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ORIGINAL PAPER

# "Climate Bailout": a new tool for central banks to limit the financial risk resulting from climate change

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## Abstract

To achieve the climate goals of the Paris Agreement, the bulk of identified fossil fuel resources cannot be burned and have to stay in the ground. This fact leads to a situation where a significant part of the fossil fuels already recorded in company balance sheets will become stranded assets in the near future. Since 2015, central banks have identified climate change as a large risk for financial stability, stranded assets constituting a significant element of this risk. To protect the economy from this risk, central banks need novel tools. The aim of this paper is to outline a new "climate bailout" tool which would enable fossil fuel industry actors, both in the Global North and Global South to sell their potentially stranded assets to central banks (mainly from the Global North) upon committing themselves to invest the received money into new and additional renewable energy (RE). Multilateral development banks and other development finance institutions would support this process, while central banks would take a new kind of long-term, low-yield green climate asset onto their balance sheets. The newly financed RE would substitute for lost fossil fuel energy supply and stabilise related prices. We demonstrate that a climate bailout would not only be in line with the general mandates of central banks, namely maintaining price stability and preserving the stability of the financial sector, but would also provide a new tool for central banks to counter fossil fuel price shock-induced inflation (fossilflation). We show how countries both from the Global South and the Global North could benefit from the implementation of this new financial tool.

**Keywords** Climate finance · Central banks · Stranded assets · Energy transition · Financial climate risk

## Abbreviations

| | |
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| CBB | Climate Bailout Bond |
| COP | Conference of the Parties (of the UNFCCC) |
| Covid-19 | Coronavirus disease 2019 |

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| CO2 | Carbon dioxide |
| ECB | European Central Bank |
| EU | European Union |
| GDP | Gross Domestic Product |
| MDB | Multilateral development bank |
| RE | Renewable energy |
| TEU | Treaty on European Union |
| TFEU | Treaty on the Functioning of the European Union |
| UNFCCC | United Nations Framework Convention on Climate Change |
| US | United States |
| USD | US dollar |
| US EPA | United States Environmental Protection Agency |

## 1 Introduction

Climate change poses new questions for the financial sector, as for many parts of societies. Climate finance can be broken down into adaptation and mitigation finance, the latter being dominated by the need to shut down fossil fuels and build up renewable energy (RE) systems, as part of the global response to climate change.

In 2009, at COP15 in Copenhagen, Global North governments promised USD 100 billion of annual climate finance. As of 2023, this commitment is over a decade "in the making" and has still not been fulfilled, with negative effects on the speed of negotiations and trust between countries in the UNFCCC. So, on the one hand, the world is struggling to raise the promised amount of climate finance per year. On the other hand, the world needs to mobilise even more climate finance: An external finance need of USD 1 trillion per year by 2030 has been identified for emerging markets and developing countries other than China alone (Songwe et al., 2022). However, the problem is not a lack of private green investment capital. Rather, there is a shortage of clean energy investment opportunities with adequate risk and return characteristics, both globally and especially in these countries (Waldron & Gould, 2021: 45).

Transforming a fossil fuel-based economy into a fully renewable one requires a huge amount of investments (McCollum et al., 2018; Peake & Ekins, 2017) that sometimes generate a return, such as investments in renewables which have already outpaced fossil fuel investments in the energy sector (IEA, 2023). But some costs arise that may not be attractive investments under current circumstances, such as grid enhancement, storage systems, insulation and other efficiency investments (OECD, The World Bank, & United Nations Environment Programme, 2018: 24). The assumption is that if they were, we would already be seeing them on a much larger scale. A stable financing framework is necessary in each case to implement these investments.

A stable legal framework also needs to exist to make a RE investment, especially in the Global South, calculable and thereby bankable, because it is not a lack of "green money" but a lack of bankable projects that is holding the energy transition back (IRENA Coalition for Action, 2018). The scale and speed needed for aligning this energy sector transformation with the climate emergency's short timeframes is unprecedented. This singularity applies also to the problem of stranded fossil fuel assets discussed in more detail below.

In this context, a rewriting of the rules of finance to make them better fit for dealing with climate change has been proposed by Mia Mottley, Prime Minister of Barbados at COP26,

and turned into the "Bridgetown agenda". The search for new tools that allow unlocking necessary capital for the tasks at hand also motivates the current article. We turn to central banks as an actor that could play an important role in unlocking resources on the necessary scale for a swift global energy sector transformation.

Central banks have demonstrated that they are capable of acting in a very fast manner during the financial crisis of 2008 and the COVID-19 pandemic. These instances of "bailing out" the financial system and threatened economies have been crucial to overcome these crises. With the same urgency, we argue, a "climate bailout" could help overcome the climate crisis.

Climate change in fact poses several challenges for financial stability—a key goal for central banks. This fact has been acknowledged by central banks at least since 2015 (Carney, 2015). The Network for Greening the Financial System has identified two kinds of financial risk resulting from climate change: physical and the transition impact (NGFS Secretariat, 2019). Assessing these risks is a very complex task, and there are serious methodological problems for modelling them (Barnett et al., 2020; Eren et al., 2022; Hansen, 2022) and quantifying associated costs (Bolton et al., 2020; Campiglio et al., 2023; Deghi et al., 2020; European Central Bank, 2021; OECD, 2021; Packer et al., 2022).

## 2 The upcoming stranded asset crisis

The Carbon Tracker Initiative has pointed to potentially "stranded assets" for over a decade (Carbon Tracker Initiative, 2011). These refer to fossil fuel resources and infrastructure which become uneconomic due to a transition away from fossil fuels. Fossil fuel resources in danger of becoming stranded assets include oil, gas and coal which are still in the ground, but are already included in the books of fossil fuel companies as reserves. Infrastructure assets that could be stranded include fossil fuel power plants, refineries, pipelines and "upstream" extraction infrastructure and even real estate. Large amounts of stranded assets could seriously endanger financial stability. The transmission channels that bring "transition risk" expressed by government policies, investor or consumer sentiment, or technological change to bear on established risk categories such as credit, market, liquidity and operational risk can be divided into micro- and macroeconomic transmission channels (Basel Committee on Banking Supervision, 2021: 4, Fig. 1).

### 2.1 Size of the issue

Different authors have tried to quantify stranded assets in different sectors and with different methodologies (see Daumas, 2023 for a recent overview of the literature). While there are a number of estimates that use non-monetary metrics such as capacity of coal power plants or potential emissions of fossil fuel reserves, the most interesting analyses for central banks are those that quantify a financial impact. An important distinction in this regard is between book value of fossil fuels and foregone income streams. While Carbon Tracker has quantified the issue at slightly over USD 1 trillion, 0.6 trillion of which for assets listed at stock exchanges (Allen & Coffin, 2022), and pointed to USD 9 trillions of lost profits for "petrostates" (Coffin et al., 2021), Mercure et al. (2018) have quantified what they call values at risk at USD 12 trillion. Other estimates reach as high as USD 44 trillion for all fossil fuel reserves that could

be stranded under a 1.5 °C compatible pathway (Hansen, 2022) (Daumas, 2023, gives a full picture of the range of methodologies and resulting estimates that can be found in the literature).

The amounts are, on the one hand, potentially too high for public budgets to cope and thus merit bringing central banks into the picture, and on the other hand, they are on a scale that is certainly within reach for central banks, judging from existing precedents.

### 2.2 On top: stranded liabilities

A topic that has not received much attention in academic literature is that of "stranded liabilities" (Schuwerk et al., 2020). It refers to *asset retirement obligations*—costs for environmental remediation and plugging wells—which can get "stranded" when a company goes bankrupt. In such a case, the public steps in and absorbs the costs. In theory, there are financial mechanisms in place to assure that such costs are covered. In practice, these mechanisms are only partly functional, with money set aside being either too little, or practices such as blanket bonds for many wells at once, or self-bonding (Heard, 2017) which cease to function properly in the case of a bankruptcy. This has led to a situation where bankruptcies can lead to significant stranded liabilities in the coal (Macey & Salovaara, 2019) and oil and gas industries (Schuwerk & Rogers, 2020).

The issue is not well studied on a global scale, but some partial results indicate that it is sizeable: In California, about USD 100 million are available for an estimated need of over USD 9 billion to plug roughly 100,000 wells (Boomhower et al., 2018: 28, Table 8), while the US EPA estimates a total of 2.1 million unplugged abandoned wells for the US alone (Raimi et al., 2020). Offshore wells in particular are expensive to plug: The 82,257 wells in the US Gulf of Mexico have been estimated to cost USD 44.4 billion to plug and abandon (Agerton et al., 2023). How to improve the regulatory framework is a topic of active discussion in the US (Fitch, 2021; Gouzoules, 2022; Rusco, 2019), where a federal rule already exists that prior owners can be held liable in the event of a bankruptcy. Internationally famous cases such as the Niger Delta in Nigeria (United Nations Environment Programme, 2011) or Lago Agrio in Ecuador (Gomez, 2013) testify to the current lack of institutional and legal means to oblige fossil fuel companies to clean up behind themselves.

Schuwerk et al. (2020: 6) have pointed to a dynamic that could give the topic particular relevance for financial stability: the interaction between asset stranding and liability stranding. Because current rules allow operators to push retirement costs further into the future and discount them in the present, the stranding of an asset raises the present costs of retirement. A perceived crisis with environmental liabilities being purposefully stranded (Boomhower, 2019) could very plausibly provoke a regulatory reaction of stricter rules around retirement obligations in future—which, in turn, could lead to additional assets becoming stranded.

When a fossil fuel company declares bankruptcy, its climate liabilities also get stranded. Climate damages attributable to fossil fuels have been estimated at USD 69.6 trillion over the period 2025–50 (Grasso & Heede, 2023). How this "bill" is going to be footed is currently unclear. The climate bailout we will discuss in the next chapter could be a way to bring the financial burdens of both asset retirement obligations and climate damages into a more structured process where the bill will be paid.

### 2.3 Why not let markets alone deal with it

Lord Nicholas Stern's evaluation that climate change is history's biggest market failure is well known (Stern, 2007: viii). This can largely be blamed on the time horizons of economic decisions and the huge externalities that are not priced in when opting for fossil fuels. The International Monetary Fund has published a working paper that estimates these externalities and considered fossil fuel subsidies on this basis to lie at around 5 trillion per year in the mid-2010s (Coady et al., 2019). A challenge in transforming this situation with large unaccounted damages being caused on an ongoing basis is the *lock-in* dynamic, where sunk costs are high and maintain an unprofitable industry operating even when it is no longer competitive against cleaner alternatives from a full lifecycle perspective (Erickson et al., 2015; Seto et al., 2016; Unruh, 2000). Locked-in fossil fuels will require additional resources to be unlocked.

An additional concern is that today's energy markets are getting distorted by subsidies. These have the effect of making fossil fuel projects financially much more attractive (Achakulwisut et al., 2021; Lunden & Fjaertoft, 2014) and, in the worst case, push uneconomic projects forward (Erickson et al., 2017). When risks and rewards are distributed unevenly in time or among institutions, it becomes possible to move forward with big, risky projects on the basis of "optimism bias", leading to cost overruns (EY, 2014: 9). Big fossil fuel projects tend to generate path dependencies of their own, including constituencies in favour of maintaining or deepening the fossil fuel status quo (Brauers & Oei, 2020; Corral-Montoya et al., 2022; Haley, 2011; Newell & Johnstone, 2018). In cases such as the German coal phase-out, big fossil fuel actors have shown quite capable of defending their economic interests in the face of policy efforts towards a swift energy transition (Brauers et al., 2020), reaping benefits such as big subsidies (Furnaro, 2023). A close connexion between politics and fossil fuel projects can thus shield them to a certain degree from the market. For both coal-powered electricity and fossil gas deliveries, there is a tendency to put in place long-term contracts which make it difficult to exit the technology, even if the economics of renewables have advanced so much that building new renewable facilities would be cheaper than just the operating cost of written-off fossil fuel facilities [see Bodnar et al., 2020, for a global evaluation of coal power plants and Brauers et al. (2021) for fossil gas lock-in].

### 2.4 The potential role of central banks

The huge global problem of climate change needs a similarly huge global solution. And the only economic institutions which have the power to handle the economic size of climate change are central banks, in particular from the Global North. Central banks which create internationally accepted reserve currencies are capable of purchasing bonds from states and other economic entities to provide the needed liquidity for the biggest economies to surmount obstacles of the magnitude of the financial crisis in 2008 and the COVID-19 pandemic. This unique economic capability of central banks could also be used to support the global RE transition and overcome the stranded asset issue. One possible new tool to do this is a climate bailout laid out below.

One potential strong point of central banks for the topic at hand is their independence. There is a wide literature discussing this topic [see Vasicek et al. (2023) for a recent overview] but for our focus on ending fossil fuels, a specific dimension of independence is

important: Central banks could potentially be better shielded from the influence of fossil fuel actors on politics (Fagan-Watson et al., 2015; Markussen & Svendsen, 2005). Compared to other public institutions, central bank operations are normally more based on economic science, with research departments actively debating different ideas and concepts and explicit channels for evidence-based learning (although there may be other inherent biases, too [see Fabo et al., 2021)]. This may place them as an important neutral actor in the final term of the fossil fuel age where the public's best interest aligns with a swift energy transition. In the current political–economic configuration, fossil fuel interests continue to determine the way of the global economy in spite of more and more severe climate change impacts. Year after year of UNFCCC Conferences of the Parties with declarations that emissions should be brought down contrast with constantly rising greenhouse gas emissions. When taking this emissions outcome perspective, the question suggests itself whether the political game is constantly being won by fossil fuel interests, which have an incentive to delay the energy transition as long as possible and whether additional interventions by new actors are needed for a different dynamic.

## 3 The "Climate Bailout" proposal

### 3.1 Basic elements: how it works

The basic idea of the climate bailout is to give fossil fuel companies a way out of their current, obsolete business model, so that the fossil raw materials that are no longer allowed to be burned remain in the ground, and at the same time, RE is built up that can replace the fossil energies.

To implement the climate bailout developed here, it is first necessary to identify the fossil raw materials that must remain in the ground because their burning would make it impossible to achieve climate goals. The companies that own these raw materials and have already accounted for them as assets fear that the value of these raw materials might fall sharply in the near future, if they can no longer be used for energy. This threatens the companies with high and possibly existential balance sheet losses, even threatening financial stability. The climate bailout is a last resort out of this dilemma because it enables companies to sell their fossil assets which are in danger of becoming stranded before they become worthless. However, the sale of these commodities is only made possible if the companies simultaneously commit to investing in RE and the associated infrastructure with the proceeds.

#### 3.1.1 Converting presumably stranded assets into renewable energies

The coupling of the expansion of RE with the non-use of fossil raw materials envisaged in this proposal has an important energy-related reason: If fossil raw materials remain in the ground, they are no longer available for energy use and must be replaced by RE. This applies equally to oil, gas and coal. With the transition from fossil fuels to electricity from renewable sources, great efficiency gains are realised. In this way, the current high primary energy consumption can be reduced to about one-third. Thus, only a part of the current energy production needs to be replaced. Nevertheless, the supply of renewables must be increased in the course of the phase-out of fossil energy sources. The climate bailout links these two elements and thereby improves the stability of the energy sector.

The fossil fuel companies can sell their unmined fossil resources (and associated infrastructure, such as mines and refineries) to designated financial institutions, such as national or multilateral development banks (MDB). The MDBs bundle the stranded assets into new "Climate Bailout Bonds" (CBB). Since the market value of fossil resources that can no longer be extracted and the associated infrastructure will fall sharply in the future, the MDBs must be enabled to sell on the CBBs directly and without loss to central banks. To this end, the central banks must establish in advance how many CBBs they are planning to buy from the MDBs.

### 3.1.2 Determining the price for presumably stranded assets

First, the price for the fossil raw materials remaining in the ground must be determined. Here, it seems sensible to take the CO2 content of the raw materials remaining in the ground as a reference. A fixed amount of money could be paid per tonne of CO2. This amount must be high enough for companies to have an interest in getting rid of their fossil assets that could get stranded. At the same time, it must not be too high, because only the losses threatened by stranding are to be limited and no extra profit is to be financed. Here, the MDBs could apply a trial-and-error procedure that allows timely price adjustments in order to find the price corridor that achieves the desired steering effect. An ex-ante quantitative analysis could be useful for calculating a starting price. Potential sellers must also be aware that the sales price will fall over time, so waiting too long is not a sensible strategy.

Once a price (or price corridor) per tonne of CO2 has been determined, the process can continue with a bidding competition between the companies willing to sell. Only the companies that will build the most RE (or other climate friendly measures) with the sales proceeds will be selected. Where and how much RE they want to build up must be explained in detail by the companies in advance in a transparent and credible manner. Only new and additional RE projects would be eligible that do not crowd out other RE investors.

If the expansion targets are not met, sanctions must be imposed, such as the repayment of the sales price. In any case, the sanctions must be strong enough to deter unreliable bidders. Bidders can also invest in other infrastructure necessary for the energy transition, such as grid enhancement, storage systems and the necessary reconversion plants. It would also be possible to invest in higher efficiency, better thermal insulation and the construction of heat pump systems, as well as the conversion of the industry's process heating needs to electricity from renewable sources.

It is also important for a functioning bidding competition that the central banks participating in the procedure must determine in advance a maximum amount with which the MDBs can buy up the stranded assets, bundle them into CBBs and resell them to the central banks. The bidding process ensures that the largest possible renewable capacity is achieved per CBB bought up by the central bank. However, in order to reduce emissions as much as possible, the maximum amount of CBBs to be bought up by the central bank should not be too limited. Rather, the aim should be a bidding competition in which the majority of companies can sell their stranded assets in exchange for the creation of new RE. However, there must also be a minimum amount of RE to be built up per fossil raw material unit sold, to avoid an unjustified gain for the sellers of the fossil assets. If the minimum amount is not achieved, no purchase is made by the MDBs.

### 3.1.3 The refinancing process via the central bank

The task of buying up and bundling in CBBs could be taken on by national development banks or MDBs. In any case, the procedure must be coordinated with the related central bank, and the MDBs must receive a fee for the service of bundling in CBBs and monitoring the implementation of the contractually agreed RE build-up, which must be paid by the sellers of the fossil assets.

The possibility for the MDBs to refinance the CBB purchases at the central bank without losses is crucial for the climate bailout. No private economic entity whose objective is to make profits can buy such barely liquid, very low-yield CBBs. Public budgets would also be overburdened in view of the extent of the decommissioning of fossil raw materials and their infrastructure necessary to save the climate. The same applies to other private financiers. The central bank takes the CBBs onto its balance sheet as a new asset at their nominal value. CBBs consisting of fossil fuels that are also suitable for non-energy use can continue to generate a financial return if the raw materials are sold for this use. Therefore, the infrastructure required for extraction and processing (e.g. wells, pipelines, mines and refineries) may still be able to generate a partial return when non-energy uses are continued.

## 3.2 Widening the central bank toolbox

Why should a central bank, besides preventing climate damages, have an interest in buying up largely illiquid low-yield bonds like CBBs and adding them to its balance sheet at nominal value? The aftermath of the great financial crisis of 2008 has shown that most central banks have no monetary policy tool to directly stimulate economies when interest rates are already very low. This lack led the European Central Bank (ECB)—as a substitute action—to buy a wide variety of assets on a large scale in order to pump new liquidity into the markets, intended as an expansionary stimulus. But also this tool works only in an indirect way. This shortcoming could be remedied with a monetary policy tool that exerts a direct effect on real investments in the green energy transition, e.g. via purchases of CBBs.

The current sources of inflation in the euro area are supply/demand shocks and bottlenecks in the value chains. At the same time, recent developments show that the central banks do not have an effective tool against "fossilflation"—inflation triggered by rising fossil energy prices—(Schnabel, 2022) either. A monetary policy tool that has a direct, dampening effect on rising energy costs would make it much easier for a central bank to fulfil its main mandate of price stability in the medium term. This could be achieved through a tool that leads to the expansion of renewables and lowers the economy's dependence on price-volatile fossil fuels. RE prices are more stable than volatile fossil fuels and show a declining trend in the long run (IRENA, 2023).

The price-stabilising effect would be even greater if the substitution of fossil energies were promoted by many central banks on a global scale. In addition, central banks could avoid the dilemma of making urgently needed investments in the energy transition more expensive and thus more difficult by raising interest rates. Furthermore, a climate bailout would reduce the number of fossil energy assets stranded by the energy transition and thus also improve the overall stability of the financial sector.

To summarise the expansion of the central banks toolkit: The climate bailout tool expands the toolkit in four ways:

1. It can stimulate the economy in a more direct way than ordinary asset purchases.
2. It expands the toolkit for fulfilling the central banks new mandate on climate change.
3. As it is a kind of monetary financing, the tool will support the fast energy transition without burdening the national budget.
4. The tool will support the way out of highly volatile fossil fuel prices.

### 3.3 Central bank mandates and a climate bailout

A climate bailout would expand the monetary policy toolbox of central banks. We will discuss the question whether the presented climate bailout is in line with the general mandate of central banks, taking the example of the ECB. In principle, an adjustment of the central banks' mandates is also possible, but could require a time budget that is no longer available with regard to the climate crisis.

The current Treaty on the Functioning of the European Union (TFEU) provides that the primary objective of the ECB is to maintain price stability (Article 127 TFEU). At the same time, Article 127 TFEU states that the ECB shall support the general economic policies of the Union with a view to contributing to the achievement of the objectives laid down in Article 3 of the Treaty on European Union (TEU). This applies as soon as the primary objective of price stability is not thereby jeopardised. Among other things, Article 3 of the TEU explicitly names "a high level of protection and improvement of the quality of the environment" as an objective. At the latest with the ratification of the Paris Agreement by the EU states, it can be claimed that the "high level of environmental protection" also means global climate protection. Thus, three reasons can be identified in the European Treaties that make a climate bailout as a monetary policy tool appear not only permissible, but also even imperative: First, it supports financial stability, second, it helps the ECB achieve price stability and, third, it helps it fulfil its (secondary) mandate to support the EU in implementing climate protection. This also disproves recurring criticisms that the ECB's activities in the area of climate protection represent an overstretching of its mandate.

#### 3.3.1 A climate bailout and the role of state financing

Other critics, however, might object that the purchase of CBBs, with very long, even perpetual maturities and low earning power, constitutes a form of monetary state financing, because—indirectly—objectives are pursued that could be met with ordinary budget funds (Hülsewig & Steinbach, 2021). However, the direct acquisition of bonds from public development banks (such as MDBs) by the ECB is permitted under Art. 123, para. 2 (TFEU) and thus does not fall under the prohibition of monetary state financing. This would also apply for the direct purchases of CBBs issued by MDBs from the central bank in the context of a climate bailout. In addition, budget financing through the purchase of government bonds by the ECB (monetary government financing) is only prohibited if it is carried out directly (Art. 123, para. 1, TFEU). As soon as these purchases are made indirectly, they are permitted. This view has also been confirmed by the European Court of Justice (Redaktion Beck-Aktuell, 2018).

The ECB made very successful use of the monetary policy tool of indirect purchases of bonds of government and other issuers both in dealing with the financial crisis of 2008 and with the COVID-19 pandemic. It was only through the mass purchase of these bonds that the enormous financial tasks that the states had to perform could be borne by the public budgets, and the crises could be mastered. Nevertheless, there is a discussion on

the adverse consequences and possible drawbacks of the ECB purchase programmes [see Beckmann et al. (2020) for a detailed overview]. Successfully mastering the climate crisis might not be possible via financing from ordinary, tax-based budgetary resources alone either. We, therefore, suggest an approach similar to the one taken to deal with the financial and COVID crises.

#### 3.3.2 Climate Bailout Bonds (CBB) as permanent part of a central bank balance sheet

The ECB's new climate bailout tool means that the part of the asset side of the ECB's balance sheet consisting of CBBs has very little, if any, liquidity left and is, therefore, no longer available for balance sheet-reducing monetary policy actions, such as asset sales to the financial markets by the ECB. However, in any case, only a relatively small part of the balance sheet needs to be available for such measures. Empirical evidence [see, for example Board of Governors of the Federal Reserve System (US) (2023) for the US] shows that the monetary base as major part of the balance sheets of central banks grows moderately and continuously in economically normal times and is only reduced again when existential crisis situations have previously led to a very strong and rapid increase in the balance sheet total. It is thus plausible to regard a substantial part of a central bank balance sheet as permanent.

## 4 Discussion

### 4.1 Benefits

One important benefit of the climate bailout proposal consists in the incentive change of the fossil fuel lobby groups from promoting fossil fuels and hampering renewables towards a lobby group that will support a better legal framework for renewables. Until now, fossil fuel companies gain their revenues with coal, gas and oil and every year in which they can postpone the transformation into renewables they can earn a lot of money with this behaviour. Upon the implementation of the climate bailout, the fossil fuel companies would have a strong incentive to get rid of their stranded assets to avoid future losses and to do this they must—according to the bailout plan—heavily invest into new and additional renewables. Hence, it can be assumed that fossil fuel companies would change their lobby activities towards promoting a new legal framework which will support a fast climate friendly energy transition.

Even though the international dimension of a climate bailout may seem like an unwarranted "giving away" of resources to a foreign country by a central bank, there is a way in which a central bank can provide financial resources to other countries and create a benefit at home: via "home economy clauses". If these are established in a climate bailout mechanism, this would mean that a set portion, for example 50%, of the money paid to entities in other countries for their stranded assets needs to be spent on goods and services from the central bank's home economy. This means, to stick with the 50% example, that half of the money would necessarily flow back into the home economy and stimulate economic activity there, namely those sectors which produce goods or deliver services relevant for a swift RE transformation. In money system implications, the outcome would be quite similar to quantitative easing and COVID bonds described above. It would not meet the "market neutrality" principle sought for quantitative easing by those who see this as an important

principle of central bank action. But then, this principle has been criticised for being biased towards fossil fuel companies which emit more corporate bonds than zero-carbon energy companies (Matikainen et al., 2017).

As Heede and Oreskes (2016) have pointed out, the bulk of fossil fuel reserves is not in the hands of private companies, but rather controlled by state-owned enterprises, many of which are in the Global South. In principle, this could make innovative mechanisms such as a climate bailout easier, because, on both sides of the table, we have institutions that are meant to look out for the best interest of society rather than private profit, including the very big interest of successfully confronting the climate emergency and meeting the Paris climate targets. Whether this is enough to enable countries which are today heavily dependent on fossil fuel export revenue to embrace a swift transition is questionable. But we assume that at least the prospects of a financial flow in the case of non-extraction would make these countries more willing to look at alternative options to the current "business as usual" which tends to aim for extracting all reserves as quickly as possible. What should not be forgotten in all this is that the objective cannot be to create another import-dependent sector in the Global South economies, but must rather be to make an initial transfer of capital and technology that seeds the growth of a *domestic RE industry* that can sustain itself.

A climate bailout may prove beneficial from two additional angles: Firstly, the payment of *climate debt* is a long-standing demand of the climate justice movement and various governments (Pickering & Barry, 2013). Climate reparations owed by fossil fuel companies for climate damages caused since 1988 have been quantified at USD 23.2 trillion (Grasso & Heede, 2023). The sheer size makes it understandable that the political will for climate debt payments is not there yet. The US even brought a clause into the Paris Agreement that attempts to explicitly shirk that responsibility. A climate bailout could potentially help break the ice by generating sizable resources that could be counted towards climate debt without placing an additional burden on government budgets.

Secondly, from the perspective of *intergenerational equity*, fossil fuel endowments should be considered "family silver" that is not to be sold, but to be conserved (Basu & Pegg, 2020). Considering fossil fuels, and in particular oil and gas "too valuable to burn" makes sense when considering the many potential non-burning uses that these materials have and which generate much higher value to society. When further taking into account the huge externalities of their burning, selling off these endowments for quick burning appears like one of the least attractive options. Via a climate bailout, central banks could take over ownership of fossil fuels and hold onto them long enough for human societies to develop methods to use these materials in a better, non-burning way.

### 4.2 Potential critiques

Every new tool for central banks will need to withstand many critiques. We want to consider at least a few of them in a very brief manner.

The first critique would be that the tool could itself generate risk of inflation. But the global additional amount of investments into renewable and other climate friendly measures would be very small in relation to the global GDP. Hence, only a very small inflationary pressure would occur from implementing the climate bailout.

The question could also be raised: Why have central banks not already done this? This is indeed a very good question. To answer it, we need to keep in mind that central

banks have started to regard climate change as part of their mandate only since around 2015. As necessarily conservative institutions, they need time to go beyond their usual approach.

In particular in the Euro area, there is a discussion about whether the mandate of the ECB would allow new tools which deal with any kinds of state financing. But, in the end, this is a question of political will and not of the words into the EU treaty.

Another critical question the proposal may raise is: Why should we support the old fossil fuel industry by getting rid of their stranded assets? The unpleasant answer is that the fossil fuel industry exists as a very powerful entity and will hamper the urgently needed energy transition in the absence of a solid incentive to change their behaviour, an "exit ramp" if you will. *Moral hazard* is an important topic to be taken into account in the further design of the mechanism and can build on some existing thinking and analysis on the question [see, e.g. Daumas and Salin (2021), Scott Cato and Fletcher (2020)].

Related to the previous concern, a climate bailout could be viewed as another fossil fuel subsidy. Farming subsidies are one possible analogy, where farmers are paid for not farming their land. While the climate bailout mechanism provides resources that are not currently afforded by the market for unlocking an end to fossil fuels, we argue that it provides an opportunity to include certain costs, such as environmental and climate liabilities which markets currently ignore or discount. See also Sect. 2.3 of this article ("Why not let markets alone deal with it") for several additional reasons why the problem can't be expected to "solve itself". Rather than subsidising a fossil fuel status quo, a climate bailout would provide a last exit offer from the authorities, which could also build legitimacy for stronger regulatory action on ending fossil fuel burning.

## 5 Conclusion

Financing the needed investments for addressing climate change requires unconventional and innovative tools at a massive scale. The climate bailout is a tool that can address two problems at once: RE growing too slowly, and financial instability resulting from stranded fossil fuel assets. Details for implementing a climate bailout remain to be worked out. While central banks are conservative organisations, they helped overcome the 2008 financial crisis and the COVID-19 pandemic by developing a number of ground-breaking new financial tools. Thus, there is hope that they may also deploy new financial tools to address the climate emergency. It could bring much needed progress in the climate finance field, but will surely not be a silver bullet. Central banks will also need a formal, or at least informal, permission from their parliament or government to implement a climate bailout which could be interpreted by some as overstepping their mandate. We hope to have shown that it would not only fall within their current mandate, but also would actually allow them to meet it better.

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