



# TRANSITIONING TO A NET ZERO AND **NATURE POSITIVE** ECONOMY

Central banks and financial supervisors  
mandate to tackle twin environmental crisis

TECHNICAL BACKGROUND REPORT

2022



## Technical Background Report

This is a joint report created by WWF Switzerland and WWF Verdensnaturfonden, Denmark  
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### About WWF

WWF is one of the world's largest and most respected independent conservation organizations, with over 5 million supporters and a global network active in more than 100 countries and territories. WWF's mission is to stop the degradation of the Earth's natural environment and to build a future in which humans live in harmony with nature. We do this by conserving the world's biological diversity, ensuring that the use of renewable natural resources is sustainable, and promoting the reduction of pollution and wasteful consumption.

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## FOREWORD WWF SWITZERLAND AND WWF DENMARK

### THOMAS VELLACOTT & BO ØKSNEBJERG

Essentially, all economic activities depend on nature. Life on Earth, referred to as “biodiversity”, is in sharp decline, with extinction rates of animals or plants currently running at tens to hundreds of times historical rates. Regarding climate change the situation looks similarly bleak. Instead of decreasing, global greenhouse gas emissions are still increasing.

Together climate change and biodiversity loss form the twin environmental crisis of our time, as they both reinforce each other. On the bright side, this means that biodiversity recovery will also have a positive impact on climate mitigation and vice versa. On the negative side, climate change will further exacerbate biodiversity loss, while damaged ecosystems will be less resilient to the effects of climate change.

The changes in nature are already having important impacts on humans and the economy. Negative impacts will increase further over the coming years, even if everything were done today to change course. As the financial sector is at the center of the economic system, it is already and will increasingly be impacted by shocks induced by climate change and biodiversity loss. This in turn will have an important influence on price and financial stability, which it is the mission of central banks and financial supervisors to safeguard. Despite increasing attention to climate change and, to a lesser extent, biodiversity loss, they are not doing enough. This needs to change.

This is the reason why WWF decided to publish this report: To call upon central banks and financial supervisors to treat the twin environmental crisis as the existential crisis it represents. Their existing primary mandates require central banks and financial supervisors to manage climate- and biodiversity-related financial risks and impacts. Because today's environmental damage is tomorrow's financial risk. Thus, central banks and financial supervisors need to act now as precautionary agents, with a focus on those economic activities, companies and sectors that are always environmentally harmful. These activities, companies and sectors are associated with the highest risks of destabilizing price and financial stability. We urge the leaders within central banks and financial supervisors to do whatever it takes to combat this twin environmental crisis. Every available instrument of monetary policy and financial regulation/supervision needs to be now analyzed and activated in order for it to contribute effectively to the reduction of greenhouse gas emissions and to safe-guarding and restoring biodiversity.

WWF will monitor and report on annual progress of central banks and financial supervisors, individually and collectively, in addressing the climate and biodiversity crisis. It will offer its support and collaboration to all who are interested in working together in these challenging times. Despite the grim environmental status quo, the future does not need to resemble the past. Similar to Kim Stanley Robinson's book “The Ministry of the Future”, central bankers and financial supervisors have the choice to opt now to envision a different future. One in which they live up to their mandate and recognize that the economy is embedded in and dependent upon nature and price and financial stability depend on functioning ecosystems. Let's do whatever it takes to safeguard the foundations of life on earth.

**Thomas Vellacott**  
CEO WWF Switzerland

**Bo Øksnebjerg**  
CEO WWF Verdensnaturfonden, Denmark

## FOREWORD

## PROF. SERAINA GRÜNEWALD

“It is better to be vaguely right than precisely wrong.” This quote, often attributed to John Maynard Keynes but actually coined by the British logician and philosopher Carveth Reed, reflects nicely the choice financial regulators and central banks see themselves confronted with. Information on how climate change and biodiversity loss will impact economic and financial conditions is naturally limited. Non-linearities and the sheer complexity of the dynamics involved make it impossible to put a price tag on risks associated with climate change and biodiversity loss – and to be “precisely right”. That reality is difficult to accept for financial regulators and central banks. Instead of aiming to be “vaguely right” and to act upon the information that is available, they prefer (for a large part) to remain inactive. Climate science, however, tells us that, with inaction, we will end up “precisely wrong”.

There is a way out of the dilemma, this report argues. It involves a change of mindset – a precautionary approach. Financial regulators and central banks know enough to act now. Waiting for more certainty means that their actions will come too late. And we cannot afford to be late. With every day of inaction, we get closer to reaching climate tipping points and to destroying environmental equilibria irreversibly. Every day, species go extinct, irreversibly. The consequences are catastrophic for life on earth – and they have profound implications for financial and price stability. The recommendations of this report could not be more timely. Financial regulators and central banks would do well to read them carefully.

“CLIMATE SCIENCE, TELLS US THAT, WITH INACTION, WE WILL END UP “PRECISELY WRONG”

**Seraina Grünewald**  
Professor of European and Comparative Financial Law at the Faculty of Law, Radboud University



## FOREWORD

## DR. JASPER BLOM

This timely report rightly underscores the entanglement of ecological and financial stability: biodiversity meltdown and climate change pose risks to financial stability, while business-as-usual in the financial sector poses risks to the ecological stability of the planet. Commendably, the authors do not only propose a solution to tackle this entanglement, in the form of the precautionary approach, but they also provide a detailed implementation plan.

These suggestions to central bankers and supervisors are welcome. Research has demonstrated the relative isolation in which global financial policymaking has too often taken place. Public consultations on policies mainly draw responses from the financial industry, while the entanglement of ecological and financial stability means it is vital that civil society organizations like WWF are involved. A more balanced input in global financial policymaking, especially when this includes actors with nature's interests at heart, can improve outcomes in terms of financial and ecological stability. The knowledge about climate and ecosystem dynamics that is needed to address ecological risks to financial stability does not come natural to financial policymakers. WWF can play an important role in providing this expertise, building on ideas with a long pedigree in environmental policy (like the precautionary approach). However, the provision of expertise should be accompanied by broader public mobilization to demand stringent regulations to mitigate ecological risks in the financial sector. Only then can sufficient pressure be built to overcome vested interests in dirty-business-as-usual. This report outlines the needed policy proposals, so it deserves a wide readership. And then: *mobilization!*

“THE KNOWLEDGE THAT IS NEEDED TO ADDRESS ECOLOGICAL RISKS TO FINANCIAL STABILITY DOES NOT COME NATURAL TO FINANCIAL POLICYMAKERS.

**Dr. Jasper Blom**  
Research Fellow at the Sheffield Political Economy Research Institute, University of Sheffield



## FOREWORD

## PROF. JAKOB VESTERGAARD

It has been estimated that, if global warming is to be limited to 1.5°C, global emissions will need to reach net zero by 2050. A key objective of the Paris Agreement was to make financial flows consistent with a pathway towards low carbon dioxide emissions, but financial flows are not on that path at all. Despite decades of efforts to promote sustainable finance, by the sector itself as well as by governments and international organizations, there has been only modest progress. By some calculations, the financial system is effectively funding temperature increases of over 3°C.

Against this background, central banks are increasingly being called upon to take an active role in greening our financial systems. By deploying monetary policy and financial regulation to create relative incentives that favor ownership of green over brown assets, central banks could influence the investment decisions of financial institutions, which in turn would create incentives towards green technology adoption and the development of lower-carbon business models.

But most central banks and financial supervisory authorities are reluctant to engage in this way. The central banking community favors an engagement with climate considerations that is purely defensive; oriented toward protecting financial systems against the economic impacts of climate change. Promoting green transitions is a task for politicians, not for independent central banks, they say. This is the kind of attitude, however, that will get us exactly nowhere. WWFs report on how central banks and financial supervisory authorities should put 'precaution first' is an excellent contribution to an exceedingly important debate.

“ DESPITE DECADES OF EFFORTS TO PROMOTE SUSTAINABLE FINANCE, THERE HAS BEEN ONLY MODEST PROGRESS.

**Jakob Vestergaard, PhD**

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## FOREWORD

## RENS VAN TILBURG

Almost seven years ago, 196 nations agreed in Paris to limit climate change. It was also in 2015 that Mark Carney, then president of the Bank of England, stated that “climate change will threaten financial resilience.” Since then, stacks of reports have been published about the financial risks of both climate and biodiversity. In 2019, the Network for Greening the Financial System, a network of 114 central banks and financial supervisors, concluded that climate “falls squarely within the mandates of central banks and supervisors.” In March 2022 they recognized the same for biodiversity loss.

Unfortunately, the extent of action on the ground, where financial flows need to shift from harming our climate and nature to preserving it, contrasts strongly with the rhetoric. Despite judging that none of the largest banks meet the European Central Bank's supervisory expectations for disclosures, none has seen its capital requirements increased as a result. On biodiversity, the situation is arguably even worse.

As this report convincingly argues, inaction in the face of such clear and present dangers is a breach of any mandate aimed at financial or price stability. Whereas no one disputes the materiality of climate or biodiversity risks, central banks are still unable to do what it takes to effectively reduce these risks. “The window of opportunity is finite and shrinking”, Mark Carney said seven years ago. This is now more true than ever. Precious time has been wasted. Central bankers and supervisors should start acting.

“ PRECIOUS TIME HAS BEEN WASTED. CENTRAL BANKERS AND SUPERVISORS SHOULD START ACTING.

**Rens van Tilburg**

Director of the Sustainable Finance Lab at Utrecht University



# Executive summary

This report, from WWF Switzerland and WWF Denmark, makes the case that those actors responsible for financial and price stability (central banks, financial regulators, and supervisors) have an existing mandate to proactively encourage the mitigation of climate change and the restoration and recovery of biodiversity. Doing so would recognize that these twin environmental crises pose an imminent threat to their primary mandates of safeguarding price and financial stability. It would acknowledge that they need to do whatever is necessary to immediately reduce greenhouse gas (GHG) emissions and halt biodiversity loss, applying techniques to address recent financial crises to a new source of systemic financial risk, which stems from nature-related impacts and dependencies.

This report thereby contributes in four ways to the academic debate: Firstly, WWF defines the precautionary approach for central banks and financial supervisors facing the twin environmental crises. Secondly, WWF defines a three-phase pathway to 2050 with intermediary goals (2025 and 2030) regarding the reduction of greenhouse gas (GHG) emissions and the recovery and restoration of biodiversity that central banks and financial supervisors need to proactively and effectively encourage. Thirdly, we define 'rules of thumb' (heuristics) on which financial and price stability stewards can base their pre-emptive actions against climate change and biodiversity loss. Lastly, WWF defines a list of filters that permit the identification of 'always environmentally harmful economic activities, companies and sectors' to enable central banks and financial supervisors to modulate today all their monetary policy and financial regulation instruments towards reducing GHG emissions as fast as necessary and stopping biodiversity loss.

The question is, are central banks and financial supervisors playing their part in addressing these twin environmental crises? There is some evidence that they are beginning to act, but their actions are limited and piecemeal – and, crucially, they are so far having little impact in terms of orientating financial systems and the economies they serve on to a more sustainable path. Central banks and financial supervisors have moved from a 'wait and see' approach to one that can be best characterized as 'wait until we have a better understanding'. Most efforts are thus far oriented towards better understanding the twin environmental crises and measuring and assigning quantified risk probability distributions.

The problem with this is twofold. First, climate change and biodiversity loss are characterized by radical uncertainties regarding when and how they materialize, and to what extent they create financial instability. Gathering 'sufficient knowledge' is potentially an impossible task; integrating climate change and biodiversity loss in the risk models currently used by central banks and financial supervisors could take years. Secondly, climate change and biodiversity loss are already materializing. We risk soon reaching tipping points past which there is no possibility of going back to a previous environmental equilibrium.

Central banks and financial supervisors are therefore in a conundrum, as climate change and biodiversity loss challenge the conventional wisdom regarding how they define their mandates or the methods they use to legitimize their actions. They acknowledge that climate change and biodiversity loss lead to epistemological breaks. But there is not yet the recognition that they will and must lead to an ontological break – namely, that central banks and financial supervisors need to contribute to climate change mitigation and biodiversity restoration and recovery actively and effectively. The current situation is instead one of 'organized irresponsibility', where governmental actors, politicians, central banks, and financial supervisors each refer to their limited mandates and responsibilities. The fact is: we all share responsibility.

Central banks and financial supervisors have an important self-interest in addressing climate change and biodiversity loss. The economy depends on nature, and environmental degradation will sooner or later translate into financial and price instability. Central banks and financial supervisors thus need to address the main causes of the twin environmental crises if they are to execute their mandates today and in the future.

### Acknowledging embeddedness by applying a precautionary approach

There is no financial and price stability on a planet Earth that systematically overshoots the planetary boundaries defining the safe limits within which humanity can thrive. We argue that recognizing our embeddedness within nature means that central banks and financial supervisors need to embrace a precautionary approach regarding climate change and biodiversity loss. We define such an approach as a crisis management framework or mindset in situations with incomplete data and radical uncertainties. This approach allows to act before the full materialization of the risks, based on the acknowledgment that non-action regarding climate change and biodiversity loss would be fatal, catastrophic and irreversible.

WWF stipulates that adopting a precautionary approach requires that central banks and financial supervisors integrate financial risks and impacts related to climate change and biodiversity loss into their daily decision-making processes, regarding all the financial regulation and monetary policy instruments they have at hand, and in a manner which is globally coordinated with their peers. They must therefore focus on taking pre-emptive, proactive measures which effectively contribute to reducing global GHG emissions, as well as recovering and restoring biodiversity as fast as required. Their efforts must be focused firstly on the highest emitting sectors, companies, and economic activities which are associated with the highest financial risks and, secondly, they must utilize the array of tools at their disposal to encourage the transition to a low-carbon economy.

In recent years, central banks and financial supervisors have challenged the conventional wisdom of the 'Great Moderation' era, which ran from 1981 to 2007-08, mainly due to the financial crisis at the end of that period, the EU sovereign debt crisis, and in response to COVID-19. The lessons that central banks and financial supervisors learned are to act decisively, cooperatively, and creatively. This experience must now be applied to the climate and biodiversity crises, to proactively manage them under conditions of uncertainty.

### Core principles and a great transformation

This report sets out a series of principles (heuristics) that central banks and financial supervisors should adopt to address the twin environmental crises. These include:

- Acknowledging the reality and the scientific basis of climate change and biodiversity loss, the imminent risk of tipping points, and the threat they pose to human life on Earth.
- No longer distinguishing between climate- and biodiversity-related financial risks and impacts. Today's environmental impacts are tomorrow's financial risks and are thus within the existing mandates of central banks and financial supervisors.
- Acting now with the available data and solutions, rather than waiting for 'sufficient knowledge' and certainty. Inaction or insufficient action are policy choices which result in high risks for financial and price instability.
- Communicating the urgency of the twin crises and setting short-, medium-, and long-term goals for GHG emissions reduction and the recovery and restoration of biodiversity.

- Acting now to utilize all available monetary policy, financial regulation, and supervisory instruments and tools, with particular attention to the economic activities, companies, and sectors that are driving climate change and biodiversity loss, as these pose the greatest financial risk.

### Shifting gears towards acute crisis management

The Great Moderation era was characterized by inflation targeting. In the face of the twin crises, this report suggests a three-phase pathway, to attain net-zero GHG emissions and full biodiversity recovery by 2050, with intermediary goals for 2025, 2030, and 2040. Central banks and financial supervisors would thus embrace a new 'Great Transformation' era, where they would support the transformation to a climate- and biodiversity-friendly global economy.

To achieve these goals, this report presents a series of recommendations, of which the following are most urgent:

- **Treat it like a crisis**, with central banks setting environmental goals, taking a precautionary approach, publishing their own transition plans, and requiring regulated financial institutions to also do so.
- **Focus on contributing to a rapid reduction of GHG emissions and a halt to biodiversity destruction**, by explicitly integrating the financial risks of environmentally harmful sectors, companies, and economic activities, thereby rendering them less financially attractive.
- **Extend the time horizon for the management of environment-related risks to 10 to 30 years**, to not only take into account financial risks to the banks themselves, but also the adverse impacts they cause.
- **Do good housekeeping**. Start integrating climate change and biodiversity loss within the analyses which provide the foundations for their monetary policy, financial regulation, and supervisory activities.
- **Cooperate**, working with the G20, the International Organization of Securities Commissions (IOSCO), the Basel Committee, and the IMF to elevate climate change and biodiversity loss as a key priority.
- **Be forceful stewards**, lobbying governments, rating agencies, and companies in which they invest to take action on climate and biodiversity.
- **Start supporting the green transition**, using their promotional role to encourage and support the transition to a low-carbon, nature-positive economy.

To be clear, central banks and financial supervisors are not the only relevant actors. They must act within policy frameworks created by government. But their existing mandates to protect financial stability require them to proactively and urgently act to shift financial and economic systems towards protecting nature and cutting emissions. The upcoming G20 meetings, the 15th Conference of the Parties (COP 15) to the Convention on Biological Diversity (CBD) and the climate COP in Egypt in December 2022 are good moments to start showcasing results. Failing to do so would be a dereliction of their duty and would put the future wellbeing and prosperity of humanity at risk.

# INTRODUCTION: THERE IS NO ALTERNATIVE

PHOTO: CESAR DAVID MARTINEZ GERENGA

**“THE ECB IS COMMITTED TO DOING EVERYTHING WITHIN ITS MANDATE TO INCORPORATE CLIMATE AND ENVIRONMENTAL CONSIDERATIONS INTO OUR ACTIVITIES.”<sup>1</sup>**

— Frank Elderson, Member of the Executive Board of the European Central Bank (ECB).

The year before Elderson made those comments, ECB President Christine Lagarde had pledged “to explore every avenue available in order to combat climate change.”<sup>2</sup> Both statements echo the willingness and determination of Mario Draghi in 2012. The then-ECB President declared that, “Within our mandate, the ECB is ready to do whatever it takes to preserve the euro.”<sup>3</sup> We argue that central banks, financial regulators, and supervisors need to go a step further and embrace Draghi’s clarity, persistence, and willingness to do everything within their mandates when facing the twin environmental crises of climate change and biodiversity loss. This requires that they begin encouraging proactively and effectively the reduction of GHG emissions and the restoration and recovery of biodiversity. In our view, this is already part of their existing mandates, and they need to act now to do so. In embracing Draghi, Elderson and Lagarde could have stated that, “Within our mandate, the ECB is ready to do whatever it takes to combat climate change and to recover and restore biodiversity.”

There is no alternative to recognizing the threat posed by climate change and biodiversity loss. As climate expert Sir David King puts it, “what we do over the next three to four years, I believe, is going to determine the future of humanity.”<sup>4</sup> Environmental science is clear: climate change and biodiversity loss are already well advanced, and we are in the midst of twin environmental crises that will worsen, even if humanity takes decisive action over the coming years. If we fail to change course, there is a high degree of confidence that planet Earth will soon be populated by fewer humans than at present, and those who survive will experience living conditions worse than those we have known over the previous 40 years. As economic historian Adam Tooze wrote, “if our first reaction to 2020 was disbelief, our watchword in facing the future should be: ‘We ain’t seen nothing yet.’”<sup>5</sup>

There is no alternative for central banks and financial supervisors to acknowledge that their mandates require them to effectively encourage the rapid reduction of GHG emissions and the fast recovery and restoration of biodiversity. The financial sector and the economy are deeply embedded within the natural boundaries of planet Earth. Environmental degradation is impacting price and financial stability. If inflation is allowed to run rampant, standards of living fall. If financial crises emerge, the risks of political polarization, income inequality, social unrest, famine, and conflict increase massively. These issues are linked directly to the impacts of climate change and biodiversity loss. Central banks and financial supervisors therefore have a clear shared responsibility with governments and elected parliaments to encourage and support the financial sector and the wider economy to address climate change and biodiversity loss in the most effective and rapid ways possible. Financial journalist Neil Irwin describes central banks and financial supervisors as “the possessors of extraordinary power over our collective fate.”<sup>6</sup>

Central banks and financial supervisors must adopt a crisis management framework and mindset suited to situations with incomplete data and radical uncertainty, and apply them to the reflection, analysis and integration of climate change and biodiversity loss into their



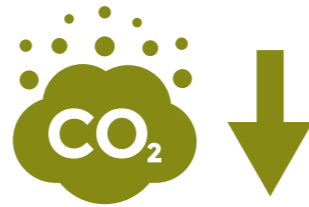
daily decision-making processes. They need to apply a precautionary approach to climate and biodiversity, utilizing every monetary policy, financial regulation, and supervisory instrument at hand, to ensure they are able to execute their mandates to protect financial and price stability today and in the future: there is no financial and price stability in a world where we systematically overshoot the planetary boundaries that define the safe spaces within which humanity can thrive.<sup>7</sup>

Given what we know, we must borrow Margaret Thatcher's famous slogan that "there is no alternative" (which led some to nickname her "Tina"). But while Thatcher used that phrase in support of the market economy, we use it to stress that we have no choice but to reduce GHGs and restore biodiversity as quickly as possible, if we are to avert disaster.

In the first chapter of this report, we analyze the twin environmental crises. Secondly, we examine the status quo regarding the integration of climate and biodiversity aspects into the daily decision-making processes of central banks and financial supervisors. Thirdly, we analyze trends describing how the current status and conventional wisdom are starting to crack, opening up the possibility of a new, precautionary approach to emerge. Fourthly, we define that precautionary approach, indicate how it challenges current conventional wisdom, set out core principles of a precautionary approach regarding the twin environmental crises, and draw parallels from previous active crisis management amid conditions of uncertainty. This allows us to describe what action by central banks and financial supervisors could look like. Sixthly, we define a pathway that sets intermediary environmental goals that central banks and financial supervisors could use to guide them as they implement the menu of potential measures that we discuss in detail. Finally, we conclude and indicate the most pressing measures that we believe could deliver an immediate impact on GHG emissions and the recovery and restoration of biodiversity.

#### Who are central banks and financial supervisors and what are their mandates?

In this report, we address the roles and responsibilities of central banks, financial regulators, and supervisors. These are the institutions to which governments delegate responsibility for ensuring price stability and the integrity and stability of financial systems. These are considered the primary mandates of central banks and financial supervisors. Financial stability is often divided along micro-prudential (financial stability of individual financial actors within a jurisdiction) and macroprudential (the whole financial system within a jurisdiction) lines. In some jurisdictions, central banks, financial regulators, and supervisors have further mandates, such as contributing to full employment, encouraging economic growth, or supporting sustainable development. Some countries have one central bank retaining all responsibilities, whereas in others there are also financial supervisors that have certain duties regarding financial regulation, or these may reside with the finance ministry. Overall, this report focuses on all delegated authorities in charge of delivering price and financial stability. We consider these bodies to be 'stewards' of financial and price stability. This concept clarifies that these delegated authorities do not operate from a position of total independence and neutrality. Due to the far-reaching powers and influence of these institutions, they have a broader accountability to the general public and also have a responsibility to acknowledge their disproportionate leverage on society and the economy.<sup>8</sup>



THE LATEST IPCC REPORT (2022) IS CLEAR: "THE TIME FOR ACTION IS NOW. WE CAN HALVE EMISSIONS BY 2030"

# AN AGE OF TURBULENCE

## THE TWIN ENVIRONMENTAL CRISES



In 1972, exactly 50 years ago, a team of scientists at the Massachusetts Institute of Technology (MIT) led by Dennis and Donella Meadows published *Limits to Growth*.<sup>9</sup> The book set out a number of computer-derived scenarios showing how exponential growth would rapidly lead to the human race exhausting the availability of non-renewable natural resources. Failure to alter these growth trends would risk pushing the system towards collapse. To avoid social, financial, and political disaster, and uncontrolled reaction and chaos, the scientists argued that humanity should instead opt for a “well-managed peak and decline” of over-consumption and called for “forward-looking policy” to escape this overshoot trap. Fifty years later, the predictions made within *The Limits to Growth* ring truer than ever. What the MIT research team postulated in 1972, based on limited computing power, has been widely researched and cross-checked.

The call to action has not been heard. The Intergovernmental Panel on Climate Change (IPCC) is clear: current climate change has caused warming of about 1.1°C above pre-industrial levels (that is, levels before 1750); many risks related to climate change are greater than previously thought and some are happening at lower levels of global warming than anticipated; current adaptation levels are insufficient; and some responses to climate change are doing more harm than good.<sup>10</sup> Overall, we are not prepared for more global warming and even 1.5°C warming is no paradise, but rather a critical threshold for many ecosystems. What has happened over the 50 years since 1972?

Since the 1970s, the scientific foundations of climate change and biodiversity loss have been studied extensively, and awareness regarding the necessity of collective action has increased significantly. For example, the risk reports produced by the World Economic Forum (WEF) each year show a similar picture: many of the high-impact, high-probability risks of which these reports warn are related to environmental degradation.<sup>11</sup> However, despite increasing awareness about the human impact on

climate and biodiversity loss, environmental degradation has increased rather than decreased.

**A looming climate emergency**

Since the 1860s, when John Tyndall first discovered the greenhouse effect, and suggested that slight changes in atmospheric composition could bring variations in climate, a great deal of scientific research on climate change has been conducted. Over the past 100 years, carbon dioxide (CO<sub>2</sub>) emissions have been increasing yearly in both absolute and relative terms. This is the problem of stocks and flows – also referred as the ‘bathtub problem’. Flows of CO<sub>2</sub> into the atmosphere have increased annually, driven mainly driven by humanity’s dependence on fossil fuels (for heating, power generation, and transport), land use change and agriculture. These emissions are generated at a rate that exceeds the ability of natural sinks, primarily the oceans and plant life, to absorb them, leading to gradual increases in the stock of carbon emissions in the atmosphere, expressed as concentrations of CO<sub>2</sub>.

# 1.1°C

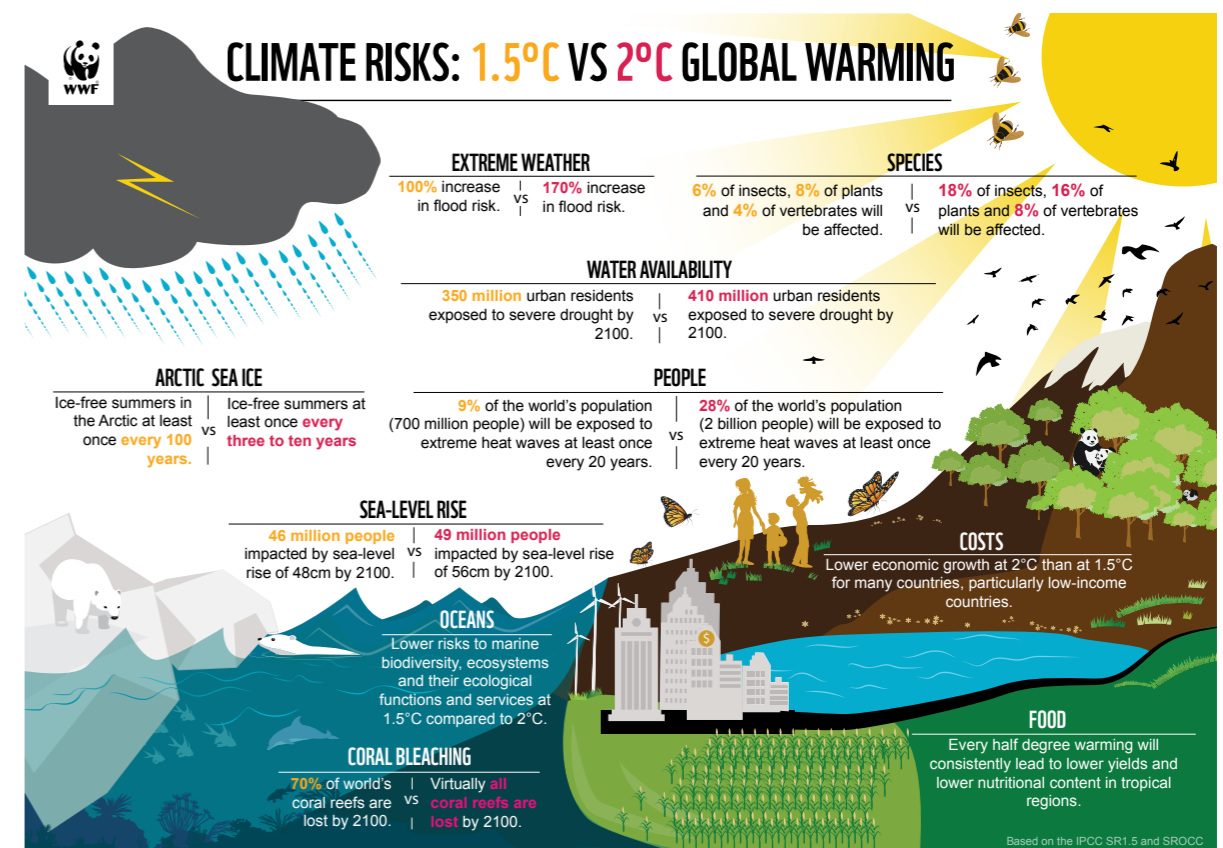
CLIMATE CHANGE HAS CAUSED WARMING OF ABOUT 1.1°C ABOVE PRE-INDUSTRIAL LEVELS.

For the last million years, these concentrations ranged from 172 to 300 parts per million (ppm). In 1912, the concentration exceeded 300 ppm for the first time. In 1988, it stood at 350 ppm. At the end of January 2022, we have reached around 418 ppm. A level of 430 ppm is associated with warming of 1.5°C above pre-industrial levels. Reaching 450 ppm is associated with a warming of 2°C. The scientific consensus agrees that global warming beyond 2°C significantly threatens humanity’s living conditions. Since the IPCC’s report in 2018 on the impacts of 1.5°C of warming,<sup>12</sup> the scientific consensus has shifted, suggesting with a high degree of confidence that the living conditions we currently enjoy could only be safeguarded if global warming remains below 1.5°C. The IPCC noted that this is due to the importance of ‘tipping points’, like thawing permafrost, ice sheet disintegration, or changes in atmospheric circulation, which could be triggered if global warming exceeds 1.5°C. Once these tipping points are passed, the risks grow of runaway climate change and the death and suffering of many millions of people.

(Figure 1 illustrates the differences between global warming of 2°C and 1.5°C.)

The logic of stocks and flows of CO<sub>2</sub> leads us to the concept of the ‘carbon budget’ – the volume of GHGs that humanity can produce before reaching CO<sub>2</sub> concentrations that will lead to certain levels of warming. Given that humanity is currently emitting about 50 billion metric tons of CO<sub>2</sub> equivalent each year, concentrations of 430 ppm will be reached within seven years – by 2028 – and 450 ppm in 25 years.<sup>13</sup> To stay below the 1.5°C threshold, global GHG emissions need to fall by half by 2030 and reach net zero by 2050.<sup>14</sup> This means that, starting from now, GHG emissions need to fall by around 7% annually – greater than the roughly 5% drop caused by the COVID pandemic.<sup>15</sup> Such a rapid decline contrasts with the nationally determined contributions (NDCs) submitted by most countries as part of the Paris Agreement, which would put the world on course for global warming of at least 2.4°C.<sup>16</sup> The IPCC is therefore clear: “Without immediate and deep emissions reductions

FIGURE 1: Difference between 1.5° and 2°C global warming. Source: WWF



across all sectors, limiting global warming to 1.5°C is beyond reach.<sup>17</sup> The IPCC has repeatedly and urgently warned of the dangers of exceeding 1.5°C; most countries have set targets to attain net-zero emissions by 2050, which would most certainly result in warming above 2°C. The largest countries in the world, China and India, aim to be net zero by 2060 and 2070, respectively. To compensate for these, the rest of the world would need to reach net zero much sooner than 2050, by 2040 or even 2030.

**Nature in crisis**

The other aspect of atmospheric concentrations of CO<sub>2</sub> is the outflow. The stock of CO<sub>2</sub> emissions could be reduced by using nature's capacity to store CO<sub>2</sub> in natural sinks. However, many of these

carbon sinks are under enormous pressure from the second environmental crisis that is underway, and which is even more severe than the climate emergency: the crisis of biodiversity loss, also referred to as the Sixth Mass Extinction. This was acknowledged in the first IPCC assessment, in 1990: "Ecosystems affect climate, and will be affected by a changing climate and by increasing carbon dioxide concentrations. Rapid changes in climate will change the composition of ecosystems; some species will benefit while others will be unable to migrate or adapt fast enough and may become extinct."<sup>18</sup>

Biodiversity encompasses all life on earth, describing the variability among living organisms, the ecosystems in which they live, and the diversity within species, between species and of ecosystems.<sup>19</sup>

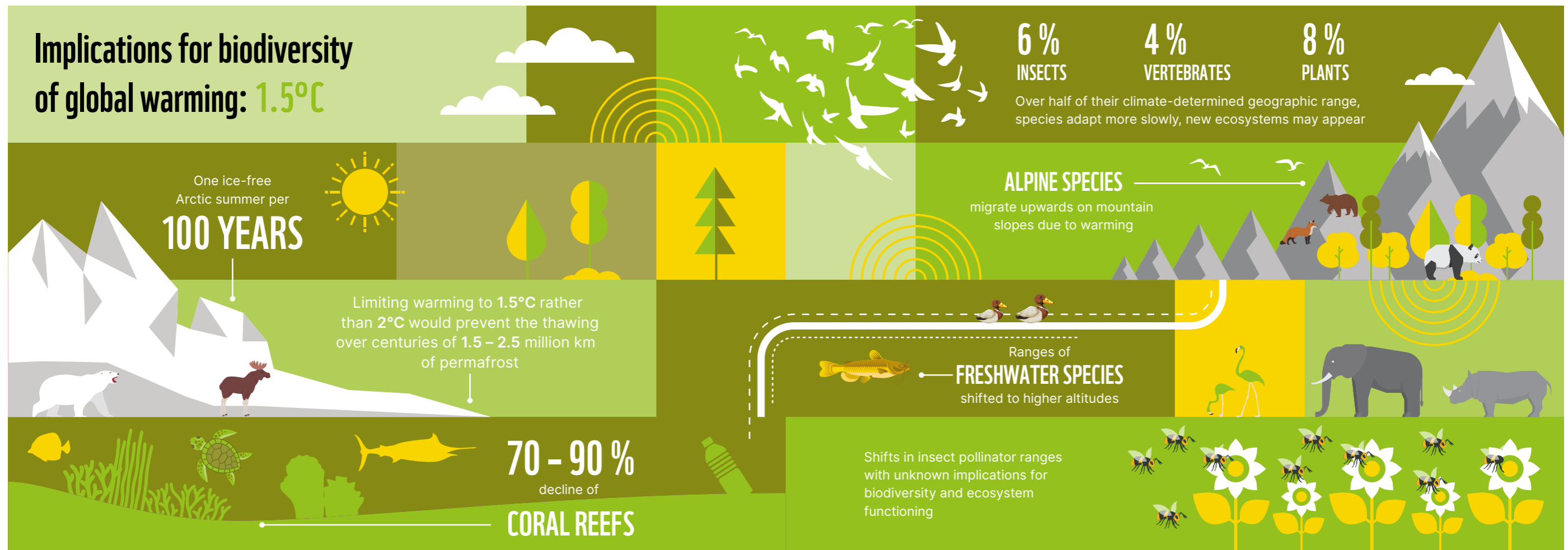
Biodiversity is fundamental to life on earth, notes climate scientist Johan R ockstr om: "Without biodiversity, no ecosystems. No ecosystems, no biomes. No biomes, no living regulator of all the cycles of carbon, nitrogen, oxygen, carbon dioxide, and water."<sup>20</sup>

There are more than 10 million different species on Earth, of which humans use around 40,000. All humans depend on biodiversity, for food, fiber, medicine, etc. But this biodiversity is under threat. Between 1970 and 2012, the population sizes of mammals, birds, fish, amphibians, and reptiles have fallen by an average of 68%, according to WWF's Living Planet Index.<sup>21</sup> Much biodiversity loss is driven by our food systems, which are the main contributors to deforestation, water over-use and soil degradation: "Most agricultural land (82%)

is used to produce animal food directly through grazing or indirectly through the cultivation of feedstocks such as soy, while 10% is used to grow crops for direct human consumption. The sheer scale of land use makes agriculture the largest cause of deforestation and loss of precious habitats such as wetlands. It is also the largest user, and polluter, of fresh water, linked to 92% of the global water footprint."<sup>22</sup> The Intergovernmental Science-Policy Panel on Biodiversity and Ecosystem Services (IPBES) identifies the five main direct drivers of biodiversity loss to be land-use change, climate change, pollution, natural resource use and exploitation, and invasive species.<sup>23</sup>

The Convention on Biological Diversity (CBD) is the biodiversity equivalent to the UN Framework Convention on Climate Change (UNFCCC), which spawned the 2015

FIGURE 2: Interaction between biodiversity loss and climate change. Source: WWF, published in PwC/WWF report "Nature is too big to fail" (2020)



Paris Agreement on Climate Change. At the first part of the 15th Conference of the Parties (COP 15) to the CBD in 2021 (with the second part to be held in Kunming in 2022), governments adopted the Kunming Declaration, declaring that they “committed to develop, adopt and implement an effective post-2020 global biodiversity framework that would put biodiversity on a path to recovery by 2030 at the latest, towards the full realization of the 2050 Vision of ‘Living in Harmony with Nature’”.<sup>24</sup> The open-ended Working Group on the post-2020 Global Biodiversity Framework stipulates three goals: “Zero [net] loss of nature from 2020, [net] positive by 2030, and full recovery by 2050 – for the benefit of all people and life on Earth.”<sup>25</sup>

In contrast with climate change, there is currently no commonly agreed quantitative target that defines the boundary of total ‘acceptable’ biodiversity loss. But this does not mean that there are not any targets that could be used. The Kunming Declaration states that, by 2025, the world should achieve no further net loss of nature (meaning that no more biodiversity is lost), and that, by 2030, the world should have more nature than there was in 2020 (becoming ‘nature positive’). In addition to these objectives, some financial institutions use Means Species Abundance (MSA)<sup>26</sup> or Potentially Disappeared Fraction of species (PDF/m2/year)<sup>27</sup> as indicators of biodiversity intactness. An MSA of 72% can be considered the lower boundary of a ‘safe operating space’ for biodiversity.<sup>28</sup> Currently, we are at around 62% MSA, with no bending of the curve in sight. It is clear that measuring biodiversity loss is a complex issue. But this does not mean that there is no scientific consensus on its main underlying drivers, and it is clear which economic sectors are most responsible for its destruction.<sup>29</sup>

**The links between biodiversity and climate**

To further complicate the picture, biodiversity loss is a key driver of climate change, as noted by the IPCC and the

Intergovernmental Science–Policy Platform on Biodiversity and Ecosystem Services (IPBES),<sup>30</sup> creating a set of reinforcing negative feedback loops (see Figure 2). Conversely, restoring biodiversity helps to mitigate climate change. Forests, grasslands, wetlands, and seagrass meadows all sequester CO<sub>2</sub> from the atmosphere and thus contribute to reducing the atmospheric stock of GHGs. UN General Secretary Antonio Guterres quoted research finding that healthy ecosystems can provide up to 37% of the mitigation needed to limit the global temperature rise.<sup>31</sup> However, ongoing massive deforestation and degradation of land is instead contributing to increased CO<sub>2</sub> concentrations, as natural systems are less able to capture carbon. The conversion or destruction of eco-systems also threatens animals, water quality, soil quality, etc. The Earth’s soils host at least a quarter of the world’s biodiversity and contain twice as much carbon as the entire atmosphere. More than half of agricultural land is degraded due to erosion, compaction, chemical pollution, and loss of nutrients.<sup>32</sup>

We are in a dire situation. The current rate of environmental degradation risks accelerating environmental collapse, which could end disastrously for humanity. It is also clear that biodiversity loss, climate change and ocean acidification are all related, and that environmental disasters are coming faster than anticipated. The particularity is that the changes in the environment are non-linear, endogenous and, once they pass tipping points, irreversible.

Without action on the dual crises of nature and climate, efforts to address the whole gamut of social and environmental challenges we face become at best extremely difficult, and at worst impossible. Achieving the 17 Sustainable Development Goals, which aim to tackle issues such as poverty, hunger, poor health, educational access, and inequality, as well as environmental issues such as clean energy and clean water, depends upon a stable climate and healthy nature. In addition, the economic and financial risks from inaction are potentially huge. Swiss Re estimates that the world

**43%**

**TO STAY BELOW THE 1.5°C THRESHOLD, GLOBAL EMISSIONS NEED TO FALL BY ABOUT 43% BY 2030 AND REACHING NET ZERO BY 2050.**

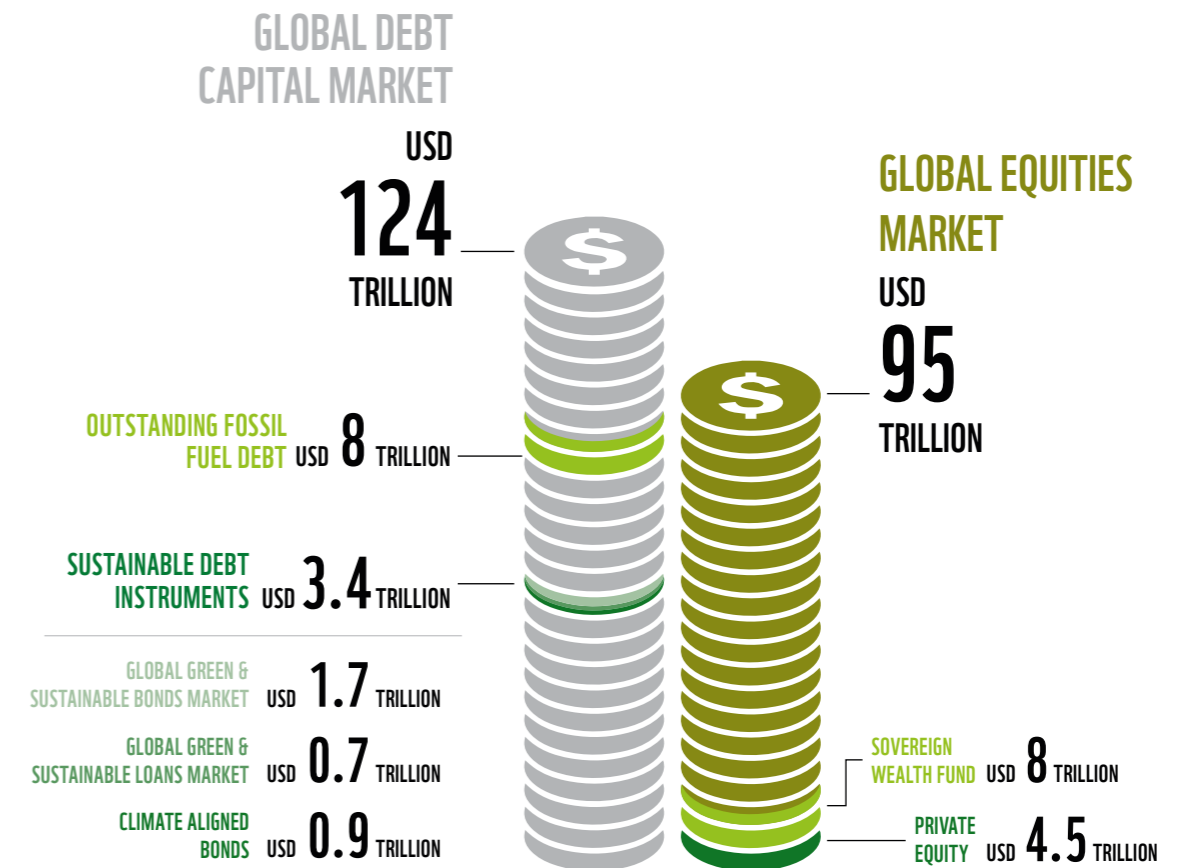
economy stands to lose up to 18% of GDP by 2050 if no action is taken on climate change.<sup>33</sup> One-fifth of countries worldwide are at risk from ecosystem collapse, the insurance giant warns, noting that 55% of global GDP depends on the services provided by ecosystems and biodiversity.<sup>34</sup> We have a very complex, and very large, problem at hand. But, as indicated by the IPCC, “The time for action is now. We can halve emissions by 2030.”<sup>35</sup>

**Why money matters**

Our economic system is the main cause of biodiversity decline and climate change. At the core of all economic systems sits the financial sector. Banks, insurance

companies, pension funds, asset managers, etc. provide the capital that enables the economy to function. These financial actors deploy that capital according to the rules of the game, which are set by central banks, financial supervisors, and financial regulators. Not only are central banks and financial supervisors thus challenged by climate change and biodiversity loss, as they have an influence on financial and price stability, but their decisions also tend to influence where banks allocate money, or insurance companies provide underwriting products. They shape the face of the economy. The Sustainable Finance Lab at Utrecht University looked at the potential impact that central banks could have if they applied instruments within their control – capital requirements, collateral frameworks,

FIGURE 3: **Size of global capital markets**  
Source: WWF (2021) “Can debt capital markets save the planet?”



Data compiled by WWF. According to the International Institute for Finance’s Global Debt Monitor (February 2021), total debt outstanding at the end of 2020 was US\$281 trillion. According to the SIFMA 2021 Capital Markets Fact Book (July 2021) outstanding bonds globally in 2020 were worth US\$123.5 trillion. According to McKinsey’s Global Private Markets Review 2021, private equity amounts to US\$858 billion at the end of 2020. Data includes both government and private sector assets.

asset purchase programs, and refinancing operations – to lowering the cost of capital for climate-friendly investments. Such policies, they found, could substantially accelerate the net-zero transition, delivering 5-12% of the emission reductions needed under an ambitious climate action scenario.<sup>36</sup>

Some numbers provide context of the scale of the economic task ahead, and of the feasibility of fulfilling that task. To decarbonize the energy system, the International Energy Agency (IEA) estimates that annual clean energy investment worldwide needs to reach US\$4 trillion by 2030, nearly four times the US\$750 billion invested in 2021.<sup>37</sup> Furthermore, the IEA states that all new investments in oil, gas, and coal would need to stop right away, if we are to reach net-zero emissions by 2050. Regarding biodiversity, reversing the current loss would cost at least US\$722-967 billion annually until 2030.<sup>38</sup>

These are large figures, but they are not impossibly large. Jointly combatting climate change and biodiversity loss would cost about US\$3.5 trillion per year by 2025 (in 2022 dollars) and between US\$5 trillion and US\$7 trillion by 2030. Dividing US\$5 trillion by the current 7.8 billion population of the Earth amounts to about US\$642 per capita per year. This compares with annual per capita spending on health in 2017 of US\$1,056, or US\$9,606 for each Swiss citizen, or US\$10,103 for every American.<sup>39</sup> The costs for ensuring an environment that allows humanity to have a decent life on Earth after 2030 are low.

These costs become even more manageable when they are compared with the size of the world's capital markets (see Figure 3). Compared to the US\$124 trillion global debt capital markets and the US\$95 trillion value of the world's equities markets, or the US\$8 trillion in outstanding debt owed by the fossil fuel sector,<sup>40</sup> the costs for combatting climate change and biodiversity loss are

affordable. This is especially so when it is borne in mind that these are not solely costs but include investments that will create jobs, build infrastructure that will generate returns and, ultimately, will ensure a livable future. As the IPCC has stated, the “global economic benefit from climate action is likely to exceed the cost of mitigation.”<sup>41</sup>

The money is there. “Anything we can actually do, we can afford,” argued John Maynard Keynes, in a different context.<sup>42</sup> The herculean task of mitigating climate change and restoring and recovering biodiversity loss is a question of political will and not technical feasibility.<sup>43</sup> It is a question of repurposing the economic system, which is the main cause of environmental destruction. One means of doing so is reforming the financial sector, which is at the heart of the economic system and which provides the financial means for it to function. “Where banks decide to allocate credit has considerable implications on the direction of economic development and growth,” say Kedward et al.<sup>44</sup> Currently, they argue, their lending and investments mean that banks are “facilitating, and potentially exacerbating ... systemic risks” from biodiversity loss. When considering the significant positive economic outcomes from addressing these risks, which such a transformation of the economic system would do, the large sums cannot be considered costs but rather investments with a high return.

Central banks and financial supervisors have enormous leverage over the financial sector which they could apply to addressing these environmental challenges. They have the instruments at hand to contribute to a rapid reduction in GHG emissions and the recovery and restoration of biodiversity. They should have the will to integrate climate change and biodiversity loss within all their daily decisions. But are they doing so?

# ARE CENTRAL BANKS AND FINANCIAL SUPERVISORS PLAYING THEIR PART?

**TODAY'S NEGATIVE ENVIRONMENTAL IMPACTS ARE TOMORROW'S FINANCIAL RISKS AND INACTION ON CLIMATE CHANGE AND BIODIVERSITY LOSS IS NOT NEUTRAL BUT AGGRAVATING THE SITUATION.**

**There is no single moment that marks the point when central banks and financial supervisors began integrating environmental issues. Since the seminal speech of former Bank of England Governor Mark Carney “Tragedy of the Horizon”<sup>45</sup> in September 2015, the learning curve has been very steep. However, some of the first moves to integrate environmental aspects within central bank mandates can be found in the BRICS countries<sup>46</sup> and other emerging economies.<sup>47</sup> In 2004, Brazil’s central bank published Resolution 4.327, mandating all banks to develop environmental and social policies. In 2012, the China Banking Regulatory Commission introduced its Green Credit Guidelines, which advises banks to include environmental and social considerations in credit decisions.<sup>48</sup> A sign that the tide was also changing in Europe came in the 2016 report from the European Systemic Risk Board, *Too late, too sudden: Transition to a low-carbon economy and systemic risk*.<sup>49</sup>**

The Sustainable Financial Regulation and Central Bank Activities (SUSREG) assessment by WWF<sup>50</sup> and Positive Money’s Green Central Banking Scorecard<sup>51</sup> confirm that there has been considerable progress since these initial steps. These reports are the first systematic and global assessments of how central banks and financial supervisors account for and manage climate change and biodiversity loss within their mandates, indicating the increasing number of central banks and financial supervisors that are taking concrete steps to create a more sustainable financial system. Regarding price stability, a number of good practices have emerged. The Bank of England has said it intends to green its corporate bond purchase scheme to support an orderly economy-wide transition to net zero.<sup>52</sup> The People’s Bank of China announced in June 2018 changes to its medium-term lending facility collateral framework,<sup>53</sup> to facilitate green investments.<sup>54</sup> And, in 2021, the Bank of Japan introduced new fund provisioning measures (refinancing lines), through which it provides funds to financial institutions for investments or loans to address climate change issues.<sup>55</sup> In 2022, the link between inflation and climate change also became increasingly discussed. Of particular interest is the speech by Isabel Schnabel,

a member of the Executive Board of the ECB, distinguishing between climateflation, fossilflation and greenflation.<sup>56</sup>

A growing number of instruments are also being deployed to address financial stability. One of the more widely used tools is the climate stress-test. The European Central Bank (ECB) undertook an economy-wide climate stress-test in 2021, assessing over four million companies and 1,600 banks.<sup>57</sup> Under Spain’s Climate and Energy Transition Law, banks under the supervision of the ECB and the Bank of Spain will be required to publish from 2023 specific decarbonization targets to align their lending and investment portfolios with the Paris Agreement.<sup>58</sup> The ECB has undergone a strategic review prioritizing climate change, publishing its supervisory expectations, following in the foot-steps of the Bank of England.<sup>59</sup> And, in 2020, the Monetary Authority of Singapore published its *Environmental Risk Management Guidelines for Banks*.<sup>60</sup>

Regarding biodiversity, the Dutch central bank, De Nederlandsche Bank (DNB), has been leading the way in exploring the interactions between the financial system and nature-related risks. Its ‘biodiversity stress-test’ found that an average of 36% of

# 5-12%

**THE SUSTAINABLE FINANCE LAB OF THE UTRECHT UNIVERSITY CONCLUDED THAT ALONE FOUR CENTRAL BANKS POLICIES SUPPORTING THE ECOLOGICAL TRANSFORMATION COULD INDUCE A GLOBAL REDUCTION OF GHG EMISSIONS OF 5-12%.**

Dutch financial institution portfolios were highly or very highly dependent upon at least one ecosystem service.<sup>61</sup> The DNB also estimated that the biodiversity footprint of Dutch financial institutions represents the loss of over 58,000 km<sup>2</sup> of pristine nature, an area 1.7 times larger than the Netherlands. Such a biodiversity analysis has also now been undertaken by the Banque de France.<sup>62</sup>

This increased momentum has been mainly driven by the Network for Greening the Financial System (NGFS), a voluntary grouping of central banks and financial supervisors formed in 2017. It was created by eight central banks and supervisors with the aim of “strengthening the global response required to meet the goals of the Paris agreement and to enhance the role of the financial system to manage risks and to mobilize capital for green and low-carbon investments.”<sup>63</sup> It has grown rapidly: it currently has over 100 members. Over its short lifetime, it has published a variety of best-practice reports to offer guidance and it runs a number of working groups to contribute to the development of environmental and climate risk management in the financial sector. In its *Call for Action* report, published in 2019, the NGFS formally acknowledges that combatting climate change is part of the mandate of central banks and financial supervisors.<sup>64</sup> In March 2022, it published a statement affirming that this mandate also extends to biodiversity loss.<sup>65</sup> During COP26, it published its ‘Glasgow Declaration’, stating that it intends to transform itself from a ‘Club of the Willing’ to a ‘Club of the Committed’.<sup>66</sup> “In light of the urgency and seriousness of climate change and environmental issues, we will expand and strengthen our collective efforts to improve the resilience of the financial system to climate-related and environmental risks, and encourage the scaling up of the financing flows needed to support the transition towards a sustainable economy,” the declaration said.

### Some progress, but not enough

The assessments by WWF and Positive

Money examine whether these words from central banks translate into action. They come to a clear conclusion: faced with the looming climate and biodiversity crises, central banks and financial supervisors are not doing enough to mitigate and manage the risks involved. First, barely a third of the 38 central banks and financial supervisors assessed by WWF integrate climate and biodiversity aspects into their financial regulation and supervision, and require that the financial actors they oversee strengthen their environmental risk management practices. Just 22% integrate climate or biodiversity aspects in key monetary policy measures, such as asset purchases, collateral frameworks or refinancing programs. Secondly, even if some central banks and financial supervisors are integrating environmental aspects within some of their activities regarding financial and/or price stability, the measures are often implemented weakly, and are usually voluntary in character for the financial institutions regulated in a specific jurisdiction. Thirdly, no financial and price stability steward utilizes all instruments and measures at their disposal (using “every avenue available”, to repeat a term used by Christine Lagarde<sup>67</sup>) to adequately mitigate the risks stemming from climate change and biodiversity loss. Lastly, most measures taken by central banks and financial supervisors focus on climate, and only a handful of examples can be found where biodiversity has been integrated. This is particularly worrying, given that the NGFS has acknowledged that “the potential impacts of physical and transition risks related to biodiversity loss pose threats to financial stability, meaning that it falls within the mandates of central banks and financial supervisors to better understand and assess such risks.”<sup>68</sup>

It is widely recognized that implementation is running behind expectations and is failing to keep pace with the urgency of the climate and biodiversity crises. ECB board member Elderson acknowledged as much in November 2021: “The gloomier side of things, though, is that the banks themselves deem 90% of their practices to be only

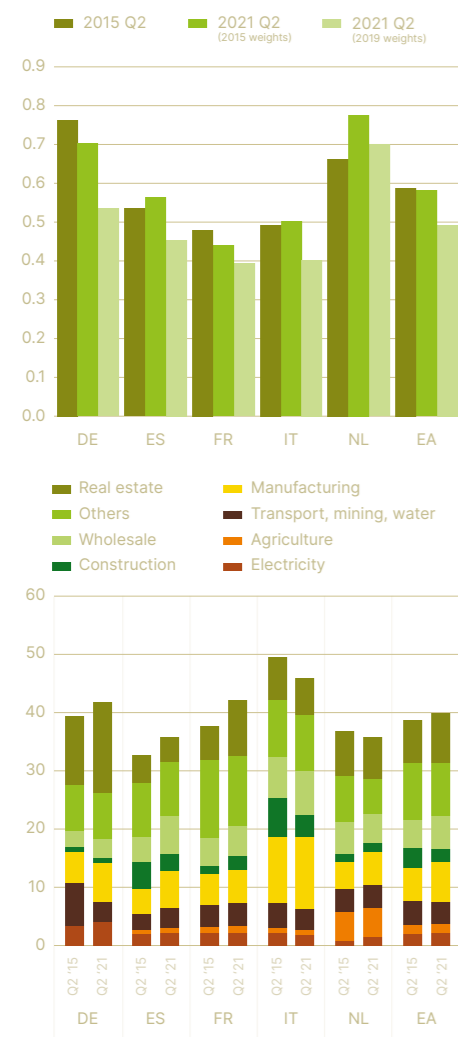


**UNTIL GLOBAL GHG EMISSIONS BEGIN TO FALL AND BIODIVERSITY DESTRUCTION IS HALTED AND REVERSED, IT CAN BE ASSUMED THAT THE FINANCIAL SECTOR IS NOT ALIGNING ITS FINANCIAL FLOWS WITH THE ENVIRONMENTAL OBJECTIVES, AND FINANCIAL RISKS ARE INCREASING.**

partially or not at all compliant with the ECB's supervisory expectations. (...) It is time for banks to start using their toolbox for short- and medium-term planning to mitigate the long-term impact of climate change on their strategies.<sup>769</sup>

The important question is whether the investment, lending, and underwriting products offered by financial institutions effectively account for climate change and biodiversity loss and thereby reduce the negative environmental impacts associated with our current modes of production.

FIGURE 6: Average emission of banks' exposure and exposures to different sectors of the economy  
Source: ECB Climate Stress-Test 2021



Data from the Bank for International Settlements (BIS) shows that ESG and SRI funds have grown massively over the last 10 years, as one of the fastest growing market segments.<sup>70</sup> The Global Sustainable Investment Alliance noted that, as of the end of 2019, approximately 36% of all professionally managed funds, worth some US\$35 trillion, were managed using some kind of sustainable investment strategy.<sup>71</sup>

However, despite this impressive growth, there is no indication that those assets are actually reducing climate or biodiversity risk. In its 2021 stress-test, the ECB showed that banks' average emissions and exposures to various sectors of the economy had not significantly changed since the Paris Agreement was signed in 2015 (see Figure 4)<sup>72</sup>. This is confirmed by the BIS, which found that over 92% of global investment funds are invested in companies with GHG reduction targets that would lead to warming of 2.75°C or greater (see Figure 5 on the next page)<sup>73</sup>. As a reminder, the Paris Agreement goal is to hold warming to no more than 2°C, and ideally below 1.5°C. The CDP calculates that just 0.02% of all investment funds globally are invested in companies aligned to the Paris goals.<sup>74</sup> In other words, of more than 16,000 funds analyzed, exactly 65 of those were Paris-aligned. The CDP concludes that, "despite mounting net-zero commitments from the financial sector, and an apparent ESG 'boom,' the truth is that not even 1% of fund assets are currently Paris-aligned."

A similarly grim picture is presented by the insurance sector. Finance Watch found that US and European insurance companies have currently "around US\$600 billion invested in fossil fuel assets, and insurers worldwide provide the industry with insurance coverage with estimated premia of US\$17.3 billion."<sup>75</sup> The financial sector clearly does not internalize the environmental externalities generated by the companies and assets in which it invests or underwrites. As Finance Watch<sup>76</sup> and Kedward et al. indicate, the financial sector continues to be part of the problem, enabling climate change and biodiversity loss. The Sustainable

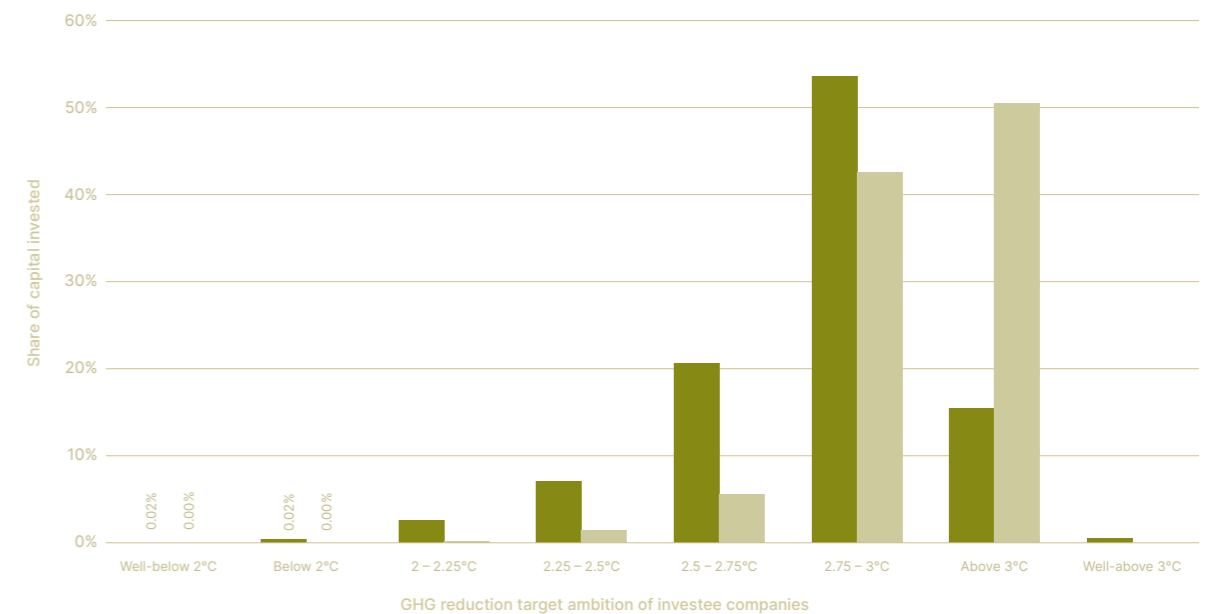
Finance Lab of the Utrecht University confirms this by analyzing the Dutch financial sector: "Dutch banks made 40% of the profits of all European banks on loans to the most controversial companies linked to deforestation, one of the main drivers of biodiversity loss."<sup>77</sup>

An even simpler analysis is to look at annual global GHG emissions and biodiversity destruction. These are neither stopping nor reducing. As long as these indicators are not going down, it can be assumed that the financial sector is not aligning its financial flows with the Paris Agreement and the Convention on Biological Diversity.

As Elderson rightly says: "Unfortunately, unlike the pandemic, we are not even close to start thinking about a world after the climate and environmental crisis."<sup>78</sup> Finance Watch also underlines this: "Despite their recognition of the issue and of its urgency, central banks and supervisors are taking a slow route. [...] we do not take comfort

from hearing fire fighters say that they will start intervening only after they have precise assessment of the damage that will be made by the fire."<sup>79</sup> Grünewald suggests that the NGFS and central banks and financial supervisors have moved merely from 'wait and see' to 'wait until we have a better understanding'<sup>80</sup>, where most actions taken focus on attempting to reduce uncertainty and get 'sufficient knowledge'. There is not (yet) an attempt to utilize all instruments at hand to effectively contribute to GHG reduction or the recovery and restoration of biodiversity. Why wait? The world's central banks and financial supervisors are already equipped with the mandates and tools to be good firefighters.

FIGURE 5: Capital allocation of global investment funds by the GHG reduction target ambition of investee company  
Source: BIS 2021 report 'Taxonomy of Taxonomies', with data from CDP



# IS THE STATUS QUO SLOWLY CRACKING?

**“THE DIFFICULTY LIES, NOT IN THE NEW IDEAS, BUT IN ESCAPING THE OLD ONES, WHICH RAMIFY, FOR THOSE BROUGHT UP AS MOST OF US HAVE BEEN, INTO EVERY CORNER OF OUR MINDS.”<sup>81</sup>**

— John Maynard Keynes

Change can come suddenly, seemingly without warning. But “major events are the manifestation of maturing and converging underlying trends: they reflect the change that has already occurred within the system.”<sup>82</sup> Central banks and financial supervisors went from rejecting any responsibility regarding climate change and biodiversity loss to acknowledging that climate change and biodiversity loss can generate financial risks and therefore need to be managed. However, the recognition that central banks and financial supervisors have a broad responsibility to act as precautionary agents when facing climate change and biodiversity loss, and must therefore effectively contribute to the reduction of GHG emissions and the recovery and restoration of biodiversity, is not yet generally agreed. But developments and changes are occurring that could force this necessary recognition. These are the product of important developments over recent years which challenge the still prevalent mindsets and conventional wisdom of central banking, financial regulation and supervision that date from the 1980s.

However, there is a significant probability that the status quo does not change. Acting and, more importantly, acting swiftly means a departure from long-held and cherished ideas. Therefore, the ‘inaction bias’ could mean that action is delayed or is insufficient. This risk is real, as this inaction bias increases the greater and more complex that a problem is. This could be disastrous given the reality of climate change and biodiversity loss, where the next few years

will be vitally important, requiring swift, concerted action. The future will tell us if the conventional wisdom of central banks and financial supervisors is able to persist, or if a precautionary approach could instead replace it.

Different central banks and financial supervisors have different mandates, which can be traced to their differing origins and the motivation behind their inception, whether fiscal need, a response to a financial or political-economic crisis, or monetary demands.<sup>83</sup> Over time, most central banks and financial supervisors come to share several primary objectives, such as assuring price stability,<sup>84</sup> financial stability,<sup>85</sup> and the safety and soundness of financial institutions. Secondary mandates can include making an effective contribution to economic growth, sustainable development, full employment, the protection of consumers of financial products, and protecting the reputation of a financial center.<sup>86</sup> Dikau and Volz found that, of 135 central banks analyzed, 12% have a specific and explicit ‘sustainability mandate’, and 40% are tasked with supporting their governments’ national policy objectives.<sup>87</sup>

## **From the Great Moderation to global crisis**

These mandates and their interpretations have changed a lot since Paul Volcker was elected Governor of the US Federal Reserve in 1979, shortly before inflation peaked at 14.8% in March 1980. Volcker raised interest



rates to 20% in June 1981. This so-called ‘Volcker Shock’ was followed by a large recession and widespread unemployment. This approach initiated a new dogma focused on managing inflation, ideally at no more than 2% annually. This has subsequently become widely – and falsely – assumed to be the sole mandate of central banks and financial supervisors. The period between the 1980s and the 2007–08 financial crisis is often referred to as the era of ‘the Great Moderation’, during which inflation remained low and growth seemed to be steady, increasing the belief that inflation-targeting was the sole instrument that could and should be used by central banks and financial supervisors. This approach went hand in hand with the belief that financial markets best regulated themselves. The most important tool to encourage markets’ smooth operation was through the setting of interest rates. ‘Light touch’ was the mantra that informed financial regulation and supervision in the years leading to the financial crisis.

When the financial system started crumbling in 2007, so did a series of long-cherished ideas about how the economy works. Jean-Claude Trichet, Governor of the ECB from 2003 to 2011, said: “As a policymaker during the crisis, I found the available models of limited help. In fact I would go further: in the face of the crisis, we felt abandoned by conventional tools. In the absence of clear guidance from existing analytical frameworks, policymakers had to place particular reliance on our experience. Judgement and experience inevitably played a key role.” Many books have been written about the financial crisis.<sup>88</sup> Scholars and journalists have acknowledged how certain individual actors, such as Ben Bernanke, Mervin King, Trichet, Timothy Geithner, etc. moved swiftly, with incomplete information, using all available tools and instruments, and advocated for large interventions rather than for small ones. They recognized that inaction or small steps would lead to disaster. They recognized that central banks and financial supervisors had to be proactive, innovative, and use novel monetary policy or instruments of financial regulation. Central

banks took center stage when it came to saving our financial system and economy. Their approach was best characterized by Trichet’s successor Draghi who, in 2012, pledged that the ECB was “ready to do whatever it takes” to save the euro. Under his successor Christine Lagarde, this positioning has been reaffirmed. Grunewald notes that Draghi and Lagarde have turned the ECB “into a central bank that actively addresses and counteracts crises along with fiscal and regulatory authorities.”<sup>89</sup> What if this approach of proactive crisis management under uncertainty were applied to the twin environmental crises?

From this financial, economic, and intellectual tumult, a new school of thought has emerged, best epitomized by the then-Bank of England governor Mark Carney’s famous ‘Tragedy of the Horizon’ speech.<sup>90</sup> Its theme alludes to the concept of the Tragedy of the Commons, which describes the conventional wisdom in economics whereby individuals pursue self-interest to the detriment of society as a whole.<sup>91</sup> Carney described how climate change presents an important financial risk but one which is not recognized in conventional risk models – the primary tools of analysis on which central banks and financial supervisors rely. By the time climate change materializes in these risk models, it will be too late to act effectively on its causes. Following this seminal speech, the NGFS was created, and the BIS began considering and becoming active on climate change.

### Two epistemological breaks, but an ontological one is missing

One of the most important moments in central banking and financial supervision came in April 2019, when the NGFS published its *A call for action* report.<sup>92</sup> The first sentence acknowledges the challenge posed by climate change and the responsibility of central banks and financial supervisors to act: “Climate-related risks are a source of financial risk. It is therefore within the mandates of central banks and supervisors to ensure the financial system is resilient to

these risks.” It goes on to argue that, while the legal mandates of NGFS members vary, they typically include responsibility for price stability, financial stability, and the safety and soundness of financial institutions. For the first time, central banks and financial supervisors had acknowledged that they do not need a specific and explicit mandate for the management of environmental risks. Their current mandates suffice, a point of view which has also been confirmed by important figures such as Isabel Schnabel, a member of the Executive Board of the ECB.<sup>93</sup>

Furthermore, it is acknowledged that this requires modifications to current approaches to analyzing and managing financial risks if a ‘climate Minsky moment’,<sup>94</sup> leading to the next financial crisis, is to be avoided. In their *Green Swan* report, the BIS and the Banque de France recognize that these developments represent a moment of rupture, by means of two epistemological breaks. The first is that the tragedy of the horizon represented by climate change (and, by extension, biodiversity loss) requires forward-looking data to incorporate medium- or long-term risks into current risk models. The second is that the BIS recognizes that central banks and financial supervisors need to become more vocal in encouraging governments and other actors to take decisive action to combat climate change and biodiversity loss. This is because inaction would impede the future ability of central banks and financial supervisors to exercise their mandates.

However, the NGFS argues in its call to action that their mandates are limited. “Even though the prime responsibility for ensuring the success of the Paris Agreement rests with governments, it is up to central banks and supervisors to shape and deliver on their substantial role in addressing climate-related risks within the remit of their mandates. Understanding how structural changes affect the financial system and the economy is core to fulfilling these responsibilities.”<sup>95</sup> The NGFS therefore limits its mandate to environmental impacts for which financial risks can clearly be measured and integrated into existing risk models. It

requires facts that undoubtedly show that environmental degradation leads to financial risk. This can also be seen in the statement of Andrea Maechler, a member of the Executive Board of the Swiss National Bank: “We don’t have the goal to make the world greener. That’s not our mandate. [...] The balance sheet must fulfil the monetary policy goals.”<sup>96</sup> The recognition that proactively combatting climate change and biodiversity loss is part of the existing mandate of central banks and financial supervisors is not yet broadly shared.

This implies that the negative environmental impacts of measures implemented by central banks and financial supervisors do not currently need to be managed. In other words: central banks and financial supervisors do not perceive themselves as being coresponsible for tackling climate change and biodiversity loss, and do not need to recognize that today’s environmental damage is tomorrow’s financial risk (expressed as ‘double materiality’. See Figure 6). There is still a sense of “organized irresponsibility”<sup>97</sup> where a lot of time is wasted in putting the burden of responsibility on other actors, and not fully acknowledging one’s own responsibility. Central banks and financial supervisors see themselves as being responsible for managing the financial risks that stem from climate change and biodiversity loss, but not for actually combatting climate change and biodiversity loss, even though failing to do so will create risk for themselves in the future. As Bartholomew and Diggle correctly point out, central banks and financial supervisors should at the very least not “be acting in a way that pushes against government objectives”<sup>98</sup> such as reducing GHG emissions and recovering and restoring biodiversity.

The BIS was right in recognizing that developments between 2015 and 2019 show an epistemological break in the way the risk models are constructed. However, the more important and larger ontological break involves recognizing that the current existing mandate requires that ‘double materiality’ be addressed: that is, that today’s

environmental impacts are tomorrow's financial risks, and therefore are within the remit of the existing mandates of central banks and financial supervisors. This break has not yet been made.

### A futile wait for certainty

When considering the integration of climate change and biodiversity loss into their daily decision-making, central banks and financial supervisors often point to the lack of data in general and, specifically, to the insufficient quality of data, the lack of established methods, uncertainties in environmental science, the lack of back-testing, etc. as barriers. They therefore call for better data and improved disclosure, hoping that this will encourage the internalization of environmental externalities. This 'wait until we have a better understanding' approach is based on the premise that action against climate change and biodiversity loss needs to be based on 'sufficient intellectual capacity'. As Grünwald points out, this bears the question: "Will sufficient intellectual capacity for policy action ever be reached?"<sup>99</sup>

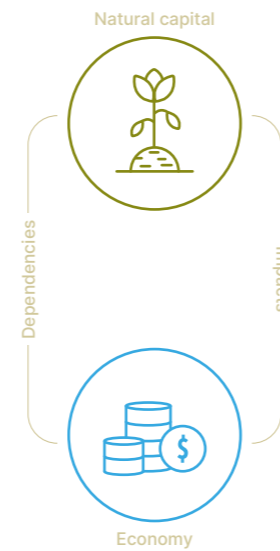
This search for greater understanding misses the point. First, the lack of action reinforces the status quo and thereby an economy which is accelerating climate change and biodiversity loss (Finance Watch calls it a "fossil fuel supporting factor")<sup>100</sup>. Secondly, it's not in the nature of climate change and biodiversity loss that the resulting risks potentially materialize solely in two, five, 10 or 20 years. The true tragedy is the one of central banking, financial supervision, and financial regulation. The nature and architecture of their conventional risk models are not up to the task of integrating risks such as the ones stemming from climate change and biodiversity loss. Any analysis of developments since the Paris Agreement was signed would conclude that the risks due to climate change and biodiversity are increasing. Thirdly, as the Dasgupta review states, it is important to distinguish between 'green' and 'black swan' events, as the likelihood of the occurrence

of 'green swans' is highly likely and their effects will be irreversible.<sup>101</sup> It is only their timing and their form that remain uncertain. The twin environmental crises challenge central banks and financial supervisors; the conventional systemic risks they deal with are dramatic if they materialize, but they are reversible by nature. Climate change and biodiversity loss are reversible up to a certain point, but after tipping points are passed, the effects of climate change and biodiversity loss become irreversible.

Despite these important changes over recent years and the two epistemological breaks, the ontological one, recognizing that today's environmental impacts are tomorrow's financial risks, still needs to materialize. This idea that the economy is part of the environmental system of planet Earth, and is therefore dependent on that system's stability, is not new. Even the first economic thinkers, the Physiocrats, understood this. It seems that economic thinking during the Great Moderation forgot many fundamental axioms of economic science. Or, as Kate Raworth says, "the economy is so evidently embedded in the biosphere, how has economics so blatantly ignored it?"<sup>102</sup> The current conventional wisdom still promotes the idea of central banks and financial supervisors narrowly focusing on price and financial stability and being nearly completely independent of environmental issues – unless a dependency can be proven within the current risk models used for internal decision-making, or unless we reach a state of 'sufficient knowledge' and 'manageable uncertainty' to legitimize action by central banks and financial supervisors.

Instead, we argue that central banks and financial supervisors need to embrace a precautionary approach, acting as precautionary agents, to fully address the twin environmental crises and thus secure the ability of delivering their primary mandates in the future. But what does such a precautionary approach imply?

FIGURE 6:  
Double materiality, showing how today's impacts are tomorrow's risks.  
Source: Natural Capital Finance Alliance (2018). A step-by-step guide for banks



# A PRECAUTIONARY APPROACH TO THE TWIN ENVIRONMENTAL CRISIS

## “SCIENTIFIC KNOWLEDGE IS AS MUCH AN UNDERSTANDING OF THE DIVERSITY OF SITUATIONS FOR WHICH A THEORY OR ITS MODELS ARE RELEVANT AS AN UNDERSTANDING OF ITS LIMITS.”<sup>103</sup>

— Elinor Ostrom

These words of Nobel laureate Elinor Ostrom begin the *Green Swans* report from the BIS and the Banque de France. In this landmark report, the authors acknowledge the two epistemological breaks mentioned in the previous chapter. Ostrom, however, goes further, advocating as she has been throughout her career that the economy is deeply embedded within broader society and nature. This referencing of Ostrom at the beginning of the BIS report hints towards the understanding that climate change and biodiversity loss pose a challenge on an ontological level. It strikes at how central banks and financial supervisors understand and define their own roles and responsibilities in society, and on which ‘proof’ they are basing and legitimizing their actions.

We argue that recognizing this embeddedness means that central banks and financial supervisors need to embrace a precautionary approach regarding climate change and biodiversity loss, given the impossibility of their pursuing their mandates on a planet that can no longer support advanced economies. Chenet et al. suggest that the precautionary approach is an alternative financial policy approach or mindset that offers an intellectual framework for legitimizing more ambitious financial policy interventions.<sup>104</sup> They argue that such an approach is necessary to enable decisive actions to be taken in advance of full certainty regarding risks from situations such as a climate crisis, where (1) the threat is systemic and (2) inaction would be catastrophic and irreversible.

Grünewald adds that “the implementation of precautionary measures would be driven by heuristics, such as ‘rules of thumbs’ or ‘trial and error’, rather than deterministic or probabilistic indicators.”<sup>105</sup>

Thereby, the precautionary approach allows to escape the ‘organized irresponsibility’ by focusing on what financial and price stability stewards can do within their current mandate. The precautionary principle is well understood within the field of environmental law and, since the financial crisis of 2007/2008, is also recognized by central banks and financial supervisors. In contrast to other financial risks, climate change and biodiversity loss are irreversible. Furthermore, the materialization of climate change and biodiversity loss are not uncertain as they are already happening. The uncertainties that remain are about how strongly climate change and biodiversity loss influence each other, how strongly they can influence financial instability and when further risks are likely to materialize. Complete information and certainty will come too late, when climate change and biodiversity loss have materialized and a new equilibrium is attained, with no possibility of reversal. This would be fatal for price and financial stability as well as for humans on Earth.



**PROTECTING BIODIVERSITY IS KEY TO TACKLING CLIMATE CHANGE AND FALLS IN THE MANDATE OF CENTRAL BANKS AND FINANCIAL SUPERVISORS, AS IT HAS BEEN RECOGNIZED BY THE NGFS.**

Building on the work of Chenet et al., Monnin<sup>106</sup> and Grünewald<sup>107</sup>, we suggest the following definition of the precautionary approach, as applied to central banks and financial supervisors facing the twin environmental crises:

**The precautionary approach as WWF defines it is a crisis management framework and mindset for stewards of financial and price stability, when taking pre-emptive measures to proactively and effectively fight climate change and biodiversity loss. It requires that they apply all necessary instruments of monetary policy and financial regulation at their disposal, and base their decision-making on the worst-case-scenarios regarding climate change and biodiversity loss.**

A first and necessary step towards such a switch in mindset is the establishment of a common language, a *lingua franca* to provide an understanding and a vocabulary on which action can be based. To clarify further how we define the precautionary approach, we suggest in the following paragraphs how this approach challenges conventional wisdom. Based on this, we specify these heuristics (rules of thumb) that allow financial and price stability stewards to act as precautionary agents when facing climate change and biodiversity loss. Finally, we explain how the precautionary approach has consequences for the way central banks and financial supervisors act, and showcase historical precedents.

### **A challenge to conventional wisdom**

The precautionary approach, as defined above, challenges the way the existing mandates of central banks and financial supervisors are interpreted, and the tools and instruments that are used to legitimize their actions. Confronted by the twin environmental crises, these need to be reinterpreted and new core principles recognized and acknowledged to take pre-emptive action to effectively contribute to a reduction in GHG emissions and the recovery and restoration of biodiversity.

## CHALLENGE 1: THE INERTIA OF EXISTING MANDATES

Central banks and financial supervisors often argue that their mandates require them to remain independent and act as neutral agents, and therefore the responsibility of tackling climate change and biodiversity loss should fall to governments. Independence is granted so that central banks and financial supervisors can execute their mandates properly and not be subjected to political pressure and vested interests. As Bartholomew and Diggle argue, the independence and neutrality of central banks and financial supervisors are not absolute but depend on public opinion and political will.<sup>108</sup> The decisions of central banks and financial supervisors have important ramifications within the real economy. Thus, central banks and financial supervisors are, in our view, jointly responsible for combatting climate change and biodiversity loss. They have enormous power and responsibility. Donald Brennan argued during the Cold War for deescalation and an indefinite stalemate, because of the ‘mutually assured destruction’ threatened by nuclear war between the USA and the USSR. The same principle can be used in the context of climate change and biodiversity loss, which challenge the core of the mandates and the existence of central banks and financial supervisors as well as governments.

In light of four major financial panics between 1825 and 1857, Walter Bagehot proposed the “responsibility doctrine”, which required the central bank “to subsume its private interest to the public interest of the banking system as a whole.”<sup>109</sup> The same applies to climate change and biodiversity.

Central banks and financial supervisors have ‘market-shaping’ roles,<sup>110</sup> as they are not exogenous to the financial sector but rather active players within a complex system, where their decisions influence market participants and vice versa.<sup>111</sup> As climate change and biodiversity loss are mainly driven by the way the economic system currently operates, which is in turn influenced and shaped by the actions of central banks and financial supervisors, and that climate change and biodiversity loss influence price and financial stability, central banks and financial supervisors have a mandate to proactively and effectively contribute to the rapid reduction of GHG emissions and the recovery of biodiversity, as this will stabilize prices and the financial system over time. Furthermore, there is no need to distinguish between climate- and biodiversity-related financial risks and impacts, under an apprehension that the mandate of central banks and financial supervisors only applies to the risk element. Negative environmental impacts are the financial risks of the future and thereby already fall under the existing mandates of central banks and financial supervisors. There is no need to amend and change existing mandates. What needs to change is the current interpretation of these mandates, which supports industries that harm the climate and biodiversity, whereas the novel understanding elucidated above needs to be rapidly recognized. Lastly, a lack of active intervention, or at worst inaction, is itself a policy choice that carries high risks<sup>112</sup> and which potentially threatens the future execution of existing mandates.

## CHALLENGE 2: RISK VS. (RADICAL) UNCERTAINTY

Much of what central banks and financial supervisors do is about managing risk. Risk models are an important tool to help them do so. As Chenet et al. explain: “The pricing of an asset is mainly a function of its risk probability distribution. As risk probability distributions provide market actors with knowable information about the future, capital portfolios can be adjusted to maximize profits and mitigate possible risks. In case it is not possible to assign an event a probability, the financial risk associated with this event is non-quantifiable and non-insurable. For greater precision, in much of the economic and finance literature a ‘Knightian risk’ refers to a risk that can be priced, because there is enough knowledge about the implicit or explicit probability distribution.”<sup>113</sup> As John Kay and Mervin King<sup>114</sup>, or Nassim Nicholas Taleb<sup>115</sup> spell out, conventional risk models, which are used for decision-making within central banks and financial supervisors, are often based on simplistic probabilities that have been assigned, providing a bogus sense

of precision and falsely suggesting the possibility of management.

This hubris that everything can be captured within the current risk models has particularly stark implications for the management of risks related to climate change and biodiversity to which, by their nature, it is difficult to assign probabilities. Chenet et al. state that climate- and biodiversity-related financial risks “are unique in their far-reaching impact, unforeseeable nature and irreversibility. They are also endogenous and systemic in nature – with the potential to affect the entire economy and financial system.”<sup>116</sup> In their report *Nature is too big to fail*, WWF and PwC find not only that financial risk models currently in use underestimate climate change risks, as they often do not account for supply-chain GHG emissions, but also that the interactions between climate change and biodiversity loss are not accounted for, creating an amplifying factor (see Figure 7).

FIGURE 7:

### Inadequateness of current, conventional financial risk assessments.

Source: PwC and WWF (2020). *Nature is too big to fail*.

#### Current best practice financial risk assessment in 2020:

$$X \text{ (TOTAL RISK)} = x + a$$

x = Financial risks

a = Climate-related transition and/or physical financial risks



#### Optimal financial risk assessment in 2020:

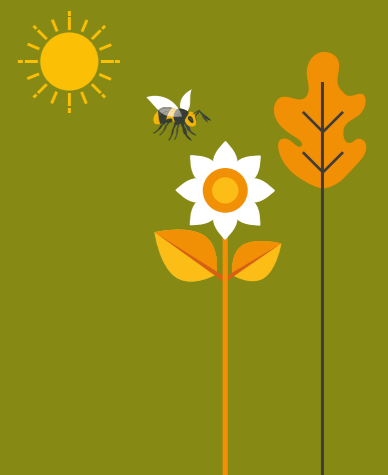
$$X \text{ (TOTAL RISK)} = x + \alpha \cdot (a+b)$$

x = Financial risks

a = Total of physical, transition, litigation and systemic climate-related financial risks – based on 1.5°C IPCC scenario

b = Total of physical, transition, litigation and systemic biodiversity-related financial risks

$\alpha$  = amplifying factor due to feedback loops between climate change and biodiversity loss.  $(a+b+c)/(a+b)$  whereas c = Climate- and biodiversity-related financial arising from feedback loops between climate change and biodiversity loss



Climate change thus generates risks for which probabilities of different outcomes are impossible to calculate – as the *Green Swan* report states. Frank Knight calls this “radical uncertainty” and John Maynard Keynes “irreducible uncertainty”, where “agents have no rational basis for making any probabilistic statements about a specific event occurring or not occurring.”<sup>117</sup> Chenet et al. suggest that the “intellectual capacity for policy action will potentially never be reached in advance”. There is a long-standing tradition in international environmental law that requires action in the face of uncertainty. The Rio Declaration of 1992 states that, “Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental damage.”<sup>118</sup> The true probability of the risk materializing can only be calculated after the event has happened. Given the irreversibility of climate change and biodiversity loss, waiting for the risk to materialize would be organized suicide.

Action must thus be based on the existing mandate rather than on the assumption of what is considered the right method or

tool (namely, probabilistic risk models). The mandates of central banks and financial supervisors do not require them to favor certain methods (whether quantitative or qualitative) over others. This is a matter of choice, preference, and conventional wisdom. Similarly, certain central banks started abandoning the ‘market neutrality’ principle for their asset purchases, in the light of climate change. Isabel Schnabel admitted that such market neutrality was “flawed when it comes to climate change.”<sup>119</sup>

Sufficient certainty regarding climate change and biodiversity loss is most certainly not feasible within the constraints of the current models used by central banks and financial supervisors, and potentially not even desirable. It will take too long to attain the level of certainty to move to the decisive action which is required to combat the twin environmental crises. Thus, recognizing the following core principles should guide central banks and financial supervisors when taking pre-emptive action with regards to the crises of climate change and biodiversity loss.

**EXISTING MANDATES TO PROTECT FINANCIAL STABILITY REQUIRE TO PROACTIVELY AND URGENTLY ACT TO SHIFT FINANCIAL AND ECONOMIC SYSTEMS TOWARDS ZERO NET EMISSIONS. ANYTHING LESS WOULD BE A DERELICTION OF THEIR DUTY AND WOULD PUT THE FUTURE WELLBEING AND PROSPERITY OF HUMANITY AT RISK.**

#### Core principles regarding climate change and biodiversity:

- Climate change and biodiversity loss are happening, and they are directly linked to patterns of economic activity. These findings are not new; the scientific community, business leaders and policymakers have been aware of these threats since the 1970s.<sup>120</sup>
- Climate change and biodiversity loss are both the result of more than a century of unsustainable energy and land use, lifestyles, and patterns of consumption and production.<sup>121</sup> Climate change is currently driven by GHG emissions produced by fossil fuels, agriculture and land-use change (historical emissions before 1950 were dominated by land-use change). Biodiversity loss is mainly driven today by land-use change caused by agriculture and resource extraction.
- Even with a significant reduction of GHG emissions, it will be difficult to hold warming below the 1.5°C threshold, given inertia in the climate system and with continuing ecosystem loss significantly reducing uptake of carbon by natural sinks such as forests. Nonetheless, reducing GHG emissions dramatically and halting biodiversity loss over the coming seven years are essential if we are to limit global warming to 1.5-2°C.
- Global warming exceeding 2°C will lead to catastrophic impacts on natural and human systems, with unknown consequences for the global economy and financial system. It will lead to irreversible environmental changes.
- Climate change and loss of nature are twin problems that feed each other in a vicious circle. Given their inter-relationships, central banks and financial supervisors need to focus on climate change and biodiversity simultaneously. Restoring and recovering biodiversity will also help to mitigate climate change. For example, food systems are both the biggest single contributor to nature loss and also contribute to around 30% of global GHG emissions.<sup>122</sup> However, it should be noted that some climate change solutions risk negative impacts on biodiversity (such as large-scale bioenergy projects, or monoculture afforestation of non-forest biomes).
- Preparation should be made for worst-case scenarios where runaway climate change could make Earth uninhabitable for humans (e.g. insurance company AXA characterizes a world with 4.4°C of warming “uninsurable”<sup>123</sup>). Recent scientific research concludes that environmental decline is taking place faster than previously assumed, with tipping points materializing sooner.

#### Core principles regarding the financial sector and climate change/biodiversity loss:

- Regarding climate change, reducing the exposure of the financial sector to the oil, gas, and coal sectors and activities related to deforestation is of the highest priority, as those sectors are the core drivers of GHG emissions and therefore represent the highest financial risks from efforts to reduce emissions.
- As for biodiversity loss, the greatest financial risks stem from the exposure of the financial sector to the conventional/industrial agriculture and the extractive sectors, which are large drivers of land-use change and deforestation.
- Until global GHG emissions begin to fall materially, and biodiversity destruction is halted and reversed, it can be assumed that the financial sector is not aligning its financial flows with the objectives of the Paris Agreement and the Convention on Biological Diversity, as is enshrined in the former and as is proposed for the latter’s forthcoming Global Biodiversity Framework.<sup>124</sup>

### Core principles regarding the activities of central banks and financial supervisors

- Central banks and financial supervisors should assume that all environmental damage is potentially material for price and financial stability. When making decisions, economists, central bankers, and financial supervisors should first be required to prove that any resulting environmental degradation has no effect on financial and price stability, instead assuming that environmental degradation is *per se* financially risky. Clearly, environmental degradation can have enormous implications for financial and price stability, and inaction in the face of this evidence is itself a policy decision. There is a simple rule of thumb: the greater the GHG emissions produced or the higher biodiversity loss from a specific investment, project, or company, the higher the financial risk, and the greater the negative impact on our future resources, implying ever greater risks for our economy.
- Central banks and financial supervisors should assume that environmental damage or risk has not been effectively internalized and accounted for by the market and that financial risks stemming from environmental degradation are by nature endogenous. The ECB indicated in 2022 that it was not able to assess the risk of climate change based on the disclosures of European banks, referring to their disclosures as being “white noise”.<sup>125</sup>
- Given the high uncertainty related to the current and future consequences of climate change and biodiversity loss, central banks and financial supervisors should, given their existing mandates, adopt a precautionary approach requiring them to act, based on the understanding of the environmental crises and the consequences of insufficient action or inaction. As Nobel Laureate Robert Lucas observed, “in cases of uncertainty, economic reasoning would be of no value.”<sup>126</sup>
- Biodiversity loss and climate change are inherently linked to the core mandates of central bank and financial supervisors, namely to assure financial and price stability and protect consumers. By orienting their monetary policy and financial regulation tools and instruments such that they contribute to the reduction of GHG emissions and help biodiversity to recover, central banks and financial supervisors will therefore be able to continue to execute their mandates over the decades to come.
- Central banks and financial supervisors should communicate their goals clearly, consistently, and do so continually. As the COVID crisis demonstrated, poor communication resulted in lower levels of trust among the population in its decisionmakers, leading to more cases, higher hospitalizations and mortality.<sup>127</sup> Communication in a clear, continuous manner, referencing the overall goal, builds trust, support for future measures and facilitates the smooth management of the crisis.<sup>128</sup>
- Central banks and financial supervisors should seek to simplify the challenges involved. Climate change and biodiversity loss are undeniably complex, wicked problems. But there are a number of elements that are simple, such as acknowledging that they exist, that they are interlinked, and that addressing them falls within the mandates of those responsible for financial and price stability.
- With regards to the ‘radical uncertainty’ related to climate change and biodiversity loss, it is better to act now with imperfect solutions and data rather than wait for greater certainty. Delay is itself a choice. As Janet Yellen argued regarding climate change, “the thinking goes that, because we know so little about climate risk, let’s be tentative in our actions – or even do nothing at all. This is completely wrong, in my view. This is a major problem and it needs to be tackled now.”<sup>129</sup>

- Stewards of financial and price stability should utilize all instruments at hand to contribute to the reduction of GHG emissions and the restoration of biodiversity, using *ex ante* measures.
- The current structure and decision-making of central banks and financial supervisors indirectly supports and subsidizes the destruction of biodiversity and climate change. The world’s largest publicly listed companies in 2008 generated more than US\$2 trillion of costs via environmental damages.<sup>130</sup> This needs to be acknowledged and stopped, to assure a level-playing-field for all companies.
- Central banks and financial supervisors should focus on reducing the attractiveness of highly CO<sub>2</sub>-intensive and biodiversity-destructive economic sectors and sub-sectors. The current economic system is highly environmentally damaging. There is a clear understanding of what is definitively not green and can be classified as always harmful for the climate and biodiversity and, therefore, as always contributing to financial risk. Once commonly agreed standards are available on what are climate- and biodiversity-friendly economic activities, companies, and sectors, then central banks and financial supervisors can start reflecting on how to encourage these sectors, through, for example, their monetary policy operations.
- Central banks and financial supervisors must be forceful stewards. They should:
  - ↳ Request that governments and regulated financial actors take swift, pre-emptive measures, in an orderly fashion, to reduce the risk of a climate- and nature-related financial crisis.
  - ↳ Acknowledge that environment-related risks from biodiversity loss and climate change are the single most important issue that society faces and, therefore, addressing this risk will be their primary priority over the coming seven years.
  - ↳ Contribute to the discussions within the Convention on Biological Diversity and the Paris Agreement on Climate Change to raise awareness about the role of financial policymakers and to provide knowledge and expertise to the discussions.

### Putting the precautionary approach into practice

The power of central banks and financial supervisors was vividly demonstrated with the so-called Volcker Shock of 1981, through which the US Fed sought to tame inflation by hiking interest rates. Since then, the leverage of central banks and financial supervisors has become increasingly apparent, particularly during the financial crisis of 2007-08 and the recent COVID crisis. How central banks and financial supervisors define their mandates depends on conventional wisdom and mind-sets. The previous chapter has elaborated basic assumptions and principles on which a precautionary approach should be grounded. This has important consequences for how central banks and financial supervisors act.

Many definitions of the precautionary approach emphasize the role of this mindset and theoretical framework to legitimize pre-emptive action, based on incomplete and uncertain information, and with the acknowledgement that inaction carries excessively high risk. We agree with this definition but would like to stress that climate change and biodiversity loss are already real, material and advancing at great speed. A true precautionary approach can therefore no longer be applied, as to do so would have involved central banks and financial supervisors reacting to the first IPCC reports in the 1990s, when scientific knowledge was sufficiently robust to justify preventative and pre-emptive measures. In 2022, central banks and financial supervisors

can and need to act in a way to avoid the worst tail risks. But the precautionary approach as we understand it, and as we deem applicable in 2022, is not solely a framework for taking *ex ante* action before risks materialize, but can be understood as an active crisis management approach under uncertainty, when risks are already materializing, but are potentially not yet widely perceived or measured.

The precautionary approach as defined by Chenet et al., which legitimizes action before risks materialize, in a context of high uncertainty, has, to our knowledge, not been fully embraced or applied by central banks and financial supervisors. But there are many precedents of central banks and financial supervisors undertaking active crisis management under conditions of uncertainty. As noted above, during the financial crises in 1929 and in 2007-08, the Eurozone crisis and the COVID pandemic, actions needed to be taken swiftly, using all possible measures, in conditions of incomplete information. Important learnings from these events can be applied to the twin environmental crises.

- **‘When facing a crisis, treat it like one’:** Northern Rock in 2007, Bear Stearns in 2008, and the Greek government in 2010-12 were all considered ‘bad apples’ within a larger set of institutions and countries which were operating well, until policymakers, central banks, and financial supervisors recognized the systemic nature of the various crises. Until such recognition, decisions were taken in a case-by-case manner instead of on a consolidated basis for all institutions and countries. Despite being aware of the deadliness of the coronavirus in early February 2020, governments continued playing down its severity until mid-March.<sup>131</sup> Within a few days, the Federal Reserve, based on a change of course by the US president, recognized the gravity of the crisis. It moved to support the Treasury market with short-term loans, cut interest rates to zero and announced assistance for corporate borrowers.<sup>132</sup>
- **‘Act fast, be bold, don’t hold back’.** In times of crisis, there is no time to waste. A few days after the statement by the World Health Organization that COVID-19 was a global pandemic, the ECB expanded its asset purchase program, introduced its pandemic emergency purchase program, installed bridge long-term refinancing operations and recalibrated its targeted longer-term refinancing operations.
- **Use every available avenue; do whatever it takes.** After the initial steps by the ECB at the beginning of the COVID-19 pandemic, new actions were announced in April, June, July, August, and December 2020. Without these, the economic shock in Europe would have been massive, with mass unemployment adding to the existing health crisis. This was based on experience from the financial crisis of 2007-08 and the Eurozone crisis. There is no assurance that a certain program will be effective. The rule of thumb for central banks and financial supervisors is therefore ‘better safe than sorry’, and for them to use all available tools at their disposal.
- **‘Cooperate’:** In Ben Bernanke’s memoir *The Courage to Act*, he underscores the importance of cooperation between the Fed and other agencies in the US and abroad that allowed a swift and coordinated response to the chaos that reigned following the Lehman Brothers bankruptcy.<sup>133</sup> This prevented a greater economic catastrophe. Similarly, Neil Irwin noted the recognition in September 2008 that “it was time for the bankers to stop working individually, at different speeds and with different tactics, and begin addressing the crisis together.”<sup>134</sup>
- **‘Be creative, be audacious’:** Bernanke sent e-mails with the subject line ‘Blue Sky’ at the height of the financial crisis in 2008, asking for broad, audacious ideas on how the Fed could strengthen the financial system. In times of crisis, there needs to be a willingness to come up with new thinking. Janet Yellen reflected on this in 2017: “A substantial body of evidence suggests that the U.S. economy is much stronger today than it would have been

without the unconventional monetary policy tools deployed by the Federal Reserve in response to the Great Recession.”<sup>135</sup>

- **Support governmental policies.** Baer et al. distinguish between the prudential and promotional policy motives of central banks and financial supervisors.<sup>136</sup> Historically, central banks have been instrumental in cofinancing economic efforts<sup>137</sup> (e.g. reconstruction after World War II) and they could play a similar role in the transformation of the economy towards a climate- and biodiversity-friendly one. At the very least, central banks and financial supervisors should not go against government policies such as the Green Deal in the European Union.

The environmental challenge is massive, and central banks and financial supervisors have begun responding, but not sufficiently and with no effective reduction in GHG emissions or the destruction of biodiversity. The good news is that a precautionary approach could be embraced today by central banks and financial supervisors within their existing mandates. The bad news is that the twin crises of climate and nature have the potential to be many times worse than the financial crisis of 2007-08, the euro crisis, and the COVID crisis combined. Regarding inflation their goal is clear, namely holding average annual inflation to around 2%. But what should their goals be regarding climate change and biodiversity loss?

# TRIGGERING A 'GREAT TRANSFORMATION'

**"FACED WITH SETS OF EVENTS THAT ARE COMPLEX, SUBJECT TO RADICAL UNCERTAINTY BUT WITH THE LIKELIHOOD OF A MASSIVE FUTURE IMPACT, GREEN SWANS CALL LESS FOR IMPROVEMENTS IN RISK MODELLING AND MORE FOR DECISIVE AND IMMEDIATE ACTION AND COORDINATION."**<sup>138</sup>

— Luiz Awazu Pereira da Silva, BIS Deputy General Manager

In *The Great Transformation* (1944), the economist Karl Polanyi analyses how modern market structures emerge and how they interact with the state and civil society, suggesting that they are not based on a natural state, but are social constructs defined by humans. The founding principles of the Great Moderation in monetary policy have been challenged over the last 15 years. However, the old mindset of that period is still prevalent and shapes policy. Thus, the response to climate change and biodiversity loss from central banks and financial supervisors has been characterized by an approach that focuses on individual, rather small measures, emphasizing the internalization of environmental externalities and advocating for better data and improved disclosure. The response has not been driven by a precautionary approach that focuses on actions which would encourage the rapid reduction of GHG emissions and the recovery and restoration of biodiversity. Pereira da Silva is right: it is time to be decisive and implement immediate action and coordination. It is time to apply the precautionary approach that central banks and financial supervisors adopted during previous crises.

It is also time for a new era to replace the Great Moderation – a 'Great Transformation' driven by the precautionary approach.

Such a transformation also refers to the necessary transition of the whole economy, which would be indirectly supported and encouraged by this novel approach from central banks and financial supervisors. High-emitting economic sectors and those linked to high biodiversity loss would become less attractive, whereas low-emitting and biodiversity-positive sectors would increase in attractiveness.

To proactively combat climate change and biodiversity loss, central banks and financial supervisors need a clear set of goals to guide their actions over the short-, medium-, and long-term. The three phases set out on the next page, translate the latest scientific consensus regarding climate change and biodiversity loss and applies it to the reality of central banks and financial supervisors, providing them with a general orientation. Individual central banks and financial supervisors can be more ambitious regarding their quantitative targets. Being less ambitious however, would contradict their mandate of being precautionary agents. It is important to keep in mind that addressing the twin crises depends on action over the coming seven to 10 years, and phases 0 and 1 are therefore arguably the most important ones, as they set the foundation for the others



**Phase 0 (2022):**

Plan, set, and publicly declare expectations to send the necessary signals to financial markets.

**Phase 1 (2022-25):**

By 1st January 2025, central banks and financial supervisors should be proactively and effectively contributing to and encouraging the abatement of at least 15% GHG emissions (against a 2019 baseline) and the stabilization of the biodiversity crisis by achieving zero (net) loss of nature, implementing a precautionary approach and using all necessary monetary policy and prudential supervision tools at the micro and macro levels.

**Phase 2 (2025-30):**

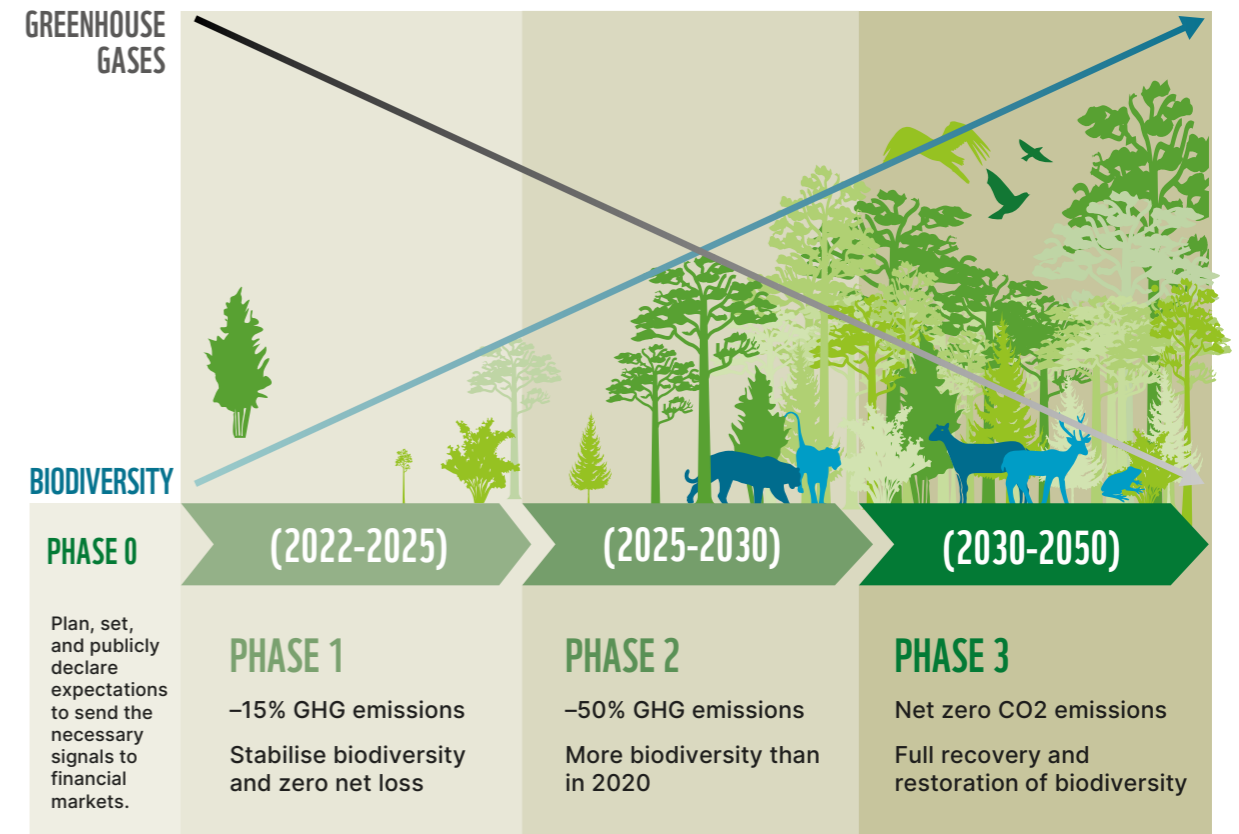
By 1st January 2030, central banks and financial supervisors should be proactively and effectively contributing to and encouraging the abatement of at least 50% GHG emissions (against a 2019 baseline), and the reversal of biodiversity loss by recovering and restoring it, so that there is more nature from 2030 onwards than in 2020, implementing a precautionary approach and using all necessary monetary policy and prudential supervision tools at the micro and macro levels.

**Phase 3 (2030-50):**

By 1st January 2050, central banks and financial supervisors should be proactively and effectively contributing to and encouraging net-zero CO<sub>2</sub> emissions and be on track to the full recovery and restoration of biodiversity by that date, implementing a precautionary approach and using all necessary monetary policy and prudential supervision tools at the micro and macro levels.

Based on these phases, the principles of a precautionary approach, and learnings from previous active crisis management by central banks and financial supervisors, the following sub-chapters set out measures that could be implemented by central banks and financial supervisors, civil society, and government. The focus is on reducing GHG emissions and stopping biodiversity loss as rapidly as possible, thereby safeguarding price and financial stability. These measures cover the full range of monetary policy and financial regulatory tools, and both climate and biodiversity aspects. The measures are attributed to the phase during which they are expected to influence GHG emissions and biodiversity loss, as well as to the actors which should implement each measure. They focus more on the prudential mandates of central banks and financial supervisors and to a lesser degree on their promotional mandates. Measures for phase 3 are not spelled out, because actions during that phase will depend upon the degree of success of the two previous phases. The below should not be considered a checklist but rather a menu of potential measures that only develop their full potential if combined with each other. There is no silver bullet which will solve all problems, but instead there is a need for many complementary solutions.

**A PATHWAY TO A CLIMATE SAFE AND NATURE POSITIVE GLOBAL ECONOMY**



\* The GHG and Biodiversity related curves are linear for illustration purposes. These need to align with science based scenarios such as 1,5C aligned with no/low overshoot by 2050.

\*\* The time intervals depicted here are focused on near term priorities. Nevertheless it is essential for financial actors to do regular continuous target setting in 5-yearly (ideally shorter) time intervals, and annual progress reporting against these targets.

2022

# PHASE 0

This phase has no significant influence on GHG emissions or the reduction of biodiversity loss. However, it lays the foundation for further work. Central banks and financial supervisors need to plan, set, and publicly declare expectations to send the necessary signals to the financial markets. This needs to happen now and be revisited regularly. The measures in this phase do not have to be implemented before the measures in phases 1 and 2 can be started. However, if the phase 0 measures are implemented well, they will provide strategic orientation and guidance for phases 1 and 2.

## Central banks and financial supervisors should:

**Integrate two additional nominal anchors as indicators for implementing their mandates.** Up until now, most central banks and financial supervisors have typically followed an inflation-targeting goal of achieving, on average, 2% annual inflation and assuring financial stability based on the Basel III Framework. To this, central banks and financial supervisors should add a goal of holding warming to no more than 1.5°C and a qualitative target of fully recovering and restoring biodiversity by 2050. In this way, central banks and financial supervisors would acknowledge that combatting climate change and biodiversity loss is part of their mandates and set quantitative goals to do so. These would guide central banks and financial supervisors on an ongoing basis, providing a clear structure for their decisions. It would also encourage the development of indicators tracking progress in the real economy on carbon abatement and biodiversity protection.

**Publicly acknowledge their adoption of a precautionary approach and its core principles, as outlined on pages 41–45 of this report.** This will inform market players such as banks, insurance companies, asset managers, etc. on the road ahead so that they can prepare accordingly.

**Create the necessary structures and institutions to handle the climate and biodiversity crises.** The current situation is one of “organized irresponsibility”, where the diffusion of responsibility creates a lack of a determined and structured approach towards the climate and biodiversity crises. Central banks and financial supervisors share responsibility for addressing this situation. During the 2007–08 financial crisis and the COVID crisis, central banks and financial supervisors set up the necessary structures for common, coordinated and rapid action. The same should hold true for the twin environmental crises in terms of collaboration with government and other actors. In particular:

- The G20 Sustainable Finance Working Group should integrate biodiversity alongside climate to ensure the coherence of policies at the international level and to promote convergence in practices. The G20 should integrate climate change and biodiversity loss as key priorities within its existing working groups.
- IOSCO, the Basel Committee on Banking Supervision and the International Association of Insurance Supervisors should establish a joint climate and biodiversity working group (under the auspices of the Financial Stability Board) to adapt international financial standards and ensure the coherence of action across different financial sectors, heavily investing in better data and comparable disclosure regimes.
- The IMF should integrate climate and biodiversity targets and international standards into its Financial Sector Assessment Program monitoring, and regularly assess and publicly report on compliance with international financial standards.

## Set targets for climate change and biodiversity for 2025, 2030, 2040, and 2050.

- Central banks and financial supervisors need to lead by example and provide necessary clarity and forward guidance to financial markets actors by publishing their own clear and detailed transition plans (with quantifiable climate and biodiversity goals for 2025, 2030, 2040, and 2050) covering all central banking, financial regulation, and supervisory activities.
- All regulated financial institutions should be required to publish credible transition plans with quantifiable climate and biodiversity goals for 2025, 2030, 2040, and 2050, covering all their business lines (investment, lending, underwriting, etc.).

## Open up to civil society stakeholders and create internal expert teams.

- Similarly to the Jackson Hole meetings, where academics are invited to present their findings, central banks and financial supervisors should invite climate change and biodiversity experts, such as those involved with the IPCC and the IPBES, to the appropriate forums to help them better understand the challenges at hand. Equally, the heads of leading central banks and financial supervisors should participate in key meetings of the UNFCCC and the CBD.
- Central banks and financial supervisors should set up internal climate and biodiversity expert teams, responsible for tracking the policy and science debates around climate and biodiversity, engaging with relevant stakeholders, and training staff of other central banks and financial supervisors with regards to the latest findings of the IPBES and IPCC.

## Civil society groups should:

**Make the connections between biodiversity loss and climate change.** Too often, civil society groups focus solely on climate change. Biodiversity loss is rarely discussed in the context of financial regulation, supervision, or monetary policy and even less often are the two issues linked. It is time that civil society addresses the interconnectedness of biodiversity loss and climate change and makes clear that restoring and recovering biodiversity is the most effective way to combat climate change.

**Define a ‘quantitative biodiversity target’ and work together with central banks and financial supervisors to meet it.** Climate policy benefits from a clearly defined, scientifically accepted goal of holding warming below 1.5°C. There are numerous metrics to measure biodiversity loss, such as MSA and PDF/m<sup>2</sup> – each with significant flaws. This makes it more difficult for central banks and financial supervisors to understand what kind of indicators need to be used, significantly complicating the task of defining scenarios regarding biodiversity loss and recovery. This needs to change. Scientific leaders and NGOs need to work with central banks and financial supervisors to address the problem and define a quantitative target for biodiversity recovery.

**Create a ‘Rochers de Naye’ consensus for nature-positive economics:** In 1947, Friedrich von Hayek and others created the Mont Pélérin Society, named after a mountain just next to Vevey, a small town in Switzerland. They defined a new conventional wisdom on what, in their view, should be perceived as ‘good economic policy’. Their thoughts and axioms have since shaped economic policy and thereby the actions of central banks and financial supervisors. The Jackson Hole Consensus and the Washington Consensus are deeply influenced by the paradigms promoted by this school of thought. It is time for a new consensus, based on the precautionary approach. We propose a ‘Rochers de Naye Consensus’. The Rochers de Naye is a mountain above Montreux, a town next to Vevey, which is significantly higher and thus offers a clearer view over the region.

2022-25

# PHASE 1

Reaching the goals of the Paris Agreement and the CBD will depend on the next three-to-five years. This phase is therefore of the utmost importance, as it will determine if the goals of the later stages can be met. Therefore, the measures outlined below work towards the goal that, by 1 January 2025, central banks and financial supervisors are proactively and effectively contributing to and encouraging the abatement of at least 15% GHG emissions (against a 2019 baseline) and the stabilization of the biodiversity crisis by achieving zero (net) loss of nature, via a precautionary approach and using all necessary monetary policy and prudential supervisory tools at the micro and macro levels.

## Central banks and financial supervisors should:

**Focus on contributing to a rapid reduction in GHG emissions and the halting of biodiversity destruction, by defining a list of always environmentally harmful sectors, companies and economic activities, adapting it regularly and applying it to all monetary policy and financial regulation instruments:** D’Orazio and Popoyan argue that central banks and financial supervisors and their instruments and tools could contribute significantly to the ecological transformation of the economy.<sup>139</sup> This requires, however, that they can agree what ‘ecological’ is. Current efforts to draw up taxonomies of economic activities have focused on determining what is green. The EU Taxonomy illustrates the difficulty of doing so, as such an approach raises questions about activities that are environmentally damaging, but will be necessary for the transformation of the economy. As there is no scientific proof that ‘green’ investments are always less financially risky, it is difficult for central banks and financial supervisors to use the EU Taxonomy for their core monetary policy, financial regulation, and supervisory instruments. The ECB has therefore stated that it supports “the development of a ‘brown’ taxonomy as a necessary complement to the green taxonomy”.<sup>140</sup> Bingle et al. show that current models to assess climate-related financial risks have a high degree of divergence regarding their assessment of different companies, except for the most- and least-emitting firms.<sup>141</sup> This confirms that a focus on ‘always environmentally harmful’ economic activities, companies and/or sectors represents a risk-based approach which is within the existing mandates of central banks and financial supervisors.

Given that the highest GHG emitting and biodiversity destroying economic activities, companies, and economic sectors are the financially riskiest, with the highest probability of becoming stranded assets, central banks and financial supervisors adopting a precautionary approach need to treat them differently to their less damaging equivalents. See the tables on the following pages, which provide a list of indicators that can be used by central banks and financial supervisors to modulate their capital requirements, asset purchase programs, liquidity ratios, etc. There is no need to wait, because all these adaptations are explicitly required by their mandates to safeguard financial and price stability. To capture future developments, such a list will need to be updated on a regular basis to account for the evolving understanding of the environmental damage caused by various economic sectors and companies and assure coherence with political developments (e.g. the approval of the EU Taxonomy). It will also have to take into account the highly location-specific nature of biodiversity loss, and urgent issues such as deforestation or freshwater. Based on this ‘always environmentally harmful list’, central banks and financial supervisors should:

## Immediately:

- Adapt monetary policy tools according to the ‘always environmentally harmful filter list’ (see table 1, 2 and 3 below).
  - ↳ Central banks should no longer invest (e.g. via asset purchase programs or foreign exchange portfolios) in those sectors, companies, or economic activities included in the list.
  - ↳ Central banks should reduce their exposure to physical and transition risks from climate change and biodiversity loss by using the list to modulate their collateral frameworks (through the collateral they accept, both in their eligibility criteria as well as in the haircuts applied).
  - ↳ Sectors on the list should be automatically excluded from any targeted refinancing operation program (unless the logic of these programs is reversed to penalize specific sectors).
- Ensure that all financial regulation instruments take into account the ‘always environmentally harmful filter list’.
  - ↳ Central banks and financial supervisors should require that banks lending to companies included in the list set aside regulatory capital for the full amount of that lending.
  - ↳ All assets of companies and projects from sectors on the list should no longer be considered liquid and should therefore be excluded in the calculations of banks’ net stable funding factors and liquidity coverage ratios.
  - ↳ Those banks subject to existing systemic risk buffers should face increased rates according to their exposure to actors on the list, or to assets in particularly vulnerable regions.

## On an ongoing basis:

- Central banks and financial supervisors should assess the exposure of all regulated financial entities to the ‘always environmentally harmful filter list’. If exposure to the list is not sufficiently reduced, central banks and financial supervisors should:
  - ↳ Set maximum credit ceilings and exposure limits for investments in companies on the list. Credits in those sectors and/or companies should for example not exceed 5% of the total loans by the individual bank.
  - ↳ Define a sector leverage ratio for exposure to the list, which should be sufficiently high that it has a steering effect (e.g. between 50 and 100%).
- Central banks and financial supervisors should convene and cooperate with the leading climate and biodiversity scientists as well as environmental organizations to regularly update and extend the initial ‘always environmentally harmful filter list’.

**TABLE 1:**  
**ALWAYS ENVIRONMENTALLY HARMFUL ECONOMIC ACTIVITIES**

	Always significantly harmful economic activities	Harmful economic activities that could be retrofitted to exit the harmful category	Geographical location of economic activity
<b>DESCRIPTION</b>	The EU Platform on Sustainable Finance, the European Commission’s expert group, has just published a report proposing an ‘extended EU taxonomy’ including a category of environmentally harmful activities. Such activities include those that are always significantly harmful and which need to be decommissioned. Coal activities are explicitly included in the law; the European Commission is in the process to assess how and when to develop this list. WWF is developing a project to issue criteria recommendations for this list by early 2023.	The EU Platform on Sustainable Finance, the European Commission’s expert group, has just published a report proposing to set an ‘extended EU taxonomy’ including a category of environmentally harmful activities. Such activities include those that are currently harmful but can be retrofitted to exit the harmful category.	Biodiversity loss, and its recovery and restoration are highly location-specific. Certain economic activities such as mining are necessary for the ecological transformation of the energy system. However, mining in biodiversity hotspots is highly environmentally damaging and risks the overall stability of Earth’s biodiversity. It is therefore important that companies do not undertake certain economic activities within specific regions of the Earth (“no go areas”). Companies therefore need to disclose asset-level data on specific production areas to enable an assessment and decision-making process. For example, a financial actor investing in or insuring a company that mines for cobalt in a biodiversity-rich area increases its reputational, litigation, and transition risks.
<b>INDICATORS</b>	Report from the EU Platform on sustainable finance	Report from the EU Platform on sustainable finance. Significantly harmful activities that can be retrofitted: all activities in the EU taxonomy that do not meet the Do No Significant Harm criteria. List of activities with DNSH criteria	Natural World Heritage Sites
	By definition, all activities within Harmful Economic Sub Sectors (see page 40) are harmful.	Truck manufacturers	Protected Areas based on the Convention on Biological Diversity
	Additional to EU list: Logging of primary or old-growth forests	Airplane manufacturers	Key Biodiversity Areas
	Additional to EU list: Deep-sea bottom trawling (fishing)	Car manufacturers	ENCORE: interactive map to explore geographical-specific risks of depleting natural capital stocks (avoid high depletion areas areas)
	Additional to EU list: Hunting of species on the IUCN Red List of Threatened Species	Steel manufacturing	ESG transparency assessments of commodity producers and traders
		Cement manufacturing	
Buildings			

TABLE 2:  
**ALWAYS ENVIRONMENTALLY HARMFUL COMPANIES**

		BROAD			SPECIFIC		
		Companies that are expanding coal production	Companies that are expanding oil and gas production	Constituent companies of the Carbon Underground 200	Companies that are expanding their environmentally harmful activities	Thresholds for considering a company harmful	Exception: Harmful companies that can be exempted
DESCRIPTION		The Coal Exit List from Urgewald is a public database that identifies the largest companies that are expanding the oil and gas production and highlights the largest CO <sub>2</sub> -emitting companies, based on their yearly real production and the associated emissions. The list consists of over 1,000 parent companies and around 1,800 subsidiaries operating along the thermal coal value chain (upstream, midstream, and downstream), representing 90% of the world's thermal coal production and the world's coal-fired capacity. Thereby it thus covers captures the physical climate risk part and is a proxy for future lock-in situations and thereby high transition risks.	The Global Oil and Gas Exit List is a public database that identifies the largest companies that are expanding the oil and gas production and highlighting the largest CO <sub>2</sub> -emitting companies by focusing on their yearly real production and the associated emissions. The list consists of 887 companies operating in the upstream and/or midstream sectors of the oil and gas sector, capturing physical climate risk. The list also tracks the exploration and new oil and gas infrastructure capex, providing a proxy for future lock-in situations and high transition risks.	The Carbon Underground 200 identifies the top 100 coal and top 100 oil and gas publicly traded reserve holders globally. The companies are ranked by the potential carbon emissions content within their reported reserves. The transition of the economy, those reserves will become stranded assets. In contrast to the Global Oil and Gas Exit List from Urgewald, this list does not account for effective annual emissions per year.	Some companies have legacy harmful activities but are not developing new ones (i.e. they have revenues from but no capex for harmful activities), and their exposure to harmful activities is decreasing over time. Others have capex for new harmful activities and their exposure to harmful activities could increase over time. This is a fundamental difference that should be taken into account: new harmful activities that need to repay their investment or could be stranded are far riskier financially than existing ones that may be near or at the end of their productive lifetime and can potentially be decommissioned soon.	The EU Taxonomy focuses on economic activities: it is possible for companies to use the taxonomy Do No Harm criteria to assess their total corporate exposure to environmentally harmful activities, by aggregating each activity not meeting the Do No Harm criteria they have in their operations (or portfolio, for financial institutions). It is then necessary, in addition, to set 'high risk' thresholds for corporate exposure to harmful activities, to identify those companies that are most exposed and hence face the highest related financial risks. The thresholds have two critical features. First, they must be dynamic (i.e. decrease over time), to reflect the growing financial risks related to corporate exposure to harmful activities. Secondly, they should be sector-specific (i.e. tailored) in the sectors where climate and environmental science finds that pathways towards full sustainability (e.g. net-zero emissions) must be faster than average (e.g. the power sector needs to be decarbonized quicker than the rest of the economy).	A growing number of companies are taking action to reduce their exposure to harmful activities. As a result, their related financial risks will decrease over time. It is proposed to remove companies from the list of high environmental risk companies if they comply with the three following complementary requirement listed below.
	INDICATORS				Companies expanding harmful activities (i.e. with capex planned for harmful activities) should systematically be considered as high environmental risk, whatever their exposure to harmful activities and their environmental targets and transition plans.	<p>30% of revenues from harmful activities until 2025, decreasing by 6 percentage points every five years to reach zero by 2050.</p> <p>Based on the IEA's 1.5°C scenario, thermal coal needs to be phased out in the EU/OECD by 2030. For these activities, the threshold should be at 15% of revenue until 2025, decreasing to zero by 2030.</p> <p>Based on the IEA's 1.5°C scenario, deforestation-related activities need to be phased out globally by 2030. The threshold should be at 15% of the revenue until 2025, decreasing to zero% by 2030.</p>	<p>The companies have set and published measurable, specific, time-bound, science-based target(s) for the environmental issues that create material risks to their operations (e.g. using the six environmental issues defined in the EU taxonomy). For that purpose, the Science Based Targets Initiative could be taken into account for climate mitigation.</p> <p>Companies have set and published five-year detailed implementing transition plan(s) describing how they will achieve their target(s), including their capex plans.</p> <p>Companies report annually on the progress towards the achievement of the target(s) and include corrective measures in case of delay.</p>

TABLE 3:

## ALWAYS ENVIRONMENTALLY HARMFUL ECONOMIC SUB-SECTORS

ALWAYS ENVIRONMENTALLY HARMFUL ECONOMIC SUB-SECTORS	
DESCRIPTION	Historically, fossil fuels are the driving force for climate change on biodiversity loss. A number of economic sub-sectors have the historic responsibility for past emissions and still contribute a large part to today's emissions. High negative environmental impacts come with high physical, transition, and litigation risks for financial institutions. As the current economic system is still in large part dependent on fossil fuels, these economic sub-sectors thus represent a systemic risk for the financial industry.
	Historically, fossil fuels (oil, gas, and coal) are the driving force for climate change and, have also a significant influence on biodiversity loss. A number of economic sub-sectors have the historic responsibility for past emissions and still contribute a large part to today's emissions. High negative environmental impacts come with high physical, transition, and litigation risks for financial institutions. As the current economic system is still in large part dependent on fossil fuels, these economic sub-sectors thus represent a systemic risk for the financial industry.
INDICATORS	Oil & Gas Drilling (GICS Code: 10101010)
	Integrated Oil & Gas (GICS Code: 10102010)
	Oil & Gas Exploration & Production (GICS Code: 10102020)
	Oil & Gas Refining & Marketing (GICS Code: 10102030)
	Oil & Gas Storage & Transportation (GICS Code: 10102040)
	Coal & Consumable Fuels (GICS Code: 10102050)
	Fertilizers & Agricultural Chemicals (GICS Code: 15101030)
	Gas Utilities (GICS Code: 55102010)
	Electric Utilities (GICS Code: 55101010)
	Multi-Utilities (GICS Code: 55103010) in so far as it relates to electric and/or gas utilities (not water utilities)
	Independent Power Producers & Energy Traders (GICS Code: 55105010)
	Steel (GICS 15104050) in so far as it relates to metallurgical (coking) coal mining used for steel production (not steel production itself)

**Do Good housekeeping:** Central banks and financial supervisors need to do their homework and start integrating climate change and biodiversity loss within the analyses which provide the foundation for their monetary policy, financial regulation, and supervisory activities. Namely, they should:

- ↳ Quantify and model the various channels of influence of climate change and biodiversity loss on inflation (providing ranges, rather than single-point estimates) based on worst-case scenarios.
- ↳ Collect and publish data and analytics as a public good to enable climate and biodiversity risk assessments by financial institutions and define reporting templates based on the recommendations of the TCFD and the TFND.
- ↳ Request that financial institutions to disclose asset-level data to improve the risk analytics regarding biodiversity loss. The TNFD has shown that location matters greatly for the identification, assessment, mitigation and management of nature-related risks. The TNFD Beta Framework<sup>142</sup> therefore stresses the necessity of asset level data as a key design consideration.
- ↳ Run annual scenario analysis, using worst-case scenarios, for climate change and biodiversity loss for the banking and insurance sectors, and develop scenarios that combine climate change and biodiversity loss.
- ↳ Build capacity regarding their own internal credit ratings and the integration of climate change and biodiversity loss, and thus improve their own credit risk assessments.
- ↳ Define contingency plans for financial institutions that are hit heavily by climate change and biodiversity loss, indicating how they will be safeguarded and potentially dismantled to reduce the risk of a financial crisis and avoid taxpayer bailouts.

**Be forceful stewards:** Central banks and financial supervisors share responsibility for addressing the biodiversity and climate crises. They have important leverage to drive change, but they cannot tackle this enormous challenge alone. Therefore, central banks and financial supervisors need to make sure that their voice is clearly heard. In their *Green Swan* report, the BIS and Banque de France suggest that central banks become coordinating agents regarding fiscal, monetary, prudential, and carbon policies, working to embed them into broader societal changes such as the better integration of sustainability into financial and economic decision-making.<sup>143</sup> They should thus:

- ↳ Echo the "Act Now" paper from the Glasgow Finance Alliance for Net Zero, requesting governments take more decisive action.<sup>144</sup>
- ↳ Cooperate with policymakers and the CBD to draw up a scientifically sound quantitative biodiversity target which could help guide the instruments and tools at their disposal.
- ↳ Initiate discussions with external credit rating agencies, requesting the clear and transparent integration of climate change and biodiversity loss data points into agencies' risk models.
- ↳ Draft proxy engagement and voting guidelines regarding central bank investments. If, within two years, no significant progress regarding the alignment with climate and biodiversity goals by an issuer is perceived by the central bank, it needs to divest all that issuer's assets held in asset purchase programs, foreign exchange portfolios, pension plans, etc.

**Financial supervisors should:**

**Combat greenwashing:** As Albert Camus said, "*Mal nommer un objet, c'est ajouter au malheur de ce monde.*"<sup>145</sup> The ontological question of 'what is green' and the related epistemological question 'how to know if something is green' have gained a lot of traction in 2021. Considerable media attention was generated by the whistleblower Desiree Fixler, who asserted that DWS Group over-stated its ESG credentials, triggering a greenwashing probe by the Securities and Exchange Commission,<sup>146</sup> and by Tariq Fancy, former BlackRock

sustainable investing chief, who called out ESG investing as a “dangerous placebo”.<sup>147</sup> In Switzerland “greenwashing” was named ‘Word of the Year’ by a financial newspaper.<sup>148</sup> And Nikhil Rathi, chief executive of the UK’s Financial Conduct Authority, said in November 2021: “We can’t let this greenwashing persist and risk the flow of much-needed capital to help secure our futures.”<sup>149</sup> This is also confirmed by research by Infrac/Inrate, which shows that “sustainability funds hardly direct capital towards sustainability,”<sup>150</sup> and a study by EDHEC Business School which finds that “climate-focused investment vehicles are routinely engaging in greenwashing.”<sup>151</sup> Given these concerns, a number of financial supervisors have taken up the issue and have, among other things, set up technical advisory groups (e.g. in the UK<sup>152</sup>), set expectations regarding climate-friendly investments (e.g. in Switzerland<sup>153</sup> and in Denmark<sup>154</sup>), or made recommendations on how to disclose and inform investors about the integration of environmental aspects (e.g. in France<sup>155</sup>). It is important that greenwashing is combatted, as it risks undermining the trust of the general public (particularly consumers of financial products) that the alignment of financial flows can have a positive environmental impact. If this trust is undermined, those consumers will lose interest in sustainable finance. This calls for a response from financial supervisors. From 2022 onwards, they should:

- ↪ State publicly that all investment vehicles that do not provide proof of their significant environmental contribution cannot call themselves ‘climate-friendly’, ‘environmentally-friendly’, ‘sustainable’, etc.
- ↪ Use an ‘always environmentally harmful sector, company or activity list’ (discussed above) and signal that investment vehicles invested in any companies engaged in these activities cannot describe themselves as ‘climate-friendly’, ‘environmentally-friendly’, ‘sustainable’, etc. and need to be labelled as ‘significantly harming the environment’.
- ↪ Publicly disclose how many greenwashing cases have been analyzed internally and on what criteria the analysis was based.

#### **Governments should:**

**Redirect harmful subsidies towards nature-positive impact areas:** All companies engaged in activities on the ‘always environmentally harmful filter list’ should no longer receive any state subsidy. The Dasgupta Review observes that governments globally spend around US\$500 billion per year on measures that are “potentially harmful to biodiversity.”<sup>156</sup> As during the financial crisis of 2007-08 and the COVID pandemic, fiscal policy is key to support the measures and activities taken by central banks and financial supervisors. Fiscal policies need to be supportive, and measures by central banks and financial supervisors effective, to assure a ‘just transition’, so that the most vulnerable citizens are compensated with redistributive measures and negative financial impacts are offset.

**Pursue a Green New Deal:** It is not sufficient for central banks and financial supervisors to fully integrate climate and biodiversity risks within their activities. Capital needs to flow to more sustainable projects and companies. This is the responsibility of elected governments, which need to promote the creation of sufficient investable projects and companies to absorb the sheer amount of money that needs to be directed towards the net-zero transition. Efforts in this direction include, for example, the New Deal in Europe and the Build Back Better legislation in the US. However, more policies like these are needed, such as, for example, a high-speed train system across Europe (also called the ‘European Silk Road’<sup>157</sup>) or a requirement that the European Investment Bank issue new bonds worth about 5% of EU GDP to fund the green transition – particularly the installation of solar panels on all European roofs, the installation of non-fossil fuel heating systems and the insulation of all European buildings up to the highest energy efficiency standard.<sup>158</sup>

2025-30

## PHASE 2

Planning for this phase is less urgent, as it builds on the success of phases 0 and 1. However, it is important that these measures are thought through and that the necessary foundations are laid so that, by 1 January 2030, central banks and financial supervisors are proactively and effectively contributing to and encouraging the abatement of at least 50% GHG emissions (against a 2019 baseline), and the reversal of biodiversity loss, so that there is more nature in 2030 (‘nature-positive’) than in 2020, implementing a precautionary approach and using all necessary monetary policy and prudential supervision tools

#### **Central banks and financial supervisors should:**

**Overcome the tragedy of the horizon:** Monetary policy (e.g. the setting of interest rates) is orientated towards the business cycle, which typically lasts between two and three years. The time-horizon for financial regulation is the credit and financial cycle, which lasts between 10 and 16 years.<sup>159</sup> The argument that then-Bank of England Governor Mark Carney made in 2015 is that the risks posed by climate change may not materialize within these time horizons and are therefore typically considered out of scope for central banks and financial supervisors, despite the potentially systemic risks they represent.<sup>160</sup> We agree that the time frames central banks and financial supervisors use are too short. However, it is important to note that, with a high degree of confidence, it can be expected that risks related to climate change and biodiversity loss will increase significantly over the coming years. Therefore, the time horizon for risk management of environment-related risks should be extended to 10 to 30 years to not only take into account the financial risks to the banks themselves, i.e. the consequences of their financed activities, but also the adverse impacts they cause.

**Managing expectations:** The Basel III framework provides, through Pillar 2 (Governance) and Pillar 3 (Transparency), a variety of tools for central banks and financial supervisors to enhance the management of climate change and biodiversity loss by financial actors. These two pillars need to be swiftly adapted to clearly communicate the expectations of central banks and financial supervisors to regulated entities, so that they can change their business models, operations, risk models, reporting requirements, etc. This could have significant impacts on GHG emissions and biodiversity loss between 2024 and 2029.

#### → **Pillar 3 of Basel III – Transparency:**

Disclosure of climate-related financial risks has been the most important pillar of work of the NGFS. Since its inception, the quality of disclosure has improved, albeit only marginally. This has been noted by Frank Elderson: “Banks are trying to compensate for the poor quality of their disclosures by issuing a great volume of information around green topics. We end up with a lot of white noise and no real substance on what both markets and supervisors really want to know: how exposed is a bank to C&E risks and what is it doing to manage that exposure?”<sup>161</sup> This needs to be addressed urgently.

- ↪ In 2022, central banks and financial supervisors should define and publish disclosure principles and templates of climate and biodiversity risks and impacts and make disclosure mandatory for all regulated financial actors.
- ↪ From January 2023 onwards, they should request half-yearly disclosure of GHG emissions and

biodiversity impacts by financial flows by all regulated financial entities.

- ↳ They should announce that, by 2023, all regulated financial institutions should have a clear transition plan that indicates how they are attaining GHG and biodiversity goals by the end of 2025, 2030, 2040, and 2050.
- ↳ From 2023 onwards, all financial actors not disclosing according to the TCFD, and from 2025 onwards additionally according to the TNFD standards, should be considered to be part of the 'always environmentally harmful filter list'.
- ↳ From 2023 onwards, central banks and financial supervisors should encourage the disclosure of supply chain data. Without supply chain information, any assessment of risk will only provide a partial picture of the overall risks faced by companies.

→ **Pillar 2 of Basel III - Governance:**

- ↳ From 2023 onwards, the majority of boards of regulated financial institutions need to be able to demonstrate expertise on climate change and biodiversity.
- ↳ From 2023 onwards, central banks and financial supervisors should undertake targeted quarterly on-site assessments of regulated banks and insurance companies regarding their management of climate and biodiversity risks.
- ↳ From 2023 onwards, capital add-ons should be introduced for those financial institutions with climate and biodiversity risk management shortcomings.
- ↳ From 2023, it should be expected that the "fit and proper tests" that regulated entities must pass should indicate how they are implementing the above-mentioned transition plan.
- ↳ From 2024 onwards, all remuneration packages at regulated financial institutions should be linked to progress regarding GHG emissions and biodiversity. This should also extend to a portion of dividend payouts to shareholders.

**Start supporting the green transition:** The current economic system is not nature-positive, and massive reorientation of financial flows away from the worst to less bad emitters will not result in a nature-positive economy. Central banks and financial supervisors have experience in strengthening the real economy by, for example, measures such as the 'SME supporting factor',<sup>162</sup> which directs help to small- and medium-sized enterprises, which represent the backbone of most economies. Using their promotional role, central banks can use monetary policy operations to encourage and support the transition to a low-carbon economy by influencing firms' funding conditions. This kick-starting instrument is necessary for phase 3 of the suggested pathway.

- ↳ Incentivizing green SMEs: Based on existing SME supporting factors that many central banks and financial supervisors have implemented, these refinancing operations could be modulated so that those SMEs that are aligned with a green taxonomy (e.g. EU, Colombia, etc.) can benefit from preferential interest rates or earmarked lending volumes.
- ↳ Green asset purchases: the massive asset purchases after the 2007-08 financial crisis and during the COVID crisis were instrumental in successfully combatting those crises. These ongoing asset purchase programs and any subsequent ones should only be able to invest in companies that have set science-based climate and biodiversity targets, or are eligible within a green taxonomy. A further option could be that, from 2023, bonds that do not provide information on the taxonomy alignment of the use of their proceeds would no longer be eligible for asset purchase programs (in jurisdictions with an existing green taxonomy).

# CONCLUSIONS AND THE 'TINA' AGENDA



**“CHANGE IS, I BELIEVE, INEVITABLE. THE QUESTION IS ONLY WHETHER WE CAN THINK OUR WAY THROUGH TO A BETTER OUTCOME BEFORE THE NEXT GENERATION IS DAMAGED BY A FUTURE AND BIGGER CRISIS.”<sup>163</sup>**

— Mervin King, former Governor of the Bank of England

Fifty years ago, *Limits to Growth* argued that only a few years remained to “manage decline” to avoid overusing our planet’s resources. The authors claimed that if preemptive measures were not taken, the environmental equilibrium as we had known it over prior decades would collapse. Fifty years later, human-induced environmental degradation is real: we have already overshoot five of nine planetary boundaries. Humanity therefore faces a hard deadline. The next seven-to-10 years will be critical to reverse the trend and safeguard prosperous human life on Earth. There is no alternative. The longer we wait, the greater will be the interventions that will be needed. For too long, ‘organized irresponsibility’ has driven policy decisions, where each actor has pursued mandates that cumulatively contribute to climate change and biodiversity loss, but where no one felt obliged to proactively and effectively combat them.

But what has been the case in the past does not need to be true in the future. There needs to be a willingness to tackle the challenges in front of us. Such a willingness was seen in the decision by US President John F. Kennedy to launch the Apollo program in the midst of the Cold War to send a manned flight to the surface of the moon and safely back to Earth. “We choose to go to the moon in this decade and do the other things, not because they are easy, but because they are hard, because that goal will serve to organize and measure the best of our energies and skills, because that challenge is one that we are willing to accept, one we are unwilling to postpone, and one which we intend to win, and the others, too.”<sup>164</sup> This positive vision created spill-over effects, generating new knowledge, jobs, innovation, etc.<sup>165</sup>

This report shows that the existing mandates of central banks and financial supervisors require them to combat climate change and biodiversity loss effectively and proactively. They are not the only institutions that need to do so. So do governments and elected politicians. However, due to the deep embeddedness of the economy within nature, environmental degradation will sooner or later become a financial risk, threatening financial and price stability. A mandate to protect financial and price stability has no meaning on a planet where humans can no longer live.

There is some hope to be found in the increasing attention that central banks and financial supervisors are paying to environmental destruction and the growing number of instruments they are deploying in their daily business activities to address the risks it will create. It is also good to see strong support from leaders within central banks and financial supervisors, such as Christine Lagarde at the ECB, who stated at the IUCN Conference in September 2021 that “climate and biodiversity are two sides of the same coin; it is vital that we look at them together.”<sup>166</sup>

We argue that recognizing this embeddedness means that central banks and financial supervisors need to embrace a precautionary approach regarding climate change and biodiversity loss. This

should enable them to deploy all the tools at their disposal to contribute to GHG emissions reduction and biodiversity recovery. Doing so would ensure they could protect financial and price stability today and in the future.

This report has shown that the precautionary approach challenges conventional wisdom regarding the interpretation of the mandates and methods by which central banks and financial supervisors legitimize their actions. We argue that the precautionary approach first takes into account the specific nature of biodiversity loss and climate change, which are characterized by radical uncertainty, which by definition is incompatible with the current probabilistic risk tools used by central banks and financial supervisors. Secondly, we indicate that the precautionary approach as an active crisis management mindset has been applied during the 2007-08 financial crisis, the Eurozone crisis and the COVID crisis. There is enough precedent for swift, bold, large-scale, pre-emptive measures that acknowledge uncertainty, but which also recognize that inaction is by far the worst option as it exacerbates the current crises.

This report thereby contributes in four ways to the academic debate: Firstly, the WWF defines the precautionary approach for central banks and financial supervisors facing the twin environmental crises. Secondly, WWF indicates a three-phase pathway by 2050 with intermediary goals (2025 and 2030) regarding the reduction of GHG emissions and the recovery and restoration of biodiversity that central banks and financial supervisors need to proactively and effectively encourage. Thirdly, we define ‘rules of thumb’ (heuristics) on which financial and price stability stewards can base their pre-emptive actions against climate change and biodiversity loss. Lastly, WWF defines a list of filters that permit the identification of ‘always environmentally harmful economic activities, companies and sectors’ which allow central banks and financial supervisors to modulate their instruments of monetary policy and financial regulation to orient all their efforts towards reducing GHG emissions as fast as needed and stopping biodiversity loss.

The urgency of the climate and biodiversity crises requires the full attention of central banks and financial supervisors and the deployment of all measures and instruments at hand. We have outlined in chapter 5 a series of measures to help in this endeavor and to support practitioners working for central banks and financial supervisors. At a minimum, central banks and financial supervisors must immediately:

- **Treat it like a crisis**, with central banks setting environmental goals, taking a precautionary approach, publishing their own transition plans, and requiring regulated financial institutions to also do so.
- **Focus on contributing to a rapid reduction in GHG emissions and the halting of biodiversity destruction**, by explicitly integrating the financial risks of environmentally harmful sectors, companies and economic activities and thereby rendering them less financially attractive.
- **Extend the time horizon for the management of environment-related risks to 10 to 30 years**, to not only take into account the financial risks to the banks themselves, but also the adverse impacts they cause.
- **Do good housekeeping**. Start integrating climate change and biodiversity loss within the analyses which provide the foundation for their monetary policy, financial regulation, and supervisory activities.
- **Cooperate**, working with the G20, IOSCO, the Basel Committee, and the IMF to elevate climate change and biodiversity loss.
- **Be forceful stewards**, lobbying governments, rating agencies, and the companies in which they invest to take action on climate and biodiversity.

→ **Start supporting the green transition**, using the promotional role of central banks to encourage and support the transition to a low-carbon economy.

We are *in medias res* – in the midst of the plot. Climate change and biodiversity loss will not be reversed overnight. We therefore call on decision-makers within central banks and financial supervisors to act fast, be responsible, be bold, be creative, be audacious, and not to hold back. Be scientific – demand the necessary.<sup>167</sup> We are here to support central banks and financial supervisors, so that they can contribute to a drastic reduction of GHG emissions and the restoration of biodiversity.

The COVID pandemic has shown, as Yuval Noah Harari states, “that humanity is far from helpless. Epidemics are no longer uncontrollable forces of nature. Science has turned them into a manageable challenge.”<sup>168</sup> The same holds true for climate change and biodiversity loss. The biggest enemies are inaction and our lack of time. As Chomsky and Pollin argued: “The methods are there. They’re feasible.”<sup>169</sup> For those that do not act sufficiently fast or act insufficiently, different pressures are arising. Amongst others, these include litigation risks. Companies such as Shell,<sup>170</sup> and governments like that of the Netherlands,<sup>171</sup> are among the first to have been judged on their inadequate responses regarding climate change. More judgements are to come. The Dutch litigator Roger Cox expects that banks and central banks and financial supervisors will be the next targets.<sup>172</sup> A recent legal working paper by the ECB comes to the same conclusion.<sup>173</sup>

At the end of the day there is no silver bullet, no perfect solution, and just many imperfect measures, all of which must be deployed to avoid catastrophe. Despite the grim environmental status quo, the future does not need to resemble the past. As per Kim Stanley Robinson’s book “The Ministry of the Future”<sup>174</sup>, central bankers and financial supervisors have the choice to envision another future – one in which they recognize that the economy is embedded in nature, that price and financial stability depend on the health and integrity of nature, and it therefore lies within their current mandates to protect nature, with whatever it takes.

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