The value of life

What would climate policies look like if they mirrored the COVID-19 response?

2° investing initiative

1 IN 1000

Supported by:

Federal Ministry for the Environment, Nature Conservation and Nuclear Safety

based on a decision of the German Bundestag

eit Climate-KIC

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About 1in1000

1in1000 is a new research program by 2° Investing Initiative that brings together new & existing research projects on long-termism, climate change, and (inter-)connected future risks for financial markets, the economy, and society. Its objective is to develop evidence, design tools, and build capacity to help financial institutions and supervisors to mitigate and adapt to future risks and challenges. The programme focuses on climate change (inter-) connected risks and challenges, notably risks stemming from ecosystem services and biodiversity loss, as well as risks from social cohesion and resilience. To achieve this objective, 1in1000 operates with three main areas: i) Long-term metrics; (ii) Risk (management) tools and frameworks; and (iii) Policies & incentives.

About 2° Investing Initiative

The 2° Investing Initiative (2DII) is an international, non-profit think tank working to align financial markets and regulations with the Paris Agreement goals. Working globally with offices in Paris, New York, Berlin, and London, we coordinate the world's largest research projects on climate metrics in financial markets. In order to ensure our independence and the intellectual integrity of our work, we have a multi-stakeholder governance and funding structure, with representatives from a diverse array of financial institutions, regulators, policymakers, universities, and NGOs.

About the funders

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Introduction to the thought experiment

The COVID-19 pandemic triggered one of the most robust and expansive policy response dedicated to saving lives.

We estimate that, on average, countries lost about $600 to $1392 per capita in terms of GDP during lockdowns between January 2020 and April 2021. For some countries, this number went as high as $12,000 per capita. Furthermore, in the same period, countries spent on average $320 per capita on COVID-19 healthcare interventions. The global costs of these interventions lie approximately between $4-8.4 trillion, comparable to the combined GDP of the UK, France, and Germany (World Bank, 2021). On the other hand, estimates suggest that these policies saved between 17 to 31 million lives globally.

This report is a thought experiment. It explores the characteristics of the response from policymakers to the COVID-19 pandemic and compares these lessons to the climate crisis.

The term “thought experiment” is designed to highlight the uncertainty and limitations of the findings presented in this paper. The conclusions we draw are illustrative, simplifications of a policy issue associated with radical uncertainty. We recognize the challenge of comparing the COVID-19 pandemic and the climate crisis. Nevertheless, the orders of magnitude of the results in this report are a sign that the findings are robust even under uncertainty. The objective of the analysis is not to critique the COVID-19 pandemic response, but rather use the insights that response gives us in terms of what it teaches us about the climate crisis.

The thought experiment explores four questions:

1. What are the relative costs of preparing now versus reacting later to a systemic crisis like a pandemic or climate change?
2. How equitable is the related burden sharing of these costs?
3. What were the relative costs of saving a life in the COVID-19 pandemic versus the estimated relative costs of saving a life by mitigating the climate crisis?
4. What does policymakers’ willingness to prevent a statistical death ‘today’ tell us about how they value current and future global climate mortalities?

The thought experiment identifies four key findings:

1. For both COVID-19 and climate change, a preparedness strategy is about 3 to 4 times cheaper in terms of lives saved than a reactive strategy.
2. The costs of preparedness measures are more evenly distributed than the costs of react measures.
3. For the COVID-19 pandemic, a preparedness strategy came too late. It is not too late for the climate crisis. The cost of saving a life associated with acting now on climate change is 2 to 3 times lower than the costs for the COVID-19 pandemic, suggesting the significant cost effectiveness and utility of acting now.
4. The fact that the current policy ambition as outlined in the NDCs is not enough to meet the Paris Agreement climate goals suggests policymakers de facto discount the lives saved from climate change. We estimate that they discount future lives by ~1.7% annually. That means that a life in 2050 is worth 39% less than a life today.

We recognize the uncertainties and assumptions that underpin these types of analytics, but nevertheless see both the orders of magnitude and the overall comparison as meaningful to inform policymakers.

While this is a thought experiment associated with high degrees of uncertainty, that does not mean all findings share the same level of uncertainty. The findings outlined above are presented in decreasing order in terms of confidence.

There are several parallels between COVID-19 and climate change, but it is also important to stress the differences.

Perhaps most importantly, both events share two crucial features: they are systemic in the sense that they affect and present a risk to the economic system and society, and they are 'preventable' in the sense that human actions can significantly mitigate their impacts both by preventing the risk from materializing in the first place and strengthening resilience when the risk materializes (Manzanedo and Manning, 2020).

Despite their similarities, there are obviously meaningful differences when comparing these two risks:

1. The pandemic is a discrete event in the process of transforming into an endemic feature of society. We thus have historical information, whereas climate change policies are largely related to estimating future events.
2. The logic of the pandemic response is primarily tailored to saving lives. In the case of climate change mitigation, there is a bigger emphasis on the economic impacts related to physical risks and associated damages beyond lives saved. While there are positive externalities to saving lives, these features make the two issues somewhat different. In order to provide more comparable results, we focus in both cases exclusively on the costs to saving a life without consideration of broader economic externalities. While this impoverishes the analysis, it also reduces the uncertainty and increases comparability.

The thought experiment here will focus on the similarities between these two systemic risks – policy intervention and the extent to which it saves lives, while recognizing the limitations.

The analysis is a first of its kind, bringing together different strands of research on the costs of pandemic preparedness, climate policy interventions, and the potential benefits measured in statistically saved lives.

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Concepts that we use in this thought experiment

In this report, we distinguish between the following concepts. For further information on the methodology, sources and calculations, please see the Questions and Answers Document.

1. **Policy measures for systemic risks can be categorized as either preparedness or react (or response) strategies (*Key Finding #1*).**

Preparedness measures are policies to prevent a risk from materializing, to prepare the system should they materialize, and to implement mitigation measures in advance if the risk materializes. React policies in turn only take place once the risk has already materialized.

2. **Policymakers can implement prevention strategies now, i.e., "act now", or they can delay their action, i.e., "delayed action" (*Key Finding #3*).**

In this report, we also distinguish between "act now" and "delayed action" - where the former means taking action now, and the latter means delaying action by 5 years (OECD, 2017).

3. **To compare the COVID-19 crisis and the climate crisis, we calculate the concept of "cost per statistical life saved" (*Key Finding #1, #3 and #4*).**

Cost per life saved is a statistical concept that quantifies the cost necessary to save a statistical life. An alternative concept is the cost per quality-adjusted life year (QALY). While the cost per QALY is a more granular and meaningful concept and perhaps more popular in particular in health economics, it requires additional assumptions about the age distribution of the risk and the intervention. In this report, we use cost per statistical life saved for simplicity, recognizing the caveats of the approach relative to using QALYs.

The concept exists to provide for a relative assessment of different policy interventions in light of finite resources. It is important to note that it is a statistical concept and thus not a comment on the relative value of individual lives (Blomqvist, 2002). In addition, the COVID-19 pandemic saves lives almost immediately in response to a policy intervention (but creates potential future deaths as well). Climate change is delayed with policy now impacting climate in 30-50 years. As a result, our cut-off point for costs of climate policies is 2050, but our deaths cut-off point is 2100. Of course, neither costs end at those points, but these cut-offs provide manageable uncertainty.

4. **We identify the revealed preferences of policymakers with regard to discounting future lives (for key finding #4).**

In economics, the concept of revealed preferences assumes that consumers' purchasing habits can reveal their preferences. In this thought experiment, we want to introduce this concept in terms of the revealed preferences of policymakers in saving lives today (saving lives in the COVID-19 crisis) versus saving lives in the future (saving lives in the climate crisis) (Goodin, 1982). To calculate the revealed preferences of policymakers we do the following: We calculate how much policymakers were willing to pay to save a current life versus what they will have to pay to save a future life. In the case where policymakers choose to save a (statistical) life today for a certain cost but not save a (statistical) life in the future, this suggests that policymakers discount the future life. This could represent a 'temporal' discounting related to how the future is valued, but also be driven by other factors (uncertainty, lack of knowledge, etc.). Using the COVID-19 pandemic as a reference point, we identify an *implicit* discount rate used by policymakers for valuing future lives.

The table below summarizes the preparedness and reaction strategies we contrast here, for the case of pandemics and climate change.

Strategies	Pandemics	Climate change
Prevention, Preparedness & Mitigation *Reducing chronic systemic risks*	***We define as:*** Investing in preparedness, through investment in vaccines, surveillance systems, and systems to stop epidemic spread. A prevention strategy should also seek to better understand and address root causes (habitat fragmentation, wildlife commerce).	***We define as:*** Stabilizing global temperatures by decarbonizing the economy. Note that a pure prevention strategy for climate change is now out of reach, all policy scenarios will include some degree of climate change impacts and therefore some need for react to extreme events.
	We model: Investment in preparedness and resulting costs, mortality impacts and implied cost per life saved.	***We model:*** Emission scenario that stabilizes temperature under 2°C, with associated policy costs, climate change damages, adaptation costs, and mortality impacts.
React *Coping with extreme events once they materialize*	***We define as:*** The react strategies deployed against COVID-19: lockdowns, travel bans, test and trace campaign, vaccine rollout.	***We define as:*** Insufficient mitigation to stabilize temperature, and therefore reliance on adaptation and coping with impacts as they materialize.
	We model: The lockdown and health intervention policies of each country between January 2020 and April 2021, with associated economic costs, mortality impacts and implied cost per life saved.	***We model:*** Emission scenarios that fail to stabilize temperature under 2C: we use Nationally Determined Contributions, with associated policy costs, climate damages, adaptation costs, and mortality impacts.

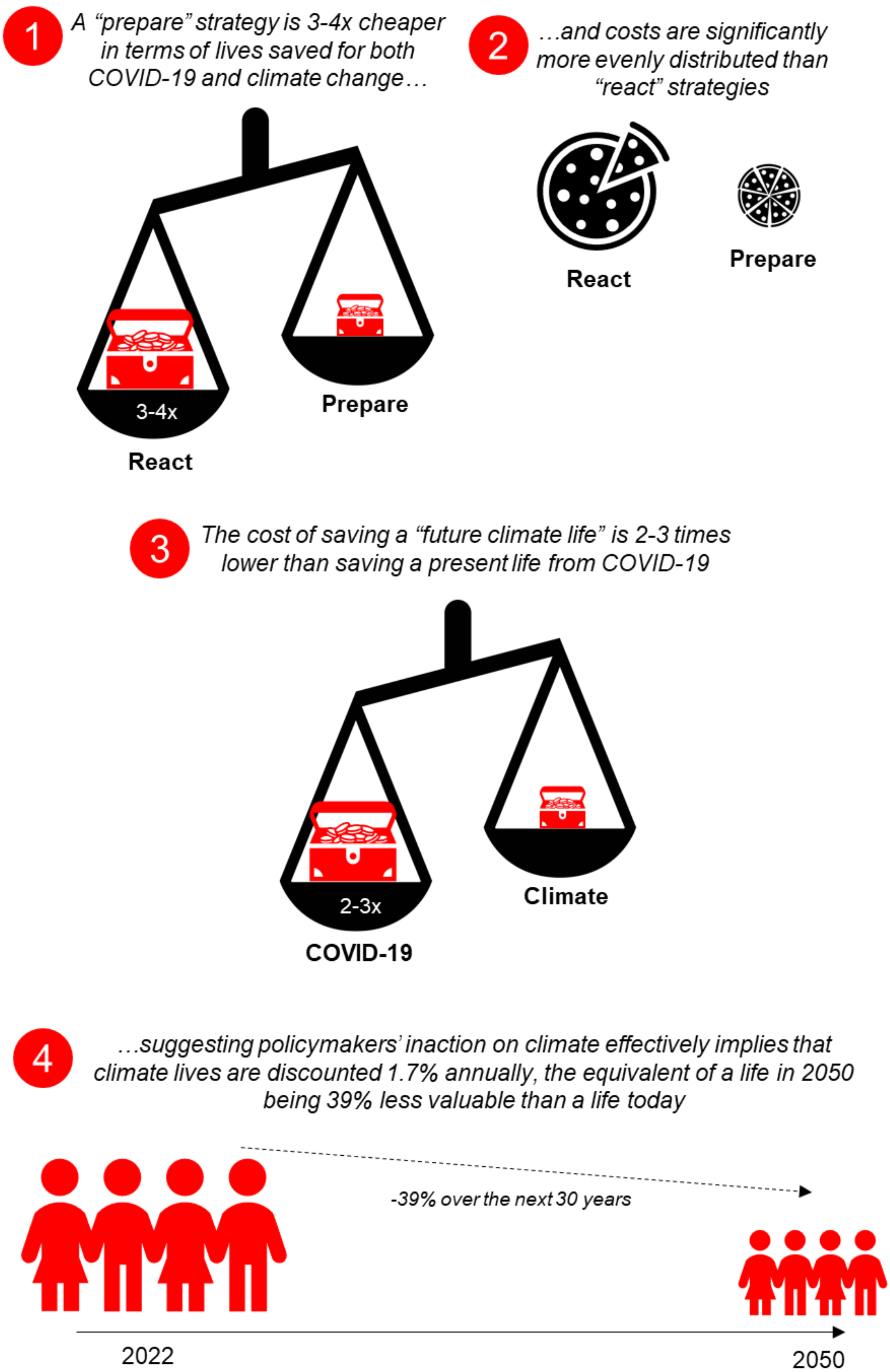
A comment on data sources:

We use two different sets of scenarios and data inputs to develop the key findings in this report given the differences in the research questions between Finding #1 & #2 and Finding #3 & #4. Specifically, Finding #3 & # 4 seek to compare ‘act now’ vs. ‘delayed action’ strategies and consider a narrow set of policy costs. As a result, we rely on a set of OECD scenarios, which provide for granular disaggregation of cost components, for modelling climate policy costs. We do not use the same OECD scenarios for Finding #1 & Finding #2 given that they are not the most recent scenarios available and not referenced in the NGFS scenario database.

3

Key findings

Figure 1: *Infographic summarizing the findings. (Source: own representation)*



Finding #1: For both COVID-19 and climate change, a preparedness strategy is about 3 to 4 times cheaper in terms of costs per life saved than a react strategy.

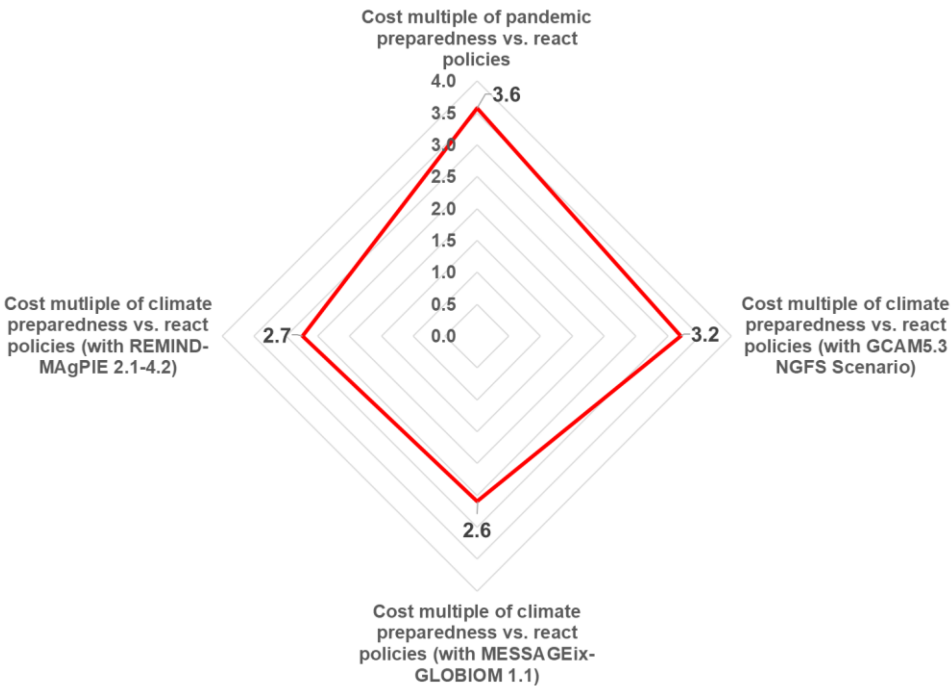
In collaboration with Vivid Economics, we have estimated the costs per life saved of preparedness and react measures for COVID-19 and climate change. The result is that preparedness measures are in the mean 2.6 to 3.6 times cheaper in terms of lives saved than react measures across pandemic and climate responses.

To quantify the costs of pandemic preparedness measures, we include the costs of strengthening public health systems, funding research and development for vaccinations, as well as funding global coordination and emergency response (McKinsey, 2021). For the costs of COVID-19 react activities, the costs of lockdowns and public health interventions are included. Climate change preparedness measures represent the costs until 2050 to achieve a scenario of less than 2°C warming by 2100. As a brief methodology note, given the delay in global warming related to emissions, we only consider policy costs until 2050, but climate change impacts until 2100.

For climate react actions, we take the mitigation costs, climate damages, adaptation costs and mortality impacts for a climate scenario based on the nationally determined contributions (NDCs), which will lead to global warming of just over 2.5°C by the end of century.

Given the uncertainty of potential tail end climate damages, these ratios may of course dramatically understate the benefits of preparedness. This speaks to the notion of a "precautionary principle", where we have a relatively high certainty as to the costs of preparing, but significantly higher uncertainty around reactions. Interestingly, the relative cost ratios are similar between climate change and COVID-19 pandemic, which may suggest a broader pattern as to the benefits of preparing vs. reacting.

Figure 2: *Comparison of the cost multiple of react strategies compared to prepare strategies for costs per life saved for pandemics and three climate scenarios (in the mean), where for climate below 2 °C (B2C) is the prepare scenario and nationally determined contributions (NDC) is the react scenario. Refer to the Q&A document for more details on the categorization of prepare vs react. (Source: own representation based on data from Vivid Economics)*

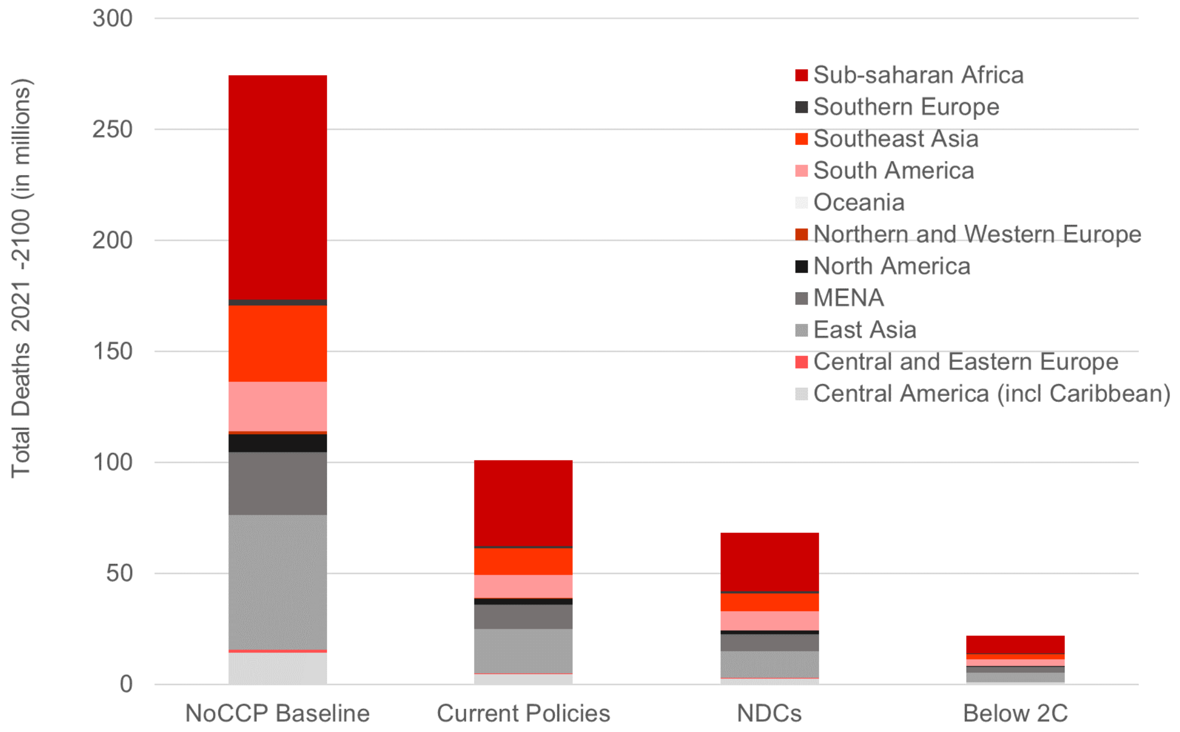


Finding #2: The costs of preparedness measures are more evenly distributed than the costs of react measures.

Preparedness measures for systemic risks lead to a far more equitable outcome than reacting to the crisis when it materializes. The reason is that preparedness strategies require global cooperation to build global public goods that benefit everyone. In the case of pandemics, the preparedness strategies produce public goods such as healthier ecosystems, smaller populations of livestock, better sanitation, a surveillance system, R&D on infectious diseases and the capacity to deploy vaccines (European Council, 2021). In the case of climate change, the public good is a stable global climate.

The mortality impacts of these risks can be uneven across regions. This is particularly true for climate change, where impacts are concentrated in Africa and Asia (shown in the chart below) – in countries which have contributed comparatively little to global historical emissions. Furthermore, in reaction to the acute crisis, each country takes action to protect its own citizens, leading to highly unequal impacts and inefficiencies in policy reactions. In the case of COVID-19, national policymakers made their decisions with limited global coordination leading to very heterogeneous costs. The policy costs of lockdowns and travel bans put a heavy burden on countries that are most dependent on tourism for example. Following this, the costs of react policies can be in part externalized on other countries, leading to inequitable outcomes. Within countries, the measures to combat the crisis led to large generational inequities, with the elderly suffering more from the disease (Santesmasses et al., 2020) and the young bearing the brunt of the policy costs (OECD, 2021a).

Figure 3: *Total cumulative temperature-related deaths from 2021-2100 under different climate scenarios (NoCCP – no climate policies, current policies, NDCs – nationally determined contribution, below 2°). (Source: own representation with data from Vivid Economics)*

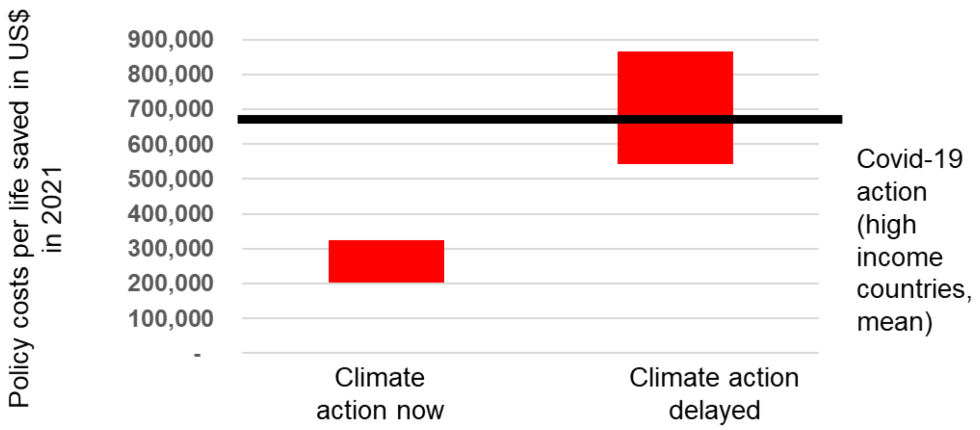


Finding #3: For the COVID-19 pandemic, a preparedness strategy came too late. It is not too late for the climate crisis. The cost of saving a life associated with acting now on climate change is 2 to 3 times lower than the costs for the COVID-19 pandemic, suggesting the significant cost effectiveness and utility of acting now.

Based on estimates from Vivid Economics, high income countries faced costs of $680,000 on average per life saved from COVID-19 (see Figure 4 below). Depending on the discount rate for climate costs, the climate costs per life saved range from approximately $203,000 to $324,000 for an act now scenario. In other words, saving lives through climate action is 2-3 times cheaper than responding to COVID-19 in an act now scenario. Where policymakers delay climate actions, costs increase to $544,000 to $866,000. These additional costs are the result of policy interventions in a delayed scenario that are more disruptive to economic activity and increase total stranded assets.

In collaboration with Vivid Economics, we analysed the cost of COVID-19 measures, and the number of lives saved by these measures to obtain the cost per life saved. In the analysis, we only used estimates of the mean costs per life saved for high-income countries. 2DII developed the estimates of climate costs per life saved based on third-party estimates of climate policy costs. We used data from the OECD report “Investing in Climate, Investing in Growth” (OECD, 2017). The report estimates the impact on GDP in G20 countries until 2050 due to climate policies that lead to a 2°C scenario with 66% probability. Figure 4 shows the impact on GDP by 2050, considering first the costs associated with implementing the policy and secondly the investment benefits arising from the intervention. The calculation of the costs is a worst-case scenario as it does not include avoided damages, other fiscal benefits or net growth effects making the costs even negative (see Q&A document). The costs in terms of GDP losses were discounted by 2.5% to 5% annually. The varying costs depending on the discount rate range from 2.5% to 5% are depicted with the red bars in the Figure 4 below. In this exercise, only monetary costs were discounted over time and not the saved lives. For lives saved by climate policies, we use the same estimates as in finding #1. We assume that the G20 countries are responsible for 80% of global emissions and therefore also responsible for 80% of all climate-related deaths (OECD, 2021b).

***Figure 4**: Comparing the costs per life saved through climate policies acting now or delayed with the mean of COVID-19 costs per life saved in high income countries. The costs include the policy costs and investment benefits and are discounted with a 2.5-5% discount rate indicated by the red range in Figure 4 (Source: own representation using data from OECD (2017), for climate mortalities please see Q&A Q1.9)*



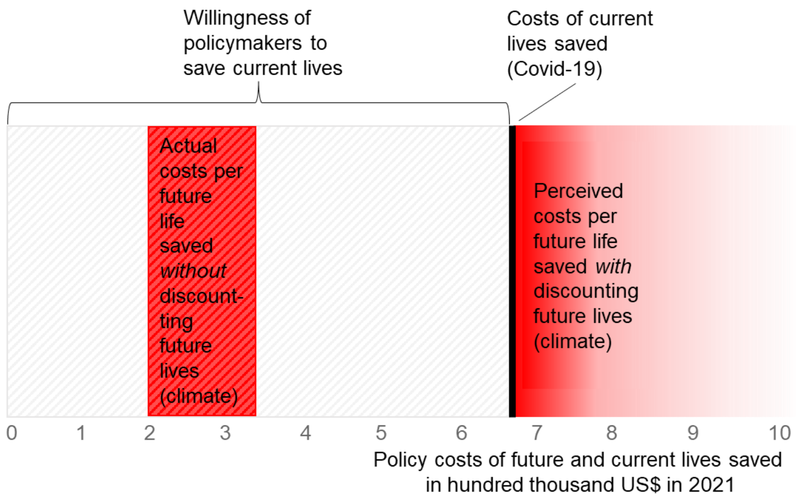
Finding #4: The fact that the current policy ambition as outlined in the NDCs is not enough to meet the Paris Agreement climate goals suggests policymakers de facto discount climate lives. We estimate that they discount future lives by 1.7% annually. That means that a life in 2050 is worth 39% less than a life today.

Since we are currently not on a climate aligned pathway based on Nationally Determined Contributions (NDCs), we can assume that policymakers are currently unwilling to implement the measures needed to achieve international climate goals. This is the case even though the previous analysis shows that climate action as a measure to increase preparedness is a cheaper (Finding #3) and fairer (Finding #2) way to save future lives than the COVID-19 reaction was to save current lives.

This suggests that policymakers are de facto discounting climate lives relative to other policy priorities. The comparison of COVID-19 and climate policy costs allows us to estimate the implicit discount rate in policy decision-making processes. This is the first natural experiment we are aware of that allows for such an analysis. Under the assumption of a capital discount rate of 3.5%, we find that policymakers discount climate lives at about 1.7%. Figure 5 below illustrates the principle of this idea.

The decision – whether consciously or unconsciously – to discount future lives may have multiple reasons. First, a simple explanation is difference in temporal materialization, which could mean that future lives are discounted the same way future costs and benefits are discounted. But there may be other reasons. Second, there may be a 'tragedy of the commons' issue where action is prevented from the need to act collectively in order to achieve climate goals. Third, policymakers may discount future lives where these do not relate to their own citizens, a key challenge as outlined in finding #2 in terms of the distribution of climate mortalities and contributions to climate change. The same idea extends to future lives where these are not the voters. Fourth, future lives may be discounted given the uncertainty of the dynamic around climate deaths. A fifth argument could be short-term thinking of policymakers because most of the deaths will materialize after policymakers' term and in different countries. Finally, future discounting of lives may be driven by a belief in future technology to 'save a life', in other words a belief that climate mortality estimates overestimate climate deaths.

Figure 5: *Cost of current lives saved through COVID-19 costs and the actual costs of future lives saved through climate action now, to demonstrate the perceived discounting of future lives by policymakers. (Source: own representation using data from OECD (2017), for climate mortalities please see Q&A Q1.9)*



4

Overcoming policy shortcomings – Options & insights from the finance sector

The thought experiment shows that preparedness is fairer and more cost effective than react measures to systemic crisis.

Arguably, those reasons ought to be enough for policymakers to act now on the climate crisis. However, they don't. This section will explore insights from the financial sector to incentivise policymakers to think more about the future and to increase its integration in today's decision making. The financial sector may not be an intuitive place to look for lessons on long-termism and bringing the future into the present. However, finance is good at looking into the future, trying to price risks and thus it can help to deal with uncertainty centred around systemic risks (Schoenmaker & Schramade, 2019).

Evidence from the Global Financial Crisis and academic research has highlighted the disease of 'short-termism' in financial markets.

A range of incentives across the investment chain drive short-term behaviour, creating a 'valley of death' between long-term assets and long-term liabilities of institutional investors managed with short-term time horizons.

However, a growing recognition of short-termism has led to a range of innovations over the past few years around driving more long-term behaviour. This section will review examples of these.

This discussion is not meant to suggest that the finance sector has solved short-termism. The contrary remains the case, as parallel research shows (Bird et al., 2017; Janicka et al., 2020; Rösch et al., 2021). However, innovations within the financial sector can teach us lessons about the way financial markets and institutions have sought to remedy short-term incentives ("tragedy of the horizons") – and bring the future into the present.

Insight I: Bring policymakers' incentives into the future.

Insights from the financial sector. The financial sector has developed concepts to create more long-term incentives. One of these concepts are so called "loyalty shares" that provide specific incentives for financial market actors that hold stocks for extended periods of time. The equivalent concept on the management side exists as a function of creating longer vesting periods for stock options. These can be coupled with clawback provisions that allow companies to 'clawback' gains made by individuals under certain conditions. Of course, personal liability – while limited – is a corollary of that mechanism.

Potential application to policymakers. Financial and economic policymakers do not operate under the same incentive regime as individuals in the private sector. Poor political performance may create lasting reputational damage, but these don't appear to be very sticky. When George W. Bush left office in 2008, his approval rating among Democrats was in the single digits. In 2018, surveys suggest that 54% of Democrats viewed Bush favourably. Presidents and Prime Ministers are typically sufficiently financially independent to not be too reliant on public pensions and there are risks to using these instruments for political purposes. The same is true for policymaker liabilities as it pertains to their time in office.

However, there are mechanisms to consider more long-term accountability for policymakers, notably around creating long-term financial incentives, notably through liability concepts specifically focused on areas where policymakers acted or failed to act when it comes to saving lives.

Insight II: Bringing the future into today's decision-making frameworks

Insights from the financial sector: The finance sector is increasingly using scenario analysis and stress testing models to understand complex future risks. The ECB, for example, is now conducting its first climate-related stress test to improve its understanding of future opportunities and threats of climate-related financial instabilities (de Guindos, 2021). A new concept is the delayed stress test, which is based on the idea that stress testing frameworks should consider shocks that occur at a future point in time with certain materiality. Specifically, delayed stress-tests involve applying stress-tests not based on today's markets but at some future point in time.

This creates a degree of "realism" for risks that are unlikely to materialise in the short term. While these stress tests and scenario analyses are currently only used for exploratory purposes, such horizon scanning provides insights into possible outcomes that the future may bring.

Potential application to policymakers: There is a clear gap in the policy modelling space when it comes to dealing with radical uncertainty and long-term policy impact modelling. A recent report by 2DII highlights the gaps when looking at the extent to which sustainable finance policies implemented by the EU are evidence-based (Cooke et al., 2021). The EU has recently launched a call for research on improving economic and climate policy modelling and their role in design (European Commission, 2021). Scenario analysis and the use of simulations will play a crucial role in this dynamic moving forward. Part of this process should also consider the issues of interpretability and communicating on outcomes. The objective is not just to build more complicated models but also to ensure that they operate at a level where they are understood interpreted and used by decision-makers.

Insight III: Take preferences of future generation into account.

Insights from the financial sector: Retail investors like voters in political processes have voting rights through their equity investments. These voting rights are wielded by the investment managers with traditionally very little to no input from retail investors. New technology solutions like Tumelo in the UK are seeking to engage retail investors and pension fund beneficiaries more proactively as to their voting choices. The 2DII platform MyFairMoney seeks to similarly drive more active engagement by retail investors in the fund decision-making process. While these innovations are not specifically targeted at 'future generations' they demonstrate the capability for more participatory decision-making processes and prove broader access to younger generations.

Potential application to policymakers. At the moment, the political input process is designed similarly to financial markets, where voters are consulted at the start of a process (a legislature) and their engagement during the policy design is often either run through media pressure and the use of unstructured political survey data, or consultation processes that involve very high transaction costs for individuals to engage with and thus, are often limited to well-funded NGOs or more likely, industry associations. Innovation in the financial sector can demonstrate how lowering transaction costs through technology can help drive more regular engagement by ultimate beneficiaries. Given the overwhelming support for climate policies at least in Europe, such a process would likely drive more climate ambition in decision-making processes, especially given that they would mobilize in particular younger generations with a more focused view on climate change.

This involves both the consultation process, but also a structured approach to involving in particular young people in policy design where policies are most likely to affect future generations.

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