks of climate change to the financial risks and highlighting risks. So as we do our work here, many important decisions lie ahead of us, some of them in the near term, and we will announce those as appropriate.

I would say that there are a lot of reasons to think that climate scenario analysis can contribute in a very positive way to this. One thing that it clearly does is it raises awareness within institutions and within our own thinking of how these paths may play out. It can also be used to illustrate what different sets of government policies might bring forth in terms of results for climate. So, there is a lot to like about climate stress tests, and we have benefited from carefully studying what the ECB did, what the Bank of England did, and what the Banque de France and the ACPR did. It is all informative; you can just understand that we are carefully studying all of that. We are also in significant discussions with particularly the larger financial institutions, who are all doing different kinds of climate stress analysis. We are putting that all together and thinking about how we might move forward with that. But again, we haven't made a formal decision on that. Nonetheless, there is a lot to like about this as a potential tool.

Gillian Tett

Does the Federal Reserve have a position on whether it is time to introduce **TCFD reporting**, or some form of climate change reporting, in corporate accounts and banking accounts?

Jerome Powell

In our world here, our highly capable Securities and Exchange Commission has authority over disclosure. So that is a decision for them and for the administration. But let me just say, at a high level, it would be hard to overstate the centrality and the fundamental, foundational nature of better data and better disclosure. I will read you a quote from our own Federal Advisory Committee; these are banks that we regulate and supervise. They said it so well, I will just quote it: "The development of uniform data standards and metrics for disclosures will be critical to adequately identify and compare climate risks across businesses and sectors." It is as simple as that. We need to have the data. It needs to be disclosed in a manner that is helpful in understanding the risks of climate change. That is a tall order, easier to say than do.

The question of when to make it mandatory Obviously, what we are headed toward, the ideal, will be standardised disclosure that is highly informative and consistent across jurisdictions. I very much agree with the sort of analogy to banking supervision or regulation. That was quite a process to go through to get all of the major economies around the world on the same page on banking regulation. It took some time, but it happened. That is what needs to happen here. Disclosure needs to be consistent; it needs to be useful. The time at which you make it mandatory is an issue, in our jurisdiction, for the SEC. But again, the importance of it can hardly be overstated.

Gillian Tett

You would support a "Green Basel Accord"?

Jerome Powell

Those would be your words, not mine. TCFD has been highly useful: 1,500 companies using it; many trillions of dollars' worth of assets under it. It's a great foundation. But it is not an accounting system. The disclosures that are coming out are useful, but they are not consistent. And we have a lot more to learn. For example, for banks, what data can you get from the companies that you lend to? Whose responsibility is that data? Who should develop that data? Exactly what data should you get?

So, I think there is a process to be had. As you know, this is what the FSB is working on, the IFRS is working on it, the G20 is working on it; we are all working on this. This is – and deserves to be – very much at the top of the list of things to do, to get to a disclosure system that is useful for investors – and to Agustín's point – so that the financial markets can do their job in allocating capital. [Useful] for governments, so that we can understand the implications of our policies. And for financial institutions – and, by the way, non-financial institutions too – so that they can understand what their activities are, what they mean for climate change and how they can live up to the commitments that many of them are now making across the world to get to net zero, to get to Paris-consistent levels of greenhouse gas emissions by 2050.

Gillian Tett

If you look at, say, **TCFD adoption**, there is a very stark discrepancy. You've got very high levels of TCFD adoption in the UK, extreme enthusiasm in Japan – almost any financial institution that moves in Japan appears to have adopted it – and yet the US is lagging dramatically behind, relative to the scale of its financial sector.

When you look – with your supervisory hat on – across the US financial system, do you think it is prepared for the type of changes that could be coming down the road pretty soon? Or do you think the last four years of differing policy approaches means that there is actually going to have to be a lot of catching up in the US, in domestic financial institutions, to prepare for this? Because, although you have got the big banks and Wall Street banks who are exposed to European regulations having done a lot, I see tremendous discrepancy amongst smaller financial institutions, and I am often asked by smaller financial groups in America what exactly TCFD is. So, I am curious about your views on that.

Jerome Powell

There is a great deal of interest and momentum on addressing climate among US companies, and that goes for both financial and non-financial companies. If you are a publicly traded large company, as you mentioned, particularly one that might be active abroad, this is a high focus for you. If you look at any annual report, if you listen to the things that they are doing, many of them are making commitments. So, we see that, and I think that process is moving along very well.

They are also managing under the watchful eyes of investors with a strong and growing focus on ESG issues. Many large US financial institutions have committed to net zero by 2050. Many have signed up for the Glasgow Financial Alliance for Net Zero pledge.

You are right that this, for now, is principally a focus of large financial institutions, and regional financial institutions, too. That is where our focus is at this moment as well. We are heavily engaged with those who are actively involved in this, and I think that is an appropriate place for us to be working now.

Gillian Tett

Right. If time permits, at the end I will come back and ask you each briefly to say what you would like to tell the G20 and whether you think the Covid pandemic has changed the political climate around this in any way, to make it easier to talk about climate change issues. It is obviously a question that is very interesting in the US context.

But I want to bring in Governor Yi Gang at this point and ask, is China preparing to support **TCFD** and embrace TCFD? And to what degree do you think Chinese financial institutions are able or willing to incorporate these types of approaches in how they disclose information?

Yi Gang

We work very closely with the Financial Stability Board on TCFD standards. We asked our largest commercial bank, ICBC, to join as a member of TCFD and to try to follow the standard. And for the central bank, as you said, our task is to make a level playing field that is fair to all of the private sector.

Our job is to first do the taxonomy. On taxonomy, we work closely with our EU colleagues, working on the international convergence of commonly recognised taxonomies on green loans, green bonds, etc. We had already set our standard for green loans in 2015 and our standard for green bonds in 2018. We are working on the taxonomy domestically as well as with our international colleagues.

Second, we want to make the disclosure standard very clear. That is the main purpose of TCFD. We are working on first asking our major commercial bank to disclose their climate risk-related information and carbon emission information, then we're working on asking our listed companies to disclose their carbon information. Our goal is to create a uniform disclosure standard, and in the future, we will go in the direction of mandatory disclosure of climate-related information.

Third, for the central bank, we are also designing some monetary policy and credit policy incentive tools to encourage the private sector to make more loans to green projects and to help with the green transition.

Fourth, we already conducted stress testing and applied, as we call it, evaluation criteria on the financial sector, measuring their performance on the green transition. That is, we try to evaluate commercial banks' green assets and brown assets. Also, in the future, we are considering assigning different risk weights to green assets versus brown assets so that, for green assets, commercial banks can save their economic capital, providing a positive regulatory incentive for financial institutions to have more green assets.

So, to answer your question very briefly, we are positive about the TCFD standard. And we're trying to work on the details and standardise the disclosure requirement and also work on the policy toolkit, risk measurement and stress testing, for the entire financial sector in China.

Gillian Tett

Thank you very much, indeed, Governor Yi Gang. I am glad you explained that because I think that some people in the western world don't realise the degree to which the People's Bank of China is moving ahead. I am curious, first of all, on the question of the stress tests, what type of results did you find or are you finding from your **stress testing** of the Chinese financial system, in terms of its readiness for climate change? Do you have any plans to publish the results in a public forum to increase public understanding of these important issues and change the national consciousness as a result?

Yi Gang

I am sure that we will publish the results in the future. You see we are already carrying out the pilot programme on commercial banks. First, we have the evaluation procedure, we call it the macroprudential and climate-related evaluation of the commercial banks, of their assets. And I think our banks are gradually recognising how important the implications of climate change, climate change risk, is. Right now, they are planning their asset allocation strategy and their investment strategy so that, in the future, we will provide some guidelines for this transition following their strategy.

I want to provide a caveat here. Given that the economy – power generation and the entire structure of the economy – is in transition, the central bank's task is managing the transition in a smooth manner. For example, if there is some sudden movement and then there is perhaps some immediate crisis or risk event, we need to be very much alert about the trajectory or parameters and try to give guidance to the commercial banks so as to make the entire transition smooth and safe.

Gillian Tett

Speaking as a journalist, I would certainly be very interested to see the results as and when you do publish any stress test results in the future. Because of course, there is great interest around the world in the readiness and the transition issues of the Chinese financial system with regard to this, as there is in other countries, too.

I am going to ask Christine Lagarde in a few moments about whether the ECB will publish stress test results and what attitude you have towards regulatory weighting. But Governor Yi Gang, I would like to ask you another question, which is about **taxonomies**. The People's Bank of China has been developing its own taxonomy, which you have been using through things like green bonds. The European Union has its own taxonomy, too. You signalled in your speech that you support the efforts the European Union is making, but how similar do you think the EU and Chinese taxonomies are? Does it matter if they are a bit different? Of course, America doesn't have a taxonomy yet, so I can't ask you to compare the Chinese and US taxonomies. But I am curious about how similar the taxonomies need to be.

Yi Gang

I think they are very similar. At this point, in terms of the green bond taxonomy, China's and the EU's have 80% similarity. And we just revised a new version of our green bond taxonomy last April. In that new taxonomy, we removed all fossil fuel projects from the green bond catalogue. That means that we are working with international colleagues, especially in the EU. And as Jay mentioned, the US and China are co-chairing the G20 Sustainable Finance Working Group. We are working with our US colleagues and EU colleagues to make the taxonomy commonly recognised internationally. That is our goal.

Gillian Tett

That's fascinating. I would like to now turn to Christine Lagarde and ask about the European Central Bank's point of view.

As I say, if we have time at the end, I would like to ask you each very briefly to reflect on how Covid-19 has or has not changed this debate, and messages for G20. But before we do that, does the European Central Bank plan to publish **climate stress tests** soon? Do you plan to do climate stress testing soon?

Christine Lagarde

Thank you, Gillian. Two things.

One is that we have already published some economy-wide climate stress tests; we did that a couple of months ago. I would just like to say a few words about that, because it's quite a gigantic project, of which we have published the first part. And that will be updated as soon as the scenarios that François was talking about are released on Monday, because we will rerun the exercise that we have conducted.

What we have done is actually map several massive databases together. We use the scenarios of the NGFS – which are being challenged by some, but I would completely align myself with the comments made by François; I think the scenarios are quite solid, and the latest version will be even more solid. So, we are mapping that with massive financial data that actually cover four million corporate accounts, plus 1,600 banks. That covers pretty much all banks in the European Union – and, of course, beyond, but I am particularly concerned about the European Union in my current function. We try to assess what the risks are, taking into account a period of 30 years, so you can imagine the magnitude of the exercise that was conducted.

We are already finding some really interesting findings and conclusions from that. The first one is clearly that, by all accounts, whatever cost there is of transition, of prevention, it certainly [is dwarfed by] the risk that could be associated with doing nothing. In other words, sitting by and doing nothing now is going to cost so much more down the road than what it will cost today to try to prevent or mitigate and to help with the transition. That is the key overriding finding, and it is obvious when you actually assess the nature of the risk, which we see for the moment as largely physical risks which vary by geography. So, you have much more risk related to flooding in certain northern parts of Europe, and much more risk related to drought and shortage of water in the southern part of Europe.

The second finding is that some of these risks are concentrated in a rather small number of banks. About 10% of the banks that are covered by that study will see an increase in their risk by 30%, whereas the others see much smaller increases in risk. So, we are publishing that, and we will continue to publish as soon as we can complete our exercise of mapping all these databases and when the scenarios are released by the NGFS next Monday, as François indicated. That is one category of climate test.

The second category, which we will publish next year in 2022, is based on supervision. For that one, we published a guide last December to tell the banks: this is what we expect, we really would like you to focus on this, this, this, this and that; and as part of our supervision mission, we will go and inspect whether you have taken that into account.

The first cut a few months ago, when we tried to assess how much was taken into account, was not exactly satisfactory. But they are all on notice, and they are all going to move forward with – hopefully – implementation.

Gillian, if you allow me, I would like to draw on my previous experience as a finance minister, having gone through the financial crisis, and my IMF period to just draw our attention to two key risks that I see. These are what I would call the “Play it again, Sam” kind of risks.

The first one is – and this is no criticism of the initiative taken by Mark Carney and the huge efforts put into it by Michael Bloomberg – that TCFD is a private sector initiative in the main, with voluntary observance of the principles. That reminds me so much of the self-regulation principles that we applied prior to the Great Financial Crisis, where the light-touch regulation was: let the businesses organise themselves; they will find out the principles by which they should abide and the markets will sort them out.

Well, we know where that took us, so that is risk number one, which in my view plainly justifies the regulators and authorities in charge actually co-constructing together, if necessary, using a building block approach where they have common principles from which they move towards more ambitious goals.

That would plainly justify us moving in that direction, and if there is one message that I would like to give to the G20, it's please go in that direction.

The second risk that I see is that we could yet again go into this sort of double standard, or different types of disclosures, that we saw right after the Great Financial Crisis, where key principles were devised by the IFRS and IASB and followed by some, generally accepted on a voluntary basis by others, and not accepted at all by others somewhere else, because it is a political game. We have to just be cognizant of that and make sure that we have as much standardisation as possible so that we can actually – to quote another great American, not to imply any particular political preference, but because he said it right – trust, but verify. Otherwise, we are going to risk massive greenwashing by those who will pledge but not necessarily plan, prepare and deliver. I believe that standardisation is going to cut that risk of greenwashing that really would hurt all of the developments.

So, you asked me what I would like to ask the private sector. I am going to borrow a page from Goldman Sachs, which I myself took on when I was in the private sector. Be swans: smart, work hard, ambitious and nice – nice because climate and the environment are public goods. Be nice to those so that all of us, on the panel and beyond, can stand proudly in front of our grandchildren and say they were swans because we asked them to be so, and we verified.

Gillian Tett

Well, thank you. I would like to pick up on a few of the comments you made there and ask you questions about them: given that your macro stress testing has shown such an imbalance in terms of where the risk will hit financial sector players, do you plan to publish the names of the banks that will be most affected? That is clearly quite an important issue in terms of the wider perception and debate in the market around financial institutions, and probably would be the most powerful catalyst you can imagine to encourage them to act.

Christine Lagarde

It's not something that has been discussed internally, but from what I have seen and from what the financial stability consequences could be as a result, I think my gut feeling is: probably not. I think the first port of call will be those particular banks so that they can take all the necessary steps to reinforce and mitigate against the risks that they are exposed to, in order to alleviate those risks and maintain financial stability, without which we don't have price stability, to circle back to the mandate.

Gillian Tett

I am curious about your reaction to Governor Yi Gang's comment that the People's Bank of China is looking to, in the future, try and use risk weighting as a tool to redirect financial flows towards greener activities. Does the European Central Bank have any thoughts about whether it is going to introduce **brown and green risk-weighting systems** in the future?

Christine Lagarde

We could only do that if we had both the green and the brown taxonomies. In Europe, while we have made much progress – and, as you know, this is totally transparent and open and everybody can go and verify – but, for the moment, we only have the green side of the taxonomy, and more work needs to be put into the less green, a little brown, very brown and extremely brown categories. We can only start using those tools and those data and measurements once they are complete. They are not complete. We are trying to move as fast as we can; I know the European Parliament is doing that as well, and it is critically

important, because if we look just at Europe, €330 billion are needed annually in order to fulfil the commitments of the Paris Agreement. That is going to mean a green bond market – a green product market in general – that is going to expand significantly. It is one of the fastest growing. A large portion of it is located in Europe; a large portion of it is in the euro as a currency. We need to move fast in order to be able to use those tools in whichever way we can. But I am delighted that Yi Gang is referring to the good cooperation we have in that respect, because we try to compare notes and we try to have as little discrepancy as possible.

Gillian Tett

Well, certainly, if there is 80% consistency between the two taxonomies, that is very striking. But I am also curious about your point about the difference between taking a private sector-led initiative towards **reporting disclosure**, which has driven most of the debate in America and the efforts of people like Mike Bloomberg and the work of SASB and others, and the different attitude in the European Union, which would have been much more top-down, mandatory and driven by the Commission in terms of the taxonomy. Do you support the idea of a “Green Basel Accord” that would actually create a collective framework on the part of central bankers and bank supervisors to actually lay down some kind of mandate, rather than simply let the private sector take the lead?

Christine Lagarde

As I said, I think we ought to be concerned about exclusively private sector-led initiatives in such matters. I think that the issue of our responsibility towards climate change is something that needs to be debated and decided upon by much larger groups when it comes to a public good. I think that this will probably involve decision-makers at the level of parliament and at the level of governments. While I am sure that under Agustín’s excellent leadership the BIS will make great efforts and the FSB will endeavour as well, I think that it is a much larger project that involves all decision-makers, not just the bankers and not just the private sector.

Gillian Tett

Well, we haven’t got a lot of time left, but I would like to really ask each of you to reflect a bit on what message you would like to give the G20. Chairman Powell, when you think about what needs to happen, America has taken a fairly private sector-led approach thus far. Do you think that is the right one? You think there needs to be more government mandate involved in where the climate change debate is going? **What kind of message would you give to the G20?** And just to add one other question, do you think **Covid-19** has made it easier for public sector leaders in America to talk about climate change issues within your own domestic and political environment?

Jerome Powell

Well, in essence, climate change is in the nature of a very large market failure; so, expecting the private sector to deal with it without any intervention from authorities is not going to be a good strategy. I would say using the private sector and its ability to allocate capital is often a good strategy, but subject to what I just said. I think that decisions about taxonomies amount to decisions about allocating capital to different sectors, preferring one over another, and it is inherently a political act that needs to be done by directly politically accountable, elected people who have a mandate.

I also want to just be clear; you have been asking about climate stress tests. I want to draw a very clear distinction, at least for us, between climate scenario analysis and stress tests, which have immediate

regulatory consequences. For us, the benefits of scenario analysis are for everyone, including for the regulated institutions. Indeed, many are doing them now. They are not meant to be setting up a regulatory consequence, which obviously does flow from our regular regulatory stress tests.

In terms of Covid-19, I am tempted to say it is too early to say what the implications are. I would say it is a fact that our collaboration muscles are in good shape. There was a lot of collaboration globally, a lot of meetings about collaborating around the world, and that may help. Maybe one other thing, and this may be a stretch, but there are those who want to see 100% certainty about climate change. I would just say the pandemic shows that even low-probability events do happen, and what we do is we build resilience against them and we address them. We don't wait until they bear fruit. I think for climate change, that may be some learning that can be had from the pandemic on that front.

As for the G20, central banks don't go to the leaders' meetings, and it is really ultimately governments who set those broad principles – appropriately so – for the Members to stand behind. That is really not a role for us; we have a narrow mandate. But we will contribute, as Yi Gang and I have discussed, to the Sustainable Finance Working Group and contribute our thoughts on the economy and such, within the context of our mandate.

Gillian Tett

Right. I would like to ask Governor Yi Gang what kind of message you might have for the G20 leaders when they meet, given that you are working, obviously, with your American counterparts in the working group.

Yi Gang

I want to send a message that we'd like to continue our economic recovery and try to control Covid-19, to minimise Covid-19's negative impact on the global economy. In this process, I would like to work with G20 colleagues on the sustainable finance work, which is to first finish drafting the roadmap to decarbonisation and, together with our US colleagues and the Italian presidency and all the other G20 colleagues, try to have a disclosure standard by the end of this year. That's our message.

Gillian Tett

Well, that's a very bold message, and it certainly is a good challenge for the G20. I'm going to ask Agustín and then I'm going to ask François to say the last word, since you are technically the co-hosts here.

Agustín, do you want to say something about what your message to the G20 would be? I'm curious for any reflections on whether you think the pandemic has changed the political willingness to act.

Agustín Carstens

Yes, thank you very much, Gillian. On the G20, I think something that has come across very strongly in this panel is the urgent need of cooperation and coordination. I think we need to coordinate across countries, across sectors and across policies.

There are chapters of the G20 where there are ministers of finance and governors of central banks, but there are obviously other aspects out there that are discussed in other parts of the G20. So, I think the G20 is great for us to try to improve this cooperation and coordination that, needless to say, will be of the essence. We can start with cooperating and collaborating with the Treasuries, but I think that for the final outcome, especially since we have a multi-decade horizon in front of us, other policies and other sectors will be of the essence.

And yes, I think Covid has, very much along the lines of what Jay said, put very bluntly presented us with the possibility of simultaneous global shocks that we need to be better prepared to act on. And needless to say, climate change really could be an area where these types of problems can manifest themselves. So yes, I think that Covid is a great wake-up call for us to mobilise ourselves and address this problem.

Gillian Tett

Right. Governor Villeroy, your last word, and then I'll say a couple of thoughts to wrap up. What would you like to tell the G20?

François Villeroy de Galhau

About the G20, it will gather in Rome at the end of October. Christine reminded us at the start of this panel about Johannesburg almost 20 years ago and its sad message: "Our home is burning, and we are looking away". If I could wish for a more positive message for Rome, it would be: we are looking ahead. We are in the oldest city of all of Europe and we are looking ahead. And we are looking ahead *together* – which is also very important; this is a unique opportunity for political alignment. Gillian, you stressed that in this panel we had three continents gathered with a common cause, and this is very new. Europe was ahead some years ago, and it sometimes felt a bit lonely. So, it's a unique opportunity to look ahead together and this will be a very positive message for our fellow citizens. On the substance, there is also the agenda on financial issues, which we discussed.

If I had to express a personal wish, more as a citizen, it would be also for the G20 to make progress on two other key points which are not financial issues. The first one is carbon pricing, in whatever form it takes. If not, it will definitely be the missing element. And the other element, which is probably easier to deliver, is not to forget about funding climate transformation in poor or middle-income countries. It was a promise in Paris six years ago; now we should deliver.

Gillian Tett

Well, thank you very much, indeed. And thank you to all of you for your comments and thoughts and interventions. I just have a few points to make to sum up.

Firstly, that the debate that we've just heard is absolutely remarkable, if you look back at the sweep of history. Not just because, as I've said earlier, we have representatives from the US, Chinese and European central banks all on the same stage – or the same virtual stage, if you like – but also because, five years ago, it would have been almost unimaginable to have central banks talking about their mandates and challenges and responsibilities in this way. It is a startling sign of how quickly the zeitgeist has changed. If nothing else, Covid-19 has shown that sometimes the zeitgeist can change very fast, and political and public audiences can change their ideas of what's normal and expected with a speed that's often unimaginable beforehand.

Secondly, there is obviously still a lot of work to be done in terms of trying to flesh out what this means in practice. Different jurisdictions have different ideas about the degree to which this can or cannot be embedded in monetary policy; clearly, Europe and the US are in different situations about definitions of their own mandates, but everybody agrees that this matters enormously for financial stability and financial supervision.

The questions about how one conducts stress tests, the questions about whether there need to be regulatory weights assigned to green or brown assets in the future, and the questions around reporting are obviously extremely complex. There's going to be a lot of debate and dialogue. There are differences

of views, and it won't be necessarily simple to resolve, particularly in terms of the degree to which it's private sector-driven or public sector-driven, but these are clearly issues that will be discussed.

This leads me to my third point, which is: this debate is moving quite fast. Behind the scenes there is a lot of discussion happening. If anyone is watching and thinks that this is something which is going to be a five- or 10-year development, I think they're probably wrong. With the COP26 talks coming down the tracks, I suspect there will be quite a lot of breaking news in this respect, from all of your jurisdictions, but also in terms of international forums and bodies like the BIS.

So, that's a long-winded way of saying "watch this space", because as somebody who's committed to trying to cover this as a journalist and trying to communicate it to the wider public in the most effective way for good, bad and ugly, I think we're going to have a lot of news to write about and report on in the coming weeks and months on these issues. So, I'll just finish by saying thank you all for your very thoughtful comments, and very best of luck in navigating your different challenges in terms of trying to find ways to combat climate change in the coming months. Thank you.

Main messages of the conference

Luiz Pereira da Silva

Deputy General Manager, Bank for International Settlements

Hello, everyone. I'm Luiz Pereira da Silva at the Bank for International Settlements, a co-organiser of this Green Swan Conference. I'm here to give you a summary of the main messages of the conference and to relay some of these messages, in the next session, to Governor Ignazio Visco of the G20 presidency and the Banca d'Italia. The main purpose of the conference was to establish a platform for dialogue and coordination between various actors on climate change, to raise awareness and to provide some inputs to the G20 presidency.

Just some numbers: we had about 170 journalists, with an equal number of news items in the last couple of days. We've had a lot of social media and attention vis-à-vis this conference, with close to 1,200 social media posts, 1,800 views of livestreams of our conference and 30,000 visitors on our conference website. So, this is a signal that it attracted a lot of interest, and I would like to thank all the participants for having devoted time to the sessions, particularly our special guest speakers.

Now, rather than a synthesis, as the debates are still very fresh in our minds, let me try to give you a selection of topics and discussions that were mentioned throughout these last three days.

The notion of climate risk

First of all, regarding the notion of climate risk, I think the awareness battle about this is really well underway – climate risk is characterised as a new type of systemic risk, not as something that might happen as a very rare event, but as something that is certain to happen if we don't act. There is full awareness of the complexity of these types of risks and the fact that they can unleash damaging, catastrophic, nonlinear types of events that go much beyond just financial stability – they can threaten human lives and trigger a number of unforeseen consequences.

This is what we characterise as a "green swan", and this is why there is a need for many actors to tackle this type of risk. Central banks can play a coordinating role – I will come back to that – but certainly not substitute for other major policy actors. Central banks should use their available instruments. This is one of the topics that was discussed in this conference.

Carbon pricing, disclosure and regulation

Second, there is a set of areas where work is underway. A lot of discussions took place around a series of topics that I will now try to name one by one. The first is **carbon pricing**. Of course, it's a necessary instrument, but it was seen as something that is difficult and complex to implement. Even so, many participants pointed out that *under-pricing* of carbon creates a major risk for financial stability equivalent to that of the under-pricing of risks that led to the 2008 financial crisis. There were discussions about how to further develop carbon markets, how the appropriate incentives should be put in place and how comparability and homogeneity should be ensured in terms of the information and indicators that are needed to develop this type of instrument.

The second topic is **disclosure**, a very important issue for addressing risks related to climate change – what are we exposed to in terms of physical and transition risks? There was a discussion about what characterisation Task Force on Climate-related Financial Disclosures (TCFD) disclosure should have. It was mentioned several times that it should be, of course, mandatory and that regulators should take

more responsibility in making sure there is a movement towards TCFD disclosures. The other side of this was also discussed: there is also a lot of pressure in society itself to be aware of the risks that financial systems are running into. Pressure for disclosure that can come from shareholders themselves – in a sort of move towards radical transparency and because of the new characteristics of communications in our society – is also growing.

The third topic is **regulation**. Of course, coordination is needed here because green financial regulation faces a risk of fragmentation. For example, some participants mentioned the idea of a “green Basel Accord”; others said that this is a bit premature because we do not have the right data or we still don’t have the right taxonomy to engage in meaningful coordination around macroprudential regulation and other forms of minimising risks in the financial sector. But indeed, the idea of making progress in this area – improving definitions, standards, norms, certification and verification precisely to enable engagement in a discussion about prudential regulation in climate change – was evoked by many participants.

Finance and the transition

Fourth, on to the topic of **finance**, we had several subtopics. The first is the relationship that financing has with the transition to net zero. Some participants said that we were navigating a scenario where there could be a climate catastrophe, a sort of Minsky moment for climate; others were saying it is possible to get to a more sustainable, net-zero economy because of the technological progress that we are making. Because of this need to be cautious, the idea of a **precautionary imperative** vis-à-vis financing the transition was discussed. To many participants, financing the transition to net zero meant a close coordination with fiscal policy. This makes sense, because public resources might have a horizon for returns that goes beyond that of private resources. Therefore, the need to be able to finance new investments, new alternative technologies and new means by which we are going to transition to net zero, requires reflection about **the role public resources** should play in this game. This is very important because, as many participants reminded us, many technologies that are needed to facilitate this transition are currently just prototypes. In order to make them viable in actual industrial production, they need to be developed much more decisively.

There were also many powerful speeches that associated the recovery from Covid-19 with the need to finance – at a much higher and more decisive level – the transition to net zero, particularly with pleas to use more public investment – up to, say, two per cent of GDP – for this **green recovery**. The idea that this would be precisely the opportunity to provide more medium- and long-term returns to those who want to invest in green technologies towards net zero was also presented.

Another topic within finance was **financial innovation**. This is related to the fact that a number of new technologies for constructing net-zero portfolios are coming into play. How exactly do you carry out this type of transition? How do you technically enable the financial sector to construct such a portfolio? This was a topic that was debated – what type of techniques, what type of filters, what type of directions you take in order to ensure that the balance sheets of your institutions align with the objectives of the Paris Accord.

Another finance topic was the idea that the transition should be done with **public-private partnerships** in various segments of financial markets, using public asset owners and blended financial techniques. There was also discussion about **new financial instruments** that would allow us to sail through this transition (securities, parametric insurance instruments and resident risk management as service platforms to enable technology in finance to facilitate the transition to net zero). Of course, there was a lot of discussion about **how to hedge against climate risk**. As you know, in some areas, it is almost impossible to hedge against certain forms of climate risk. So, the idea of catastrophe bonds and what markets can be triggered to that effect were discussed in the conference. Also addressed was the idea of **data** – new sources of data that may change the way we map our perception of greenhouse gas emissions.

The technical contributions of central banks

Beyond finance, another big topic discussed in the conference was the technical contributions of central banks to this debate, with new macroeconomic models, new risk approaches, scenario analysis, analysis of the impact of climate on inflation, financial stability and new techniques for stress testing, as well as analysis of how these types of risks are being included by rating agencies. It will take some time, and it was recognised that, because of that, alternative measures may need to be adopted to incorporate climate-related financial risk into the risk management of the financial sector and of central banks.

It was also mentioned that the central bank community can begin to measure the carbon footprint of its own investments. There was also the question of what sort of policies central banks should adopt to make sure that their monetary policy activities are compatible with a net-zero commitment by their government. For example, what sort of progress can be considered in incorporating climate risk into collateral frameworks and asset purchase programmes.

Of course, there was mention of the way all this is being done within the coordinating forums that the central bank community has defined, for example the NGFS, and the way in which this membership has been very instrumental in developing some of these same techniques and tools that I'm referring to.

Distributional consequences and the importance of coordination

Last but not least, there was a lot of discussion about the evidence that climate change, as well as the policies that fight climate change, have distributional consequences. They primarily affect poor countries – those that are located in areas potentially subject to more severe weather events. Even within rich countries, climate change and climate-related risks affect primarily poor households. Therefore, in order to implement mitigation policies, there is an issue of political economy that has to be considered in how we see those risks and design policies to combat them.

To finish, let me mention a topic that was widely discussed and agreed upon in the conference: the need for coordination. I think the conference itself was a testament to this power of central bank cooperation and convening. I think many participants said that these voluntary approaches that spontaneously exist today probably need to be coordinated into a more formal part of the international architecture.

Let me conclude by saying that the conference brought a wealth of material, food for thought and practical proposals. What we would like is to now put these proposals – in a very humble way, of course – to the various working groups of the G20 presidency, and I will therefore give the floor to Governor Ignazio Visco, who will tell us about the initiatives of the G20 on sustainable finance and how some of these proposals may be helpful for the reflection that the working groups and the G20 will conduct in the near future. Ignazio, thank you very much, and the floor is yours.

The conference messages in light of the G20 Presidency programme

Ignazio Visco

Governor, Bank of Italy

Let me start by thanking the conference organisers – the Bank for International Settlements (BIS), the Banque de France, the International Monetary Fund (IMF) and the Network for Greening the Financial System (NGFS) – for their kind invitation. I also wish to express my heartfelt congratulations to them for having organised this event: the valuable contributions provided by the participants, along with their commitment and support, are powerful allies in the fight against climate change.

This conference confirms that there is now widespread awareness of the importance of the problem: climate change is having an evident effect on all our countries, threatening economic growth, development and financial stability. The changes that are taking place in the environment also threaten our health, as demonstrated by the tragedy of the Covid-19 pandemic, with which we are still struggling: many of the root causes of climate change, such as deforestation and loss of habitat, amplify the risk of new future pandemics by increasing the chance of contact between people and wildlife.

Counteracting these risks and shifting economic development towards a sustainable path requires strong and consistent political determination and the involvement of all human activities. The first step is to transform our energy systems: we need to implement clean and efficient technologies at unprecedented speed and scale. But **no country can tackle this problem alone, as carbon emissions know no border**. Climate change is a particularly dangerous example of a negative externality: pollution is a cost that spills over not only into other markets besides the one in which it originated, but also into other countries, reducing the effectiveness of national policies.

Close international coordination is therefore essential. Achieving net-zero emissions requires, **first of all, the cooperation of all national governments**. We must indeed bear in mind that governments are the key players in this context: they are the only institutions that can levy taxes on carbon emissions, introduce regulations to curb their amount and provide incentives for green investments. Yet, finance can also go a long way in helping and reinforcing this process, channelling resources towards sustainable investments.

The Group of Twenty (G20) is the ideal forum in which global cooperation can take place. G20 country members account for 80 per cent of global greenhouse gas emissions; achieving the “decarbonisation” of their economies would therefore be a giant leap in the fight against climate change.

In the rest of these remarks, I would like to briefly summarise the main activities that we are carrying out in the Finance Track of the G20. In doing so, I will also discuss the main messages that I see stemming from this conference through the lens of the work of the G20. They will be a very useful contribution to the steering of G20 activities.

The G20 initiatives on sustainable finance

The work of the Italian Presidency of the G20 is articulated around three pillars: People, Planet and Prosperity. In line with this vision, counteracting climate change is a key priority. With this perspective, the Finance Track is tackling the issue of how to redirect financial flows to support the transition towards a low-carbon and more sustainable economy and society.

The first step has been to revive the **Sustainable Finance Study Group**, proposing the United States and China, the largest advanced and emerging economies (and the largest greenhouse gas emitters), as co-chairs. We are very grateful for their decision to accept this responsibility. In April, we

agreed to elevate it to a **permanent working group** (ie SFWG), as designing an effective transition towards net zero will remain a priority for the G20 for many years to come.

This Group has made rapid progress and has taken several initiatives to promote sustainable finance, including some supporting biodiversity conservation. These initiatives are in line with the international priorities stemming from the United Nations COP26 on climate change and the COP15 on biodiversity, both to be held this year, and help prioritise these key policy issues. In particular, the Group has proposed a **sustainable finance roadmap** that will be instrumental in future years to address the priorities defined by the G20.

The roadmap covers **four areas**: (i) market development and alignment of financial flows to climate goals; (ii) information on sustainability risks and opportunities; (iii) management of climate and sustainability risks; and (iv) public finance and incentives. The work will be developed by the Group in a transparent way, allowing for flexibility and adaptation as international work and priorities evolve over time.

One week ago, the Group hosted a Sustainable Finance Roundtable, a public event involving the private sector. The event offered an in-depth perspective on the agenda, providing two new insights. First, there is growing interest in improving reporting, including on other sustainability issues such as biodiversity, in line with the findings of recent reports such as the *Dasgupta review* and – if I may add it – Italy's *Fourth report on the state of natural capital*. Risks associated with biodiversity loss are, in fact, closely related to those concerning climate change, and could have similar significant economic and financial implications. Second, special attention should be devoted to setting achievable conditions for small and medium-sized firms regarding the disclosure of climate-related risks, which should consider the principles of proportionality and cost-efficiency.

The Group's deliverables for 2021 are expected to focus on **three main areas**: (i) sustainability disclosure and reporting; (ii) metrics for classifying and verifying green investment; and (iii) alignment of the operations of international financial institutions with the goals of the Paris Agreement.

These and other topics will be discussed during **two special initiatives** of the Italian Presidency, the High-Level Tax Symposium on Tax Policy and Climate Change on 9 July and the Venice Conference on Climate on 11 July.

The **Symposium** will focus on fiscal policy – and, in particular, carbon pricing – in the fight against climate change and will elaborate on the IMF/OECD joint report *Tax policy and climate change*. The report provides **two main messages**: (i) proper pricing of carbon emissions is still a missing piece in the policy mix required to achieve climate neutrality; and (ii) concerns around carbon leakage, competitiveness and free riding may induce countries to resort to Carbon Border Adjustments (CBAs).

Let me elaborate on these messages. The existing explicit and implicit carbon taxes and emissions trading systems align very poorly with net-zero targets. According to the IMF/OECD report, 55 per cent of emissions from energy use across G20 countries remain completely unpriced. The World Bank estimates that most emissions are currently priced at 10 dollars or less per ton of CO₂, with a global average carbon price of only two dollars; the International Renewable Energy Agency, in also considering existing fossil fuel subsidies, comes to the conclusion that the effective price is actually negative. To limit global warming, the report finds that high emitting countries should price carbon at 75 dollars or more per ton by 2030. Other simulations suggest even higher carbon prices, with estimates varying depending on the stringency of the target and the hypotheses on the effectiveness of carbon removal technologies. **There is an urgent need to remove the current distortions in carbon pricing (starting from the phasing-out of fossil fuel subsidies) and to start encompassing unpriced emissions in addition to increasing the price of those that are covered by a pricing mechanism.** To this end, a useful tool would be a regular stocktaking of countries' average carbon prices and of the share of emissions covered in order to facilitate the achievement of a harmonised global level for the carbon price.

CBA's have important potential benefits but also face several operational hurdles, from the difficulty in evaluating the emissions embodied in trade flows to their compatibility with international trade rules and the risk of giving rise to a "green protectionism", which could heighten geopolitical tensions, negatively affecting global trade and investment. **Concerns around carbon leakage, competitiveness and free riding should therefore be addressed in an efficiently coordinated arena:** in particular, a common carbon price floor applied to all emissions is suggested as a reasonable alternative to CBA's.

The **Venice Climate Conference** will connect the dots between public policies and the role of private finance in the transition to net zero, with the aim of also providing a contribution to the upcoming COP26. The work will gravitate around four areas: (i) the role of governments and international institutions in implementing global policies for climate change; (ii) the initiatives of multilateral development banks in mobilising climate finance and providing support for alignment of financial flows with the Paris targets; (iii) the actions of financial regulators for monitoring and mitigating climate risks; and (iv) the role of private finance in increasing its commitments to climate and transition finance.

The Presidency has taken **other initiatives** to enhance the G20's leadership on the mobilisation of private finance. Let me mention three of them: we have asked the IMF to consider climate-related data needs in preparing a new Data Gap Initiative; we have invited the FSB to report on both disclosure and data gaps, focusing on climate-related financial risks; and we have proposed examination of how to scale up digital finance to promote sustainable economic growth.

The demand for more and better data to measure the impact of climate change on the economy and the financial system is strong. **A new international cooperation initiative**, in which G20 countries are responsible for collecting, compiling, reporting and disseminating data while the IMF and other international organisations would provide methodological advice on data harmonisation and on the reporting framework, is being studied.

The **FSB initiatives** will focus on climate-related financial risks by promoting firm-level disclosures, metrics for the assessment of climate-related vulnerabilities, and best practices on regulatory and supervisory tools to identify climate-related risks to financial stability. The FSB is also working with the G20 SFWG to define a roadmap focused on climate-related financial risks in order to accelerate the work already underway and to avoid duplications.

Finally, the G20 Presidency promotes the use of **digital finance** to help market participants in considering sustainability risks. Harnessing big data, artificial intelligence, remote sensing and other similar innovative technologies can help to collect and process a very large number of datasets, increasing transparency and accessibility of information. The recent launch of the **G20 TechSprint 2021** by the Bank of Italy and the BIS Innovation Hub will also be important to this end, by encouraging entrepreneurs and start-uppers to develop solutions for data collection and verification and climate risk assessment as well as connecting sustainable projects and investors. We have received more than 70 high-level applications, a very important result given the complexity of the topics.

Data issues

Let me now dedicate a few minutes to one of the key issues in both this conference and the work of the G20: the question of data availability. Improving the assessment of climate-related financial risks and facilitating their integration into investment strategies requires closing data gaps by enhancing disclosure by firms. **The quality of information on climate-related risks seems to be lower** than that of information on financial risks, such as market and credit risks. This problem is partly due to the wide range of **definitions of sustainability risk** used by financial investors. In the case of credit risk, for example, the common definition used in the market leads to a high correlation of credit scores across rating agencies. In the case of sustainability risk, on the other hand, there are very diverse definitions, spanning from those more concerned with its short-term financial effects to those more attentive to the long-term impact of sustainability. As a consequence, ESG scores show a much lower correlation across score providers.

A common definition of sustainability is a necessary ingredient to improve **corporate disclosure**. Disclosure standards, based mostly on voluntary practices, are highly heterogeneous in quantity and in quality. According to the report “ESG investing: practices, progress and challenges” by the OECD,¹ ESG data cover about 95 per cent of listed firms, in terms of market capitalisation, in the United States and 89 per cent in the European Union. Data availability, however, is limited to large corporations. Smaller firms, which are often less polluting than larger ones, could lose the opportunity to raise capital at lower costs unless they improve their sustainability disclosure. To ease the disclosure burden, smaller firms should resort more intensively to digital innovation, which can provide creative and efficient solutions by leveraging big data and artificial intelligence.

To increase the diffusion of sustainability information, the contribution of **private sector actors** is essential. **Greater attention to the environment is primarily in their own interest**. Today, the fate of firms depends not only on their productivity, but is also closely connected to the societal and environmental welfare of their stakeholders. Indeed, consumers and investors are increasingly more attentive to sustainability issues. The initiative of the International Financial Reporting Standards (IFRS) Foundation to establish the International Sustainability Standards Board is a move in the right direction towards creating a global, verifiable and credible reporting system on sustainability.

However, to ensure that all firms disclose information on sustainability by respecting a set of minimum standards in terms of both reporting and harmonisation, **regulation will play an essential role**. Members of the G20 will have to continue working together over the coming years to agree on basic principles which can make disclosed data comparable across countries, allowing the market to verify alignment of investment with sustainability targets (the so-called “taxonomies”) and preserving the flexibility required to adapt them to region- or country-specific features. In this regard, I fully share Mark Carney’s endorsement of widespread **mandatory reporting** in line with the recommendations of the FSB’s Task Force on Climate-Related Financial Disclosures (TCFD). Greater disclosure would also considerably help central banks to integrate climate risks into their monetary policy operations, as suggested at this conference by Jens Weidmann and many others.

Higher quantity and quality of information on sustainability is also key to ensuring that the market works more effectively. Informational efficiency on sustainability will allow market discipline to function: trustworthy issuers with leading sustainability practices will benefit from more favourable financing conditions, and the laggards will be either penalised or induced to take more credible or ambitious steps towards the transition. The market mechanism could also be **a powerful tool to prevent greenwashing**. As this risk materialises, the reputational cost of unfair behaviour would increase and would help to single out falsely misleading actors and instruments.

The role of supervisory authorities and central banks

A final issue that I would like to touch on concerns the role of supervisory authorities and central banks. The task of supervisory authorities is complicated by the fact that **there is not yet a widely accepted methodology to assess climate-related risks** and verify whether financial firms take these risks into account in their lending practices. The main tool for this purpose is a reliable **scenario analysis**, the only methodology capable of simplifying the high complexity of the uncertainty surrounding climate-related events and policy responses. The standardised climate scenarios prepared by the NGFS are, in my view, very promising in terms of providing a common reference framework for assessing the macro-financial implications of climate change.

While scenario analysis is the key ingredient for performing climate sensitivity analysis of financial vulnerability (commonly referred to as “climate stress tests”), we should be aware of the limitations and

¹ R Boffo and R Patalano, “ESG investing: practices, progress and challenges”, OECD Paris, 2020, www.oecd.org/finance/ESG-Investing-Practices-Progress-and-Challenges.pdf.

potential “oversimplification” related to this tool. It would therefore be advisable to consider the possibility that the impact of climate-related risks is greater than suggested by this analysis, especially if transition and physical risks reinforce each other, as Professor Robert Engle has explained during the conference.

Climate-related risks also affect credit and market risks, making it difficult to measure their true extent. This task is challenging as it requires the combination of data on bank exposures with estimates of the effects of a “disaster” – in other words, a low-probability event with very large negative consequences – in the case of physical risk, and a significant change in climate policy in the case of transition risk.

The complexity of assessing “default probabilities” and “losses given default” makes **cooperation among authorities** especially valuable. The first results of this cooperation are the two NGFS reports,² which analyse the transmission channels of climate change and can then support supervisors and central banks. Further results will emerge from sharing of experiences, as we have done so far in our mutual discussions on sustainable investment strategies. As firm data disclosures and scenario analyses improve, this will allow financial intermediaries to make regular and more widespread use of these tools in climate stress testing and sensitivity analyses, as already emphasised during the conference, and this will obviously then be required by supervisors.

The role of central banks in this area is multifaceted. Central banks could lead the market by example, disclosing their climate-related exposure and the methodologies used to integrate climate risks into investment and risk management practices for their own portfolios, in line with the TCFD recommendations.

The Bank of Italy, in particular, has since 2019 published consistent (ie TCFD-aligned) carbon metrics of its own equity portfolio and included climate risk consideration in several avenues. We have also integrated ESG scores into our **investment strategy**, taking away two main lessons which I would like to share with you. First, from a risk/return perspective, the good performance of ESG investments that we already observed in 2019 has been confirmed in 2020, showing the resilience of our new portfolio to the outbreak of the pandemic (our euro area equity portfolio outperformed the standard, non-ESG benchmark by more than two per cent, with lower volatility). Second, integration strategies such as narrow exclusions or tilting are to be preferred over tout court exclusions or penalising measures, as they make it possible to take advantage of wider diversification and more opportunities from transitioning firms. Overall, our experience provides an example of how financial markets might play an effective role in supporting the low-carbon transition, reinforcing the initiatives that regulators and policymakers are taking.

With regards to **monetary policy**, we must be aware that climate change and the transition towards net zero affect transmission channels, for example by determining the trend growth of key variables. Therefore, **we need to integrate climate and sustainability variables into our macro-financial models**, as rightly stressed in this conference by François Villeroy de Galhau. But how, exactly, to do this is still an open question. With the possible exception of the oil market, we have only a superficial understanding of the energy market and of the way climate change affects the rest of the economy. In this respect, I welcome the announcement given during this conference of the creation of a new joint initiative for a Central Banks’ and Supervisors’ Climate Training Alliance, with the active role of the BIS and the NGFS, for training and developing skills on climate-related scenario modelling.

The role of climate change in monetary policy is currently under consideration within the ECB strategy review. I think that, while we should certainly contribute to assessing and countering climate risks, we should be prudent in the active use of our monetary policy instruments for this purpose, carefully considering the costs and benefits of our actions with reference to the efficacy of the transmission mechanism and the effects on economic activity and carbon emissions. A more climate-oriented purchase

² Network for Greening the Financial System, *Guide for Supervisors: Integrating climate-related and environmental risks into prudential supervision*, May 2020, and *Macroeconomic and financial stability: Implications of climate change*, July 2019.

of assets is currently hampered by the fact that climate-related data and climate-aware instruments are still underdeveloped. In terms of the latter, the outstanding value of green bonds is very limited, at around 3.5 per cent globally. Within the euro area, green bonds represent less than two and seven percent of the eligible instruments for Eurosystem purchase programmes for government and corporate bonds, respectively. In sum, the thinness of the green bond market and the low liquidity of its secondary market would imply that room for monetary policy interventions in this realm is still limited. But there is no question that this room must and will grow over time, and with that, so will the ability of the ECB to incorporate the greening of the economy in pursuing our price stability mandate.

Going forward, **supervisors and central banks need to continue discussing** how tackling climate-related financial stability risks requires policy instruments or approaches that go beyond the existing ones. But while macroprudential and monetary policies may play an important role in the path to net zero, it should be clear that what central banks can do directly for climate change remains limited compared to what governments can obtain and must do.

Conclusion

Let me conclude. A widely mentioned report by the International Energy Agency³ found that in order to limit the rise of the global temperature to 1.5°C – the threshold that, if surpassed, would bring catastrophic consequences for people and the planet – no new oil and gas fields or coal mines should be developed today. Annual investment in clean energy will have to more than triple by 2030, there should be no sales of new internal combustion engine passenger cars by 2035, and the global electricity sector should reach net-zero emissions by 2040.

Though some of these results may sound overly extreme, or even provocative, we cannot hide the fact that the transition to net zero will imply high costs. The global demand for energy, for example, has not reached a plateau, and without a sufficient increase in production, consumer prices will necessarily rise. Returns in highly polluting sectors will worsen as the market for their products shrinks, and some firms will exit the market, though greener firms will enter in their place.

If we want to limit the climate-related risks for our economies, **we cannot postpone our actions.** All the available analyses show that a delayed and disorderly transition will hamper future economic growth, threatening global financial stability with self-reinforcing effects. In contrast, **prompt and clear policies can limit risks and help countries attract the resources needed to finance their low-carbon transition.**

Most studies suggest that the economic impact of the “green transformation” will be positive in the long run. **The short run, however, will see a significant reallocation of labour across sectors and regions.** The transition will be especially tough for **developing economies**, as they face an increasing thirst for energy driven by industrialisation and rising consumption. These difficulties add to those caused by the pandemic crisis, which is already reversing the progress made over the last few years in the fight against extreme poverty and energy poverty.

Therefore, I believe that a lot needs to be done to ensure not only a transition to net zero, but also a just transition. Adequate investment in skills, active labour market policies and modern social protection systems will be crucial to make sure that nobody is left behind. The progressive phasing out of fossil fuel subsidies, which are often regressive in nature, can increase the fiscal space of developing countries and provide them with fresh resources, which can then be directed towards improving energy access for the most vulnerable. The recourse to innovative financial instruments, such as debt-for-nature

³ International Energy Agency, *Net zero by 2050: a roadmap for the global energy sector*, May 2021, www.iea.org/reports/net-zero-by-2050.

swaps, could help reduce the debt of developing economies and raise funds for conservation projects, increasing the capacity for natural carbon dioxide removal.

In moving towards a greener world and a safer planet, we must not repeat the mistakes made when globalisation took place: the impact on the most fragile workers and vulnerable segments of the population should always be accounted for in the design of climate policies. **This will not be forgotten by the G20**, whose finance ministers and central bank governors recently stated that shaping the recovery from the pandemic “provides a unique opportunity to develop forward-looking strategies investing in innovative technologies and promoting just transitions toward more sustainable economies and societies, with particular attention to the most affected segments of the population and in line with the Paris Agreement”.

Panels in parallel sessions

Panel A **Biodiversity: what does its loss imply for our society? How can we better assess and integrate potential risks?**



Panellists Geoffrey Heal
Professor of Economics, Columbia Business School

Richard Mattison
Chief Executive Officer, S&P Global Trucost

Elizabeth Mrema
Executive Secretary, Secretariat of the UN Convention on Biological Diversity

Jim O'Neill
Chair, Chatham House

Dirk Schoenmaker
Professor of Banking and Finance, Rotterdam School of Management, Erasmus University

Torsten Thiele
Visiting Fellow, London School of Economics

Moderator Romain Svartzman, Banque de France

Panel B **How do executives internally lead and manage the paradigm shift about climate change in their institutions?**



Panellists Valérie Baudson
Chief Executive Officer, Amundi

Roberto Campos Neto
Governor, Central Bank of Brazil

Isabelle Kocher
Former Chief Executive Officer, Engie

Axel Weber
Chairman of the Board of Directors, UBS Group AG

Moderator Corrinne Ho, Bank for International Settlements

Panel C **Do we take sufficient account of the redistributive impacts of climate change?**



Panellists François Bourguignon
Emeritus Professor of Economics, Paris School of Economics

Mari Pangestu
Managing Director of Development Policy and Partnerships, World Bank Group

Ann Pettifor
Director, Policy Research in Macroeconomics (PRIME)

Fiona Reynolds
Chief Executive Officer, Principles for Responsible Investment (PRI)

David Wood
Director, Initiative for Responsible Investment (IRI), Hauser Institute for Civil Society, Harvard Kennedy School of Government

Moderator Jeffery Yong, Bank for International Settlements

Panel D **What is the role of governments and IFIs in mitigating risks and coordinating the policy response to climate change?** 

Panellists Maurice Obstfeld
Class of 1958 Professor of Economics, University of California, Berkeley; Senior non-resident fellow,
Peterson Institute for International Economics


 José Antonio Ocampo
Professor, Columbia University School of International and Public Affairs

 Ceyla Pazarbasioglu
Director of the Strategy, Policy, and Review Department, International Monetary Fund

 Adam Posen
President, Peterson Institute for International Economics

 Marc Sadler
Manager, Climate Funds Management unit, World Bank Group

Moderator Patrick Bolton, Columbia University

Panel E **Climate change-related risks data and accounting: how are existing methods being implemented? What are the alternatives to the existing reporting methodologies?** 


Panellists Magnus Billing
Chief Executive Officer, Alecta

 Klaas Knot
President, De Nederlandsche Bank; Vice Chair, Financial Stability Board

 Emilie Mazzacurati
Global Head of Moody's Climate Solutions, Moody's Corporation; founder and CEO, Four Twenty Seven

 Lucrezia Reichlin
Professor of Economics, London Business School

Moderator Joe Perry, IAIS Secretariat

Panel F **What is the true resilience of our financial systems to climate change risks with the buffers we currently have?** 

Panellists Nathalie Aufauvre
Director General for Financial Stability and Operations, Banque de France

 Rostin Behnam
Acting Chairman, Commodity Futures Trading Commission

 Sarah Breen
Executive Director, Bank of England

 Alejandro Díaz de León
Governor, Banco de México

 Glenn Rudebusch
Senior Policy Advisor, Federal Reserve Bank of San Francisco

 Ulrich Volz
Director of the Centre for Sustainable Finance and Reader in Economics, SOAS University of London

Moderator Joseph Noss, FSB Secretariat

Panel G **How should financial stability, regulation and supervision be considered in the context of increasing climate-related risks?**



- Panellists Tobias Adrian
Financial Counsellor and Director of the Monetary and Capital Markets Department, International Monetary Fund
- Michel Aglietta
Professor emeritus of Economics, University of Paris X: Nanterre; Scientific counsellor, CEPII
- Yannis Dafermos
Lecturer in Economics, SOAS University of London
- Arminio Fraga
Founding partner, Gávea Investimentos
- Timo Löyttyniemi
Chief Executive Officer, The State Pension Fund of Finland
- Hélène Rey
Lord Bagri Professor of Economics, London Business School
- Moderator Fernando Restoy, Bank for International Settlements

Panel H **Measuring climate-related risks in macroeconomic and global terms: do we have the right mind set, tools and models?**



- Panellists Robert Litterman
Chairman of the Risk Committee and founding partner, Kepos Capital LP
- Thierry Philipponnat
Head of Research and Advocacy, Finance Watch
- Jean Pisani-Ferry
Tommaso Padoa Schioppa Chair, European University Institute
- Carmen Reinhart
Vice President and Chief Economist, World Bank Group
- Nick Robins
Professor in Practice for Sustainable Finance, Grantham Research Institute, London School of Economics
- Laurence Tubiana
Chief Executive Officer, European Climate Foundation
- Moderator Enrique Alberola, Bank for International Settlements

Panel I **Do we have the right financial and insurance instruments to deal with the impact of climate change?**



- Panellists Bertrand Badré
Managing Director and Founder, Blue like an Orange Sustainable Capital
- Jeffrey Bohn
Senior Advisor, Swiss Re Institute
- Rafael Del Villar Alrich
Chief Advisor to the Governor, Banco de México
- Andreas Dombret
Adjunct Senior Research Scholar, Columbia University SIPA; Global Senior Advisor, Oliver Wyman; former Board Member, Deutsche Bundesbank
- Moderator Ulrike Elsenuber, Bank for International Settlements

Panel J **What are the methods and metrics currently being used to assess climate-related risks in investment decisions?** 

Panellists Remy Briand
Head of ESG, MSCI

 Herman Brill
Incoming CEO, Arabesque Asset Management; former Chief Investment Officer, United Nations
Joint Staff Pension Fund

 Olivier Rousseau
Executive Director, Fonds de Réserve pour les Retraites

Moderator Benoît Mojon, Bank for International Settlements

Panel K **What are the challenges to having “greener cities” – and how to finance them?** 

Panellists Barbara Buchner
Global Managing Director, Climate Policy Initiative


 Thierry Déau
Founder and Chief Executive Officer, Meridiam

 Torsten Ehlers
Senior Economist, Monetary and Economic Department, Bank for International Settlements

 Josué Tanaka
Principal Finance Advisor, C40 Cities; Visiting Professor in Practice, London School of Economics

 Shalini Vajjhala
Chief Executive Officer, re:focus partners

Moderator Anandakumar Jegarasasingam, Bank for International Settlements

Panel L **How is Green R&D doing? How critical is alternative energy financing?** 

Panellists Tim Adams
President and CEO, Institute of International Finance

 Charlie Donovan
Professor of Practice, Imperial College Business School; Executive Director of the Centre for Climate
Finance and Investment

 Suren Erkman
Head of Industrial Ecology Group, Institute for Earth Surface Dynamics (IDYST), University of
Lausanne

 Thierry Fornas
Co-founder and President, EcoAct

 Ian Goldin
Professor of Globalisation and Development, University of Oxford

Moderator Laurent Clerc, Banque de France

Panel M **What are the policies currently considered by central banks, regulators and supervisors – and their challenges – to address climate change?** 

Panellists Pablo Hernández de Cos
Governor, Banco de España; Chair, Basel Committee on Banking Supervision

Thomas Jordan
Chairman of the Governing Board, Swiss National Bank

Sabine Mauderer
Member of the Executive Board, Deutsche Bundesbank

Simone Robbers
Assistant Governor, Reserve Bank of New Zealand

Moderator Morgan Després, Banque de France

Panel N **How can innovations in market-based approaches using consumer carbon tracing influence consumers' lifestyle choices?** 

Panellists Chen Long
Director, Luohan Academy

Brune Poirson
Chief Sustainability Officer, Accor

Massamba Thioye
Manager, Regulatory Framework Implementation subdivision, Mitigation division, UNFCCC secretariat

Moderator Benoît Cœuré, Bank for International Settlements

Panel O **Can we provide concrete green investment opportunities for the current abundance of savings? How to structure implied Temperature/ 1.5-degree Celsius Portfolios?** 

Panellists Jean-François Coppenolle
Group Head of Credit and Sustainability Risk, Aviva


Niklas Ekvall
Chief Executive Officer, AP4

Marcin Kacperczyk
Professor of finance, Imperial College London

Johanna Köb
Head of Responsible Investment, Zurich Insurance Company Ltd

Isabelle Mateos y Lago
Managing Director, Global Head of the Official Institutions Group, BlackRock

Moderator Frédéric Samama, CPR Asset Management

Panel P **How can central banks, supervisors and regulators help to mobilise and coordinate with other actors (Treasuries, private sector) in the fight against climate change?** 

Panellists Lesetja Kganyago
Governor, South African Reserve Bank


Haruhiko Kuroda
Governor, Bank of Japan

Ravi Menon
Managing Director, Monetary Authority of Singapore

Eddie Yue
Chief Executive, Hong Kong Monetary Authority

Nor Shamsiah Yunus
Governor, Bank Negara Malaysia

Moderator Haizhou Huang, China International Capital Corporation

Panel Q **How are new investments adapting to integrate biodiversity loss risks? How are the impacts of these investment measured?** 

Panellists Claudia Kruse
Managing Director Global Responsible Investment & Governance, APG Asset Management

Matthieu Maurin
Chief Executive Officer, Iceberg Data Lab

Alexandre Rambaud
Senior lecturer, AgroParisTech–CIRED; associate researcher at Paris-Dauphine University

Olaf Sleijpen
Executive Director of Monetary Affairs, De Nederlandsche Bank

Moderator Irene Heemskerk, De Nederlandsche Bank

Panel R **How can Development Banks address the massively increased financing needs for green projects? What kind of innovative solutions can be developed?** 

Panellists Erik Berglof
Chief Economist, Asian Infrastructure Investment Bank

Ambroise Fayolle
Vice-President, European Investment Bank

Anshula Kant
Chief Financial Officer and Managing Director, World Bank Group

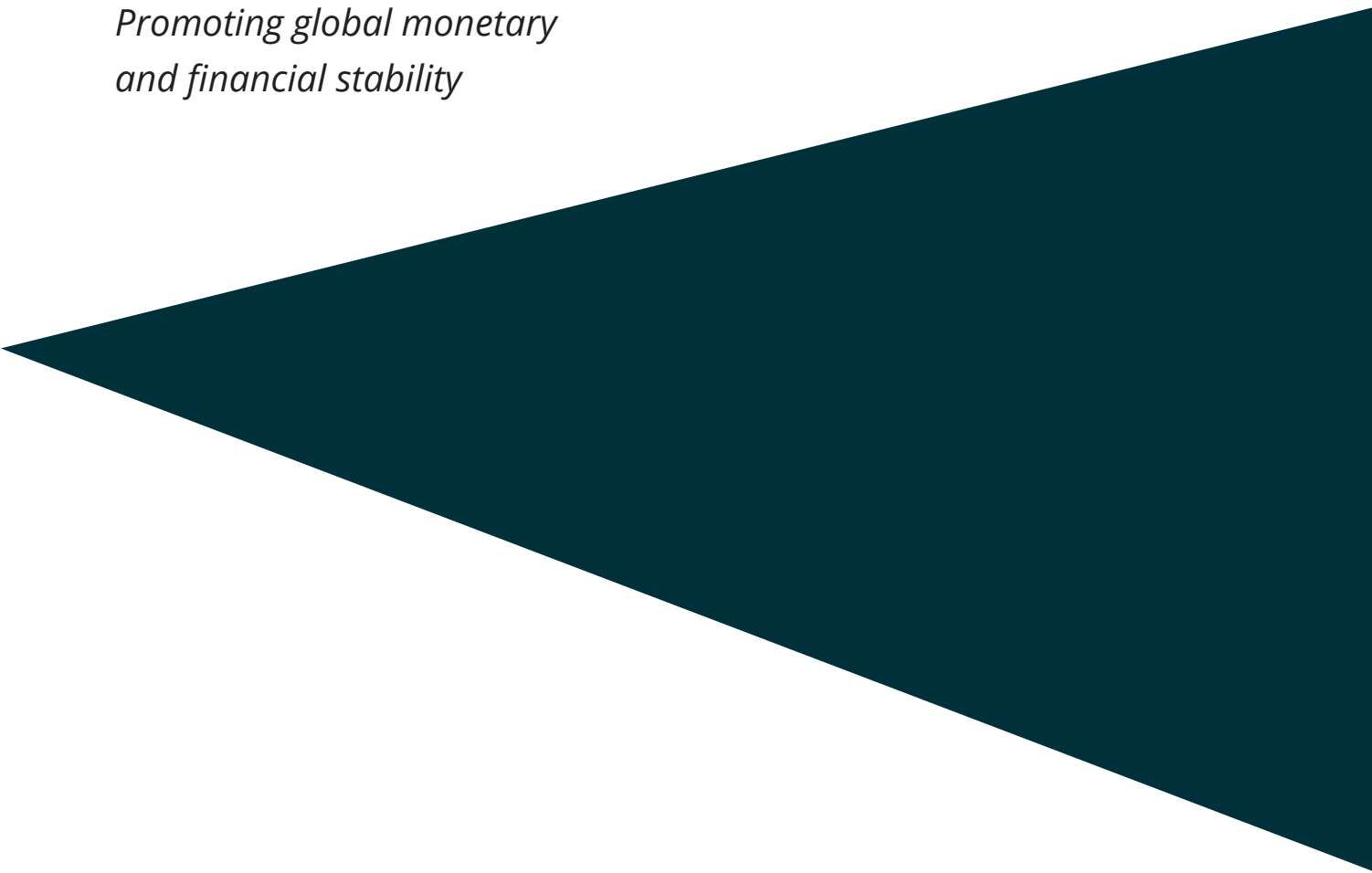
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