NEW ECONOMICS FOUNDATION

BANKING ON COAL

HOW CENTRAL BANKS CAN ADDRESS THE FINANCIAL RISKS AND SUPPORT A CAPITAL SHIFT AWAY FROM COAL

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EXECUTIVE SUMMARY

- Coal is the single largest source of greenhouse gas emissions globally – and still expanding.
- Globally, the use of coal for electricity production has to fall by two thirds until 2030 and to nearly zero by 2050 to keep the increase in global temperatures below 1.5 degrees. Analysis based on "oldest-first" retirements of coal-fired power units highlight the need for a complete phase-out of coal across the OECD by 2030.
- With 4 out of 5 coal EU power plants unprofitable and utilities facing loses of €6.6 billion in 2019 alone, a rapid phase-out of coal is critical to account for the financial risks of coal investments and the potential of "asset stranding".
- Central banks and financial supervisors are a critical catalyst in channeling capital flows and ensuring the resilience of the financial system and thus play a vital role in reducing the funding of coal – in particular by:
  - excluding coal-exposed assets from central banks **collateral frameworks and asset purchases**,
  - accounting for coal risks in setting **microprudential capital requirements**,
  - introducing **macroprudential capital buffers** for coal exposures,
  - and ensuring that the risks of coal asset stranding are adequately reflected in **stress tests**.
- Central banks across the world have exposures to coal through their collateral frameworks as well as the assets they hold. The balance sheets of major central banks today stand at more than 20 trillion USD. At least 627 billion USD of that total is allocated to equities and corporate bonds. Assuming that just 2%[1] of this sum is linked to coal-exposed assets, central bank coal exposures would amount to more than 12 billion USD. Removing this exposure is critical and urgent.
- Coal-related risks are not sufficiently accounted for in current risk analysis. Ensuring that these risks are adequately reflected in both microprudential and macroprudential supervision is vital.
- The Bank of England has taken the first steps towards stress testing the financial sector for the stranding of fossil fuel assets in general and coal assets in particular. Further financial authorities need to follow its lead.
- Key institutions to advance this agenda comprise leading central banks (e.g. Bank of England, Bank of Japan, European Central Bank, Federal Reserve, People's Bank of China, SNB), rating agencies (e.g. DBRS, Fitch Ratings, Moody's, Standard & Poor's), as well as the IMF and the World Bank.

[1] 2% corresponds to the coal exposure of the US equity portfolio of the Swiss National Bank – which is the only component of central bank holdings for which detailed private sector exposures are publicly disclosed.

1. INTRODUCTION

Global energy-related CO2 emissions reached a record high of 33.1 Gt in 2018. Coal accounted for 30% of the total and thus remained the single largest emitter of greenhouse gas emissions globally.[1][2] With just over 10'000 TWh – equal to 38% of global power production – coal also remains the largest source of electricity generation worldwide. The three countries that top the list in terms of coal-fired power generation are China (4'732 TWh), the United States (1'246 TWh) and India (1'177 TWh), followed by Japan (347 TWh), South Korea (261 TWh), Germany (229 TWh), and South Africa (225 TWh) (BP 2019).

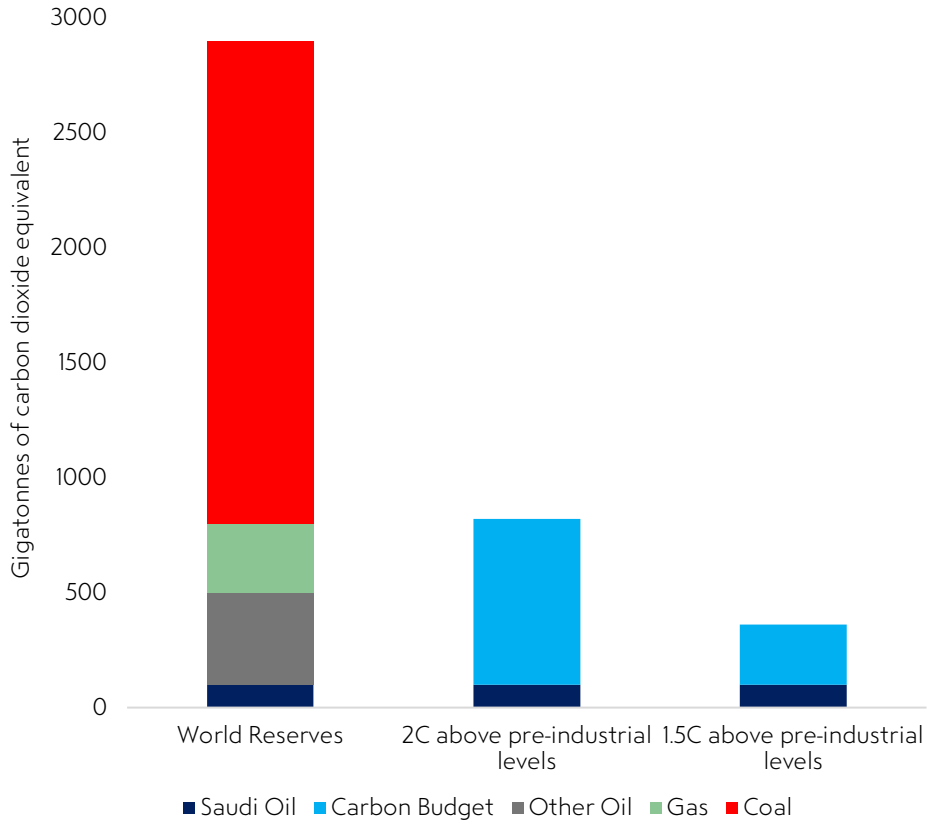
Given its high carbon intensity, significant and rapid reductions in the use of coal in global electricity generation is critical for the transition to a low-carbon economy and climate change mitigation. Yet, the current trajectory of coal-fired power production points in the opposite direction. Total coal power capacity has doubled since the year 2000 and now stands at over 2'000 GW worldwide. An additional 236 GW of coal power capacity is already being built and 307 GW is in the planning stage. 241 GW are set to retire – leading to a projected net increase of total capacity to more than 2'300 GW.[3] China (199 GW) and India (94 GW) account for the bulk of new plants that are planned or under construction. Further key countries with a sizable coal power pipeline are Vietnam (42 GW), Turkey (37 GW), and Indonesia (25 GW).[4]

Coal production has also increased from close to 2'300 Mtoe to over 3'900 Mtoe since the year 2000. China accounts for around half of both global coal production and consumption. India's share in global production and consumption are 8% and 12%. Further large producers and consumers include the United States (9%, 8%), Indonesia (8%, 2%), and Australia (8%, 2%). Global production increased by 4.3% in 2018 – underpinned by particularly strong growth in e.g. China (4.7%), India (7.5%), and Indonesia (18.9%).[5]

A reversal of this trend through accelerated phase-outs of existing coal-fired power plants, cancelling the construction of new ones, and stopping the development of additional coal mines is essential. In fact, according to the Intergovernmental Panel on Climate Change, the use of coal for electricity production has to fall by two thirds until 2030 and to nearly zero by 2050, to keep the increase in global temperatures below 1.5 degrees.[6] Analysis based on "oldest-first" retirements of coal-fired power units highlight the need for a complete phase-out of coal across the OECD by 2030.[7]

A rapid phase-out of coal is also critical to account for the financial risks of coal investments and the potential of "asset stranding" as coal loses further in competitiveness. Research by financial think tank Carbon Tracker suggests that 60% of global coal power today is already uneconomic[8], 79% of EU coal generators are currently running at a loss and could lose €6.57bn in 2019 alone[9], and by 2030 building new renewables will be cheaper than continuing to operate 96% of the currently existing and planned coal-fired power plants[10]. Figure 2 suggests that if we are to keep within the IPCC 1.5 degree target, over 80% of fossil fuel reserves – predominantly coal – will be left worthless. The Bank of England recently reflected this elevated risk for coal in its climate change stress tests for the insurance sector by attaching the highest write-down assumptions within the fossil fuel sector to coal extraction and coal power.[11]

FIGURE 1: GLOBAL FOSSIL FUEL RESERVES - PREDOMINANTELY COAL - OUTWEIGH CARBON TARGETS
GIGATONNES OF CARBON DIOXIDE EQUIVALENT



Source: Rystad Energy, IPCC, IEA, World Energy Council[12]

Box 1: What are 'Stranded Assets'?

Forecasts suggest that only one fifth of remaining fossil fuel reserves (oil, gas, and coal) can be burned if we are to keep temperatures below 2°C. If the Paris Agreement is met, most of these reserves will have to be left in the ground; fossil fuel companies may be hugely overpriced, and infrastructure built to extract the reserves may become useless (known as 'stranded assets').

The transition away from coal is thus not only key to meeting climate policy objectives, but also a matter for those who are concerned with the financial stability risks that the stranding of lossmaking coal assets pose, including central banks and financial supervisors. The following brief provides an overview on the levers they should consider in addressing these risks and in supporting a shift of capital flows away from coal towards a low-carbon economy.

2. COAL FUNDING

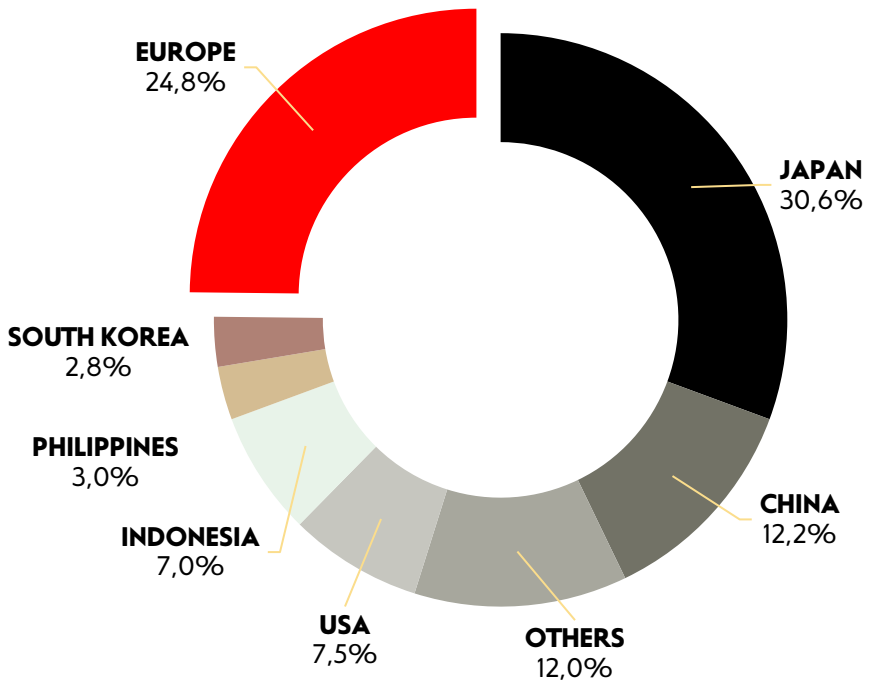
Firms secure funding for their activities from three sources: own operations, the divestment of assets, as well as externally from private banks, investors and public institutions. Our focus is on the third category – specifically on bank loans, bonds and equity.

A variety of sources provide insights into the magnitude and channels of external funding to coal.

Recent research by leading environmental organizations examines funding between January 2016 and September 2018 to the 120 top coal plant developers which are responsible for close to 70% of the global pipeline of new coal-fired power plants.[13] During that period this group of developers received more than 100bn US$ in loans from 235 commercial banks. 92% of that amount was provided as corporate loans – a type of lending that is often not within scope of banks' coal policies. The remaining 8% were project finance loans. 30% of total loans was lent by Japanese banks – a reflection of the fact that Japan has the largest coal plant pipeline in developed economies and that many Japanese companies are at the forefront of coal power development around the world. 25% of total loans were provided by European banks.[14] 238 banks channeled an additional 377bn US$ to the same group of companies through underwriting, with Chinese banks occupying the first 15 spots on the list of top underwriters and accounting for more than 70% of the total. Furthermore, the report identifies over 1'200 institutional investors with holdings of 139bn US$ in the 120 top coal plant developers – with Blackrock (11bn US$), Japan's Government Pension Investment Fund (7.3bn US$), Malaysia's Khazanah Nasional (6.7bn US$), Vanguard (6.2bn US$) and South Korea's National Pension Service (4.5bn US$) topping the list.[2]

[2] Note that holdings of institutional investors are a "stock" at a particular point in time, whereas the figures on loans and underwriting represent "flows" during a time period. On this distinction between stocks and flows, also see e.g. Rainforest Action Network (2018), p. 5. Also note that the figures from Urgewald et al. (2018), in contrast to the figures by e.g. RAN et al. (2019), are not based on pro rata but rather on total amounts. E.g. a loan of 100 million US$ to a diversified company that has 20% of its assets in coal is included with the full 100 million US$ rather than 20 million US$ in the calculation.

FIGURE 1: EU BANKS ACCOUNT FOR 25% OF LENDING TO COAL DEVELOPERS
BANK LENDING TO THE GLOBAL COAL PIPELINE, BY COUNTRY



Source: Bank Track (2018)[15]

Further research by environmental not for profits RAN et al. (2019) cover corporate lending, project finance and underwriting[3] of 33 banks based in Canada, China, Europe, Japan, and the United States, and report funding of 31bn US$ to the largest 30 coal power companies and 13bn US$ to the largest 30 mining companies.[16] The biggest amounts in both sectors are accounted for by four banks from China – China Construction Bank, Bank of China, ICBC and Agricultural Bank of China – with 17bn US$ in loans and underwriting to the coal power sector and 10bn US$ to the coal mining sector.

Recent transactions provide further illustration of funding flows to the sector. In June, Poland's state controlled energy group ENEA announced the issuance of 1 billion PLN of bonds.[17] Shortly thereafter, India's Power Finance Corporation announced that it had raised 300 million USD through a syndicated loan from State Bank of India, Hong Kong and MUFG Bank, Singapore. The announcement followed an earlier issuance of 1

[3] According to Urgewald et al. (2018), "Underwriting or investment banking refers to the process by which banks raise investment capital for companies by helping them market new shares or bonds. Banks usually purchase the newly issued bonds or shares and then re-sell them to other investors at a profit." (p. 1).

billion USD of bonds by the company.[18] In early July, Chubu Electric Power announced the issuance of 20 billion JPY of bonds – with SMBC Nikko Securities, Nomura Securities, Daiwa Securities, and Mizuho Securities as underwriters. All three companies receiving funding through these transactions are among the world's 120 top coal plant developers.[19]

3. CENTRAL BANKS AND FINANCIAL SUPERVISORS AS CATALYSTS TO REDUCE COAL FUNDING

Central banks and financial supervisors affect capital flows and thus the real economy through several policy levers – in particular monetary policy as well as microprudential and macroprudential supervision.

Monetary policy relates to the decisions of the monetary authority, typically the central bank, to control the supply of money in an economy. Setting the policy rate at which central banks lends money to the banking system is one of their key instruments in that context. Buying or selling securities (i.e. government or corporate bonds) to increase or decrease the money supply, and defining the conditions under which they lend money to commercial banks are further examples of the toolbox at their disposal.

Microprudential supervision focuses on the stability of individual financial institutions. Macroprudential supervision is tasked with safeguarding the stability of the financial system as a whole. Both domains share a number of instruments they can deploy, but with a different focus. Whereas the objective of microprudential supervision is to ensure that individual banks remain solvent and are able to withstand shocks on a standalone basis, macroprudential regulation addresses the important interactions between financial institutions and the wider economy, and the systemic risks these may entail. In this context, and to illustrate, macroprudential measures may require financial institutions to hold additional capital requirements (see Box 2) beyond those that are being set for each of these institutions on a microprudential basis.

Box 2: What are Capital Requirements?

Capital requirements compel banks to back a proportion of their lending with shareholders' equity, ensuring that investors have 'more skin in the game' when banks grant loans. In this sense, capital requirements are intended to act as a cushion to absorb losses when loans default – so that the bank can continue functioning after taking a financial hit, without taxpayers coming to the rescue.

Capital requirements are designed to prevent a repeat of the 2008 Global Financial Crisis (GFC), and are conventionally considered a useful measure to protect taxpayers against potential bank bailouts. By ensuring banks have more skin in the game, higher capital requirements may also reduce their risking-taking practices. Higher capital requirements tend to make loans more expensive for banks – i.e. they must acquire more capital from shareholders to grant a loan. If raised, other things being equal, capital requirements will thus decrease the volume of loans granted by the banking sector to households and firms.

The institutional set-up for monetary policy as well as microprudential and macroprudential supervision varies across countries – a critical aspect to keep in mind when exploring and evaluating the political economy that underpins the scope for action.

Table 1: Key Central Banks and Financial Supervisors Responsibilities

China	The People's Bank of China (PBoC) has responsibility for monetary policy as well as for large parts of the tasks related to the microprudential and macroprudential supervision of the financial systems.
Euro Area	The European Central Bank (ECB) is responsible for monetary policy as well as the direct microprudential supervision of 114 significant banks that hold almost 82% of the assets in the Euro area. The remaining banks in the Euro area are supervised by the national supervisors in close cooperation with the ECB. The ECB is also involved in macroprudential supervision in cooperation with the national authorities.

India	The Reserve Bank of India has responsibility for monetary policy as well as for large parts of the tasks related to the microprudential and macroprudential supervision of the financial systems.
Japan	Monetary policy falls within the remit of the Bank of Japan (BoJ) whereas the Financial Services Agency (FSA) is responsible for microprudential supervision. Responsibilities for macroprudential supervision is shared between the two authorities and coordinated through the Council for Cooperation on Financial Stability.
UK	The Bank of England (BoE) is responsible for monetary policy as well as micro- and macroprudential supervision – a set of tasks that is reflected in its governance through the BoE's Monetary Policy Committee, Prudential Regulation Committee and Financial Policy Committee. Additional supervisory tasks fall into the mandate of the separate Financial Conduct Authority.
United States	The Federal Reserve (Fed) has responsibility for monetary policy as well as for large parts of the tasks related to the microprudential and macroprudential supervision of the financial systems

With this in mind, the following paragraphs describe possible interventions through monetary policy as well as micro- and macroprudential supervision to shift capital flows away from coal towards a low-carbon economy. In some countries, the central bank will be the key actor to engage on all these interventions. In other economies, some of the following measures fall into the remit of financial supervisors that are separate from the central bank.

3.1 EXCLUDING COAL-EXPOSED ASSETS FROM CENTRAL BANKS' COLLATERAL FRAMEWORKS AND ASSET PURCHASES

Central banks inject liquidity (i.e. pump new money) into the banking system through two key instruments: loans against collateral and asset purchases.

Through the former central banks lend money to commercial banks against guarantees, known as collateral. Loans can take the form of short-term as well as long-term refinancing operations, such as the 1-week "Main Refinancing Operation" (MRO) as well as the multi-year "Targeted Longer-Term Refinancing Operation" (TLTRO) of the ECB.

A key aspect of such loans is the collateral framework that underpins them. It defines which securities are eligible to be pledged as collateral and what discounts, i.e. "haircuts", are applied to determine their lending value. For example, as highlighted in table 2 below, the ECB accepts securities from Anglo American as eligible collateral in transactions with the ECB. The particular security listed below is subject to a haircut of 30.5%. As a result, if bank ABC were to hold 100 million EUR of that security, it could pledge it as collateral for a 69.5 million EUR transaction with the ECB. However, if that haircut were to reflect a greater concern around the risk associated with coal, e.g. by being raised to 40%, it would reduce that amount to 60 million EUR – a significant disincentive to hold coal as collateral.

Whether a security can be pledged and whether the haircut applied to it is high or low, affects the desirability for market participants to hold it and thus its market value.[20] All other things being equal the price of a security that is eligible as collateral and/or is subject to a lower haircut is higher. Its yield and thus ultimately the capital costs for its issuer is lower. Van Bekkum et al. (2017), Mésonnier et al. (2017) and Corradin (2017) estimate the inclusion of a security into the collateral framework will reduce its yield by 7-13 basis points (a significant margin in financial terms).[21] [22] [23]

To determine whether a security is eligible as collateral and what haircut is applied to it, central banks frequently rely on external ratings – provided by rating agencies. In the case of the ECB, eligibility requires an investment grade rating from at least one of the four external rating agencies that it relies on, i.e. DBRS, Fitch Ratings, Moody's and Standard & Poor's.[24] Once a security is deemed eligible, external ratings are also a factor in determining the haircut applied to it.[25] The Swiss National Bank (SNB) requires a minimum rating of AA-/Aa3 for both the issuer of the securities it accepts as collateral as well as the country where that issuer is based.[26] The Fed and the BoE provide further illustrations of central banks that rely on ratings in their collateral framework. [27] [28]

Yet, as highlighted by the "Central Banks and Supervisors Network for Greening the Financial System" in its first progress report in October 2018, "climate- or environmental-related criteria are not yet sufficiently accounted for in internal credit assessments or in the models of credit agencies […] which many central banks rely on for their operations".[29] As a result, the financial risks related to fossil fuel assets in general and coal assets in particular are likely to be underestimated in central banks' risk management processes, including those described above that determine collateral eligibility and haircuts.

Against this background, a review of central banks' inclusion of coal-exposed assets in their collateral frameworks is not only an essential step to ensure coherence between monetary policy and climate mitigation objectives, but also to enforce the risk standards that central banks have defined for themselves.[30] A closer look at the collateral framework of the ECB, and the case for an exclusion of coal exposed assets from its list of eligible collateral, is thus vital.

Table 2: Coal Exposures in ECB Collateral Framework

ISIN Code	Issuer	Haircut	RAN 30 Coal Power	RAN 30 Coal Mining	Urgewald GCEL
XS1686846061	Anglo American Capital PLC	30.5		TRUE	TRUE
XS0818793209	CEZ AS	9			TRUE
XS1937720131	EnBW International Finance BV	20			TRUE
XS0452187320	ENEL Finance Intl N.V.	32.8	TRUE		TRUE
XS0192503695	ENEL S.p.A.	3	TRUE		TRUE
XS0906117980	Energa Finance AB	13			TRUE
XS0744577627	EVN AG	9			TRUE
XS1091799061	PGE Sweden AB (Publ)	31	TRUE		TRUE
XS1577960203	Tauron Polska Energia SA	19			TRUE

Sources: The ECB (as of 22 November 2019),[31] RAN et al. (2019),[32] and Urgewald (2019).[33] Please note that the table above is meant to illustrate exposures, but may not be complete and may not reflect the current status quo. Coal exposures are based on the list of top 30 coal mining companies and top 30 coal power companies as published by RAN et al. in March 2019 as well as on the Global Coal Exit list (GCEL) as published by Urgewald in September 2019. In some cases issuers were highlighted as exposed to coal due to their affiliation with companies on the RAN and Urgewald lists. The table above provides one example per issuer. PGE Sweden AB and Tauron Polska Energia are included in the ECB collateral framework with the one security shown above only. The other issuers are included in the framework with multiple securities.

Reviewing the inclusion of coal-exposed assets in central banks' large scale asset purchase programs is equally critical.

Through asset purchases, also referred to as quantitative easing (QE), central banks increase the supply of money by buying securities and holding them on their balance sheet. The first such program was introduced by Fed in the 1930s[34], but more recently by the Bank of Japan in 2001. In response to the financial crisis of 2007/2008 many other central banks followed suit. The Fed launched its first QE program in 2008, the BoE announced its first round of QE in 2009, and the ECB started large-scale asset purchases in 2015. Similarly, but with a different objective, the SNB started significant purchases of foreign currency in 2009 to curb the appreciation of the

Swiss Franc. In contrast to other QE programs these reserves are held in foreign currency assets rather than domestic securities.

As a result, central bank balance sheets have expanded significantly. In the peak of its Asset Purchase Program, the ECB injected 80bn EUR into financial markets a month. In comparison, total global investments into solar and wind energy in 2018 amounted to 259bn USD.[35] Today, assets on the ECB balance sheet stand at 5.2tn USD, a more than threefold increase compared to the total at the end of 2007. Similarly, the Fed expanded its balance sheet from below 1tn USD in December 2007 to 4tn USD today. Total assets held by the BoJ and the PBoC are now at 5.3tn respectively 5.1tn USD,[36] the balance sheet of the SNB has grown to 860bn USD,[37] and the holdings of the BoE amount to 570bn USD.[38] The joint total across these central bank balance sheets adds up to more than 20tn USD.

Central banks have allocated the bulk of their asset purchases to government bonds. Yet, many have also bought private sector assets – including equities and corporate bonds issued by companies with significant coal exposures. The BoJ has allocated 28tn JPY to Japanese equities through index-linked exchange traded funds.[39] The ECB holds a corporate bond portfolio of 181bn EUR.[40] The SNB[4] has an exposure of 160bn CHF to foreign equities.[41] [42]And the BoE holds 9.9bn GBP of corporate bonds through its Asset Purchase Facility.[43] With these positions these four central banks hold a total of more than 627 billion USD in private sector assets.

As in their collateral frameworks, external ratings are a key eligibility criteria for central banks' corporate bond purchases. The ECB requires an investment grade rating from at least one of the four rating agencies that it also relies on for its collateral framework, i.e. DBRS, Fitch Ratings, Standard & Poor's and Moody's.[44] Similarly, both the BoE and the SNB require an investment grade rating for their corporate bond purchases.

The lack of integration of climate risk analytics into external credit ratings thus also have an impact on central banks bond purchases. Mirroring the case for a review of their collateral frameworks, there is thus also a strong case for further scrutiny of coal exposures through central banks' corporate bond purchases.

[4] The SNB also holds corporate bonds but does not carve out these holdings separately in its reporting of its holdings in "government bonds in foreign currency, covered bonds, bonds issued by foreign local authorities, supranational organisations, corporate bonds, etc.".

Table 3: Coal Exposures in ECB Corporate Bond Purchases

NCB	ISIN Code	Issuer	RAN 30 Coal Power	RAN 30 Coal Mining	Urgewald GCEL
DE	XS0207320242	EnBW International Finance BV			TRUE
IT	XS0177089298	ENEL Finance Intl N.V.	TRUE		TRUE
IT	XS0192503695	ENEL S.p.A.	TRUE		TRUE
FI	XS0690623771	EVN AG			TRUE

Sources: ECB (2019)[45] (as of 22 November 2019), RAN et al. (2019),[46] Urgewald (2019).[47] The "NCB" column denotes the national central bank within the Eurosystem that purchased the security. See notes on table 1 for further details.

Central bank purchases of equities are generally based on market indexes. The BoJ implements its equity purchases largely through index funds tracking the TOPIX, the Nikkei 225, and the JPX-Nikkei Index 400.[48] The TOPIX is the broadest index of the three. It is published by the Tokyo Stock Exchange (TSE) and includes all domestic common stocks listed on the first section of the TSE.[49] The Nikkei 225 is published by Nikkei Inc. and comprises 225 constituents from the first section of the TSE.[50] The JPX-Nikkei Index 400 is co-published by the Japan Exchange Group, TSE and Nikkei Inc. It comprises 400 components whose main market is the TSE 1st Section, 2nd Section, Mothers, or JASDAQ market and who are selected based on a broad set of criteria including qualitative indicators such as the appointment of independent directors, the adoption of international financial reporting standards, and the disclosure of earnings and/or corporate governance information in English.[51] The BoJ also allocates a smaller share of its equity allocation to indexes of Japanese firms that are proactively investing in physical and human capital.[52]

An example of an index that has been developed by JPX and S&P Dow Jones Indices to meet this demand from the BoJ is the JPX/S&P CAPEX & Human Capital Index. The index is designed to track the leading 200 companies from the TOPIX based on a broad set of criteria including capex and R&D expense growth, as well as a qualitative assessment of its human capital performance.[53] The SNB also uses "leading share

indices" to implement its equity purchases with the additional criteria that it generally avoids investments in shares of medium and large-cap banks and quasi-bank institutions to exclude possible conflicts of interest and that it avoids shares in companies which produce internationally banned weapons, seriously violate fundamental human rights or systematically cause severe environmental damage.[54]

Both the BoJ and the SNB are exposed to coal-related assets through their equity investments. The BoJ holds equities in several Japanese coal power and coal mining companies. Crucially, as shown in table 4 below, the exposure to these companies differs, depending on the underlying index it uses. The SNB does not disclose which specific indexes it uses. However, given the implementation of its equity investments through the replication of leading share indices, it is safe to assume that a broad range of coal-exposed companies are included in its portfolio. As highlighted in table 5 below, its holdings of US equities – which the SNB has to disclose under US SEC regulations – confirm this assumption and highlight a coal exposure within its US equity portfolio of 2%. A review of the coal exposures through the equity holdings of the BoJ and the SNB, as well as of the underlying indexes they use, strengthens the case for phasing out coal exposed assets fro central banks balances sheets.

Table 4: Coal Exposures in Indexes Used by the BoJ

Issuer	TOPIX	Nikkei 225	JPX-Nikkei 400	JPX/S&P CAPEX & Human Capital Index	RAN 30 Coal Power	RAN 30 Coal Mining	Urgewald GCEL
Chubu Electric Power Company,Incorporated	TRUE	TRUE	TRUE				TRUE
Electric Power Development Co.,Ltd.	TRUE		TRUE				TRUE
Hokkaido Electric Power Company,Incorporated	TRUE						TRUE
Hokuriku Electric Power Company	TRUE						TRUE
JFE Holdings,Inc.	TRUE	TRUE	TRUE				TRUE
Kobe Steel,Ltd.	TRUE	TRUE					TRUE
Kyushu Electric Power Company,Incorporated	TRUE		TRUE				TRUE
Marubeni Corporation	TRUE	TRUE	TRUE				TRUE
Osaka Gas co.,ltd.	TRUE	TRUE	TRUE				TRUE
Shikoku Electric Power Company,Incorporated	TRUE						TRUE

Sumitomo Corporation (sumitomo Shoji Kaisha, ltd.)	TRUE	TRUE	TRUE	TRUE		TRUE
The Kansai Electric Power Company,Incorporated	TRUE	TRUE	TRUE	TRUE		TRUE
The Okinawa Electric Power Company,Incorporated	TRUE					TRUE
Tokyo Electric Power Company Holdings,Incorporated	TRUE	TRUE				TRUE
Ube Industries,Ltd.	TRUE	TRUE	TRUE			TRUE

Sources: TSE (2019) as of 30 September 2019,[55] Nikkei (2019a)[56] and Nikkei (2019b)[57] as of 22 November 2019, BlackRock (2019)[58] as 21 November 2019, RAN et al. (2019),[59] Urgewald (2019).[60] See notes on table 1 for further details.

Table 5: Coal Exposure in US Equity Holdings of the SNB

Issuer	CUSIP	Holdings (in US$)	RAN 30 Coal Power	RAN 30 Coal Mining	Urgewald GCEL
Aes Corp	00130H105	35,816,000			TRUE
Allete Inc	18522300	8,496,000			TRUE
Alliant Energy Corp	18802108	47,465,000			TRUE
Ameren Corp	23608102	103,526,000			TRUE
American Elec Pwr Co Inc	25537101	184,873,000			TRUE
Arch Coal Inc	39380407	2,233,000		TRUE	TRUE
Black Hills Corp	92113109	8,715,000			TRUE
Centerpoint Energy Inc	15189T107	50,052,000			TRUE
Cms Energy Corp	125896100	78,853,000			TRUE
Consol Energy Inc New	20854L108	799,000			TRUE
Contura Energy Inc	21241B100	993,000			TRUE
Dte Energy Co	233331107	101,375,000			TRUE
Duke Energy Corp New	26441C204	298,328,000	TRUE		TRUE
Firstenergy Corp	337932107	87,807,000			TRUE
Mge Energy Inc	55277P104	5,204,000			TRUE
Northwestern Corp	668074305	7,128,000			TRUE
Nrg Energy Inc	629377508	34,840,000			TRUE
Oge Energy Corp	670837103	29,997,000			TRUE
Otter Tail Corp	689648103	3,607,000			TRUE
Peabody Energy Corp New	704551100	2,077,000		TRUE	TRUE
Pnm Res Inc	69349H107	7,807,000			TRUE
Ppl Corp	69351T106	82,648,000			TRUE
Southern Co	842587107	287,856,000	TRUE		TRUE

Vistra Energy Corp	92840M102	31,952,000	TRUE
Wec Energy Group Inc	92939U106	158,047,000	TRUE
Xcel Energy Inc	98389B100	186,935,000	TRUE
Total Coal Exposure		**1,847,429,000**	
Total US Equity Investments		**94,087,136,000**	
Coal Exposure (in %)		**2.0%**	

Sources: SEC (2019) (as of 30 September 2019),[61] RAN et al. (2019),[62] Urgewald (2019).[63] See notes on table 1 for further details.

3.2 ACCOUNTING FOR COAL RISKS IN SETTING MICROPRUDENTIAL CAPITAL REQUIREMENTS

Banks and insurance companies are required to hold adequate capital to absorb financial losses. The risk of such losses is linked to the risk of their assets. As a result, the riskier a bank's or insurance company's assets, the more capital it has to hold.

With this in mind, a key factor in determining bank capital requirements is the calculation of its "risk-weighted assets" where each asset on its balance sheet is multiplied with a risk factor to compute a risk-weighted total. Assets that are less risky, such as an investment grade bond or a mortgage, are multiplied with a lower factor than riskier assets. The capital it needs to hold is defined as a ratio of its risk-weighted assets.

Similarly, the models that underpin capital requirements for insurance companies reflect the different risk profiles across their assets. In the EU, the Solvency II Directive requires insurance companies to hold adequate capital to meet its obligations over the next twelve months with a probability of 99.5%, respectively to absorb a shock with a 1/200 probability within one year. Required capital is determined, among other criteria, based on their exposure to different asset classes and related risk assumptions.[64] [65] Likewise, the Swiss Solvency Test as applied by Switzerland's financial supervisor defines required capital based on risk-weighted assets.[66]

As a result, risk analysis plays a critical role in defining capital requirements and is thus a key variable for a bank or insurance company to determine the return that it seeks from an asset. Holding a riskier asset requires more capital and will thus lead a bank or insurance company to require a higher return from this asset to prevent its return on equity (ROE) from falling. Increases in overall lending spreads after a raise in capital requirements[67] as well as increases in spreads for specific loans following higher capital requirements for such targeted loans are cases in point. [68] [69] The debates

and eventually the decision in the EU to lower capital charges for qualifying infrastructure investments provides further illustration.[70]

Against this background, a review of the risk analysis for coal-exposed assets in the calculation of risk-weighted assets is vital. As in the risk assessments for central bank collateral frameworks and asset purchases, the calculation of risk-weighted assets to determine capital requirments frequently relies on external credit ratings. The Basel Framework, a set of global standards defined by the Basel Committee on Banking Supervision (BCBS) that underpins global financial supervision worldwide, offers two approaches in this context: a standardised approach as well as an internal ratings-based approach. The standardised approach assigns standardised risk weights to exposures and defines exposures based on external ratings. As an illustration, risk weights to account for credit risks related to claims on corporates range from 20% for AAA-AA rated loans to 150% for assets rated below BB-.[71] The internal ratings-based approach allows banks to use their own credit assessments which, however, also frequently take external ratings into consideration. Moreover, the internal ratings-based approach is subject to a capital floor that is defined as a percentage of the RWA as calculated through the standardised approach. Engaging central banks and financial supervisors to ensure that internal credit risk assessments by banks and insurance companies, as well as external ratings provide an accurate assessment of coal-related risks is critical.

Table 6: Ratings, Basel Risk Weights for Claims on Corporates, and Coal Companies

Credit Assessment	AAA to AA-	A+ to A-	BBB+ to BB-	Below BB-	Unrated
Risk Weight	20%	50%	100%	150%	100%
Coal Companies (Examples)		Duke Energy	Anglo American		

Sources: BIS (2019).[72] Company and ratings websites.

3.3 INTRODUCING MACROPRUDENTIAL CAPITAL BUFFERS FOR COAL EXPOSURES

In addition to regulatory minimum capital requirements and capital conservation buffers, financial supervisors may choose to require banks to hold additional macroprudential capital buffers to mitigate risks in the financial system as a whole. Capital buffers were introduced as one of several macroprudential tools after the

financial crisis to account for the macro-financial environment that banks operate in and to protect the financial sector from periods of excessive credit growth.[73]

While such buffers are generally applied on a broad basis some countries have started using them to target specific segments of the credit market. Switzerland is a case in point. In February 2013, following a proposal from the SNB, the Swiss Federal Council activated a sectoral countercyclical buffer (CCyB) targeting mortgage loans for residential real estate in Switzerland. The measure reflected the SNB's concerns that imbalances in the residential mortgage and real estate markets had reached a level that posed a systemic risk to the stability of the banking sector. The measures remain in place until today and require banks to hold additional capital of 2% of the relevant risk-weighted positions.[74]

Such sectoral capital buffers may also lend themselves to address the financial risks of coal-exposed assets. In fact, BIS (2018) suggests "that in the presence of sectoral risks to financial stability, targeted instruments, such as a sectoral application of the CCyB, may both be more effective and efficient than the Basel III CCyB".[75]

3.4 ENSURING THAT THE RISKS OF COAL ASSET STRANDING ARE ADEQUATELY REFLECTED IN STRESS TESTS

Financial supervisors use stress tests to assess the resilience of financial institutions and financial markets under severe but plausible adverse scenarios. While such tests were originally designed to evaluate the impact of a shock on individual banks and insurance companies, the IMF and the World Bank started applying them to assess systemic risks in the context of their Financial Sector Assessment Programs (FSAPs) in 1999. Since the global financial crisis, the use of stress tests – with both microprudential and macroprudential objectives – has expanded significantly.[76]

Stress tests provide supervisors with information to address potential shortfalls in the ability of financial institutions and the financial sector as a whole to withstand shocks. In a microprudential context, stress tests can be used e.g. to determine whether individual banks need to increase their regulatory capital or decrease their risk exposures. They also provide insights into other resilience metrics such as liquidity. From a macroprudential perspective they are applied e.g. to calibrate macroprudential measures such as the introduction of a macroprudential capital buffer as described above.

At the core of stress tests are the scenarios they are based on and thus in particular the types and calibration of the shocks to explore. Stress tests can

simulate broad adverse macroeconomic scenarios, such as an economic downturn and its impact on unemployment, GDP and asset prices, as well as narrower scenarios to explore specific risks. The severity of the shocks to test against is likely to reflect the risk appetite of the supervisor.[77]

With these scenarios as a starting point, financial institutions themselves, financial supervisors, or a mix of the two, use models to project their impacts on capital and profitability. Projections can be produced top-down, i.e. by assessing the impact of shocks on financial markets as a whole before evaluating the implications for individual institutions, or bottom-up, i.e. by first analyzing the capacity of individual institutions to absorb losses before considering the effects on a sector-wide level. In addition to these quantitative projections, financial authorities frequently also use stress tests for a qualitative evaluation of the capabilities of financial institutions to conduct stress tests.

The Bank of England has included three scenarios on the potential impact of climate change and related policies into its 2019 biennial stress test for the insurance industry in the UK. The Bank has also announced to stress test the entire UK financial system against different climate pathways by 2021.[78] The scenarios of this year's insurance stress test reflect (A) a sudden and disorderly transition to a low-carbon economy that is aligned with the goal of keeping global warming below 2 degrees, (B) a long-term orderly transition that is broadly in line with the Paris Agreement, as well as (C) a scenario assuming a continuation of current policy trends and an increase in temperatures in excess of 4 degrees. The scenarios cover the investments of both life and general insurers as well as the liabilities of the general insurers. Scenarios (A) and (B) include assumptions on the impact of transition risks on equity investments – including a drop in valuations of 45% respectively 40% for coal mining, and of 65% respectively 55% for coal-fired power generation. Crucially, in contrast to other scenarios in this stress test which are to be assessed against the background of an overall deteriorating economic scenario, the climate change scenarios are to be explored on a stand-alone basis. Submissions of participating financial institutions to address the climate scenarios were due by end-October. The BoE plans to publish results on an aggregate level, i.e. not disclosing results for individual institutions, in Q1 2020.[79]

Ensuring that other financial authorities start integrating shocks from the stranding of coal assets into their stress tests is critical. The European Banking Authority conducts EU-wide stress tests on the banking sector based on scenarios that are developed in cooperation with the European Systemic Risk Board (ESRB), the ECB and the European Commission (EC). Its next stress test is scheduled for 2020.[80] The European Insurance and Occupational Pensions Authority (EIOPA) runs stress tests to

assess the resilience of the EU insurance sector. Its most recent 2018 edition included a scenario in which countries in Europe are hit in quick succession by four windstorms, two floods and two earthquakes.[81] The Fed uses stress tests in both its Dodd-Frank Act Stress Tests (DFAST) as well as in its Comprehensive Capital Analysis and Review (CCAR). In contrast to other financial authorities, it discloses the results of these tests on an individual bank level. The People's Bank of China applies stress tests for its China Financial Stability Report.[82] The Bank of Japan runs a semi-annual stress test in the context of its Financial System Report.[83] The IMF and World Bank use stress tests in their FSAP assessments to gauge financial sector stability in participating countries. Assessments for developing economies are the joint responsibility of the IMF and the World Bank, assessments for advanced economies are conducted by the IMF alone.[84] To our knowledge, with the exception of the BoE, none of the authorities referenced above has yet introduced a scenario that reflects the stranding of fossil fuel assets in general or coal assets specifically, into their stress tests.

4. NEXT STEPS

Against the background of the previous outline, we suggest exploring the following next steps:

1. The ECB and other central banks consider excluding coal-exposed assets from their asset purchases and collateral frameworks. In that context, consideration by the ECB is particularly urgent as it has started a third round of TLTROs in September 2019 through which it is providing long-term liquidity against collateral.[85]

2. Civil society organisations, policy makers, academics and other key stakeholders engage major rating agencies – in particular DBRS, Fitch Ratings, Moody's, and Standard & Poor's – on their ratings of companies with coal exposures.

3. The BoJ and the SNB consider excluding coal assets from their equity investments. Similar considerations ought to be taken by the providers of specialized equity indexes that the BoJ tracks with its investments and that reflect qualitative criteria, e.g. the JPX-Nikkei Index 400 and the JPX/S&P CAPEX & Human Capital Index.

4. Financial supervisors – in particular the Fed, the Japan Financial Services Authority, and the PRA within the BoE – consider increasing the risk weights for coal-exposed assets in the calculation of banks' risk-weighted assets.

5. Financial supervisors – in particular EIOPA, key US State Insurance Commissioners and FINMA, as well as the PBoC and the China Banking and Insurance Regulatory Commission (CBIRC) – consider increasing capital charges for coal-exposed investments on insurance firms.

6. Macroprudential authorities – in particular the BoE, BoJ, and Fed – consider introducing an additional capital buffer for coal-exposed assets.

7. Financial supervisors and macroprudential authorities who are running stress tests – in particular the BoE, BoJ, EIOPA, Fed, FINMA, and PBoC – consider including stringent scenarios for the stranding of coal assets.

8. The IMF and the World Bank include stringent scenarios for the stranding of coal assets in their FSAP assessments.

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