South African Reserve Bank

Working Paper Series

WP/24/12

Transition and systemic risk in the South African banking sector: assessment and macroprudential options

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Authorised for publication by Konstantin Makrelov

22 July 2024

SOUTH AFRICAN RESERVE BANK

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Transition and systemic risk in the South African banking sector: assessment and macroprudential options

Pierre Monnin,[*] Ayanda Sikhosana[†] and Kerschyl Singh[‡]

Abstract

By signing the Paris Agreement, South Africa committed to transform its economy to contribute to keeping global temperature rises well below 2°C. This transformation will inevitably impact financial institutions and could represent a systemic risk for the financial sector. According to central bank and academic research, an orderly transition should not jeopardise financial stability – but understanding transition risks for the banking sector, monitoring them and, when necessary, implementing macroprudential measures is necessary to ensure this stability. This paper is a step towards achieving this outcome. It presents the main transition risks for the South African banking sector, highlighting that the coal value chain is central to these risks. It assesses the banking system's exposure to transition risks in the corporate sector, showing that they are material and widespread. It concludes by suggesting some macroprudential policy options that could address these risks.

JEL classification

G21, G28, Q58

Keywords

Transition risk, systemic risk, bank lending, climate policy relevant sectors, macroprudential policy, financial stability

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1. Introduction

At the 28th Conference of the Parties (COP 28) to the United Nations Framework Convention on Climate Change (UNFCCC) in Dubai, representatives from about 200 countries called for “transitioning away from fossil fuels in energy systems, in a just, orderly and equitable manner, accelerating action in this critical decade, so as to achieve net zero by 2050” (UNFCCC 2023). One year before that, at COP 27 in Sharm el-Sheikh, the same parties highlighted that delivering the funding for this transition “will require a transformation of the financial system and its structures and processes” (UNFCCC 2022). This transformation will inevitably impact financial institutions, some of which will reap the benefits of this process, while others will face potential losses. Losses in some segments of the financial sector, even compensated by gains in others, may affect the system at large and trigger a degree of financial instability. Transition risks are thus potential systemic risks.

Central banks and supervisors generally consider that an orderly transition should not jeopardise the stability of the financial system. However, they also highlight that a delayed and/or disorderly transition – a scenario that cannot be excluded – could also trigger financial instability. This outcome is even more likely if no transition takes place. As such, climate-related risks, including transition risks, fall squarely into their financial stability mandate (Network for Greening the Financial System (NGFS) 2019). To fulfil this mandate, central banks and supervisors must assess this systemic risk and, when needed, do so with macroprudential policy measures.

Financial stability challenges commonly associated with the transition to a net zero economy are relevant to South Africa. Economic activities linked to the coal value chain – a large part of the domestic economy and energy generation infrastructure – are directly at risk.[1] Transition risks in South Africa are not limited to the coal value chain, however: they will also affect other economic sectors and the economy at large, including households and the public sector. South African financial institutions are not shielded from these risks, as they are exposed to them through their business relations with firms, households and public institutions, as well as through the financial assets they own.

[1] The final declaration of COP 28 specifically calls for “accelerating efforts towards the phase-down of unabated coal power” (UNFCCC 2023).

The potential systemic risk that the transition poses to the South African banking sector is not yet well understood. This paper helps to fill this knowledge gap by evaluating the exposure of banks' corporate credit portfolios to transition-sensitive economic sectors (TSES) and by assessing some of the channels through which transition risk could become systemic for the South African banking sector. It also discusses macroprudential measures that could be implemented to mitigate this risk.

We start by discussing how climate-related risks, like any other financial risks, can translate into systemic risk, as well as which features differentiate them from other systemic risks (Section 2). We then describe the main channels through which the South African economy is exposed to transition risks (Section 3), before assessing the exposure of the banking sector to these risks through its corporate credit portfolio (Section 4). Against this background, we explore which macroprudential instruments central banks and supervisors, including the South African Reserve Bank (SARB), could use to address climate-related systemic risks (Section 5). Section 6 concludes.

2. Climate-related risks and systemic risks

Climate-related risks, including transition risks, are financial risks (NGFS 2019; Basel Committee on Banking Supervision (BCBS) 2021a) and can affect the soundness of financial institutions. They thus represent a potential systemic risk for the financial system. Climate change poses two types of risks: physical and transition risks.[2] In this section, we focus on transition risks, but parallels can be made with physical risks.

2.1 Transition risks and their effect on financial institutions

Transition risks are associated with the economic and financial costs of shifting to a net-zero economy. In this transition, some business models will become obsolete, while others will gain importance. Consequently, the transition will hurt some firms and households – those relying on the economic activities of non-sustainable value chains – but benefit others –

[2] Physical risks are associated with the economic and financial costs of extreme weather events, such as droughts, floods, wildfires and storms, and progressive shifts in climate patterns, such as increasing average temperatures and changes in rainfall cycles.

those engaged in sustainable economic activities. Transition risk thus entails both negative (loss) and positive (opportunity) outcomes.[3]

Transition risks can significantly affect businesses' and households' income flows and asset values.[4] For example, firms heavily reliant on non-renewable energy and products will need to fundamentally overhaul their infrastructure and business models to adapt to a net-zero economy. As they are more likely to incur these costs, they are exposed to higher transition risks. Firms in the coal value chain are a good example of such high exposure.[5] Households relying on non-sustainable economics, like those within the coal value chain, are likely to face job losses and reduced wages. Public authorities collecting tax revenues from these activities or owning such firms will also be affected.[6]

The potential economic losses from the transition translate into credit risk and market risk for financial institutions (BCBS 2021a). Firms engaged in economic activities that are not aligned with the transition are likely to see their future income expectation revised downward, their credit rating downgraded and the value of their assets depreciate. This may impair their ability to service their debt with financial institutions and, in the case of default, financial institutions will not be fully compensated by collateral likely based on the stranded assets that characterise these economic sectors. This represents a higher credit risk for financial institutions. Similarly, the transition may also translate into market risk for financial institutions with portfolios containing financial assets from firms whose revenues and assets are at risk.

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3 Physical risks, in contrast, are likely to mostly generate aggregate losses, even though some regions, firms and households might benefit marginally from changes in weather and temperature patterns.

4 For firms, transition risks can impact on the expenditures on research and development for new low-carbon technologies, costs associated with the adoption and implementation of new sustainable practices and processes, lower income following a reduction in demand for carbon-intensive goods and services, and higher production costs due to changes in input prices (such as energy and water). Climate-related risks also affect sovereigns (see e.g. Fahr et al. 2023).

5 A steep decline in coal emissions is essential to reach net zero (International Energy Agency (IEA) 2022). The present value of the costs to phase out coal globally is estimated to be around US$29 trillion (Adrian, Bolton and Kleinnijenhuis 2022). Firms in the coal value chain are likely to see their revenues decline significantly and their assets lose most of their value in their decommissioning.

6 In this section, we focus on firms and households to illustrate the transmission of climate-related risk to the banking sector. The implication of the transition for sovereign risk in South Africa is discussed in section 3.3.

2.2 Can climate-related risks trigger systemic shocks?

Several international institutions have highlighted that climate-related risks, including transition risks, are potential systemic risks.[7] Several empirical facts point to this conclusion.

Financial systemic risk

Financial systemic risk is the risk of widespread disruptions to the provision of financial services by an impairment of all or parts of the financial system, which can have serious negative consequences for the real economy (IMF-BIS-FSB 2009). The simultaneous failure of several financial institutions is the paramount example of such an event, but systemic risk can materialise as large losses in the financial system without necessarily triggering the liquidation of financial institutions (Laeven and Valencia 2018).

Three main sources of systemic risk are usually distinguished: systemic risk-taking, contagion and amplification (Benoit et al. 2017).[8] Systemic risk-taking arises when financial institutions collectively invest in the same assets, leading to correlated and potentially large risk exposure. Contagion results from idiosyncratic problems spreading through the deeply interconnected balance sheets of financial institutions. Amplification derives from initially contained shocks multiplied by leverage, fire sales and herding behaviour in financial markets. These channels can overlap and reinforce each other.

Transition risks and systemic risks

Several signs suggest that transition risks can trigger systemic risks through all three channels described above or through their combination.

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7 The potential systemic risk of climate change has been highlighted by the Central Banks and Supervisors NGFS (with 138 global members and 21 observers as of June 10, 2024 – see https://www.ngfs.net/en/about-us/membership), which includes the Financial Stability Board (FSB), the Bank for International Settlements (BIS) and the International Monetary Fund (IMF). For concrete examples of such statements, see FSB (2020), BCBS (2020) and European Central Bank-European Systemic Risk Board (ECB-ESRB) (2020). South Africa's Prudential Authority regards climate-related risk as a financial risk that affects financial stability (SARB 2022).

8 These sources are often the result of financial distortions and externalities operating through the financial system, such as asymmetric information, market incompleteness, strategic complementarities mutually reinforcing private agents' decisions, and interconnectedness between financial institutions (Claessens 2014; Biljanovska et al. 2023).

1. **Climate-related risks, including transition risks, are widespread in the economy and financial markets.** They affect all agents in the economy (households, businesses, sovereigns) across all sectors and geographies (NGFS 2019). They are thus likely to affect most financial institutions' counterparties and, as such, constitute common risk exposure for the financial sector, with very limited hedging possibilities via diversification (ECB-ESRB 2022).[9] The realisation of climate-related shocks is thus likely to impact all or most financial institutions simultaneously (macro shock channel).

2. **Bank lending seems disproportionally tilted to firms and households with higher transition risk exposure.** In the euro area, for example, the share of high-emitting economic sectors in bank lending is around 75% higher than its equivalent share in economic activities, while more than 60% of banks' interest income derives from firms operating in the most carbon-intensive sectors. A similar lending tilt is observed to high-emitting households (ECB-ESRB 2023). This suggests that banks are more exposed to transition risks than the overall economy.

3. **Some financial institutions are more exposed to transition risks than others.** Banks appear to be more exposed to these risks than other financial institutions.[10] Risk is also sometimes unevenly distributed within the banking sector.[11] In addition, climate-related risks can affect weaker institutions, as seems to be the case in the euro area,[12] where portfolio concentration could lead to a 60% increase in expected losses on corporate lending portfolios in a disorderly transition (ECB-ESRB 2023).

4. **An abrupt and sizeable repricing of climate-related risks is possible.** There is widespread concern among central banks and supervisors that financial markets do

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9 In the euro area, for example, around two-thirds of corporate credit exposure held by banks is directed to high-emitting firms – i.e. to firms exposed to relatively higher transition risk. About 30% of bank and non-bank securities holdings are also issued by these firms (Emambakhsh et al. 2022).

10 See Ojea-Ferreiro, Reboredo and Ugolini (2022) for empirical evidence about Europe.

11 Around 35% of system-wide expected losses for the euro area banking sector are incurred by only 10% of banks (Emambakhsh et al. 2022). ECB-ESRB (2022) estimates that more than 20% of potential losses from climate-related risks reside in the holdings of 5% of euro area banks. Similarly, more than 70% of banking system credit exposure to identified high-risk firms is held by only 25 banks, while their total assets represent 64% of the banking system (Alogoskoufis et al. 2021)

12 In the euro area, exposure to firms subject to high or increasing physical risk is six times greater among the 25% least well-capitalised banks relative to the 25% most well-capitalised ones (Alogoskoufis et al. 2021).

not currently fully price in climate-related financial risks.[13] Empirical evidence supports this concern and shows that while financial markets have started to price in climate-related risks, they are not generally fully priced in.[14] Accounting for these risks would require substantial portfolio reallocation. Large asset price adjustments are likely if market participants abruptly revise expectations for climate-related costs and probability and adjust asset valuations accordingly. Such reassessments are likely given the current escalated uncertainty about climate-related costs: any new information may trigger significant updates in investor forecasts. A repricing of climate-related risks would generate losses at the global level, including for large European banks (Alessi, Ossola and Panzica 2021).

5. **Climate-related shocks, including transition shocks, can be amplified by financial markets.** An initial shock to some banks may spread to the rest of the banking sector through connections in the interbank market. Leverage is another potential amplification channel. For example, Mandel et al. (2021) show that the financial effects of flood risk in high-income countries can be amplified by the banking sector's leverage and could lead to losses commensurate with the banking sector capital in these countries. Finally, initial shocks to asset prices can start fire-sale movements on financial markets.[15]

Whether climate-related shocks can be severe enough to trigger systemic events is disputed. Several central banks and supervisors have highlighted that an early and orderly transition to a low-carbon economy will generate lower financial risks than a late and sudden transition (which carries high transition risks) or no transition at all (with high physical risks) (ECB 2022; ECB-ESRB 2022; Alogoskoufis et al. 2021; Helmersen, Korsgaard and Roulund 2020). Most central banks and supervisors also believe that an early, orderly transition will not constitute a systemic risk for the financial system. However, the conclusions for other scenarios – late and sudden or no transition – are less clear cut. In these cases, the losses

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13 See Bolton et al. (2020), IMF (2020), ECB-ESRB (2021), Organisation for Economic Co-operation and Development (2021) and NGFS (2022a).

14 See Eren, Merten and Verhoeven (2022) and Campiglio et al. (2022) for a survey of this literature.

15 For example, Alessi et al. (2022) show that an initially contained shock in high-carbon assets could trigger fire-sale mechanisms that translate into a systemic crisis with significant losses for the European Union (EU) banking sector.

for the institutions most exposed to climate-related risks are likely to be material (ECB-ESRB 2021).

2.3 Specific systemic features of climate-related risks

While climate-related risks can trigger shocks that affect and spread in financial markets like other systemic sources of risk, they also have features that distinguish them from other systemic risks. This has consequences for macroprudential policy.

Irreversibility and path dependency

Climate shocks are inevitable: they will materialise in one form or another – through physical or transition risks or a combination thereof. This makes climate-related risks fundamentally different from traditional systemic risks. Supervisors usually face risks that have a low probability of materialising at an undefined point in time and that, unlike climate-related risks, are not expected to materialise with certainty in a given period. There is thus a level of certainty around climate-related risks that does not exist for other systemic risks. The uncertainty lies more in the material form these risks are likely to take.

The magnitude, horizon and form of climate-related shocks are path-dependent. They will largely be determined by the extent and shape of the transition over the next decade. However, in terms of threats to financial stability, a clear hierarchy emerges among the different scenarios. Central banks and supervisors generally agree that an early and orderly transition will generate lower financial risks, while a late and sudden transition or no transition at all imply higher physical and transition risks for the financial sector (ECB 2022; ECB-ESRB 2022; Alogoskoufis et al. 2021; Helmersen, Korsgaard and Roulund 2020; Ojea-Ferreiro, Reboredo and Ugolini 2022). To maintain financial stability, supervisors have an interest in implementing measures that support the transition and thus lower climate-related risks for the financial sector.

The scale and shape of the long-term transition are highly dependent on short-term policy actions (NGFS 2019). Achieving an early and orderly transition, and thus minimising risks for the financial sector, requires the implementation of a comprehensive set of policies, of which macroprudential policies form a part.

Risk build-up and horizon

Climate-related risks are likely to materialise within the next 10 to 15 years. The scenarios used by supervisors show that physical risks could become systemically material by then (ECB-ESRB 2021; Alogoskoufis et al. 2021). Transition risks will materialise within the next decade if net-zero objectives are reached. This range is in line with the empirical frequency of credit and asset price cycles that supervisors use to address risks.[16]

The longer mitigating actions are delayed, the more climate-related risks for the financial system will increase and the higher the systemic risks will become. This build-up of climate-related risks is aggravated by the irreversibility of some physical tipping points without a timely transition. Once these points are reached, the economic and financial costs of climate change will become irreversible.[17] In the presence of large irreversible costs, it seems most prudent for macroprudential policy to be set to prevent such tipping points from happening rather than to ensure financial institutions build enough reserves to withstand them (Ford et al. 2022). In this context, macroprudential instruments that can curb the build-up of climate-related risks through financial incentives are particularly relevant.

Complexity and data uncertainty

Climate-related risks will eventually materialise. However, how and when they will affect financial institutions' balance sheets is not yet clear. Combined with the complexity of the physical, economic and financial interactions (characterised by non-linearity, feedback loops and tipping points) that are in play, this indicates a very high degree of uncertainty.

The lack of data and historic precedents amplifies this uncertainty. Climate-related shocks of the magnitude forecast for the next decades are largely unobserved in past financial data, limiting the usefulness of backtesting by central banks and supervisors and by financial institutions. Assessing climate-related risks requires sufficiently granular data, which are partially available, and forward-looking measurement methodologies, which are still in

16 Such cycles vary from eight to 20 years (Filardo, Lombardi and Raczko 2018; Schüler, Hiebert and Peltonen 2020).

17 Environmental tipping points thus represent a risk of system collapse rather than a temporary downturn (Vaccaro 2022).

development (BCBS 2021b). This represents a challenge for financial supervisors when implementing macroprudential measures.

Financial market shortfalls

Substantial adjustments are required in financial markets to address climate-related risks and deliver the transition necessary to mitigate them. Despite the rapid development of sustainable investment instruments and practices, financial markets overall are not aligned with portfolio allocation that leads to a transition to a sustainable economy. This misalignment supports the build-up of physical risks for the economy and financial system. Shifting portfolios to an allocation compatible with an early and orderly transition requires substantial adjustments in financial markets (ECB-ESRB 2020).

In addition, several surveys highlight that financial institutions have not yet implemented the institutional processes, data and tools necessary to manage climate-related risks (ECB 2021; Bank of England 2018). In Europe, for example, the ECB found that very few of the institutions it supervises met all supervisory expectations regarding climate-related risk management (ECB 2021). Financial institutions' deficiencies in managing climate-related risk pose an additional risk to the financial system.

3. Transition risks in South Africa

Understanding which economic activities are most affected by the transition is central to assessing the banking sector's exposure. This section is an overview of transition risks in South Africa. It summarises the country's climate regulatory landscape and its consequences for the banking sector, emphasises the central role of the coal value chain in transition risks, and reviews how these risks impact households, governments and the main economic sectors.

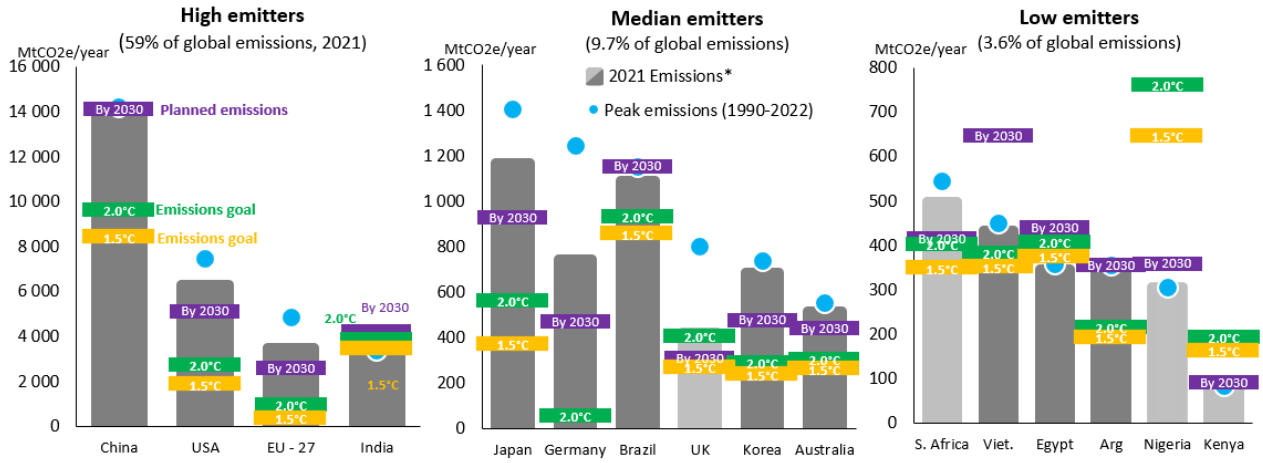
3.1 South Africa's transition and the banking sector

South Africa in the global transition

With its signing of the Paris Agreement in 2015, South Africa underscored its commitment to keeping global temperature rises below 2°C. The agreement, which strives for a more ambitious target of keeping global temperature rises below 1.5°C, requires signatories to undertake significant efforts to curb greenhouse gas (GHG) emissions. South Africa's

emission forecasts for 2030 are on track to meet the 2°C goal (see Figure 1, right-hand panel). South Africa's commitments are partially supported by the policy actions detailed in the Just Energy Transition (JET) plan.

Figure 1: South African emissions – historical and forecasts



Note: The light grey bars indicate countries 'on track' to reach their 2030 emission forecast within the 5% range of the 2°C pledge, and dark bars indicate countries 'off track', with 2030 emission forecasts greater than the 5% range.

Source: Climate action tracker

That South Africa is on track to reach its goals is a positive sign for an early and orderly transition, and thus for financial stability. However, a global early and orderly transition seems less likely,[18] and systemic transition risks are higher globally than domestically. This suggests there is still a risk of transition-induced financial instability in some major financial systems in South Africa.

Banking sector funding and regulation in the transition

Significant financing is needed to achieve South Africa's emissions commitments. Stellenbosch University estimates that a just transition would require about US$250 billion between 2025 until 2035, which is around 3% of yearly gross domestic product (GDP) (Blended Finance Taskforce 2022). Two-thirds of this capital is committed to new energy

[18] Most jurisdictions are not on track with their 2°C emissions pledge for 2030. In a sample of 16 jurisdictions ranging from high emitters (China, United States, European Union and India) to median emitters (Japan, Germany, Brazil, United Kingdom, Korea and Australia) and low emitters (South Africa, Vietnam, Egypt, Argentina, Nigeria and Kenya), 12 are not meeting their targets. Low commitment is a common global trend (UNFCCC 2023).

infrastructure (see Annexure B Figure B1 for funding estimates by Stellenbosch University and JET IP). The government's proposal for the JET Investment Plan (JET IP) package estimates the cost in the initial phase between 2023 and 2027 to be nearly US$100 billion (Presidential Climate Commission 2022).[19]

A green transition requires a push from both the public and private sectors.[20] Banks are playing an increasingly proactive role in mobilising and channelling private funding for the transition,[21] and a robust regulatory framework can support this. Enabling an orderly transition is key to mitigating potential financial instability caused by future climate shocks.

The banking sector is gradually adapting to the changing regulatory environment around climate policies. The SARB has issued guidance notes on climate-related risk practices for banks and insurers (SARB 2022 and SARB 2023). These notes form part of the discussion between stakeholders and the regulator to set up environmental, social and governance (ESG) criteria and to factor climate-related risks into their lending decisions.[22]

The implementation of green transition regulations has, however, been limited by political and governance challenges at the national and municipal levels. Calland (2023) highlights that South Africa's policy landscape vis-a-vis the green transition can be described as a “patchwork quilt” – a conglomeration of well-intended strategies marred by ambiguities and inconsistencies. Challenges are rooted in South Africa’s historical reliance on coal and in entrenched political-economic dynamics.

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19 The Presidential Climate Commission’s (2022) JET plan was supported by a pledge from the International Partners Group (which includes France, Germany, the United Kingdom, the United States and the European Union) of US$8.5 billion at COP 26. The JET plan aligns with the country's economic plans, but International Partners Group funding contributes only between 3.4% and 8.5% of total transition costs.

20 The JET-IP, for example, relies on the private sector for most of its required investment, particularly for energy generation, and envisions a blend of private and public funds.

21 The Renewable Energy Independent Power Producer Procurement Programme, a flagship initiative of the Department of Mineral Resources and Energy, has had significant investment from local banks, who have to date funded a majority of the programme's 102 approved projects (Evans and Ngcuka 2023).

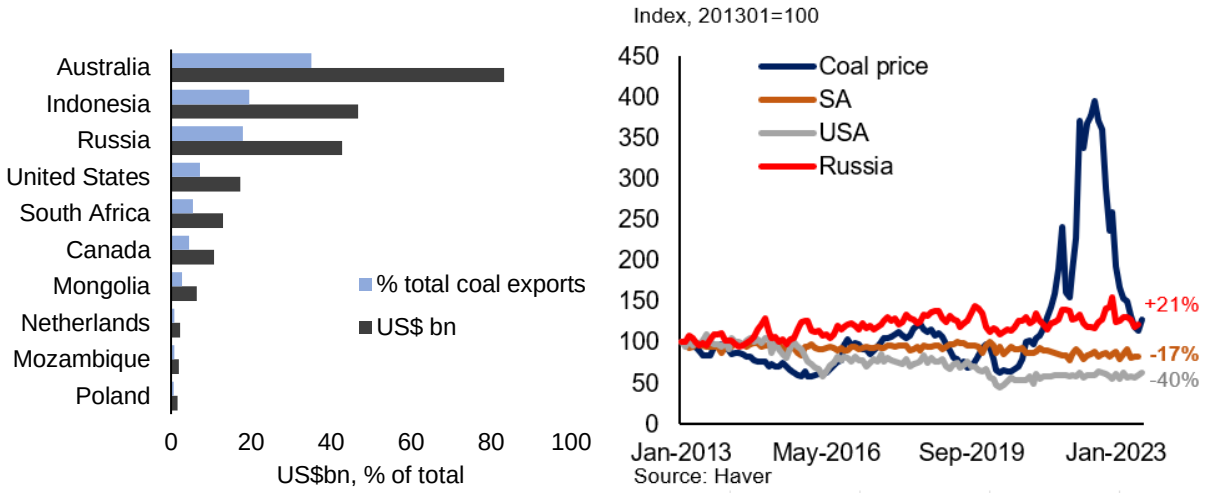
22 In this context, the Johannesburg Stock Exchange (JSE) now requires listed entities to disclose ESG metrics, bringing about a layer of transparency that nudges corporations towards sustainability (JSE 2021).

3.2 Decommissioning the coal value chain: a challenge for South Africa's transition

The global transition requires a drastic cut in coal production and utilisation. The reliance of South Africa's economy on coal, both as an energy consumer and as an exporter, is thus a critical exposure to transition risks. South Africa ranked as the 13th-highest carbon emitter worldwide and the 38th highest on a per capita basis in 2020, making it the leading carbon-emitting country in Africa. South Africa is the fifth largest exporter of coal, with around 5.5% of global coal exports for 2022 (see Figure 2). Coal constituted about 25% of the country's total exports for 2019.

From a German case study, lessons from a coal value chain transition indicate no systemic risk (see Annexure B, Box 2 for details). The overall lesson for South Africa is that the transition from coal can avoid a systemic event if the transition is orderly and starts early rather than abruptly. Orderly aspects include government's long-term planning and communication, stakeholder engagement, compensation and transition aid to affected regions and workers, and timelines and legislation with definitive timelines backed by law.

Figure 2: Top 10 global exporters; Coal market: price vs production



Source: World's Top Exports and Haver

The coal value chain plays an important role for South Africa's socioeconomic and sovereign financial soundness. The sector employed approximately 92 000 people in 2022, with the Mpumalanga region particularly dependent on coal mining for employment and regional GDP contribution (Statista 2023). Tax revenue collectors report significant contributions from the coal sector from exports and profits in the coal products and mining and quarry sectors,

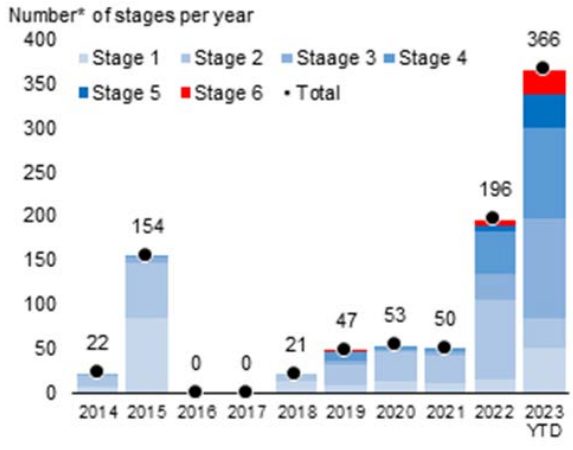
comprising 30% of total companies' tax payments for 2021/22 (South African Revenue Service 2023).

On a positive note, South African coal production is already decreasing. In 2022, it fell by 3.6% despite coal prices quadrupling during the COVID outbreak (see Figure 2). While, coal production sectors in South Africa and the United States declined 17% and 40% over the last decade, respectively. Russian, Chinese and other top coal producers surged in this time. Global demand is already shifting to cleaner energy sources and, as environmental concerns intensify, the global coal sector will structurally shift, posing challenges to South Africa's economic trajectory and its sovereign financial soundness.

Energy insecurity is another significant challenge associated with decommissioning the coal value chain. According to Calland (2023), the national electricity utility, Eskom, has been burdened with debt due to lack of investment, inconsistent policy and mismanagement and misuse of funds, and the company has struggled to maintain power generation and transmission. The fragile energy infrastructure has often led to “load-shedding” for households and businesses, with recent severe power cuts causing between two and 12 hours of blackouts daily (See Figure 3, left-hand side).

Such energy precarity further aggravates economic growth conditions, with an estimated GDP reduction of between 0.2 and 2.1 percentage points for 2022 (see Figure 3, right-hand side). This requires a shift to efficient energy production delivered by renewable sources, away from the current coal-intensive production system. However, this move is also a risk for short-term energy security.

Figure 3: Number of load-shedding stages per year and estimated 2022 GDP impact



Research institution	Methdology	Impact (%)
Investec	Working day adjustments	0.2-0.4
FNB	Ordinary least squares	0.4-0.5
Intellidex	Working day adjustments	0.9-2.2
ABSA	Ordinary least squares	1.3
SARB - SARB Quarterly Bulletin (2022)	Ordinary least squares	2.2
PWC	Input-output modelling	3.5-4.2

Note: The number of load-shedding stages exceeds the calendar days because there can be multiple instances of load-shedding per day.

Source: Eskom, SARB, Absa, FNB, PWC and Intellidex

The convergence of a carbon-intensive economy, socioeconomic precarity and energy insecurity pose challenges for South Africa's transition.[23] Between 2013 and 2035, South Africa faces a transition risk estimated at more than US$120 billion in present value terms (Huxham, Anwar and Nelson 2019).[24] This transition risk estimation is largely attributable to coal dependency and a reduced export cash flow by US$83.7 billion. This could have ramifications for global commitments such as the Paris Agreement and for risks related to stranded assets and the fiscal consequences of coal export dependence.

3.3 Climate-related risks in the South African economy: an overview

The transition in South Africa is not limited to sectors in the coal value chain: it will impact firms, households and the sovereign at large.

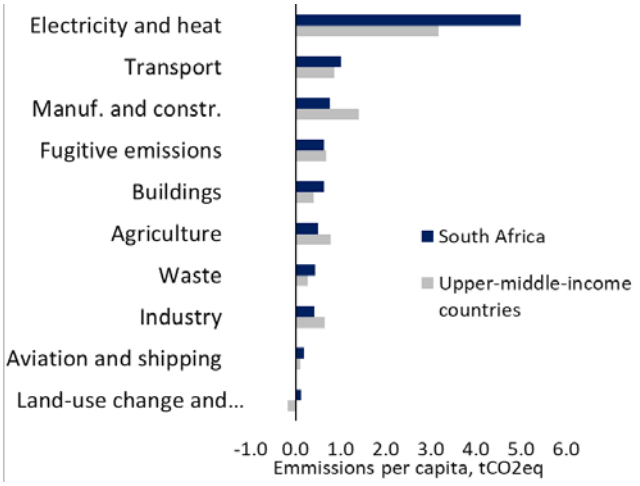
Economic sectors

The transition to a low-carbon economy does not only affect the sectors that directly emit carbon dioxide for energy (see Figure 4) – -low-and-medium-emitting sectors are affected too. Firms' exposure to transition risks is determined by the combination of their position in the production structure and the nature of their value chain (Godin and Hadji-Lazaro 2020).

[23] To face these challenges, South Africa can draw insights from the transition in other coal-intensive economies such as Germany's (see annexure).

[24] See annexure for the breakdown.

Figure 4: Energy emissions by source, 2019



Source: Our World in Data

For example, the **transport sector** is deeply intertwined with carbon-intensive sectors, especially coal, which requires significant transport infrastructure for its distribution and export. As the transition to a low-carbon economy intensifies, the direct decline in coal production and distribution could lead to decreased demand for transport services, affecting revenues and employment in this sector (Godin and Hadji-Lazaro 2020). The transition might also push for the adoption of cleaner transportation means, like electric vehicles, which would necessitate a massive overhaul of existing transport infrastructure, from refuelling stations to maintenance facilities. Furthermore, the potential decline in the automotive manufacturing industry, another major sector in South Africa, due to global shifts to greener transportation could indirectly affect transport services reliant on goods distribution from these manufacturers.

Given its diverse nature, **the manufacturing sector** is likely to experience multiple secondary effects as a result of the climate change transition. In South Africa, the coal and automotive industries are significant players in the manufacturing landscape. A shift away from coal as a primary energy source could have downstream effects on manufacturers producing coal-related equipment and infrastructure. Similarly, the automotive manufacturing industry might face disruptions as a result of a global push to electric vehicles (Godin and Hadji-Lazaro 2020). This transition affects the production of traditional vehicles and offers manufacturers opportunities to pivot to producing parts and components for electric vehicles. However, any delay in or resistance to adapting to these changes could lead to stranded assets and job losses.

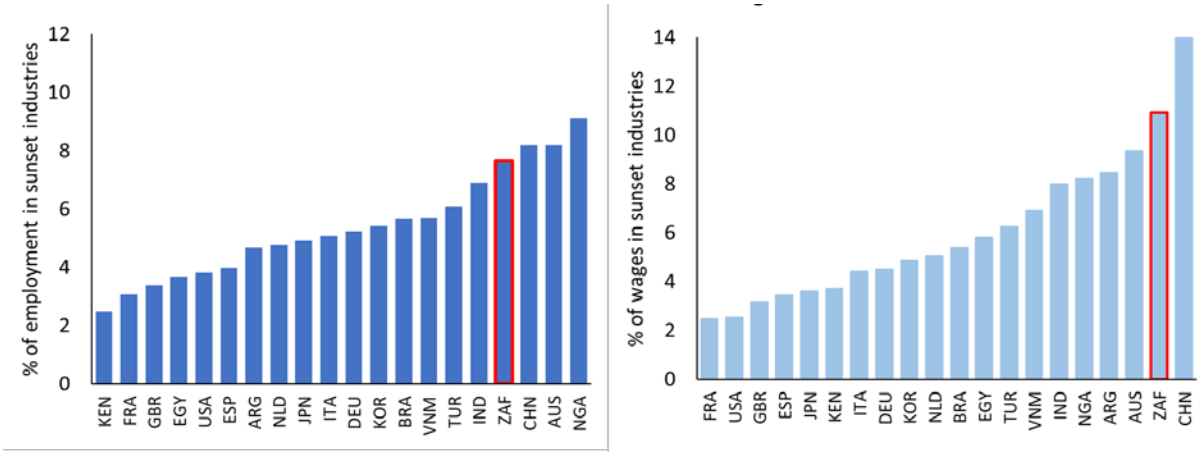
Though not directly carbon-intensive, **the construction sector** is intricately linked with sectors like coal and manufacturing in terms of infrastructure development. For instance, coal mining requires extensive construction activities, from mines to transportation routes. A decline in coal production would lead to a decline in such construction projects. The push to greener technologies and infrastructures – such as wind farms, solar parks and green buildings – can offer new opportunities for the construction sector (Godin and Hadji-Lazaro 2020). However, it is also likely to require new skills and expertise. If the sector does not adapt rapidly to these new demands, it may struggle to secure projects and maintain profitability. Similarly, any downturn in manufacturing due to the climate transition may reduce the demand for new manufacturing facilities, indirectly affecting the construction industry.

Adaptive capacities in all sectors are crucial for mitigating risks. The real risk for assets is that they become definitively unusable after a transition shock (Godin and Hadji-Lazaro 2020). For sectors or assets to remain viable, they must adapt, innovate and diversify their functions. For instance, if the automotive industry pivots to electric vehicles, certain upstream sectors can maintain their relevance by adapting to this new demand.

Households

Transition risks can also significantly affect the financial well-being and long-term security of households in South Africa. Figure 5 shows that households in the country are significantly exposed to high-carbon industries. Households dependent on industries facing transition risks (such as coal mining) could experience a direct income and employment effect from transition risk through job and income losses. A shift in job markets is also an opportunity for job creation: while employment in some sectors will decline, there will be growth in others, such as renewable energy. Transitioning between industries may not be straightforward, however, as it requires developing new skill sets or even geographical relocation. It is important to highlight that the share of employment and wages in high-carbon sectors in South Africa is high relative to international peers (see Figure 5).

Figure 5: Employment share of high-carbon industries; wages share of high-carbon industries



Note: High-carbon industries include electricity from fossil fuels, cement lime and plaster, basic iron and steel ores, aluminium products and ores, nitrogen fertiliser, fossil fuel extraction, coal, petroleum and gas.

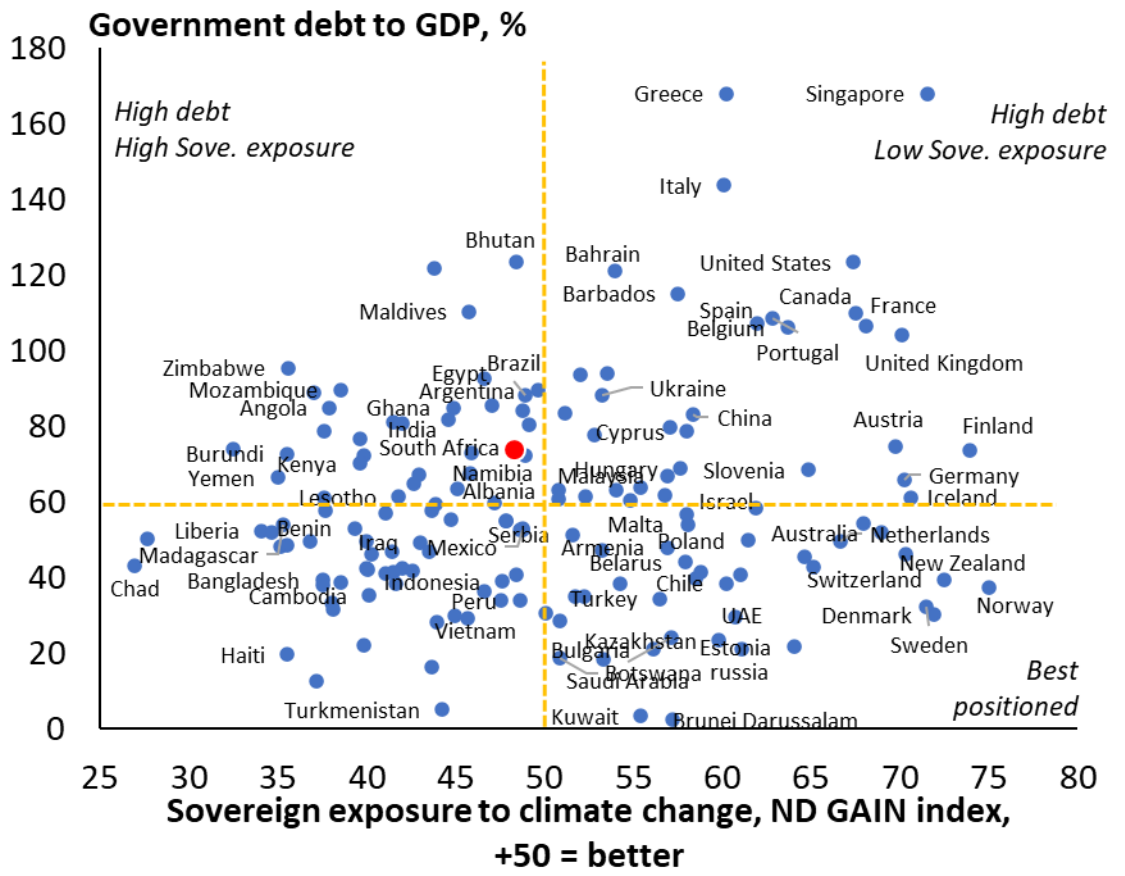
Source: Magacho et al. (2023)

Sovereign

Figure 6 shows how countries are positioned in terms of exposure to climate change and fiscal challenges. South Africa has an average climate exposure score but a high debt-to-GDP ratio for 2021.[25] The implications of climate change transition risks and mitigation risks could worsen the current debt burden for the South African government. South Africa's sovereign risk and financial stability remain intricately tied to the future of Eskom, a company directly exposed to the transition. Because of the energy insecurity that started in 2008, markets have so far focused on the energy transition risk and not on all transition risks (Morgan Stanley 2023).

[25] The estimated debt-to-GDP ratio worsened after the government's electricity bail-out in mid-2023.

Figure 6: Debt to GDP vs sovereign exposure to climate change risks

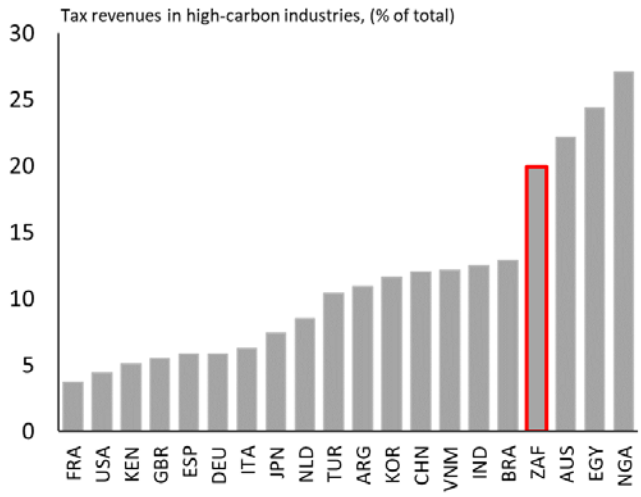


Note: ND-GAIN is an indicator of sovereigns' exposure to climate change (transition risks and mitigation risks). A higher score reflects better positioning for climate change.

Source: IMF and ND-GAIN

Fiscal pressures on the sovereign from climate change and transition issues can occur in two ways. First, they can occur through a decline in revenue. For example, the government might see a drop in tax revenues from the mining and agriculture sectors as they are affected by climate-related shocks. Magacho et al. (2023) report that 20% of tax revenue is generated from high-carbon industries; relative to its peers, this is very applicable to South Africa (see Figure 7). Second, they can occur through an increase in expenditure. Addressing climate impacts requires significant investments in infrastructure, adaptation measures and social support programmes, which may strain the government's budget. However, this could be mitigated by carbon tax revenue.

Figure 7: Tax revenues from high-carbon industries



Note: High-carbon industries include electricity from fossil fuels, cement lime and plaster, basic iron and steel ores, aluminium products and ores, nitrogen fertiliser, fossil fuel extraction, coal, petroleum and gas.

Source: Magacho et al. (2023)

A worsening of debt sustainability would contribute to fiscal pressure. The National Treasury's decision to absorb about half of Eskom's debt elevated the country's debt-to-GDP ratio to an estimated 80%. While the JET IP itself poses minimal fiscal risk, the incorporation of Eskom's debt is a significant factor in the nation's debt profile.[26] As the government incurs increased expenses without a corresponding rise in revenues, it may have to borrow more, raising concerns about debt sustainability and increasing debt-servicing costs.

4. Transition systemic risk in the South African banking sector: an initial assessment

To assess systemic risks in the South African banking sector, we estimate banks' direct exposure to economic activities that may be affected by the transition. We focus on the share of bank loans to firms that are active in such economic activities relative to their total loans,[27] applying a variation of the methodology developed by Battiston et al. (2017) and refined over the years.[28] This methodology identifies Climate Policy Relevant Sectors

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26 See annexure for a more detailed analysis of why Eskom's economic situation matters for public finance and the funding of the transition.

27 Loans are the gross amount of credit extended, inclusive of on-balance-sheet loans and advances as well as credit exposure arising from repurchase or resale agreements and derivative instruments plus off-balance-sheet loan commitments.

28 For an overview of the latest developments in this methodology, see www.finexus.uzh.ch.

(CPRS) in the economy, which are defined as economic activities that could be positively or negatively affected by a disorderly transition (including those potentially transformed into “stranded assets”).

The CPRS methodology has been frequently used by policymakers to assess the exposure of financial institutions to transition risks. Examples include the ECB, which looked at the exposure of banks, investment funds, insurers and pension funds in the euro area (Giuzio et al. 2019), the European Banking Authority (EBA) for the European banking sector (EBA 2020), the Oesterreichische National Bank for the Austrian banking sector (Battiston et al. 2020), Banca D'Italia for domestic banks (Faiella and Lavecchia 2022), Banco de México for the Mexican financial system (Roncoroni et al. 2021) and the European Insurance and Occupational Pensions Authority for the sovereign bond portfolio of European insurers (Battiston et al. 2019). It has also been applied by academics to assess, for example, euro area investors’ portfolios (Alessi and Battiston 2022) and the overseas energy portfolios of Chinese policy banks (Monasterolo, Zheng and Battiston 2018).

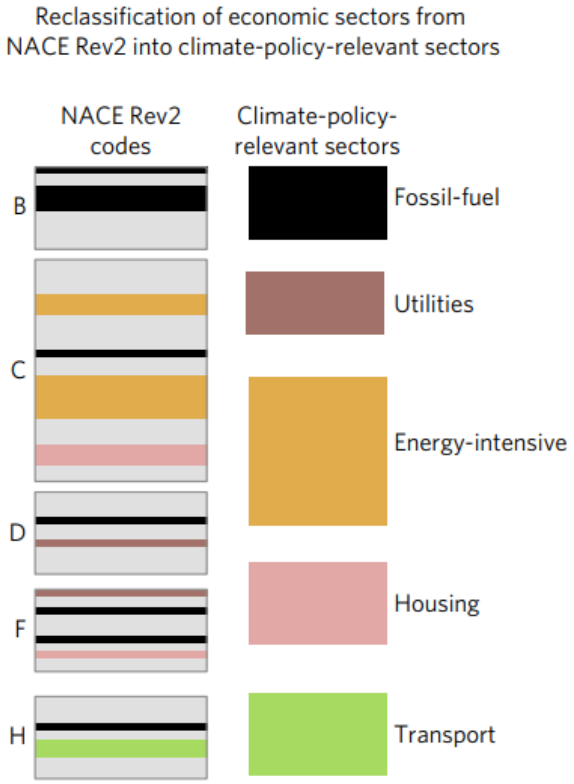
Unfortunately, the data that South African banks report to the Prudential Authority (PA) do not allow us to apply the CPRS classification directly. First, the sectors in the PA classification are much more aggregated than the level of granularity needed to map the CPRS directly, which are based on subsectors of the Nomenclature générale des Activités économiques dans les Communautés Européennes (NACE) classification.[29] Second, even at the highest aggregation level, the sectors in the CPRS-NACE classification do not always match the aggregated sectors in the PA classification one-for-one. To overcome these problems, we developed our own mapping – transition-sensitive economic sectors (TSES) – from the CPRS-NACE classification to the TSES-PA classification. To do this, we had to rely on some assumptions about the weights of the different CPRS-NACE subsectors in South African banks’ loan portfolios.

[29] The NACE classification is the statistical classification of the economic activities in the European Union. It classifies economic activities into sectors at different levels, from 13 main first-level economic sectors to sub-sectors disaggregated at the fourth level.

4.1 Identifying transition-sensitive economic sectors

The CPRS framework highlights six sectors that are disproportionately exposed to transition risks: fossil fuel, utilities, energy-intensive, transport, housing and agriculture. Each sector aggregates subsectors selected at the NACE 4-digit level from different economic sectors (see Figure 8). The TSES classification we developed for this study uses the same aggregate sectors.

Figure 8: Aggregating CPRS subsectors



Source: Battiston et al. (2017)[30]

A subsector is considered a CPRS if a disorderly transition to a low-carbon economy is likely to affect its revenues. Four dimensions are considered to assess whether an economic activity is considered part of a CPRS (Battiston et al. 2022). The first dimension considers whether an economic activity produces energy or goods. The second dimension considers whether the activity causes direct or indirect GHG emissions. The third dimension considers whether the economic activity is subject to specific policy processes. The fourth dimension

[30] The initial classification from Battiston et al. (2017) does not include agriculture as CPRS. This CPRS was added in later versions of the CPRS classification (see Battiston et al. 2022).

considers whether the activity's fossil fuel input and output are substitutable. Figure 9 explains the rationale for allocating a subsector to the CPRS sectors.

Figure 9: Stylised facts of each CPRS

CPRS main	Category of economic activities	Role in GHG emissions value chain	Specific policy processes	Nature of transition risk in relation to business model
Fossil fuel	Carry out/support production/delivery of primary energy based on fossil fuel	Mostly indirect CO2 emissions	Oil politics, taxes/subsidies	No fuel substitutability
Utility electricity	Carry out or support production of secondary energy	Mostly direct CO2 emissions (fuel mix)	Electricity authorities (e.g. feed-in tariffs)	Medium fuel substitutability (e.g. wind farms)
Energy-intensive	Manufacturing activities with intensive use of energy according to EU classification Carbon Leakage	Mostly direct CO2 emissions (fuel mix)	No specific policy processes as a group	Low substitutability (e.g. steel or rockets)
Transport	Provision of or support to transport services (e.g. vehicles manufacturing, roads and railways)	Mostly direct CO2 emissions (fuel mix)	Transport authorities and policies	Low substitutability (e.g. motor vehicles fleet)
Buildings	Provision of or support to buildings services (e.g. residential and commercial)	Mostly direct CO2 emissions (fuel mix)	Housing policies	Low substitutability (e.g. heating/cooking)
Agriculture	Provision of and support of agriculture and forestry	Direct CO2 emissions from fossil fuel; other direct GHG emissions and negative emissions (afforestation)	Agricultural policies	Low substitutability (as for transport) but emission reductions via low carbon farming

Source: Battiston et al. (2022)

The exposure of banks to the real estate sector is one channel through which transition risk could arise, especially if energy efficiency requirements are introduced, which could result in older buildings becoming less valuable. Against this background, the building sector is considered transition-sensitive by Battiston et al. (2017). However, even after highlighting this potential risk, a study conducted by the World Bank excludes the buildings sector, which includes the real estate and construction sectors, from the transition-sensitive sector in South Africa (Regelink 2022).[31] For this study, in line with the World Bank study, we present

[31] The South African buildings sector drives about 34% of the country's energy demand, with emissions linked to the sector's use of electricity accounting for more than half its emissions (National Business Initiative–Boston Consulting Group 2023). The National Building Regulator issued guidelines requiring that new buildings and extensions to existing buildings be designed and constructed to use energy efficiently while fulfilling user needs such as thermal comfort, lighting and the like.

a baseline estimate of transition-sensitive exposures that excludes the buildings sector, but we also show results that include the buildings sector.

4.2 Mapping methodology

From the CPRS-NACE sectors to the TSES-PA classification

On the one hand, the sectoral allocation of loans by South African banks is reported to the PA only according to major divisions (one-digit level) of the Standard Industrial Classification of all Economic Activities (SIC).[32,33] On the other hand, the NACE-CPRS mapping tool developed by Battiston et al. (2017) identifies CPRS in the NACE classification at lower levels of aggregation: at the two-digit, three-digit and four-digit levels. The NACE subsectors cannot be automatically matched to the PA classification. To match these two classifications, we proceeded in two steps.

First, the Supply and Use Tables (SUTs) compiled by Statistics South Africa (Stats SA)[34] provides a sufficient level of detail and disaggregation to allow for mapping of its 124 industries into the NACE classification at the two-digit, three-digit and four-digit levels, for which the CPRS are well defined. Using a mapping tool, we matched the NACE subsectors with the SUTs subsectors, sometimes manually using the descriptions of economic activities for cases that could not be matched automatically. Second, using an established and official mapping table, we could match SUTs subsectors with the SIC classification at the base of the sectoral loan classification used by the PA. A summary at the high-sector level of the mapping from the NACE and SIC classifications to the PA classification through the process described above is available in Annexure A.

For each high-level sector in the PA classification, this gives us a list of subsectors that can be considered as TSES or not. However, this does not yet allow us to assess the weight of loans to TSES in this high-level PA sector relative to all loans for this high-level sector – that

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32 The data are reported on the BA 210 form (i.e. credit risk quarterly return) accessible via https://www.resbank.co.za/content/dam/sarb/publications/prudential-authority/pa-public-awareness/GG%20No%2046159%20LEX%20and%20TLAC%201%20April%202022.pdf

33 See Appendix B - Standard industrial classification of all economic activities.pdf (resbank.co.za)

34 See Publication | Statistics South Africa (statssa.gov.za)

is, it does not yet provide us with an estimation of banks' exposure to TSES in their total loan exposure.

Assumptions underlying the assessment of banks' exposure to TSES

To assess the exposure of loans in the banking system to TSES relative to all loans, we need to know how each bank allocates its loan portfolio across the subsectors in a high-level industrial sector and then compute the share of loans attributed to TSES subsectors. Unfortunately, this level of disaggregation is not available in the data that banks report to the PA. From these data, we can only infer what loan amounts each bank allocates to every high-level industrial sector. We must thus work with some assumptions on how individual banks allocate their loans across subsectors within a high-level sector. We used two alternative assumptions for our empirical assessment:

1. **Economy key** – Within each high-level sector in the PA classification, each bank allocates its loans across subsectors according to their economic importance within the high-level sector. We measure economic importance with the relative gross value added (GVA) of a subsector compared to the total GVA of the high-level sector. Subsector GVA is available in the SUTs of Stats SA; we took GVA values for 2019. Under this hypothesis, the TSES exposure of a bank through its loans to one specific high-level sector reflects the TSES exposure of the economy in this sector.

Figure 10: Assumed transition-sensitive weights per sector based on GVA

ECONOMY KEY	Fossil fuel	Utilities	Energy-intensive	Transport	Agric	Buildings	Other
Agriculture, hunting, forestry and fishing	0%	0%	0%	0%	**100%**	0%	0%
Mining and quarrying	**22%**	0%	**65%**	0%	0%	0%	13%
Manufacturing	**12%**	0%	**51%**	**9%**	0%	**1%**	28%
Electricity, gas and water supply	0%	**100%**	0%	0%	0%	0%	0%
Construction	0%	0%	0%	0%	0%	**88%**	12%
Wholesale and retail trade, repair of specified items, hotels and restaurants	**4%**	0%	0%	**13%**	0%	**6%**	77%
Transport, storage and communication	0%	0%	0%	**67%**	0%	0%	33%
Real estate	0%	0%	0%	0%	0%	**100%**	0%
Business services	0%	0%	0%	**2%**	0%	**12%**	86%
Community, social and personal services	0%	**2%**	0%	0%	0%	0%	98%
Other	0%	0%	0%	0%	0%	0%	100%

Source: authors' calculation

2. **Long-term loans key** – Within each high-level sector in the PA classification, each bank allocates its loans across subsectors according to the long-term loans received by this subsector from different financial institutions – both domestic and foreign –

relative to the total long-term loans received by this high-level sector. Total long-term loans from domestic and foreign financial institutions by subsectors are available in the Annual Financial Statistics (AFS) survey.[35] We use data from the 2021 AFS survey for 258 economic activities.[36] Under this hypothesis, the TSES exposure of a bank through its loans to one specific high-level sector reflects the TSES exposure of the long-term loans received by this sector from different financial institutions.

Figure 11: Assumed transition-sensitive weights per sector based on long-term loans

LT LOANS KEY	Fossil fuel	Utilities	Energy-intensive	Transport	Agric	Buildings	Other
Agriculture, hunting, forestry and fishing	0%	0%	0%	0%	**100%**	0%	0%
Mining and quarrying	**6%**	0%	**90%**	0%	0%	0%	4%
Manufacturing	**5%**	0%	**50%**	**12%**	0%	**1%**	32%
Electricity, gas and water supply	0%	**100%**	0%	0%	0%	0%	0%
Construction	0%	0%	0%	**29%**	0%	**59%**	12%
Wholesale and retail trade, repair of specified items, hotels and restaurants	**8%**	0%	0%	**24%**	0%	**4%**	63%
Transport, storage and communication	0%	0%	0%	**56%**	0%	0%	44%
Real estate	0%	0%	0%	0%	0%	**100%**	0%
Business services	0%	0%	0%	**7%**	0%	**3%**	90%
Community, social and personal services	0%	**5%**	0%	0%	0%	0%	95%
Other	0%	0%	0%	0%	0%	0%	100%

Source: authors' calculation

4.3 Direct exposure empirical assessment

Data

We use data on the gross amount of credit extended by banks for the third quarter of 2022. This credit exposure includes on-balance-sheet gross loans and advances, credit exposure arising from repurchase or resale agreements, derivative instruments and off-balance-sheet loan commitments. We exclude loans to financial institutions and loans to households, because they are not directly linked to economic activities, and we focus only on loans to firms and their economic activities.[37]

At an aggregate level, corporate loans amount to R2.8 trillion, representing 37% of the banking sector's total assets and 42% of its total loans (Figure 12, left-hand side). Because of their systemic importance for the stability of the South African banking sector, we pay

35 See https://www.statssa.gov.za/publications/P0021/P00212021.pdf

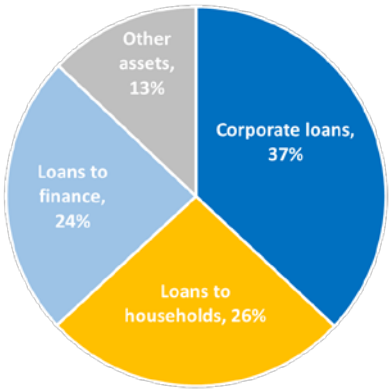
36 As described above, we use the NACE-CPRS mapping tool to manually match descriptions of the 258 economic activities in the AFS with the NACE classification at the two-digit, three-digit and four-digit levels of aggregation, and we identify which of the activities in the AFS are TSES.

37 We note that this approach underestimates impact. We discuss the potential contagion and amplification in South Africa's financial system in the next section.

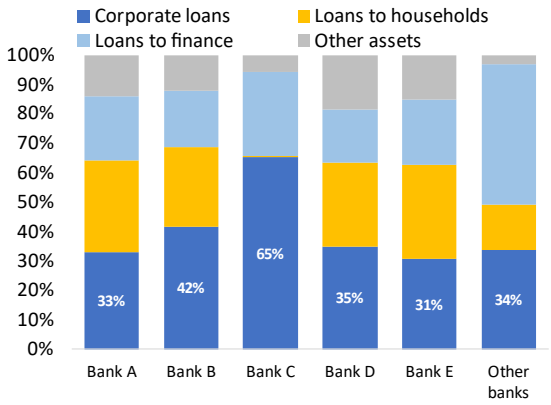
particular attention to the five big banks (referred to as banks A to E). Corporate loans from these banks represent 90% of total banking sector corporate loans. Our assessment covers between 30% and 40% of individual banks' total assets, except for one bank, for which we cover more than 60% of total assets (Figure 12, right-hand side).

Figure 12: Asset decomposition

Total banking sector assets, 2022Q3



Total assets by bank, 2022Q3



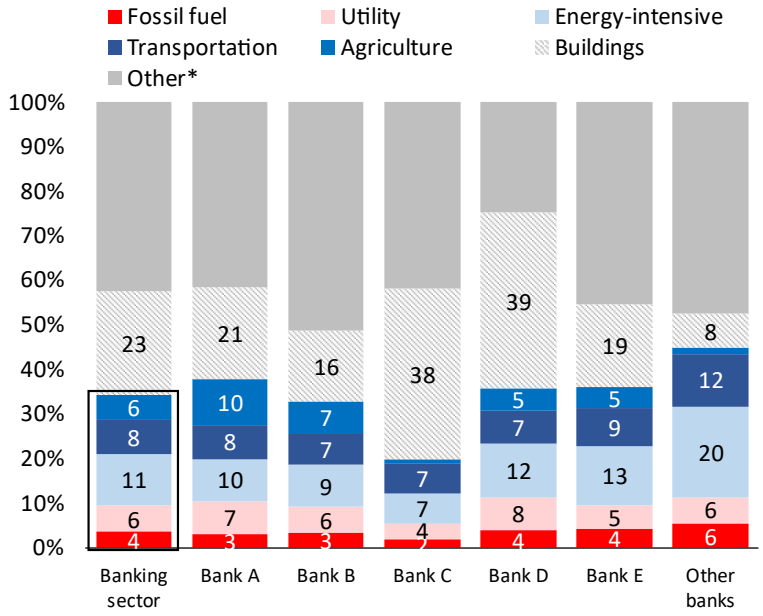
Source: SARB

Loan portfolio exposure to transition risks

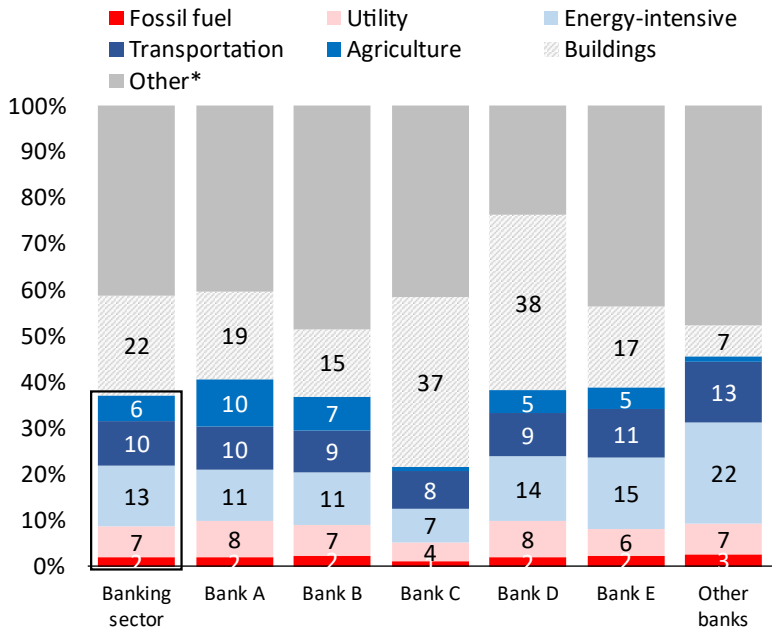
Figure 13 shows our estimation of the banking sector's direct exposure to TSES. Based on the 'economy key', we found that TSES represent about 35% of banking sector credit exposure. The energy-intensive sector is the highest TSES exposure and represents about a third of total TSES exposure, followed by the exposure to the transportation sector. The 'long-term loans key' gives us broadly similar results (Figure 13, bottom panel).

Figure 13: Exposure to TSES

Economy key



Long-term loans key



Source: authors' calculation

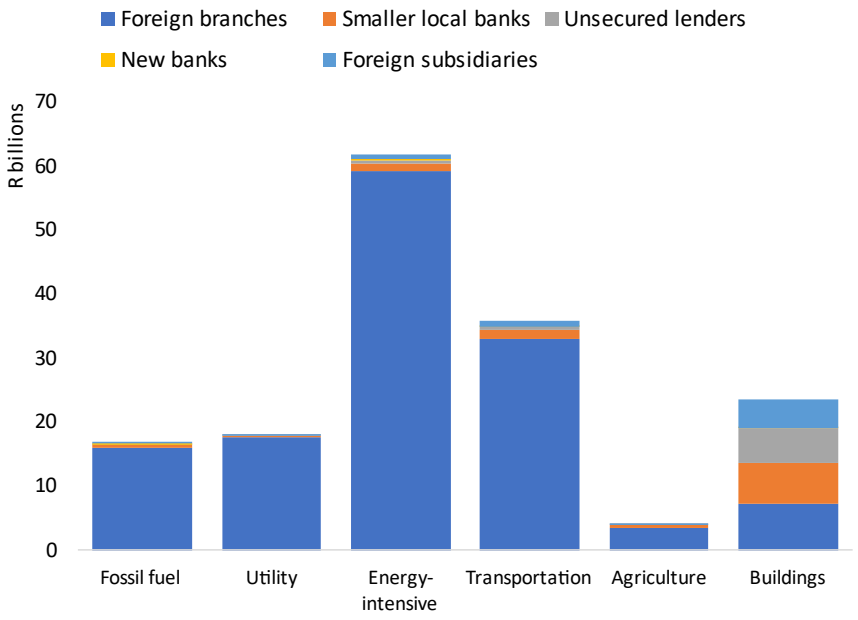
Estimations for individual big banks all lie around the banking sector average, except for one bank with lower exposure compared to its peers, at around 20%.[38] According to these estimations, no big bank seems outstandingly exposed to transition risk and in need of

[38] Note that if buildings are considered as TSES, this bank's exposure is similar to the banking sector's.

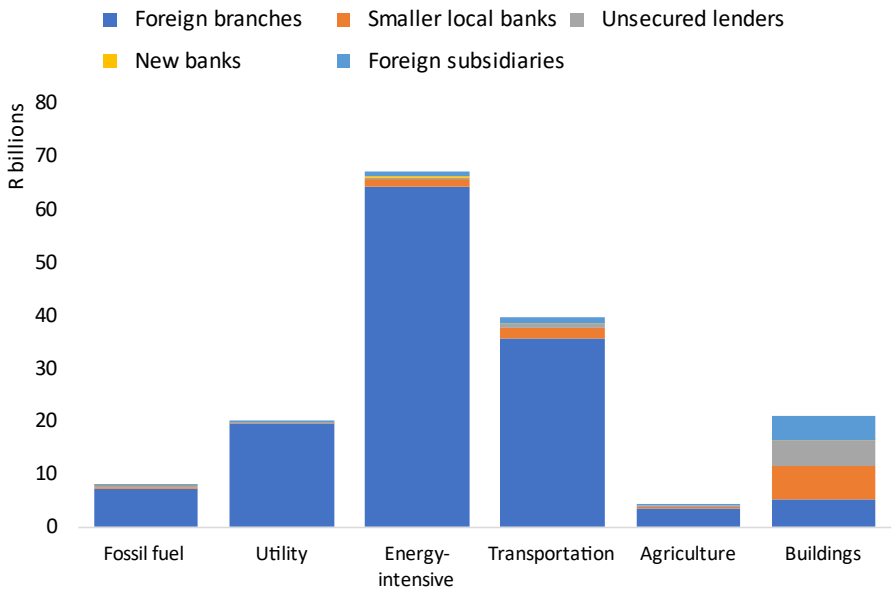
specific attention or measures.[39] By contrast, the rest of the banking sector – the other banks – are relatively more exposed to transition risk than big banks (above 40%). This is mainly driven by the higher exposure of foreign branches to the energy-intensive and transportation sectors (Figure 14).

Figure 14: Specific risk exposure allocated by other banks

Economy key



Long-term loans key



Source: authors' calculation

39 Note that when including buildings in TSES, one big bank has a significantly higher exposure than the banking sector (76% against 60% for the banking sector).

Comparison with other estimations

The World Bank reports that the exposure of the South African banking sector to transition-sensitive sectors was about 16% of total credit exposure as at the third quarter of 2019 (Regelink 2022). This is much lower than our estimate of 35% in TSES exposure. This difference may be the result of two factors. First, the main difference between our approach and theirs is that the World Bank classifies all exposures to the agriculture, mining, manufacturing, electricity and transport sectors as being exposed to transition risk. However, within each of these sectors, some economic activities at a subsector level are transition-sensitive and others are not. For example, the manufacture of mineral water is not transition-sensitive. Similarly, some economic activities in the sectors they have not selected are transition-sensitive. For example, the retail sale of automotive fuel in the 'Wholesale and retail trade' sector is sensitive to transition risk. Second, we excluded loans to the financial sector from our corporate loans, which might not have been the case for the World Bank estimate. When we include them in corporate loans (and consider them as non-TSES), we find an exposure of 23%, which is still higher than the World Bank, but less so.

When we include the buildings sector in TSES, the exposure of the banking sector is about 60%. The EBA (2020) and ECB-ESRB (2021) use a similar approach to assess transition risk in the euro area banking sector. They both include the buildings sector as a CPRS, in line with the classification developed by Battiston et al. (2017). The ECB (2021) estimates that bank loan exposures to CPRS amount to 52% of the euro area total domestic non-financial corporate loan portfolio, with more than two-thirds of CPRS exposure being in the buildings sector. Similarly, the EBA (2020) estimates that 55% of the total exposure of a sample of 29 EU banks to large corporates is allocated to CPRS. Our estimates show a slightly higher exposure for the South African banking sector. When taking the buildings sector out of the European exposure, we find that the South African banking sector is more exposed to transition risks than the European banking sector – that is, more exposed to TSES other than buildings – with an exposure of 35% in South Africa against about 18% in Europe.

4.4 Potential contagion and amplification in South Africa's financial system

To our knowledge, the potential contagion and amplification effects of a transition shock in the South African financial system are under-documented. However, some evidence suggests potentially significant second-round effects within the economy and amplification potentials of relatively contained shocks by the financial system.

First, any shock to one specific sector will percolate through the economy and will indirectly affect other sectors. The direct exposure we present in the previous section is thus only a fraction of the final banking sector's corporate loan exposure to transition risks. Godin and Hadji-Lazaro (2020), for example, estimate that a shock to coal sector output is amplified by a factor of 1.58 in the economy – so an initial decrease in coal sector output equivalent to 10% of total output induces an additional 5.8% decrease in total output due to a decrease in the output of the rest of the economy. They also estimate that a shock to the motor vehicle sector is amplified by a factor of 2.25 in the economy.

If we extrapolate this figure for the banking sector, we can hypothesise that credit losses from a transition shock in TSES could lead to similar losses in the rest of the economy, including for the corporate loans that were not initially considered as being exposed to transition risks. Note that the amplification of the transition risks in the economy also affects loans that are not analysed in this study, like loans to households. Godin and Hadji-Lazaro (2020) estimate, for example, that job losses are amplified by a factor of 2.7 for job loss in the coal sector – that is, for every job lost in the coal sector, there are roughly two other jobs lost in the rest of the economy – and by a factor of 1.7 in the motor vehicle sector.

Second, central banks and supervisors usually consider that financial markets overall are not currently aligned with a portfolio allocation that will lead to the transition to a sustainable economy; nor do they fully account for climate-related risks. This situation is prone to substantial and rapid adjustments in financial market prices and is likely to be the case in South Africa.

Third, central banks and supervisors usually consider that financial institutions still need to ramp up their capacities in managing climate-related risks for their balance sheets. In the current situation, financial institutions' deficiencies in managing transition risk pose an additional risk to the financial system. South African banks are developing climate-related

risk management capacities, but there is still significant space for improvement in this domain.

4.5 Towards a better assessment

Our initial figures and assessments indicate potential systemic risk for the South African banking sector as a result of the transition away from fossil fuels. However, a more precise picture of the situation is necessary to better understand the extent of this systemic risk. This initial assessment suggests three areas in which more work would be welcome.

First, more granular data are needed in terms of banks' corporate loan exposure to transition risks. The level of sector aggregation at which banks currently report their corporate loan exposures does not allow a fine assessment of these risks. Reporting at the subsector level would improve this situation, but research in other countries shows that transition risk exposure can be very heterogeneous across firms in one sector. Ideally, transition risk exposure metrics at the firm level – at least for large corporates – would be the best solution with which to assess systemic risks from the transition.

Second, there is an apparent lack of information and data about the potential contagion of transition shocks in the South African financial and banking sectors. A large part of South African banks' loans is to other financial institutions – we have excluded these loans from our assessment of direct exposure, but they play a key role in the potential contagion of transition shocks from one bank to the other. An assessment of the extent to which transition risks are currently reflected in South African market prices would also help assess the potential asset price corrections and credit losses that accurate pricing would imply.

Third, this study gives a rough estimation of the exposure of the banking sector to transition risk but does not assess the financial size of potential risks – i.e. it gives a rough picture of where the risks are but not how material they are. For that, an estimation of the financial consequences – for example, in terms of potential market and credit losses, or value-at-risk – of transition shocks should be available. Scenario analysis is one way to deliver such an estimation. This is the option that several central banks have chosen and developed through the NGFS scenarios. However, central banks and supervisors acknowledge that current scenario analysis methodologies are limited. They highlight, for example, that NGFS scenarios do not fully account for interdependencies and systemic risk aspects such as

indirect exposures, risk transfers, spillovers and feedback loops, including with the real economy (FSB–NGFS 2022). Consequently, they warn that climate scenario analysis likely understates climate exposure and vulnerabilities. This must be reflected in a sound systemic risk assessment – for example, by adding a margin of conservatism in scenario assessments to reflect the effect of a potential short-term shock on market expectations and sharp correction in market prices, as well as other amplification mechanisms.

5. Macroprudential policy options

As with any other systemic risk, climate-related risks deserve an effective macroprudential policy response. To date, central banks and supervisors have mainly focused on solidifying microprudential pillars to guarantee a robust basis for financial stability in the face of climate-related risks.[40] However, if a sound treatment of climate-related risks at the microprudential level is necessary to address systemic risk from climate change, their systemic nature also requires a macroprudential policy approach.[41] The current macroprudential framework, developed for other systemic risks, constitutes a natural starting point for addressing systemic climate risks and can be adapted to address them (Hiebert and Monnin 2023).

5.1 Current macroprudential framework and climate-related risks

The macroprudential toolkit currently used by financial supervisors utilises structural and cyclical instruments. Structural instruments strengthen the resilience of the financial system by ensuring that financial institutions have enough resources to absorb losses in a crisis or by limiting the exposure of the financial system to risky assets. Cyclical instruments contain the build-up of vulnerabilities, for instance by reducing excessive credit growth and bank leverage or by improving the average quality of bank assets and improving the resilience of the financial sector when risks unwind.

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40 Central banks and supervisors aim to improve the management of climate-related risk by the firms they supervise (Pillar 2 of the Basel III framework) and to expand the disclosure of information that is necessary to better assess climate-related risks (Pillar 3). They have also issued guidelines on how climate-related risks should reflect in the risk assessment underpinning capital requirements. See BCBS (2022a), BCBS (2022b) and BCBS (2023) for the integration of climate-related risks in pillars 1, 2 and 3 respectively of the Basel framework.

41 The FSB, for example, states that "as climate change is likely to represent a systemic risk for the financial sector, potential macroprudential tools or approaches would complement microprudential instruments" (FSB 2022, p. 1).

A broad range of instruments has been developed and implemented by financial supervisors to address systemic risks: from restrictions to related borrowers, instruments or activities to capital and liquidity requirements and provisioning.[42] In this toolkit, capital-based instruments play a key role. They are explicitly included in the Basel III framework: at the international level, with the introduction of the global systemically important banks buffer and the countercyclical capital buffer. At the national level, several supervisors have also implemented capital surcharges for systemic risk. This is the case, for example, in the European macroprudential framework with systemic risk buffers.

Climate-related risks are currently not explicitly reflected in the macroprudential instruments that central banks and supervisors have implemented (Baranović et al. 2021). However, several options have been proposed to implement current macroprudential instruments for climate-related risks: from systemic capital buffers (Monnin 2021; Dafermos and Nikolaidi 2022) to concentration limits (Miller and Dikau 2022) and borrower-based measures (Philipponnat 2023). Central banks and supervisors have started to explore these options (see Coehlo and Restoy 2023; ECB-ESRB 2023; and Bank of England 2023).

5.2 Adapting macroprudential policy to climate-related systemic risks

The macroprudential framework already includes instruments that could be deployed to address climate-related systemic risks. However, climate-related systemic risks also have their own specificities. Addressing them thus requires central banks and supervisors to review their current implementation practices and, if needed, adjust them (Hiebert and Monnin 2023). This section highlights some principles that central banks and supervisors can follow.

Increasing resilience and mitigating risk build-up

Macroprudential measures have two main functions: increasing the resilience of the financial system to systemic shocks, and mitigating the build-up of risks within the financial sector. Capital requirements, for example, increase the buffer that financial institutions have for absorbing losses from shocks. They also reduce risk-taking by financial institutions.

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[42] See Biljanovska et al. (2023) for a review and assessment of the macroprudential instruments currently used by financial authorities.

Ikeda and Monnin (2024) suggest three building blocks to achieve these objectives in the context of climate-related risks:

- **A component to absorb climate shocks.** Macroprudential instruments should increase financial institutions' capacity to absorb unexpected systemic losses from physical and transition shocks. This is a natural corollary of the current capital requirement framework, which requires banks to hold a level of capital that can withstand unexpected losses. Currently, several central banks and supervisors are concerned by the fact that climate-related risks are not likely to be fully accounted for by financial institutions. Additional systemic capital requirements are needed to increase the resilience of the financial system to shocks that have not yet been accounted for (see, for example, Dankert et al. 2018). Such measures should be calibrated to ensure that the financial system can withstand the most adverse climate scenarios, requiring parameters calibrated on higher climate-related risk exposure estimations (Routledge 2022).
- **A component to prevent the build-up of climate-related risks**. Financial institutions indirectly impact climate change – and thus the build-up of climate-related risks – through the economic activities that they fund (Boissinot et al 2022). As an early and orderly transition mitigates climate-related systemic risk most, an ideal macroprudential framework should be designed to support an early and orderly transition. This can be done by setting incentives for financial institutions to limit their impact on climate change and to support economic activities conducive to a low-carbon economy. The macroprudential level is the appropriate level at which to address the build-up of climate-related systemic risk (Stiroh 2022).
- **A dynamic adjustment to transition paths**. The magnitude of systemic risk from climate change varies with the transition path of the economy. Systemic risk decreases in an early and orderly transition scenario and increases significantly if there is no transition. In the latter scenario, an absorption component should increase with time to reflect these higher risks. If the transition materialises, this component can decrease with time.

Shifting from backward- to forward-looking indicators

Central banks and supervisors currently base their policy decisions and calibrate macroprudential instruments on past data observed over several economic and financial cycles. This is not possible for climate-related risks, which are yet to materialise on a scale that affects the financial system. In this context, central banks and supervisors need to move from backward-looking and relatively complete data to forward-looking data that are relatively scarcer and subject to a higher degree of uncertainty.

This shift from backward- to forward-looking data requires a significant mapping and modelling effort to gain a view of prospective losses from climate-related financial risks. Central banks and financial supervisors are actively participating in this effort, but most of them are still in the evidence-gathering phase. The shift also requires the development of new sets of indicators. Ideally, these should capture the exposure of the financial system to climate-related risks, but also how financial institutions intend to adapt their business models to mitigate these risks, including through their contributions to aligning the economy with an early and orderly transition. Transition plans are considered promising indicators in this direction (NGFS 2023; Dikau et al. 2022; Noguès and Evain 2022).

Focused and proactive deployment

An important challenge for the implementation of macroprudential measures to address climate-related systemic risks is that currently only incomplete and imprecise data are available to central banks and supervisors (NGFS 2022b). While concrete initiatives are currently underway to fill this data gap, effective reporting at scale will take time to mature. However, central banks and supervisors can use the available data to deploy measures focused on parts of financial institutions and economic activities, based on a proportionality principle. Hiebert and Monnin (2023) suggest focusing macroprudential measures on large firm loan portfolios for which data are more easily available than for smaller firms, and which constitute larger risks for the financial system. Such measures could also focus on the highest-emitting activities, which are also the most exposed to transition risks. Economic activities at risk of imminent stranding like those linked to the value chain for thermal coal are a case in point.

Hiebert and Monnin (2023) also highlight that central banks and supervisors face a higher degree of uncertainty with indicators of climate-related risk than with the risk indicators they

work with for other systemic risks, such as credit cycle risks. They argue that in these conditions, implementing macroprudential tools for climate-related systemic risk requires central banks and supervisors to be less averse to implementing prudential measures when warning signals of systemic risk are not clear-cut than they are with other risk metrics. In the context of climate change, central banks and academics have highlighted that the risks of inaction are far greater than the risks of acting based on partial data. Against this background, Hiebert and Monnin (2023) argue that acting proactively with caution, even based on partial data, may be less problematic than not mitigating a very costly crisis.

5.3 Systemic capital buffers for climate-related risks

Capital buffers are considered by some central banks and supervisors as an instrument with which to address climate-related risk at the macroprudential level (EBA 2023; ECB-ESRB 2023). In the South African context, such an instrument would be appropriate given that transition risks are widespread across the banking sector and are not concentrated in a few institutions.

The European macroprudential framework of systemic risk buffers (SyRBs) offers a capital buffer instrument that could easily be deployed. These buffers are designed to address long-term non-cyclical risks for the financial sector stemming from the real economy (ESRB 2017) – which is exactly the type of risk posed by climate change. SyRBs have been widely used by European supervisors since their introduction in 2014 to mitigate different sources of risks – banking sector concentration, external shocks and sectoral shocks – and to adjust for inappropriate incentives for systemically important institutions.

Four main types of buffers are currently envisaged to address climate-related systemic risks (ECB-ESRB 2023), differing along their buffer rate structures and their scope of application. For the buffer rate structure, at one end of the spectrum a single rate could be applied to all banks, while at the other end the rate could be calibrated to reflect the climate-related risk exposures of individual banks. For the scope of application, the buffer could apply to all banks' exposures or to a smaller subset of riskier exposures. Several options can be conceived in the continuum between both ends of these two dimensions – for example, with multiple rates applying to different risk buckets or different sectoral exposure segmentations.

Bartsch et al. (2024) propose a concrete design to specifically address transition risk with SyRBs. Their blueprint assigns different SyRB requirements to banks in different buckets, depending on each bank's exposure to the estimated climate-related risks. They calibrate capital requirements for each bucket on potential losses from additional transition efforts needed to reach net-zero emissions by 2050. For this, they use a mixture of results from top-down climate stress tests and granular loan-level data from significant institutions in the euro area. They show that the proposed capital buffer requirement would adequately cover euro area banks' exposures to transition risk.

When it comes to adapting SyRBs to the particularities of climate-related risks, Monnin (2021) highlights three recommendations. First, supervisors should require each financial institution to hold capital in proportion to their exposure to climate-related risks – an institution-specific buffer. The alternative – a similar, system-wide buffer for each bank – would dilute the effectiveness of the measure by not addressing risks directly where they exist and would potentially increase the costs associated with higher capital for the whole banking sector. Second, supervisors should implement capital requirements that generate material incentives for financial institutions to reduce exposure to climate-related risks and to increase funding costs for economic activities that contribute to an increase in physical and transition risks in the future. Third, supervisors should rely on transparent rules and metrics.[43]

5.4 Potential side-effects and trade-offs

The implementation of macroprudential measures to address climate-related systemic risks may generate side effects and trade-offs for central banks and supervisors (Coelho and Restoy 2023). Because macroprudential authorities typically resort to instruments that are also used for other purposes or from different perspectives, implementation may conflict with other policy objectives (BIS 2018). For instance, in a generalised downturn, monetary policy objectives are to loosen banks' regulatory requirements to boost the real economy, while financial stability objectives would suggest a tightening of regulatory requirements to address rising climate-related risks.

[43] Experience in the use of SyRBs shows that clear rules and an explanation thereof by supervisors are key to their effectiveness (ESRB 2017).

The implementation of macroprudential measures can also push exposure to climate-related risks to financial institutions that are not subject to these measures – for instance, to non-bank financial institutions or foreign intermediaries. In contexts other than climate-related risks, some evidence suggests that macroprudential measures implemented on bank credit have led to an expansion in the credit provided by non-banks (Cizel et al. 2016). Such leakages may reduce the direct risk exposures of the banking system, but they do not reduce the likelihood of financial stress.

Furthermore, additional capital requirements to address climate-related systemic risk may increase the aggregate capital costs for financial institutions if applied to the stock of their outstanding loans. This in turn may constrain the overall number of loans they commit to other economic activities, including those aligned with the transition to a low-carbon economy, leading to a conflict between financial stability objectives and sustainability objectives (Oehmke and Opp 2022; Oehmke 2022).

Finally, if not appropriately calibrated or if based on backward-looking indicators, macroprudential measures may reduce the availability and affordability of resources to firms that need them to make their business model more sustainable (Bank of England 2021). Similarly, it may also hinder the ability of borrowers in climate-vulnerable areas to get funding for adaptation measures that would decrease their exposure to physical risks (Dafermos and Nikolaidi 2022). In such occurrences, macroprudential measures may be counterproductive to the stability of the financial system (Dafermos and Nikolaidi 2021).

6. Conclusion

Climate-related risks, including transition risks, are significant financial risks and represent a potential systemic risk for the financial system. Central banks and supervisors have acknowledged this systemic risk on several occasions and have started to address it. Their research shows that the orderly transition scenario poses the least risk for financial stability and is unlikely to trigger financial instability; a disorderly transition or no transition is much less favourable for financial stability.

This global conclusion is likely to also apply to South Africa. Our estimation of the direct exposure of South African banks' corporate loans to TSES is in the order of magnitude observed in other countries. Furthermore, we did not detect a concentration of these

exposures in particular institutions. As in other countries, however, transition risks in South Africa are significant and may be amplified by the economy and the financial sector. Relative to countries with similar transition risks, households and sovereign economic weakness in South Africa also add to risks for the financial system.

Our results offer only a rough initial assessment of systemic risk from the transition away from fossil fuels. Given its potential impact on financial stability in South Africa, it deserves more scrutiny and a better assessment. More disaggregated data on banks' exposure to economic activities incompatible with the transition are necessary for this. Quantification and a better understanding of potential interbank contagion and financial market amplification are also key to a sound assessment of systemic risk from the transition in South Africa. Finally, an extension of this study to households and sovereign loan portfolios, as well as to equity portfolios would give a more complete picture of banks' exposure.

Navigating the transition and maintaining financial stability require appropriate macroprudential policy that involves several public and private stakeholders. Central banks and supervisors have highlighted that a holistic microprudential treatment of transition risks across all pillars of the Basel framework is a necessary basis for financial stability. However, the systemic dimension of transition risks also requires effective macroprudential policy. Central banks and supervisors are exploring their options in terms of macroprudential instruments to address climate-related risks. SyRBs have emerged as a potential solution to improve the resilience of the banking system to transition shocks and limit the build-up of climate-related risks in the longer term.

Importantly, our results for transition risks must be interpreted in the broader context of climate-related risks. While transition risks are important, they should be understood in the context of the physical risks likely to emerge if a global transition fails to materialise, when the cost of extreme weather events would drastically increase, including in South Africa. These large economic and social impacts, and the feedback loops they can trigger, also severely jeopardise the stability of the financial system.

Finally, the evolution of climate-related risks in South Africa and their mitigation through transition will largely depend on the policy actions taken now by the South African government and by governments and financial institutions globally. This requires the

coordination of global policies and a commitment from different governments to implement them. This will also require the coordination of macroprudential policy at the global level to avoid loopholes that could jeopardise efforts already made.

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Annexure A

Table A1: Mapping NACE broad structure to PA classification

NACE classification	PA classification
Agriculture, forestry and fishing	Agriculture, hunting, forestry and fishing
Mining and quarrying	Mining and quarrying
Manufacturing	Manufacturing
Electricity, gas, steam and air conditioning supply	Electricity, gas and water supply
Water supply, sewerage, waste management and remediation activities	
Construction	Construction
Wholesale and retail trade, repair of motor vehicles and motorcycles	Wholesale and retail trade, repair of specified items, hotels and restaurants
Accommodation and food service activities	
Transportation and storage	Transport, storage and communication
Information and communication	
Financial and insurance activities	Financial intermediation and insurance
Real estate activities	Real estate
Professional, scientific and technical activities	Business services
Administrative and support service activities	
Public administration and defence, compulsory social security	Community, social and personal services
Education	
Human health and social work activities	
Arts, entertainment and recreation	
Other service activities	
Activities of households as employers, undifferentiated goods and services producing activities of households for own use	Private households
Activities of extraterritorial organisations and bodies	Other

Table A2: Mapping SIC broad structure to PA classification

SIC code	SIC major divisions	PA classification
1	Agriculture, hunting, forestry and fishing	Agriculture, hunting, forestry and fishing
2	Mining and quarrying	Mining and quarrying
3	Manufacturing	Manufacturing
4	Electricity, gas and water supply	Electricity, gas and water supply
5	Construction	Construction
6	Wholesale and retail trade; repair of motor vehicles, motorcycles and personal and household goods; hotels and restaurants	Wholesale and retail trade, repair of specified items, hotels and restaurants
7	Transport, storage and communication	Transport, storage and communication
8	Financial intermediation, insurance, real estate and business services	Financial intermediation and insurance
		Real estate
		Business services
9	Community, social and personal services	Community, social and personal services
0	Private households, extra-territorial organisations, representatives of foreign governments and other activities not adequately defined	Private households
		Other

Annexure B

Box 1: Other regulations promoting a green transition not directly linked to the banking sector

- Carbon Tax Act: Introduced in 2019, this act seeks to price GHG emissions by obliging the polluter to internalise the external costs of emitting carbon, promoting the transition to a green economy (Republic of South Africa 2019).
- National Climate Change Adaptation Strategy: This provides a shared vision of climate change adaptation and resilience for the country and outlines priority areas for achieving this vision.
- Green Transport Strategy (2017–2050): This aims to minimise the adverse impact of transport on the environment and enhance sustainable green growth in the country (Department of Transport 2017).
- Post-2020 Climate Change Mitigation System: South Africa's plan for managing and reducing its carbon emissions post-2020 (Presidential Climate Commission 2021).

Figure B1: Transition funding estimates, Stellenbosch and JET IP

Investment and cost estimates (2022-2050) by blended finance (2020)				Funding requirements (2023-2027) JET IP (2022)	
		US$ billion	*Capital type needed*		US$ billion (ZAR billion)
Investment	Renewable energy	125	*Private capital*	Electricity sector	47.2 (711.4)
	Flexibility (electricity storage & gas)	50	*Development finance (Blended, DFIs, MDBs, Climate funds)*	Green hydrogen (GH_2) sector	21.2 (319)
	Transmission and distribution	40		Skills development	0.18 (2.7)
	Green industrialisation	TBC	*Public capital*	Municipal capacity	21.3 (319.1)
Cost	Early retirement of coal plants	24		New energy vehicle (NEV) sector	8.5 (128.1)
	Climate justice outcomes (workers & communities)	10	*Philanthropic*		
Total		249		Total	98.38 (1,480.3)

Source: Blended Finance Taskforce (2020) and Presidential Climate Commission (2022)

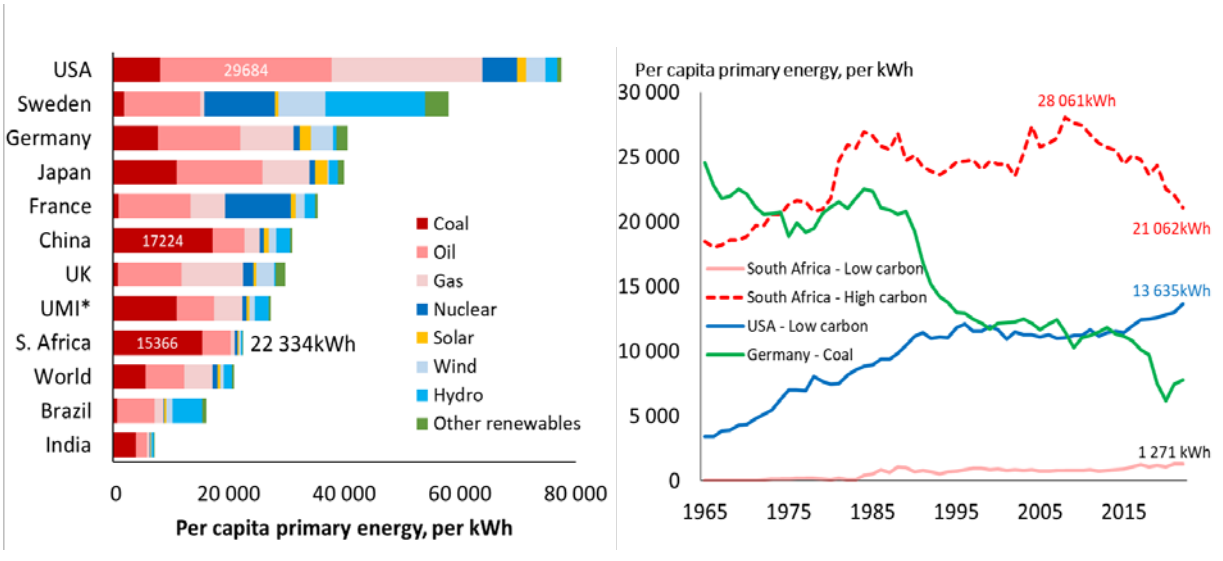
Box 2: Decommissioning the coal value chain – German case study

Roughly 70% of South Africa's power generation capacity is coal-based. Historically, coal has provided a cheap energy source, fuelled the nation's industries and offered globally competitive electricity rates. This cheap energy has, in turn, supported energy-intensive sectors like mining and manufacturing. These sectors account for a significant portion of South Africa's GDP and employment.

South Africa has inadvertently shifted away from high carbon energy sources since 2007, resulting in a significant decline of 7 000 kilowatt hours (kWh) (see Figure B2). Further reducing this reliance by half would substantially contribute to emission reduction objectives. Given the importance of the substitution effect from high to low carbon energy source, adaption progress has been slow. It is evident in the South African low carbon energy source of 1 271 kWh per capita in 2022 (see Figure B2), increasing low carbon energy technology is essential for an orderly transition. The potential for low carbon energy technological adaption is possible as evident in Figure B2 with USA's low carbon energy consumption could feasibly match South Africa's energy needs.

While the transition unfolds for the coal sector, lessons are being learned from other countries. Germany offers an example of the successful decommissioning of the coal value chain.

Figure B2: Energy consumption by source, 2022; SA vs Germany energy source 1965–2022



Note: *Upper-middle-income countries.
Source: OurWorldinData

How did Germany decommission the coal value chain?

Germany's transition from coal is a tale illustrating strategic planning, societal will and embracing sustainable alternatives. Known as the *Energiewende* or "energy turnaround", this shift offers pertinent lessons for nations entrenched in the coal value chain.

By the 2000s, amid growing climate change concerns and the ratification of the Kyoto Protocol, Germany had acknowledged the need for change. This recognition was not merely environmental; old mines were less productive, and the coal industry, once a significant employer, was waning. Recognising the shifting landscape, in 2020 Germany legislated the end of all coal mining and coal-fired power production by 2038, with compensation for affected companies and regions (German Institute for Economic Research 2019).

Did it lead to financial instability? Systemic risk – orderly or disorderly?

Germany's transition from coal energy has been a mix of orderly and disorderly developments. The answer largely depends on the specific metric or aspect under consideration.

The orderly aspects of the transition included **long-term planning and communication**. It was not a sudden decision, as the federal government set long-term targets to reduce GHG emissions, aiming for a 40% reduction by 2020 (from 1990 levels) and a 95% reduction by 2050.[44] **Stakeholder engagement** ensured a smooth transition. This included representatives from affected regions, industries and workers' unions – culminating in the establishment of the Coal Exit Commission, which proposed an end to coal-fired electricity by 2028 (Federal Ministry for Economic Affairs and Energy 2019). The German government pledged billions in **compensation and transition aid** to support affected regions and workers. This included retraining

[44] See article: https://www.bundesregierung.de/breg-en/issues/climate-action/government-climate-policy-1779414

programs for workers, investment in infrastructure, and research and development in alternative industries. Lastly, **timelines and legislation** backed by law provided clarity and direction to industries and society at large (Oei et al. 2020).

Disorderly aspects included three significant occurrences – first, **energy price volatility**. Intermittent energy supply gaps during the transition caused short-term energy price spikes. Second, **economic dislocations** for regions heavily reliant on coal mining and coal-fired power generation faced economic hardships. Despite the government's retraining and support efforts, not all displaced workers found equivalent employment opportunities (Oei et al. 2020). Third, to fill the energy gap left by reducing coal and nuclear power, the country has seen **a rise in natural gas consumption** (fewer emissions than burning coal but still an emitter). A fourth aspect is **environmental targets** – while Germany has significantly reduced its carbon footprint, it has struggled to meet some of its own ambitious interim targets (German Institute for Economic Research 2019). For instance, the 2020 GHG reduction goal was challenging, and the nation had to invest more in carbon offset mechanisms.

The overall lesson for South Africa is that a transition from coal can avoid a systemic event if the transition is orderly and is started early rather than abruptly.

Box 3: Why does Eskom matter?

Eskom's challenges include a mix of ageing infrastructure, operational inefficiencies and financial challenges. The South African economy has been affected by Eskom's persistent load-shedding, delays in setting up the independent power producer programmes and the faltering performance metrics of plants like Medupi and Kusile. This is evident in Eskom's energy availability factor – a critical measure of power reliability – which plummeted from nearly 80% in 2017 to 58% in 2023, further pressuring margins through the higher operational cost of alternative energy sources like liquid fuel powered open-cycle gas turbines.

While Eskom requires tremendous reforms to turn around its failing business model, it is also the sole entity responsible for the coal value chain energy transition. Thus, this transition will be orderly or disorderly according to Eskom's ability to overcome its operational challenges, precarious financial health (marked by mounting debt and liquidity concerns), tariff and pricing concerns and coal-stakeholder resistance.

The sovereign-bank nexus: The Eskom–sovereign-bank nexus relationships have ramifications for South Africa's banking sector. As government debt swells, in part due to Eskom's financial challenges, banks – the major holders of sovereign instruments – face heightened risks. Devaluation of these debt instruments could force banks to rebalance their portfolios. The market risk in this context is the higher interest risk premiums in financial markets, which may contribute to increased borrowing costs and potential outflows of foreign capital (Favero and Giavazzi 2004; Akinci et al. 2022). South Africa's fiscal score might deteriorate with Eskom's missing policy and economic commitments – it is likely to push credit spreads wider again, impacting the cost of borrowing.

Despite Fitch's affirmation (Fitch Ratings 2023) of Eskom's 'B' rating stems from its link with government's backing, Eskom's operational inefficiencies and dependence on government support for solvency heighten the contagion ahead. While the government provides a fiscal cushion, the underlying vulnerabilities tied to Eskom's operational performance and the restructuring of the broader electricity sector loom large.

How will the government and the private sector finance the climate transition?

According to the government's proposal for the JET IP package, the initial phase is estimated to cost nearly US$100 billion (see Figure B3 for the breakdown). The proposal outlines four major principles to be followed and envisions a blend of private and public funds. JET IP relies on the private sector for most of the required investment, particularly over a generation. Public sector expenditure is directed to ensuring that the transition is just – for example, care for affected communities, repurposing coal mining lands and research and development.

Figure B3: South Africa's JET IP funding requirements, 2023–2027

Funding requirements 2023–2027	ZAR billion (US$ billion)
Electricity Sector	711.4 (47.2)
New Energy Vehicle (NEV) Sector	128.1 (8.5)
Green Hydrogen (GH_2) Sector	319 (21.2)
Skills development	2.7 (0.18)
Municipal capacity	319.1 (21.3)
TOTAL	**1 480 (98.7)**

Source: Presidential Climate Commission (2022)

JET IP describes three main financing tools. The initial JET package of US$8.5 billion is supported by the EU, the US and the UK. This package combines grants, guarantees, concessional financing and private investment. South Africa is also considering thematic bond issuance – instruments like green bonds and transition bonds. This could appear attractive to emerging market ESG investors. Third is a carbon tax price target initiated at US$20/tonne by year-end 2025 and US$30/tonne by 2030. Revenue from this tax is expected to assist in stabilising the fiscal debt position and supporting infrastructure investment.

Morgan Stanley's research (Morgan Stanley 2023) highlights that the risk for South Africa's Eskom climate change transition fiscal conundrum is that it "lies not in its implementation, but on its failure". Key areas include: i) capacity constraints (technical constraints, labour availability oversight); ii) the financial risk of being sub-investment grade and on the Financial Action Task Force grey list, which may jeopardise feasibility; iii) policy uncertainty from the ambiguity around the relative roles of coal, gas, renewables and nuclear; and iv) regulatory factors and finalisation of the Eskom unbundling into generation, transmission and distribution units, as well as the

establishment of the National Transmission Company and the ability to wheel embedded generation into Eskom's network. The market is monitoring the above areas to calculate the likelihood of failure.