Transcending the interregnum:
Exploring how financial systems relate to sustainability transition processes

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Declaration

I hereby declare that this thesis has not been and will not be, submitted in whole or in part to another University for the award of any other degree.

Signature……..

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31 December 2019

Bismillah

I dedicate this thesis to my Shaikh.

Abstract

The financial system – defined as intermediaries, markets and infrastructure – plays a central role in shifting towards new sustainable paths. The Paris Climate Agreement, Agenda 2030 and the Sustainable Development Goals and the Addis Ababa Action Agenda acknowledge this central role by setting objectives for finance flows to be "consistent and integrated" when responding to the sustainability and climate breakdown. Although existing framings on sustainability-related finance and its role address financial innovations and new instruments for the transition, it pays limited attention to financial system-level issues. Sustainability transitions studies position finance as serving a functional, resource-based role within the economy critical for driving radical system-level changes. However, limited critical research on the role of financial systems in transitions processes has been conducted thus far. This thesis addresses these research gaps by exploring how financial systems relate to sustainability transitions processes during the "interregnum", i.e. the period of discontinuity where old paths are faltering, and new paths have not yet fully emerged.

The thesis opens with a theory-focused paper, which proposes a "transition demands" framework, and identifies design features for the financial system to meet the demands of transition processes. South Africa represents the empirical context for the next two papers. The second paper outlines the structural features and experimental approaches within South Africa's financial system and identifies issues of how transitions may be supported or inhibited. The third paper turns attention to energy transitions in South Africa which are essential for creating new sustainable pathways. It applies the "transition demands" framework to the case of South Africa's energy transition from 1994 to 2019, focusing on how financial intermediaries related to the US$20 billion renewable energy procurement programme.

The thesis offers conceptual contributions by establishing that financial systems require explicit framing and engagement to address issues such policy contexts, and implicit assumptions. The empirical contributions provide a basis for critically evaluating the degree to which the system-level changes being implemented by the financial system contribute towards new sustainable pathways. The thesis also derives policy insights for meeting the multilateral objectives of achieving "consistency and integration" in finance flows. These insights relate to mutual learning, dialogue, and adopting experimental approaches between policymakers and financial intermediaries.

Format of thesis submission

This thesis is based on the papers-style format according to the guidelines of the University of Sussex. The author confirms that the work submitted is her own, except where work that forms part of jointly-authored publications has been included.

The thesis contains two chapters that have been published and solely written by the author, and one that will be submitted during 2020:

i) **Chapter 3**: Naidoo, Chantal P., 2019. Relating financial systems to sustainability transitions: Challenges, demands and design features. Environmental Innovation and Societal Transitions. In Press. Available online, 1 November 2019 at: https://doi.org/10.1016/j.eist.2019.10.004. A version of this paper also was published in the University of Sussex Science Policy Research Unit (SPRU) Working Paper series in August 2019.

ii) **Chapter 4**: Naidoo, Chantal P., 2019. Transitioning South Africa's financial system towards sustainability. Chapter 6 in the book: Mohamed, N. (ed), 2019. Sustainability transitions in South Africa. Routledge, London.

iii) **Chapter 5** contains a paper which is still to be submitted to a journal, namely Relating energy transitions and financial intermediaries: The case of South Africa (1994 to 2019).

The author confirms that appropriate credit has been given within the thesis where reference has been made to the work of others, and acknowledgements of the contributions to these papers are made at the end of each of the chapters listed above.

Prologue

The seeds for this thesis were planted in 1988. Career choices for non-white persons were limited in apartheid South Africa and admission to university was based on a quota system. I wanted to be a physiotherapist, but the most promising fields to study were teaching, accounting, law or medicine if I had any hope of finding a job. My choice of accounting was, therefore, a practical and sober one. In December 1992, I graduated from the University of Cape Town, and a week later, long-suppressed doubts beset me – what is the role of finance, what good can finance do? I was disheartened that this was the most useless degree and wondered what benefit it could bring to humanity.

After working in different roles in the financial system in South Africa and abroad, a picture began to develop that the unifying focus of finance was maximising returns and minimising risks. While this was expected for private institutions, I was disheartened that the same focus preoccupies the funding of development and climate concerns. In my experience, policymakers focused mainly on creating “bankable projects”. I began to wonder whether the primary focus on incentivising private finance was valid in light of global challenges, and whether appeasing private funding was a precondition to the climate and sustainability challenges.

I was inspired in 2011 with the thought that the financial system needs to help the transition process. After several years developing policy ideas to this effect, that inspiration finally led me to the SPRU doctoral programme, thanks to a serendipitous meeting with Mariana Mazzucato in January 2015. My perspective has significantly shifted since starting the programme, and while policy ideas remain helpful, I have grown to understand the degree of complexity and embeddedness of the “old pathways”.

A French professor once told me the PhD is like a garden, and one’s thesis is but only a small bouquet of its many flowers. Neither the pages ahead nor any words can capture the depth and richness of the learning experience which I have been privileged to have.

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Abbreviations

BEE	Black economic empowerment
BIS	Bank for International Settlements
COP	Conference of the Parties to the UNFCCC
CPI	Consumer price index
CRISA	Code for Responsible Investing in South Africa
DBSA	Development Bank of Southern Africa
DEA	Department of Environmental Affairs
DTI	Department of Trade and Industry
EUHLEG	European Union High-Level Expert Group on Sustainable Finance
EIST	Environmental Innovation and Societal Transitions (journal)
FSB	Financial Stability Board
GCF	Green Climate Fund
GEF	Global Environment Facility
GHG	Greenhouse gas (emissions)
IMF	International Monetary Fund
IPCC	Intergovernmental Panel on Climate Change
IPP	Independent Power Producers Procurement Programme
IRP	Integrated Resource Plan (South Africa)
JSFI	Journal of Sustainable Finance and Investment
MLP	Multi-level perspective
SA	South Africa
SDGs	UN Sustainable Development Goals (17 goals)
SPRU	Science Policy Research Unit, University of Sussex
Stats SA	Statistics South Africa
UK	United Kingdom
UN	United Nations
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
ZAR	South African Rand

Glossary

Addis Agenda	The UN declaration on the Addis Ababa Action Agenda of the Third International Conference on Financing for Development, held in Addis Ababa, Ethiopia, 13 to 16 July 2015 (UN, 2015a).
Article 2.1.c	Refers to the third objective of the Paris Climate Agreement which reads “make finance flows consistent with a pathway to low greenhouse gas emissions and climate-resilient development”.
BEE companies	Shareholders from historically disadvantaged backgrounds that are invested in the SA renewable energy programme with operational and management investment in the daily affairs of the project companies.
Brundtland Report (1987)	A report of the World Commission on Environment and Development published in 1987 and adopted by the UN.
Department of Energy	The national department responsible for energy in the South African government (now called the Department of Mineral Resources and Energy)
Design features	Where used in the context of the transition demands framework, refers to contributions developed in this thesis (Chapter 3), and referred to in Chapter 6 on policy insights.
Development pathways	The text refers to development as being part of the broader economic fabric for a particular country. These pathways may be either sustainable (new) or unsustainable (old).
Empowerment codes	Refers to the codes of good practice developed by the Department of Trade and Industry to give effect to the Broad-Based Black Economic Empowerment Act (which includes BEE shareholders). This Act is part of South Africa’s policy to redress the legacy of apartheid by giving preferential economic access to non-white persons, women, and people with disabilities.
Empowerment shareholders	Community trusts and BEE companies with an equity interest in renewable energy project companies
Energy transitions	The process of making technological shifts towards sustainable energy systems that reduce harmful greenhouse gas emissions.
Financial objectives	Where used in the context of the Paris Climate Agreement, the SDG and Addis Agenda, this phrase refers to Article 2.1.c (consistency of finance flows) and the objective for integrated finance flows in the Addis Agenda.
Financial system	Defined in this thesis as intermediaries (public and private banks), markets (platforms for exchanging debt, equity, foreign currencies and commodities), and infrastructure (regulation, supervision, legal and administrative systems).

Global North	Wealthier countries in Europe, and North America, as well as Australia, New Zealand, and Japan, also known as developed countries.
Global South	Countries in Asia, Africa, Latin America and Oceania that are low- to middle-income, also known as developing countries.
Green bonds	A financing instrument that amounts to listed or unlisted debt issued by a company to raise capital mainly from institutional investors for investment in green initiatives. It is subject to terms and conditions that allow for special designation as "green".
Green Fund	South Africa's national Green Fund (administered by DBSA).
IPCC Special Report	IPCC Special Report on Global Warming of 1.5°C (IPCC, 2018).
IPP Office	Independent Power Producers Procurement Programme Office, administered by the DBSA on behalf of the National Treasury and Department of Energy of the South African government
National Treasury	The national department responsible for public finances, oversight of finance-related regulators and the South African Reserve Bank, and other finance-related roles in the South African government.
Paris Climate Agreement	Report of the COP at its 21st session, held in Paris from 30 November to 13 December 2015 (UN, 2015c).
Renewable energy project company	The company operating a power plant, and which holds the licence to generate energy under the SA renewable energy programme.
SA renewable energy programme	SA Renewable Energy Independent Power Producers Procurement Programme launched in 2011 to procure energy from solar, wind and other renewable sources. The programme has two components – Large (for projects greater than 10MW) and Smalls (for projects of between 5W and 10MW).
SDG Agenda	The UN declaration on Transforming our world: the 2030 Agenda for Sustainable Development A/RES/70/71, held in New York, 25 to 27 September 2015. (UN, 2015b).
Special Issue (2013)	The 2013 Special Issue of the EIST journal titled "Economic-financial crisis and sustainability transitions".
Stockholm Declaration (1972)	The UN Conference on the Human Environment, held in Stockholm, 5 to 16 June 1972 (UN, 1972).
Sustainable energy system	Defined in this paper as an energy system that meets environmental, social and development goals of present and past future generations.
Sustainable pathways	Refers to development pathways that are sustainable in terms of their environmental, social and economic objectives, and aligned with meeting current sustainability and climate challenges.

Sustainability transitions	Processes that involve the co-dynamics of technologies, institutions, organisations, social and other subsystems, and the process of directing these systems to bring about environmental and social alternatives.
Sustainability transition studies	An interdisciplinary field of social science research where scholars engage in the study of sustainability transitions.
Transition demand framework	A framework developed within this thesis (Chapter 3) and applied empirically in Chapter 5.
UNEP Inquiry	A commission launched by UNEP in 2012 into the Design of a Sustainable Finance System (UN, 2018a).

The purpose of life is evolution

from lower to higher

from ignorance to knowledge

darkness to light.

Lahotar

www.lahotar.com

1 Introduction

Climate scientists predict that only a short window of time exists to radically shift the global economy away from unsustainable pathways before 2030. These shifts must limit global temperature rise to 2˚C, and preferably by no more than 1.5˚C, to minimise rampant climate change, especially for small island developing states and least developed countries that are most vulnerable (IPCC, 2018). Beyond the predictions of climate scientists, increasingly frequent and intense weather-related catastrophes are occurring. As of end 2019, these include wildfires in Alaska, California and Australia, rapidly melting permafrost in Siberia, shrinking glaciers, and the potential loss of one million animal and plant species add to the sense of urgency and the possibility that the earth is in the midst of a mass extinction event (WMO, 2019; UN, 2019a). In addition, the younger generations are reminding world leaders that “change is coming whether we like it or not” (Thunberg, 2019).

The current pace and scale of responses of governments, businesses and citizens to mitigate the effects of climate change are inadequate and require urgent escalation (IPCC, 2018). The Intergovernmental Panel on Climate Change (IPCC) warns severe social, environmental and economic losses can be anticipated at the current pace and that the impacts may be felt much earlier than previously predicted. The growing incident of climate events and reports by the IPCC are leading to the adoption of “emergency”, “breakdown” and “crisis” in reference to climate change to convey the urgency and need for more radical responses (Monbiot, 2018). These positions are disputed, as others argue for “climate pragmatism” (Hulme, 2018). This thesis acknowledges that a range of views exist, and regardless of the terms applied, creating new pathways is essential for responding to climate and broader sustainability concerns.

The critical shifts that the IPCC refer to have specific qualitative elements – from old unsustainable pathways towards new sustainable pathways and meeting the environmental, social and economic goals of present and future generations. Significant shifts towards sustainability and responding to climate change in a meaningful way are unlikely to materialise from voluntary actions alone as they challenge the dominant development pathways (Stirling, 2006; Jasanoff, 2018;). The co-existence of dominant old pathways and emerging new pathways is described in this thesis as an interregnum – period of discontinuity in which an old system is dying but still holds firmly to power, while a new system struggles to emerge and become dominant (Gramsci, 1971).

This thesis is primarily problem-focused. It aims to support policymakers to relate how financial systems can engage in climate and sustainability challenges during the transition process (the interregnum).

The financial system can activate radical shifts to advance technological change (Schumpeter, 1942; Perez, 2002). However, technology cannot, on its own, sufficiently address the climate and sustainability challenges the world is facing or activate the necessary system shifts (Spratt, 2015; Mathews, 2015). In short, time to resolve these problems is not on our side (Schmitz, 2015). Even central bankers are encouraging every part of the financial system to have a plan for urgently responding to climate action and to work with governments to address these challenges (Carney, 2019b).

This chapter elaborates the research context and the assumptions and choices the author made in designing the thesis, as well as the rationale for sustainability transition studies as its theoretical base. These elements collectively represent the scaffolding surrounding the three research papers which are summarised in Chapter 2 and presented in full in Chapters 3 to 5. The thesis and its contribution to the field is discussed in Chapter 6. The appendices supplement the findings of this thesis.

1.1 Research context

This thesis begins by looking at the broad context of the United Nations (UN) multilateral agreements on climate change and sustainable development, and then moves on to national contexts. The UN agreements offer a useful starting point for understanding the global consensus on climate change and sustainable development. However, this thesis recognises that these agreements are not the primary drivers informing responses to climate change and development at country level.

1.1.1 Multilateral perspective

Two agenda-setting multilateral agreements were reached in 2015. These agreements took over 35 years of activism, advocacy and at least 20 years of global negotiations for countries to acknowledge a collective global responsibility to shift towards sustainable pathways.

The first agreement is the 2030 Agenda for Sustainable Development (SDG Agenda) concluded in September 2015 which specifies seventeen Sustainable Development Goals (SDGs) addressing health and wellbeing, conflict and climate change among other goals (UN, 2015b). The second agreement is the Paris Climate Agreement concluded in

December 2015 which focused on limiting average global temperature rise to between 1.5˚C and 2˚C, and increasing the resilience and adaptive capacity of countries to respond to climate change (UN, 2015c).

The two agreements overlap in several ways – notably, the SDG Agenda re-emphasises the need for urgent action to combat climate change, responsible production and consumption patterns, and the need to address biodiversity loss, sustainable land use, and the conservation of land and water. The Paris Climate Agreement calls for countries to shift their development paths to low-carbon and climate-resilient pathways that are in alignment with the SDGs. References in this thesis to the Paris Climate Agreement fully acknowledge that responses must also give effect to the SDG Agenda. In both agreements, finance is a critical facilitator of implementing the shift from the old development path to the new.

The essential role of finance has long been recognised in UN multilateral development processes that help to give effect to sustainable development and protect the environment. Between 1972 and 1992, finance was explicitly mentioned in UN multilateral policies in the context of integrating trade, development and financial systems to support sustainable development, and embedding environmental and social risk into the investment practices of banks, especially multilateral development banks.

The 1972 Stockholm Declaration contained finance-related recommendations which include establishing an environmental fund to support developing countries to cover the additional costs of environmental initiatives, which further entrenched the twinning of environment and development assistance processes (UN, 1972; Handl, 1992). Other financing related proposals include conducting studies of appropriate financing mechanisms, prioritisation by development finance agencies for environmental projects, and proposals on how the proposed environmental fund should be financed (UN, 1972).

The majority of the finance proposals contained in the 1972 Stockholm Declaration relate to global North countries contributing to the additional costs of tending to environmental considerations in global South countries (based on the principle of the polluter [the global North country] must pay). One recommendation calls for broader scale actions, being "*more automatic means of financing programmes of international co-operation, … on certain forms of international transport or on the consumption of certain non-renewable resources*" (UN, 1972). The call for broader scale actions appears to have been taken up as organisations such as the World Bank and the Organisation for Economic Co-

operation and Development (OECD) began instituting measures to include environmental assessment policies and apply these to bilateral and multilateral development assistance programmes (OECD, 2011). The World Bank began this process in the early 1980s and the OECD in 1986.

From a finance perspective, the 1987 Brundtland Report builds on the 1972 Stockholm Declaration in that it recognises that embedding sustainability into development generates higher implementation costs and that public finance was insufficient to cover such costs. Further, the Brundtland Report proposed offering the private sector adequate rewards for the additional risk they were assuming to implement the appropriate response. The rationale was that attracting private funding would supplement public funding for sustainability (WCED, 1987).

The Brundtland Report called for collaborative action within the financial system to environmental degradation (Labatt and White, 2002). It stated that "*two interrelated concerns lie at the heart of our recommendations on finance flows: one concerns quantity and the other the quality of resource flows to developing countries*" (WCED, 1987, 29). The Brundtland Report drew attention to the need for innovation; adjustment of lending rates; the integration of trade, economic and finance sectors; and, ensuring that all projects and programmes have the qualitative features of sustainable development. Integration is an important concept emerging from the Brundtland Report, as it implies economic and social concerns will be assimilated into economic development agendas (Levashova, 2011; de Carvalho Ferreira et al., 2016).

The next milestone in the UN multilateral processes was the 1992 United Nations Conference on Environment and Development (the Earth Summit) and its outcome document called Agenda 21 (UN, 1992). The primary focus of this process was building a global consensus that integrates environmental issues into an accelerated development process, and focused on ensuring adequate resources flow to the global South (Handl, 1992).

The distinction between quality and quantity of finance established by the Brundtland Report and inferred by subsequent UN-related processes was affirmed in 2015 through two multilateral finance-related objectives. They refocus attention on the qualities of consistency and integration. Further details are provided in Appendix A.

The first objective relates to the Addis Ababa Action Agenda on Financing for Development (Addis Agenda) calling for an ambitious and sound financial environment

to facilitate implementation of the SDGs (UN, 2015a). Specifically, the Addis Agenda promotes "*cohesive nationally owned sustainable development strategies, supported by* ***integrated*** *national financing frameworks*" as central feature of member states' efforts to finance sustainable development. The Addis Agenda draws attention to integrating and creating coherent and supportive trade, finance, monetary and economic systems to deliver on the SDGs (UN, 2015a).

The second objective relates to Article 2.1.c of the Paris Climate Agreement: "*make finance flows* ***consistent*** *with a pathway towards low greenhouse gas emissions and climate resilient development*" (UN, 2015c).[1] An implicit assumption in the Paris Agreement's objective is that finance flows are inconsistent with future development pathways, and that consistency is essential for meeting global climate goals. Article 2.1.c is unique compared to prior UN finance decisions on climate change - because it magnifies the full scale of what is required from a finance perspective to achieve the emission and resilience goals of the Paris Climate Agreement (Whitley et al., 2018).

The UN has begun developing guidance for countries to respond to these finance-related objectives. For example, the 2018 biennial technical report of the Standing Committee of Finance of the UN Framework Convention on Climate Change (UNFCCC) presents datasets that could be used to track the consistency of finance flows (UN, 2018b). The data includes quantitative and qualitative measures classified by type of finance flows, i.e. bank lending, bond markets, listed equity, private equity, insurance and reinsurance, assets under management, and financial services. Further guidance on how countries may implement Article 2.1.c is a key priority for the 2020 biennial assessment technical report. This is primarily due to the biennial assessments having to include progress towards achieving the objectives of Article 2.1.c every four years.[2]

The UN's 2019 Financing for Sustainable Development report encourages countries to develop financing frameworks to integrate sustainable development in accordance with the Addis Agenda (UN, 2019b). The report makes the important point that financing policies cannot be isolated, and any response to financing challenges must consider the broad development landscape. It suggests that countries should align their labour market

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[1] See further: https://unfccc.int/sites/default/files/english_paris_agreement.pdf.

[2] Based on discussions with the UNFCCC Secretariat.

policies, social protection systems, competition policies, financial sector regulation and strategies, and trade policies with the new realities of development (especially levels of social inequality).

In summary, the Addis Agenda and Article 2.1.c of the Paris Climate Agreement are significant in that they signal a consensus view among countries that places finance and financial systems at the forefront of the SDG Agenda and the global climate response. Implementation and interpretation, however, depends on national contexts.

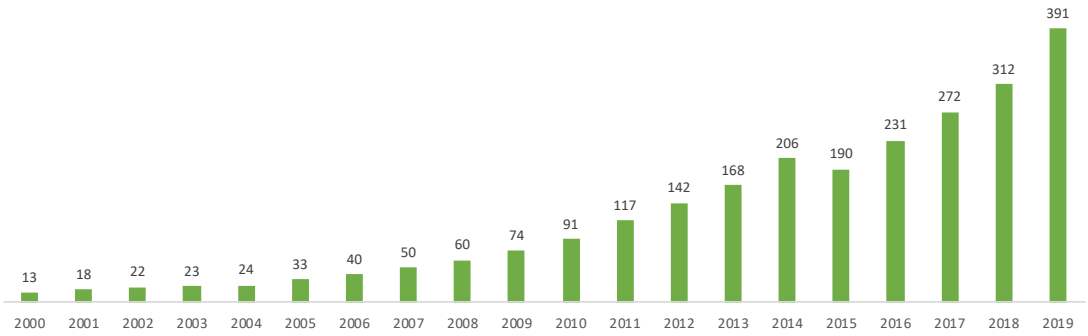
1.1.2 National context

Countries may adopt a compliance approach (e.g. provide basic information), embed multilateral policies within their national development plans, or disregard them. For example, the withdrawal of the United States as a party from the Paris Climate Agreement is a useful reminder that multilateral agreements depend on ongoing support by the governments of member states to maintain momentum (Saad, 2018; Urpelainen and van de Graaf, 2018).

The United Nations Environment Programme Inquiry into the Design of a Sustainable Financial System (UNEP Inquiry) offers a view on how countries may be responding. It tracks over 390 finance-related policy and regulatory measures for responding to sustainability and climate breakdown (UN, 2018a). The measures are classified thematically: integrating environmental, social and governance factors into investment criteria, risk and resilience linked to transition and climate risks, shareholder stewardship, trade and supply chains, and new financial innovations (e.g. green bonds). Figure 1.1 below shows the steady rise in measures since 2000, which doubled between 2015 and 2019. *However, there is a research gap in that the effects of these measures on creating a new sustainable pathways are not yet evident* (see Chapter 3).

Figure 1.1 Growth in number of finance measures focused on sustainability and climate

Source: Adapted from data provided by UNEP Inquiry[3]



A second view on the national context stems from practice-based initiatives (i.e. by policy think tanks and global programmes). According to Hafner et al. (2019), there are at least 31 initiatives linked to greening financial systems – for example, the UNEP Inquiry, the Taskforce on Climate-Related Financial Disclosures, the G20 Green Finance Working Group, and the European Union (EU) High-Level Expert Group on Sustainable Finance (see Chapter 3). These initiatives promote disclosure of climate risks and green investment standards, and they offer financing roadmaps for countries to adopt when developing greener financial systems (Hafner et al., 2019). Among others, these initiatives offer an array of interpretations and responses regarding new green or climate-related financial instruments, pacts and principles among different parts of the financial system to advance new central banking regulations, as well as insurance investment standards.

The number of initiatives is rapidly proliferating, with a strong focus on developing green financial centres, products and processes to manage the risks of transition and its potentially disruptive effects on the economy. New elements include focusing on just transitions, and more recent financial innovations in the form of transition and catastrophe bonds (Takatsuki, 2019; LSE, 2019). Among practitioners, criticisms are surfacing that some of the new financial instruments represent a shallow response, and more focus should be given to transforming the functions of finance (Michaelson, 2019). Academic researchers are, however, not yet engaging with these initiatives (Falcone et al., 2018; Hafner et al., 2019; Ahlström, 2019). *This represents a research gap in that*

[3] Green Finance Platform, Finance Measures Database, Available online at: https://greenfinanceplatform.org/financial-measures/browse.

the efficacy and alignment of these practice-based initiatives is not yet being subjected to critical analysis. There is a risk that policymakers may adopt initiatives and innovations on offer without considering the extent to which they are fully appropriate for the specificities of their national contexts.

A third view derives from the requirements of policymakers as they are responsible for developing and designing policies and implement programmes related to climate and sustainability at national and sub-national level. The response of the financial system will depend on and by influenced by the intensity of these policies and strategies, i.e. more ambitious transition policies to shift towards sustainable pathways may place higher demands on the financial system which they may or may not be able to respond to (Spratt, 2015).

Exploratory research was first conducted by the author between 2010 and 2014 in South Africa, Peru, Chile and Colombia when these governments were in the midst of designing climate response policies (Naidoo et al., 2014). Their focus was on implementing pathways to reduce greenhouse gas (GHG) emissions for sectors such as energy, transport and agriculture. The research method involved unstructured interviews, workshops with government officials from different departments, and analysis of documentation. The research shows that finance was not central to the design of climate policies and implementation strategies at that time (Naidoo et al., 2014; Zevallos et al., 2014; Naidoo, 2011).

With the exception of Colombia, policymakers in the countries covered in the Naidoo et al. (2014) study largely engaged with financial intermediaries once projects had already been identified, and the discussion always focused on selecting financial instruments for specific projects (e.g. loans, equity, grants or guarantees). Furthermore, these policymakers did not yet understand the influence of national financial systems on the ability of their countries to implement different mitigation pathways. This exploratory research on Colombia was updated in 2018 (see Appendix B). Although progress has been hampered by political issues, new research shows growing levels of strategic engagement between policymakers and the national financial system in that country, including new regulations and strategies for utilising international and national public and private finance. This group of policymakers cited improved national engagement by financial intermediaries and a better articulation of how Colombia's financial system supports the country's climate response.

This thesis is also informed by the author's direct engagement with policymakers across 54 countries in Africa through her work with the Green Climate Fund (GCF) between 2014 and 2019. The work related to technical assistance for building strategic capacity within governments to support the national climate response. The main observation is that policymakers largely focused on funding for individual projects and paid limited attention to the finance-related objectives of the Paris Climate Agreement and Addis Agenda. The current focus of policy responses is mobilising finance for such projects through modalities such as green investment banks (Geddes, 2019; Naidoo, 2019b) and green or climate bonds (Huxham et al., 2019). These modalities are being introduced to countries in the global South by international development agencies, policy think tanks and global finance initiatives. *The policy concern this raises is the risk that such initiatives may be adopted without adequate engagement on their specific national contextual relevance or potential efficacy in meeting national objectives.*

Recent empirical research links financial systems to climate response by studying reforms in the UK's retail banking system (Seyfang and Gilbert-Squires, 2019); new greening practices among financial intermediaries within Italy's financing system (Falcone et al., 2018); using green banks as a policy instrument (Geddes, 2019); and Chapter 4 of this thesis which considers structural challenges in South Africa's financial system to achieve a just transition (Naidoo, 2019b). However, research of national contexts and the interplay between financial systems and climate responses is underexplored (Spratt, 2015; Mathews, 2015; Polzin et al. 2017; Falcone et al., 2018). *A particular research gap is how countries engage with their financial systems during the design and implementation of climate and sustainability initiatives.*

1.2 Contextual challenges

The multilateral and national contexts present tensions for policymakers in interpreting and developing approaches specific to the national context. Non-government actors such as civil society organisations, businesses, and communities are likely to add to these tensions by questioning the acceptability and legitimacy of approaches taken by policymakers (Stirling, 2006; Jasanoff, 2018).

The thesis interprets the tensions in responding to multilateral agreements at national level as:

a) Implementing urgent and radical shifts to development pathways;
b) Engaging broad coalitions in design and implementation; and

c) Defining the scope of response by financial systems.

The sections below describe the rationale for this interpretation.

1.2.1 Implementing urgent and radical shifts

The Paris Climate Agreement refers to developing pathways towards low greenhouse gas emissions and climate-resilient development (UN, 2015c). The precise meaning of this phrase is not defined in that agreement, which means that interpretations are determined by individual member states in the context of their national development priorities. This means that several interpretations of the Paris Climate Agreement may emerge, depending on whether member states see the necessity to shift their development paths in a radical (economy-wide) manner or adopt a compliance approach (i.e. minimal integration of the agreement's objectives into national policies). Incremental changes at the sectoral level may suffice for some countries, while for others, system-wide changes may be adopted (Spratt, 2015).

This thesis interprets the Paris Climate Agreement as requiring radical shifts in current development paths to mitigate and adapt adequately and urgently to the effects of climate change. The assumption is based on the rate of current damage and future resource demands that development and rising social inequalities place on ecological systems (land, food, water and air). A special report by the Intergovernmental Panel on Climate Change on limiting global warming to 1.5°C (IPCC Special Report) specifically calls for radical and urgent shifts between 2018 and 2030 to limit temperate rise to this target and build resilience to the effects of climate change (IPCC, 2018). This report confirms earlier evidence of weather-related droughts, famine and wildfires, species and biodiversity loss accompanied by increased risks of disease, job losses, food and water shortages, and social conflicts (IPCC, 2014).

The expanding global influence of development has had a destructive impact on the social, biological and geological processes of the earth despite also having made positive contributions (Mathews, 2015; Dearing et al., 2014). In particular, industrial development is resource-intensive and directly linked to high greenhouse gas emissions (IPCC, 2014; Mathews, 2015). Mathews (2015) argues that industrial development causes major problems because of its dependency on fossil energies, its unsustainable exploitation of natural resources, and its use of finance in ways that are disconnected from ecological realities. Narrow technological fixes such as carbon capture and storage, and carbon emission trading, are unlikely to reverse the environmental damage (Spratt,

2015; Loorbach et al., 2017). Adherence to the old resource-intensive forms of industrial development may force a further 100 million people into poverty by 2030 (World Bank, 2016).

1.2.2 Engaging broad coalitions

Although 193 and 175 member states of the UN signed the SDG Agenda and the Paris Climate Agreement respectively, the lock-in and inertia of incumbent political, economic and social systems and vested interests will make implementing these agreements challenging. This means that progress towards achieving the goals of the Paris Climate Agreement will struggle to emerge without contestation.

This thesis interprets responding to the Paris Climate Agreement as requiring broad coalitions of governments, businesses, communities, individuals and civil society organisations that collectively frame and appraise how different pathways evolve (Stirling, 2006; Foxon, 2013a; Scoones et al., 2015). In particular, individual partners within the coalition would need to reassess how they perceive themselves, how they relate to others, and what trade-offs they are willing to make for the benefit of the coalition (Bronfenbrenner, 1979; Scharmer, 2000). Any such reassessment depends on the equitable distribution of assets within and among members of the coalition to realise a socially just and equitable transition (Stirling, 2006; Swilling and Annecke, 2006; Ramcharan-Kotze and Olivier, 2019).

Such coalitions would require shared responsibility and accountability to act within ecological and social boundaries – all of which is difficult to achieve in practice as economies are moving towards higher levels of deprivation, degradation and inequality (Gower et al., 2012; Raworth, 2017). Framing different pathways, therefore, requires clear and transparent goals that address necessary behavioural and institutional changes, the uncertainties of different pathways, the cost of transitions, as well as barriers and opportunities for implementation (Stirling, 2006; Scoones et al., 2015).

1.2.3 Defining the scope of response

There have been attempts to embed environmental and social elements in finance since the Brundtland Commission (WCED, 1987) first linked finance and sustainability – where the first distinction between quality and quantity of finance was established (see Chapter 3, Appendix 1). The thesis therefore interprets the Paris Climate Agreement and Addis Agenda as differentiating between two objectives for finance, as first highlighted in the

Brundtland Commission. The first objective relates to the quantity of finance and emphasises ensuring adequate and predictable finance is made available by the global North to the global South. The second relates to the quality of finance focusing on enabling consistent and integrated finance flows towards creating new sustainable paths and the associated systemic changes necessary for such paths to be sustained.

This thesis recognises that policymakers may not yet be differentiating between the quantitative and the qualitative aspects of finance. The basis for this recognition is that the UN is in the early stages of developing guidance for countries to engage with the consistency objective of Article 2.1.c of the Paris Climate Agreement and the integrated finance flows objective of the Addis Agenda. New financial innovations and initiatives mainly led by financial systems based in the global North claim alignment with Article 2.1.c of the Paris Climate Agreement (Falcone et al., 2018; Hafner et al., 2019). However, policymakers also need to independently engage and develop responses to Article 2.1.c to ensure that such initiatives and innovations are indeed creating new sustainable pathways (see Chapter 3).

1.3 Research objectives and definitions

1.3.1 Objectives

The multilateral and national contexts inform the overall objective of this thesis, which is supporting policymakers to engage with financial systems and communicate what type of support they require for the transition towards new sustainable development pathways. This thesis also intends to support civil society organisations to engage on linkages between financial systems, climate and sustainable development, as well as researchers interested in developing further conceptual and empirical linkages on these issues.

To achieve these objectives and impact, the following steps are necessary:

A. Understand the theoretical links between financial systems and transition processes;
B. Analyse how financial systems respond during transition processes; and
C. Develop policy insights for relating financial systems and transition processes.

1.3.2 Key definitions

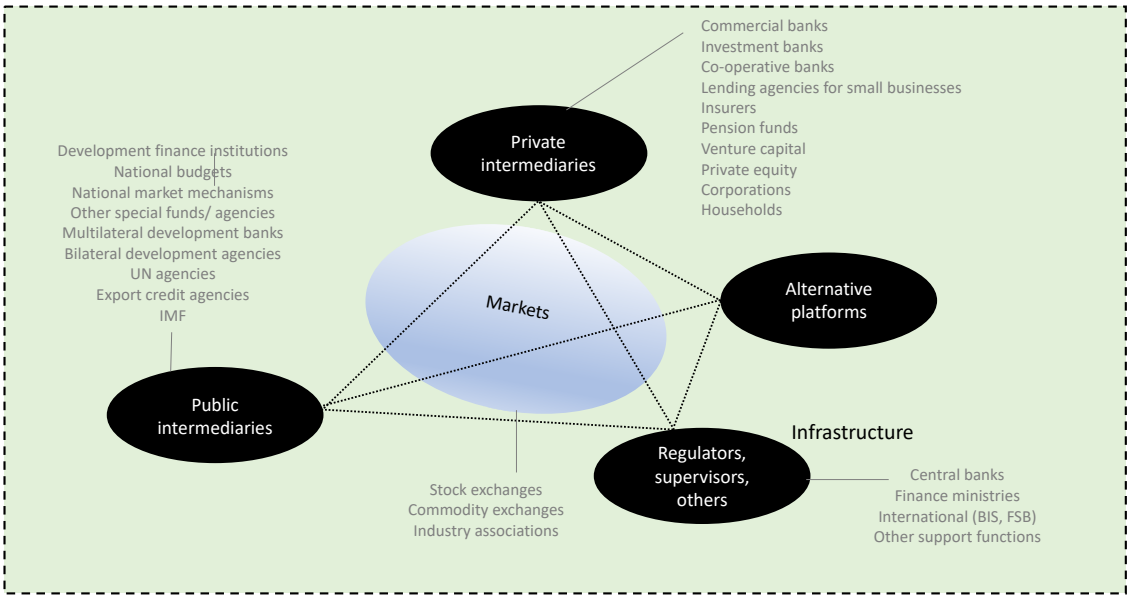
The classical textbook definition of the financial system is an “organisation of credit” that facilitates the exchange and transfer of funds from households with excess funds to those in need such as large companies or small businesses or other households (Bagehot, 1873; Spratt, 2009). Ways of defining the financial system have since broadened to reflect different perspectives by i) the type of institutions (institutional), ii) type of functions they perform in the economy (functional); iii) ability to facilitate the flow of finance (intermediation); and iv) how the elements of the financial system complement each other and collectively contribute towards economic growth and development (systemic) (Schmidt and Tyrell, 2005).

Later, the 2008 financial crisis highlighted the systemic risks and interdependency of the behaviours of institutions such as banks. This led to a useful definition being formulated by Farmer et al. (2012) and Battiston et al. (2016) of the financial system as complex *interconnected* multi-layered networks and integrated systems within and across global capital markets rather than a single system. The interconnectedness acknowledges that any changes in one part of the network reverberates throughout, with deeper impacts on the markets to which it is connected (Aziakpono, 2006).

A practice-based definition of the financial system by Crockett (2011) refers mainly to its functional components – that of *intermediaries* (meaning public and private banks and insurance companies which directly engage with households and businesses); *markets* (meaning platforms for exchanging debt, equity, foreign currencies and commodities); and *infrastructure* (meaning the regulation, supervision, legal and administrative systems that support intermediaries and markets).

Drawing from these different perspectives of defining the financial system, this thesis defines the term to mean a *network* of *intermediaries, markets and infrastructure* as illustrated in Figure 1.2. The term intermediaries as used in this thesis acknowledges that intermediaries both facilitate the transfer of funds between two parties and have the ability (where licensed to do so) to create credit for on-lending as loans. This ability is due to such intermediaries only holding a minimum of cash deposits, and lending out the balance as loans (Werner, 2014).

Figure 1.2 Schematic of the financial system as defined[4]



The financial system as depicted above facilitates the flow of finance between lenders and borrowers. It does so through financial instruments, such as debt and equity depending on borrower's needs and ability to repay. Other financial instruments may include enhancing the credit of the borrower to borrow more from the intermediaries, and improving the ability of the lender to recover the debt, e.g. credit insurance, guarantees and protection against any losses.

Debt can be provided in the form of direct loans or through the listed or unlisted capital markets (such as a bond), attracts interest and is repayable over a defined time period. Similarly with equity, the intermediary can acquire a stake in that company which confers the right of ownership either on the listed or unlisted market. The capital markets also facilitates the trading of financial instruments such as debt and equity which enables holders to exit their investments. The infrastructure supporting the financial system has both national and international dimensions – linked to payment systems, integrated with global markets and how these are configured (i.e., mainly banks, or mainly markets) (Schmidt and Tyrell, 2005; Aziakpono, 2006; Spratt, 2009). In addition, as depicted in Figure 1.2, alternative platforms relating to new financial technologies (e.g. blockchain)

[4] In the schematic, please note that BIS = Bank for International Settlements; IMF = International Monetary Fund; and FSB = Financial Stability Board.

and informal community channels (e.g. savings arrangements) exist and contribute to the flow of finance – its markets, and its infrastructure. These alternative platforms are not considered in this thesis.

The intermediaries, markets and infrastructure contained within the financial system do not act in isolation, nor are they neutral or passive participants in the economy (Spratt, 2015; Knafo et al., 2018).

1.3.3 Influences within financial system

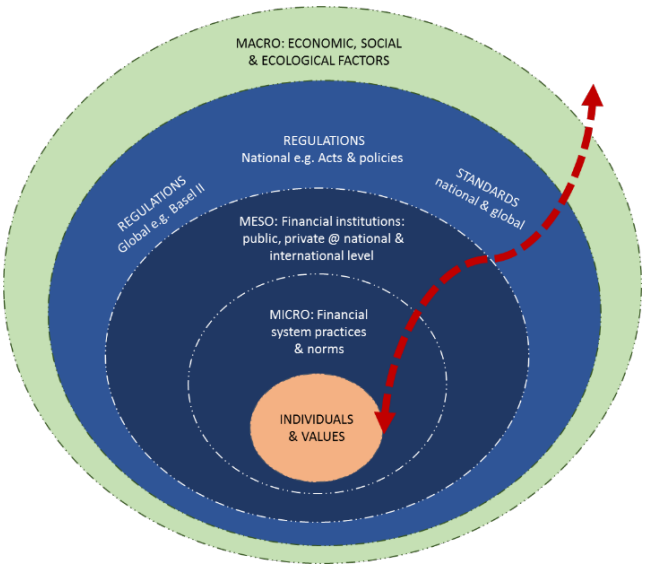
Multiple elements of influence exist within the financial system that may affect how intermediaries, markets and infrastructure engage in the economy. These influences are ultimately reflected in the behaviours of individuals working within the financial system control the flow of funds – in their roles on investment committees, as deal-makers and risk managers (Knafo et al., 2018). Such individuals include the bankers that Schumpeter (1942) called the ephors of the economy – a word referring to the leaders of an ancient Spartan council whose members wielded significant power. Through bankers' investment decisions and different combinations of finance, the financial system has the power to trigger radical shifts in the economy (Schumpeter, 1942).

Successive financial crises also reflect the power and influence of the financial system, and its ability to contribute both positively and negatively to development (Griffith-Jones et al., 2010). Such power also implies that the financial system is not a neutral or passive participant in the economy. Recognising these power dynamics is useful for understanding the tensions that may exist between climate and sustainability processes and the financial system's responses to these processes.

As illustrated in Figure 1.3, influences upon the financial system may include external factors (economic, social and ecological), international and national regulations and standards, different types of financial intermediaries, and practices and norms that bind together these influences (depicted by the red dotted line). Ultimately, these influences are absorbed and translated into the daily actions of individuals (Bronfenbrenner, 1979).

Figure 1.3 Circles of influence within the financial system

Source: Author representation, adapted from Bronfenbrenner, 1979.



The problem-solving processes of individuals are influenced by their personal and institutional values, their training, and their prior experiences in different cultural contexts (Bronfenbrenner, 1979). This implies that shifting towards sustainable pathways depends on how these individuals respond and engage with the global challenges expressed in the Paris Climate Agreement and the SDGs. *That is how do they interpret the challenge, what tools do they draw upon to respond and what incentives drive their response or lack thereof?*

Each of the components of the financial system – though viewed collectively as a network – is ultimately represented by individuals who are likely to have differing capabilities and ways of relating to the concerns and to other aspects of the financial system. This means they may differ in how they engage with the challenge of i) enabling more volume of investment (quantity); and ii) ensuring such investment is directed towards sustainability outcomes (quality). These differences may, in turn, influence the extent to which the intermediaries, markets and infrastructure of the financial system complement each other's response and collective contribution towards creating sustainable pathways.

1.4 Theoretical options for thesis

This section highlights other theoretical options for framing the analysis, which informs the choice of sustainability transitions research as the conceptual base for this thesis (see section 1.5).

1.4.1 Sustainability-related finance approaches

When the Brundtland Commission first established links between the role of finance in sustainable development, a considerable array of financial innovations emerged (see Appendix A, also Chapter 3). Between 1988 and 2019, at least 11 different sustainability-related framings of finance are evident in academic literature with over 2,500 publications (see section 3.4.1.2) including sustainable finance, green finance, environmental finance, impact investing, climate finance, carbon finance and social finance. Yet, minimal cross-engagement among these framings, and with mainstream finance research exists (Goodall, 2008; Patenaude, 2011; Diaz-Rianey et al., 2016, and Aspinall et al., 2018). Further, the cross-engagement among the 11 framings of finance suggests a lack of an integrated and unified position on sustainability within orthodox finance.

Finance-related research adopts mainly quantitative approaches to managing the risks and opportunities associated with sustainability, and fails to adequately apply qualitative research approaches (Spratt, 2015; Lagoarde-Segot and Paranque, 2017; Diaz-Rianey et al., 2016). The limited qualitative research on finance and sustainability is unsurprising. Finance as an academic discipline principally derives from quantitative models in economic studies which regard environmental and societal elements as externalities which are not priced into investment decisions (Spratt, 2015; Lagoarde-Segot, 2017). The primary research methodologies applied in finance research are quantitative with no qualitative approaches – based on an examination of over 30,000 published papers by Brooks et al., 2018. Further, less than 3% of finance research is regarded as interdisciplinary due to the apparent publication pressures favouring quantitative and single discipline approaches (Raffles et al., 2012; Brooks et al., 2018). Orthodox finance research is especially criticised as being unconcerned with how governments and practitioners may utilise findings in policy- and practice-related challenges (Brooks et al., 2018; Diaz-Rianey et al., 2016).

The review of literature in this area offers useful insight into the dominance of quantitative research and risk-based framings of sustainability-related finance research, which mainly relate to new financial instruments or framings for investing in new projects and programmes. These origins affect how further conceptualisation and empirical work advances, and contain implicit assumptions informing how further ideas have evolved. The extensive scoping review in Chapter 3 on finance and sustainability shows that the research studying the intersection of these fields is fragmented in that various conceptual approaches exist with limited cross references. The research context offers limited

conceptual and empirical approaches for this thesis, without having to first make several assumptions or conduct extensive research on how the 11 different framings on finance and sustainability relate to each other (which is outside the objectives of this thesis). Further, such research makes limited reference to the *process* of implementing sustainabilty transitions. The state of research on finance and sustainability, as well as nascent engagement on the transition process – other than from the perspective of financial intermediaries and new instruments being created – which would have limited achieving the policy objectives of this thesis.

1.4.2 Physical and transition risk approaches

Risk-based approaches are a dominant feature of how financial systems respond to transitions or radical shifts, aiming first to maintain financial stability and prevent market failures (Bergek, et al., 2008; Weber and Rohracher, 2012; Mazzucato, 2015). The risk posed by the climate breakdown is framed according to the physical and transition risks it poses to the stability of the financial system – where physical risks relate to the damage and disruption to financial stability caused by climate events (e.g. floods, droughts); while transitions risks relate to the impacts of rapid shifts away from unsustainable and towards sustainable economic practices (e.g. transitioning energy systems from fossil-fuel to cleaner energy sources) (Carney, 2018).

Central banks have the capabilities to support the transition process through a series of policies and instruments at their disposal – including requiring information disclosures of climate risks by the intermediaries and using risk management strategies to assign higher weightings to climate-exposed assets and industries (Campiglio et al., 2018; Battiston et al., 2016; Stolbova et al., 2018). In response, central banks are developing risk models for stress-testing the resilience of financial systems to the climate breakdown (Carney, 2019a). Academic researchers are also developing new models to support central bankers to assess the financial risks of climate change, and the threats posed to financial stability (Monasterolo et al., 2019; Campiglio et al., 2018; Dafe and Volz, 2015).

The research priorities of the Supervisors Network for Greening the Financial System (comprised of over 50 central banks) reflects their primary concerns and responses towards creating sustainable pathways. These include i) micro-prudential regulations such as considering mandatory disclosure by intermediaries of environmental, social and governance factors; ii) macro-financial risk and regulation including assessing forward-looking risks in investors' portfolios; iii) developing monetary policy approaches such as

investing in financial instruments earmarked for green or sustainable investments; and iv) engaging on sovereign risk and bond purchases through impact on credit ratings of a country's response to climate change and the SDGs (Dikau et al., 2020).

Tensions exist between physical and transition risks. While physical risks can be mitigated through low-greenhouse gas and climate-resilient investments, the need for accelerated investment, however, creates transitions risks as the shift away from high-carbon towards low-carbon activities generates economic losses (Semieniuk et al., 2020). This implies the need for policymakers to create economic policies that foster the "transition" and reduce the associated risks (Stolbova et al., 2018; Semieniuk et al., 2020). Academic researchers are also developing tools for engaging with the risks that climate breakdown poses to investors and policy makers, especially since economic models inadequately account for these transition risks (Monasterolo et al., 2019).

Two recent practice-based examples reflect the counterpart of risk-based approaches which is the opportunity to mitigate risk through investment. For example, the Climate Bond Initiative's invitation to a green bond conference in 2020 reads: "*green transition – opportunity of the decade*". The City of London positions its green finance strategy as "*exploiting the opportunity*" to establish itself as the green finance centre of the world.[5] A recent initiative called the "Inevitable Policy Response" suggests that responding to the climate breakdown requires inevitable policy shifts and the UN-supported Principles of Responsible Investment (PRI)[6] is now focused on preparing investors for the portfolio risks associated with imminent climate change (PRI, 2019a, 2019b). Article 2.1.c and related references to the Paris Climate Agreement are often cited as the basis for these practice-based initiatives, which are also presented to policymakers as potential solutions for greening their financial systems (see Chapter 3).[7]

Climate-risk and opportunity-based framings of transition processes relate mainly to how the financial system – reflected in its intermediaries, markets and infrastructure –

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[5] See, for example: https://cbi20.climatebonds.net/; http://greenfinanceinitiative.org/; and PRI, 2019a, 2019b.

[6] A partnership between large institutional investors, the UN Environment Programme Finance Initiative, and the UN Global Compact.

[7] The speeches and publications of several initiatives especially the UNEP Inquiry highlight the importance of Article 2.1.c usually as a preface to their policy recommendations and proposals. See, for example: http://www.lse.ac.uk/GranthamInstitute/news/making-finance-climate-consistent-how-could-the-uk-implement-article-2-1-c-of-the-paris-agreement/ and https://www.unpri.org/inevitable-policy-response/what-is-the-inevitable-policy-response/4787.article

responds to transition processes necessitated by the climate breakdown. These risk- and opportunity-based approaches also contain embedded assumptions of the role of governments in transition processes to act towards private investors in a particular manner – especially since the climate breakdown has historically been framed as a market failure (Stern, 2007), and the traditional role of the state is to address such market failures (Mazzucato, 2015; Foxon, 2015).

Radical, urgent and dynamic approaches are critical for meeting the objectives of the Paris Climate Agreement, and therefore more system-wide approaches to the financial system's response to these challenges are necessary. For example, some countries are focused on greening their financial systems such as United Kingdom, Germany, Kenya and Colombia in order to align with the objectives of the Paris Climate Agreement (UK, 2019; Naidoo, 2019d).

1.4.3 Economics of innovation

Perez (2002) describes the process of diffusing technological revolutions as a period of profound change that leads to modernising and rejuvenating the economic system, and whose influence stretches beyond the new industries or technologies created (Freeman and Perez, 1988; Perez, 2002). In this way, technological revolutions are a form of transition that may contribute towards creating new sustainable paths as envisaged by the Paris Climate Agreement and the SDGs. However, there are at least five characteristic-related differences between innovation and sustainability transition processes.

Firstly, sustainability transitions relate to achieving new change in a specific direction, in relation to economic, environmental and societal goals, and are connected to existential threats, while technological revolutions appear agnostic on these issues. Secondly, sustainability transitions are inherently time-bound processes requiring acceleration to manifest transformative environmental, societal and economic impacts by 2030 beyond fossil fuels (IPCC, 2018) whereas technological revolutions have no specific time constraints.

Thirdly, achieving just and equitable sustainability transitions is critical whereas technological revolutions are silent on the social quality of new innovations. Fourthly, sustainability transition processes directly target rejuvenating the entire economic system as the primary goal, placing greater emphasis on the system-level influences that can be achieved through different types of innovations, whereas technological

revolutions focus on innovation, with system-level influences positioned as an indirect consequence of diffusion. Finally, the Paris Climate Agreement, the SDGs and the Addis Agenda underpin the financial focus of sustainability transitions, both of which require the integration and consistency of finance flows, whereas financing technological revolutions does not prescribe such preconditions.

1.4.4 Limitations of these approaches

Applying the risk-based approaches with which climate and finance have thus far been engaged with offers limited insight into the challenges and complexities of these processes. The alternative approaches discussed here are derived mainly from the perspective of the intermediaries, markets and infrastructure of the financial system, and reflect a preoccupation with the risks that they face. *What risks do they face? What are their requirements for financing transition processes?*

The starting point of risk-based approaches is therefore, largely, incompatible for achieving the objectives of the thesis, which are primarily to contribute to the work of policymakers. Firstly, by developing academic and empirical insights to enable them to engage with the transition process; and secondly, to strengthen their ability to evaluate the extent to which current transition-related finance practices meet policy objectives associated with transitions processes. Instead, the thesis requires a theoretical approach that broadens the complexities and challenges of the transition process, rather than narrowing them down and viewing them through a single lens of enquiry.

Both Stirling (2010) and Jasanoff (2018) emphasise the need for maintaining complexity when engaging in issues of sustainability. This includes studying how policy options are opened up and closed down, and what factors influence these choices. Specifically, Stirling (2010) highlights that narrowly focusing on assessing risk as a basis for engaging in policy "denies policy-makers exposure to dissenting interpretations and the possibility of downright surprises" (Stirling, 2010: 1029). On the basis of these insights, and the limitations of other approaches (as further elaborated in Chapter 3), maintaining complexity is essential for achieving the objectives of this thesis.

For these reasons, the theoretical focus of the thesis is situated in the interdisciplinary field of social science called sustainability transitions as elaborated in the next section.

1.5 Theoretical focus: Sustainability transition studies

The following sections offer a brief overview of the field and the reasons supporting the author's choice. The relations between sustainability transitions and financial systems are explored in depth in Chapter 3.

1.5.1 Origins of the field

Transitions as a concept was first introduced by Alex de Tocqueville in the 19th century to describe changes in master-slave relationships – a time in history when the ruling class lacked the strength to keep exercising their power in the old way (Coenen-Huther, 1996). The Brundtland Report (WCED, 1987) placed sustainability as a normative concept on the global agenda and introduced the term sustainable development, which created the groundwork for transition studies (van den Bosch, 2010). Around the same time, transition thinking was becoming recognised by policymakers.

The term transitions first referred to large-scale transformations in society or in important systems which cause the structure of systems to fundamentally shift (Rotmans et al., 2001). Also, transitions represent significant changes in structure (organisations and institutions), culture (norms and behaviours), and practices (routines and skills) (Loorbach and Rotmans, 2006). These shifts can take between 25 to 50 years to achieve (Kemp and Loorbach, 2003; Alkemade et al., 2011).

Climate change introduces new perspectives on transitions as it presents a persistent problem to society that is embedded in existing systems and unsolvable through incremental or end-of-pipe solutions. Instead, fundamental changes in systems and structures are needed (Lachman, 2013). For example, unsustainable consumption and production patterns need to be broken while new patterns are established (Raven and Verbong, 2009). In recognition of these types of changes, the term *sustainability transitions* developed to distinguish the current transition from its historical counterparts (Raven and Verbong, 2009). In this context, sustainability transitions are defined as processes that involve the co-dynamics of technologies, institutions, organisations, social and other subsystems – these processes are oriented towards controlling or directing changes that bring about environmental and social alternatives (Geels, 2011; Kemp and van Lente, 2011).

Sustainability transitions significantly differ from historical transitions in five ways. Firstly, sustainability is the normative goal guiding the strategies and actions; secondly, multiple

responses are required to effect system-level changes rather than single or incremental solutions; thirdly, an urgent response is imperative; fourthly, systems innovations generate change rather than incremental innovations; and finally, active steering maintains the focus on sustainability (Elzen et al., 2004; Raven, 2006; Geels, 2010; Lachman, 2013). In the context of these characteristics, sustainability transition studies focus on changes to systems and the process of making such changes (Elzen et al., 2004). The basis for this focus was the limited understanding of how policymakers influence system changes (Elzen et al., 2004).

The choice of sustainability transitions as a theoretical base for this thesis is based on these differentiating characteristics and its focus on offering insights to policymakers to address their real-world challenges. In particular, the origins of the field align with the goals and practical implications of the Paris Climate Agreement and the SDG Agenda, and its focus on policymakers aligns with the research objectives of this thesis.

1.5.2 Finance within sustainability transition studies

Research on financial systems and sustainability transitions is not yet well developed in sustainability transition studies, as acknowledged by transition scholars in a recently published agenda for sustainability transitions research (Köhler et al., 2019).

The earliest work by transition scholars on financial systems resides in the 2013 Special Issue of the journal Environmental Innovation and Societal Transitions on the economic-financial crisis and sustainability transitions (2013 Special Issue). Five critical themes are contained in that research, which studies the effects of financial crises on sustainability transition processes and related issues.

The first theme acknowledges that financial crises recur across history, and are endemic to system dynamics (Perez, 2013; Geels, 2013; Swilling, 2013), revealing system inefficiencies (van der Ploeg and Withagen, 2013), and creating space for new innovations to take hold, especially the prospect of green growth (Perez, 2013; Swilling, 2013). Realising the green growth potential requires reorienting and regulating finance through government intervention, adequate institutional frameworks, and suitable policy conditions (Perez, 2013; Geels, 2013; Swilling, 2013).

The second theme questions the green growth narrative associated with financial crisis, attributing the emergence of financial crises to the high growth expectations of governments, business and citizens (Antal and van den Bergh, 2013, Loorbach and

Huffenreuter, 2013, Vergragt, 2013, Witt, 2013). Opinions are divided among authors in the 2013 Special Issue between those framing sustainability transitions as green growth opportunities (Perez, 2013; van der Ploeg and Withagen, 2013; Swilling, 2013), and those who say the growth narrative masks the deep systemic and cultural problems of unsustainable production and consumption and social inequalities that need addressing (Antal and van den Bergh, 2013; Loorbach and Huffenreuter, 2013; Vergragt, 2013; Witt, 2013; Geels, 2013). Also pursuing this theme, some authors argue that social activism and engagement (Witt, 2013; Vergragt, 2013; O'Riordan, 2013) and the willingness to experiment (O'Riordan, 2013), are necessary to bring new alternatives to the fore.

The third theme identifies the inevitability of poor and inadequate policymaking due to mainstream economics failing to reflect a complete understanding of how society works (Foxon, 2013b). Open, dynamic and reflexive policy options are needed for a new economic pathway for sustainability that challenges the roles of government, factors in the bias of human actions, recognises the institutional complexities of banks and financial regulation, and acknowledges the dynamic processes shaping technological and institutional changes (Foxon, 2013b; Perez, 2013; O'Riordan, 2013; Swilling, 2013; Geels, 2013).

The fourth theme questions whether the financial system is fit for the purpose of sustainability transitions (Antal and van den Bergh, 2013), pointing out that financial-economic relationships are biased towards debt, financial returns and resource exploitation (Antal and van den Bergh, 2013; Geels, 2013) and short termism of markets (Swilling, 2013; O'Riordan, 2013). Swilling (2013) argues that financial crisis persists because of a failure to dislodge the power of finance capital, arguing that sustainability transitions can only occur if finance capital is disciplined to act in the societal interest and drive the acceleration of green technologies. The need for regulating finance capital to avert future financial crisis or carbon lock-in is also supported by other authors (Perez 2013; Foxon, 2013b; Antal and van den Bergh, 2013; Swilling, 2013; O'Riordan, 2013).

The fifth theme recognises that political and temporal tensions cause sustainability and financial-economic crisis to compete for policy attention, as each emerges over different timeframes with specific causes and solutions (Geels, 2013; Antal and van den Bergh, 2013; Loorbach and Huffenreuter, 2013; Vergragt, 2013; Witt, 2013; Swilling, 2013; O'Riordan, 2013; Perez, 2013). For example, the policy concerns over the course of a transition process differ, with immediate challenges being the mobilisation of large sums

of money, the initiation of policy and institutional changes, and the need for governments to gain public support and legitimacy during such a time (Geels, 2013).

Conceptually, finance is mainly recognised as a function and resource within a socio-technical systems, and situates bankers among the social groups that influence technical trajectories (Geels, 2002). Efforts to conceptualise finance more explicitly within sustainability transition studies are recent. In particular, a paper by Urban and Wójcik (2019) classifies the financial system as a socio-technical system operating within rules, behaviours and social norms, and uses this definition to then apply the multi-level perspective (MLP) to an empirical analysis. A paper by Geddes (2019) theorises finance as a socio-technical system, and argues that finance either confirms or adjusts its rules to technological shifts at the niche and regime level. These papers commonly apply the MLP in their empirical work – a widely applied heuristic in sustainability transition studies.

Since 2013, empirical and conceptual research on financial systems and sustainability transitions has been nascent. Chapter 3 contains a scoping review that identifies only eight papers since 2013 directly associating the keywords “financial systems” and “sustainability transitions”.

1.5.3 Scope of application

Sustainability transitions studies place the concepts of socio-technical, socio-institutional and socio-ecological systems at its centre (Loorbach et al., 2017). However, this thesis does not classify the financial system within these constructs due to the limited empirical and conceptual development of finance within the field, a factor which became apparent while conducting research for Chapter 3. Also, there is limited cross engagement between sustainability transition and sustainability-related finance studies. The need for an approach that transcends the specific heuristics of the field (such as using the MLP or first defining the financial system as a socio-technical system) became apparent during the scoping review (see Chapter 3).

This thesis, therefore, applies a broad approach aimed at identifying insights from sustainability transitions studies that are useful to understand the national context and meet the research objectives. It focuses specifically on extensive literature about the process of transitions and aims to relate the characteristics of such processes to the financial system. This follows similar approaches proposed by Perez (2002) and O’Sullivan (2005) when initiating conceptual work relating finance to innovation processes (see Section 3.5.1). The lack of classification of the financial system as a

socio-technical system does not limit the validity of the thesis because the approach taken here is not aimed at trying to apply the MLP. Instead, the approach is to understand the insights that sustainability transitions studies offer to advance interdisciplinary research on finance and transition processes at a systems level.

1.6 Research questions

Based on the framing in this Chapter, this thesis focuses on these research questions:

a) What demands do sustainability transitions place on financial systems?
b) What do such demands imply for the design of finance systems?
c) What structural features in financial systems support or inhibit sustainability transitions?
d) How do financial intermediaries relate to the demands of transition processes?

The research questions are formulated at two levels. Firstly, conceptually linking financial systems to sustainability transitions studies and developing a theoretical framework to conduct empirical research (Chapter 3).

Secondly, applying the conceptual findings to an empirical context, namely that of South Africa – a country heavily dependent on coal with an urgent need to transition its energy system in a context of growing social inequalities and economic challenges (see Chapters 2 and 5). The empirical research focuses on first understanding the structure and level of awareness of sustainability issues within South Africa's financial system (Chapter 4). Then, it takes the form of an in-depth analysis of South Africa's energy transition by studying energy investment programmes and how financial intermediaries are relating to the transition (Chapter 5).

Appendix C contains an inventory of the data developed for this thesis mapped to specific chapters.

1.7 Research design

The overall research design for this thesis is a mixed methods approach combining quantitative and qualitative methods because this thesis is concerned with epistemological reality (how knowledge is known). It adopts a pragmatist approach to understand such reality through inductive and deductive evidence. The iterative deductive-inductive research cycle inherent in mixed methods allows for the identification of emerging themes and discrepancies. A key feature of mixed methods is meta-

inference processes which integrate the research results of different approaches. This is important for data triangulation and identification of confounding factors to reduce the risk of drawing inaccurate and spurious conclusions.

These features of mixed methods contribute to the internal validity of this thesis and support defensible claims to knowledge. An alternative research design of either quantitative or qualitative methods was not suited to the evidence available for this thesis, as key issues may not have been identified, which would have had a negative impact on the study's internal validity.

A key challenge for this thesis was defining the scope of the qualitative and quantitative data to be examined. The financial system as defined in this paper includes intermediaries, markets and infrastructure which implies a large canvas that is difficult to understand in its entirety. Although the data methods originally intended to capture every component of the financial system, this proved challenging. This thesis, therefore, limited its scope to financial intermediaries, which allowed for a deeper analysis of how these intermediaries relate to sustainability transition processes. Understanding the larger system and its dynamics was addressed by interviewing a range of experts and civil society organisations directly engaged in transition processes with policymakers and financial intermediaries. These interviews contributed to verifying the data.

A further challenge was that a significant portion of the quantitative data was subject to confidentiality, which means this thesis only presents such data in descriptive and aggregated form. This challenge was handled through sensitive construction of interview questions to draw out the themes that such data represents (see Appendix D). It was also handled through textual analysis of publicly available information which served to verify data points that were critical to building the arguments for this thesis.

The research design led to the development of three papers (chapters 3 to 5) which are linked to the thesis objectives and research questions as described in Table 1.1.

Table 1.1 Summary of linkages across papers

Thesis objectives	**Research questions**	**Chapter 3** *Paper 1*	**Chapter 4** *Paper 2*	**Chapter 5** *Paper 3*	**Chapter 6** *Synthesis*
A (theoretical)	a) What demands do sustainability transitions place on financial systems?	•			

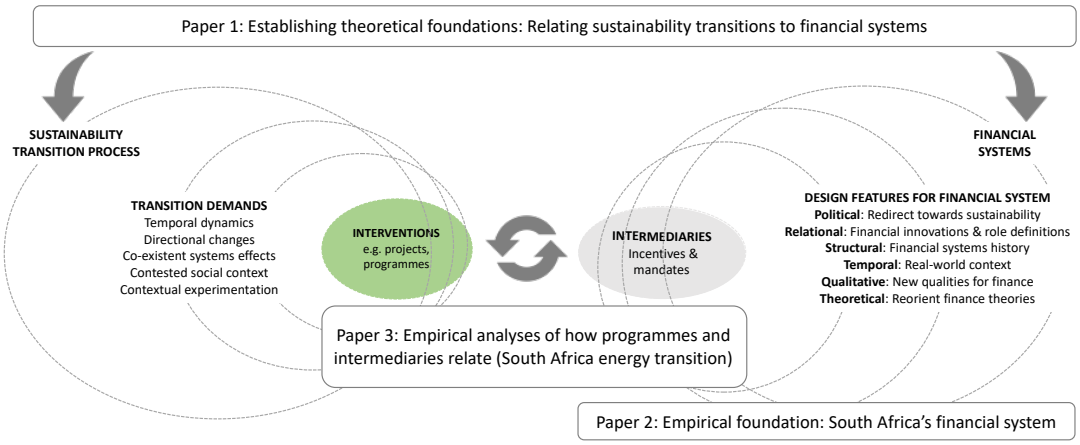
Thesis objectives	**Research questions**	**Chapter 3** *Paper 1*	**Chapter 4** *Paper 2*	**Chapter 5** *Paper 3*	**Chapter 6** *Synthesis*
	b) What do such demands imply for the design of financial systems?	•			
B (empirical)	c) What structural features in financial systems support or inhibit sustainability transitions?		•	•	
	d) How do financial intermediaries relate to such demands?	•	•	•	
C (policy)	Synthesis of research questions and results	•	•	•	•

The papers in Chapters 3 to 5 are summarised in Chapter 2, which also describes their research design and limitations. In summary, Chapters 3 and 4 apply qualitative methods, and Chapter 5 applies both quantitative and qualitative methods.

2 Summary of papers

The theoretical foundation for this thesis is sustainability transition studies. Figure 2.1 illustrates the theoretical contribution that this thesis makes, which is to relate sustainability transition processes to financial systems. It identifies transition demands and proposes design features for the financial system to meet these demands. These insights are presented in Paper 1 (Chapter 3). Paper 2 (Chapter 4) establishes the empirical foundation of South Africa's financial system, which is essential for applying the conceptual insights of Paper 1 to Paper 3 (Chapter 5). Paper 3 narrows the empirical focus to a specific intervention (in this case, energy transition investment programmes in South Africa), and to specific intermediaries (in this case, private and public banks in South Africa).

Figure 2.1 Graphical abstract of theoretical findings and linkages across papers



The sections below summarise the rationale, research design, abstract, contributions to knowledge, limitations and areas for further research for each paper illustrated in Figure 2.1.

2.1 Chapter 3 – Relating financial systems to sustainability transitions: challenges, demands and design features

The paper in Chapter 3 focuses on the research question *what demands do sustainability transitions place on the financial system?* Also, it seeks to understand *what do such demands imply for the design of financial systems?* This paper focuses on developing an understanding of the conceptual and empirical research that links sustainability transitions and orthodox finance studies, and deriving insights for advancing further research.

2.1.1 Rationale for paper

This paper initially aimed to examine practice-based finance initiatives (specifically the UNEP Inquiry) and relating these to theories on financing sustainability transitions. This starting point was selected because, as discussed in Chapter 1, practice-based initiatives represent the policy ideas being considered in the financial system by policymakers in the global North and South. The research concern relates to these initiatives mainly being led by the financial system and global policy think tanks or inquiries, and are largely biased towards the global North (Falcone et al., 2018). This means that the basis for evaluating the effectiveness or adequacy of their proposals within different country contexts is therefore limited.

The starting point for the first paper, however, shifted away from the UNEP Inquiry as the unit of analysis for two reasons.

The first reason relates to data limitations. The initial work on the UNEP Inquiry involved analysing 64 published reports and examining over 300 financial measures, after being granted access to a confidential excel database in October 2016.[8] During these examinations, the data limitations of the UNEP Inquiry became apparent as their analyses had not tracked the effectiveness or long-term effects of these financial measures. Adjusting the dataset for comparability would have entailed primary fieldwork in several geographic locations that were outside the scope of the thesis. An additional limitation is the lack of explicit rationale and assumptions of the UNEP Inquiry's recommendations in its published reports.

The second reason relates to the absence of conceptual basis for evaluating whether the UNEP Inquiry recommendations are contributing towards transitions. The under-developed conceptual and fragmented empirical work on finance within sustainability transition studies represents an interregnum of its own. This made it challenging to direct relate the UNEP Inquiry and sustainability transition studies. As Chapter 3 shows, it remains critical for academics to critically evaluate initiatives such as the UNEP Inquiry. However, the uncertain and fragmented data quality meant the potential for reaching spurious conclusions from the UNEP Inquiry was high.

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[8] This database has now been made public by the UNEP Inquiry. Available at: https://greenfinanceplatform.org/news/nearly-400-policy-and-regulatory-measures-mapped-new-green-finance-measures-database.

For these reasons, the author inverted the focus for the paper, shifting away from the UNEP Inquiry and turning her attention to insights that sustainability transition studies can offer to inform and evaluate the response of the financial system. This perspective is further described in Section 3.1.

For this paper, the term climate breakdown was adopted to convey the urgency linked to climate change as evidenced by the IPCC Special Report (IPCC, 2018).

2.1.2 Paper abstract

The Paris Climate Agreement, Sustainable Development Goals and Addis Ababa Action Agenda call for the financial system to be "consistent and integrated" in its response to the sustainability and climate breakdown. Sustainability transition studies and orthodox finance literature are failing to engage with these calls. The paper offers three contributions to address the lack of research on these issues. Firstly, it scopes the sustainability-related finance literature and finds broad but fragmented research strands with limited critical analysis and little cross engagement with sustainability transition studies. Secondly, the paper draws on insights from sustainability transition studies to propose a transition demands framework that characterises the explicit demands that sustainability transitions place on the financial system (understood as intermediaries, markets and infrastructure). Thirdly, the paper considers essential design features for financial systems to meet the specific demands of sustainability transitions and identifies critical questions for broadening research in this area.

From a policy perspective, the paper concludes that calls for consistency and integration of finance flows in the Paris Climate Agreement, SDGs and Addis Agenda relate to qualitative rather than purely quantitative expectations from the financial system. The paper also draws attention to the dangers of implicit assumptions, which may affect how finance and its role in sustainability transition processes evolve within sustainability transition studies and in practice through policy guidance.

2.1.3 Research design

The research design of this paper is a scoping review to identify the state of research on sustainability-related issues in orthodox finance, and on finance-related issues in sustainability transition studies. Scoping reviews are especially useful for new areas of research and provide insight into the prevailing research themes and state of conceptual development (Peterson et al., 2016). A Scopus search of the keywords "sustainability"

and “finance” yielded 35,000 results. Applying further keywords such as “environmental finance” and “sustainable finance” reduced the number of search results to 2,787 papers. These results were later reduced to 14 papers by searching for the co-occurrence of the phrase “sustainability transitions”. For sustainability transitions, the first papers published in a 2013 Special Issue of Environmental Innovations and Societal Transitions were used as a baseline to identify themes, supplemented by a Scopus search to identify papers on finance and financial systems within sustainability transition studies (see Appendix E). An inductive approach was then adopted to draw insights from sustainability transition studies to derive the transition demands framework and design features to inform the financial system’s meeting of these demands.

2.1.4 Contributions to knowledge

Firstly, the paper represents the first scoping review of which the author is aware that connects research in sustainability transition studies with orthodox finance literature. The paper shows a research gap: that orthodox finance is not yet engaging with insights from sustainability transition studies, and vice versa. This contribution is significant because it is the first analysis of conceptual and empirical research on finance in sustainability transition studies.

Section 3.4 presents the results of this scoping review which covers orthodox finance and sustainability transitions studies, financial crises, practice-based, and critical emergent literature. For orthodox finance, the scoping review shows that an extensive body of sustainability-related finance studies evolved for over 30 years since the release of the Brundtland Report. The review further identifies eleven different descriptions of sustainability-related finance, such as social, environmental, responsible, sustainable, green, and climate finance. These descriptions appear to have limited cross reference among each other (Chapter 3, Table 3.1). For sustainability transitions studies, the paper highlights the limited conceptualisation of finance, and the paucity of empirical and scholarly engagement with finance at a systems level (Köhler et al., 2019).

For financial crises literature, the paper draws insights from transition scholars who suggested such crises slow down transition processes (Geels, 2013; Perez, 2013). For practice-based research, the paper highlights the lack of academic engagement with many existing initiatives – specifically on contextual, impact and path dependencies (Hafner et al., 2019; Ahlström, 2019; Falcone et al., 2018). For critical emergent research, the paper identifies new approaches to orthodox economic and finance studies

that may be useful in conceptualising finance within sustainability transitions studies. These new approaches question the validity and assumptions of orthodox approaches and their applicability when engaging on the urgency and intensity of the climate breakdown, and sustainability, social and economic challenges (Orléan, 2014; Raworth, 2017; Jacobs and Mazzucato, 2016; Lagoarde-Segot, 2018). The scoping review also highlights criticisms of how sustainability transitions studies are evolving, specifically the danger of implicit assumptions and inability to study causal effects based on the current heuristics of the field (Feola, 2019; Sorrell, 2018; Svensson and Nikoleris, 2018).

Secondly, the paper draws theoretical insights from sustainability transition studies from which it derives a transition demands framework that characterises the explicit demands that sustainability transitions place on the financial system. The focus on demands of the transition process stem from similar approaches recommended by Perez (2002) and O'Sullivan (2005) for relating finance to innovation processes, and by Köhn (2012) for designing new financial products. The premise is that the characteristics of any process represent the demand (need) for that process, which in turn informs the response (e.g. innovation) to meet such demands (needs). A demand perspective places the focus on the transition process as the primary driver for determining the financial response, rather than implementation being led by what may or may not be funded by the financial system. With this in mind, the transition demands framework presents five demands in respect of: i) temporal realities; ii) directional changes; iii) co-existent system effects; iv) contested social context; and, v) contextual experimentation.

These demands build upon and extend the characteristics of sustainability transitions described by Loorbach et al. (2017), and consider the financial objectives of the Paris Climate Agreement, the Addis Agenda, and the SDGs. The aim of developing this framework was to establish a basis in sustainability transition studies for evaluating how the financial system and its constituent elements are meeting sustainability transition demands. Although sustainability transition studies do include heuristics for empirical research such as the multi-level perspective, these are not specific to finance, and are unsuited to understanding the role of financial systems. The transition demands framework, therefore, offers an initial contribution to advancing conceptual and empirical research on finance in the field of sustainability transition studies.

Thirdly, the paper derives essential design features for financial systems to meet the five demands of sustainability transitions. Six design features for responding to the transition demands are proposed: i) political – to address behaviours and incentives; ii) relational

– to examine how the financial system relates to itself and drivers of change; iii) structural – to examine the origins and interconnectedness of financial systems; iv) temporal – to instil a sense of urgent action; v) qualitative – to embrace new qualities for the kind of finance that is required; and vi) theoretical – to update theory and prepare future generations for future challenges.

These categories were derived through an inductive process, considering the global policy objectives on finance in the Paris Climate Agreement, Addis Agenda, and SDGs. Specifically, these design features highlight that proposing policy and other solutions requires careful attention to identifying their implicit assumptions and questioning how problems are being constructed. In the absence of such interrogation, there is a risk that sustainability transitions may be misdirected or stalled.

2.1.5 Research limitations

Certain dimensions of the issue under study could not be fully explored within the scope of the paper. The primary limitation relates to examining the conceptual and empirical origins of the practice-based framing of sustainability-related finance in respect of, e.g., social, sustainability, environmental, and climate impacts. Addressing this limitation in future research would help to advance interdisciplinary research, especially for identifying common and divergent features, research methods, and how these relate to the demands of sustainability transitions. Understanding the connections among these would be helpful, especially to differentiate among the ever-growing base of new framings of finance such as regenerative finance, and transformative finance.[9] A unified narrative of finance would be helpful to advance changes within the financial system and give effect to sustainability transitions. The currently fragmented narratives of finance potentially represent important individual elements that could be drawn together for a unified view of that field.

Another limitation of the paper was the lack of in-depth analyses of empirical examples. Since the paper focused mainly on understanding the state of academic research, such empirical work was outside of its scope, and formed the focus of the other two papers of this thesis (presented in Chapters 4 and 5).

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[9] For example see: http://regenerativefinance.com/, http://transformfinance.org/ and https://www.climate-kic.org/opinion/transformation-capital-investment-logic-systems-change/.

2.1.6 Areas for future research

There are suggestions for research questions throughout the paper within each of five transition demands (Section 3.5) and six design features (Section 3.6). The paper also proposes a research agenda based on the design features for advancing research on finance within sustainability transition studies, and further interdisciplinary approaches that relate financial systems and sustainability transition studies. Among these, it would be useful to prioritise reconsidering the framing of finance in sustainability transition studies away from its current background, passive framing as a resource and function within a market context (see Section 3.4.2). A recurrent theme evident from the scoping review is the need for evaluating the relevance and validity of assumptions underpinning theoretical framings of societal challenges (Section 3.7).

2.2 Chapter 4 – Transitioning South Africa's finance system to sustainability

The paper examines the case of South Africa's financial system, addressing the research question: *What structural features in a financial system support or inhibit sustainability transitions?*

2.2.1 Rationale for paper

Schumpeter (1942) and Gerschenkron (1962) ascribed an important role to financial systems – that of driving radical changes within an economy, and financial sector development being critical for economic growth. As one of the world's most unequal countries, South Africa faces the risk that driving radical changes will exacerbate these inequalities (Swilling et al., 2016). Therefore, the paper in Chapter 4 initiates the empirical work at the level of South Africa's financial system as the primary channel through which the country's sustainability transition is financed. The chapter offers insight on the structural design features for financial systems developed in Chapter 3 relating to their origin and interconnectedness. Specifically, it focuses on the structure and culture of South Africa's financial system, its engagement on sustainability issues, and learnings from efforts to finance environmental and social initiatives.

Chapter 4 was developed as a contribution to the book Sustainability Transitions in South Africa (Mohamed, 2019) which included contributions from various authors covering policy, technology and climate science-related issues specific to South Africa's transition process.

2.2.2 Paper abstract

William Shakespeare (1602) wrote that “if money goes before, all paths do lie open” which, in the context of sustainability transitions, means that financial flows are required for new development pathways to be realised. Policymakers have historically overlooked this strategic role, but this is now changing. This chapter describes the context of change within global financial systems, and offers a historical background to how South Africa’s financial system is structured. Structural constraints in this system may influence how transitions unfold in future, specifically the historical context of large banks controlling 90% of the banking sector, while financial inclusion and access to finance for smaller businesses and vulnerable groups is limited.

The chapter presents two examples of how financing sustainability transitions in South Africa are being piloted – creating a national government-funded Green Fund, and designating the South African National Biodiversity Institute (SANBI) as a financial intermediary for international environmental assistance. The third part of this book chapter describes gender-focused financial services and products in South Africa and highlights the risk that the transition may not be financially inclusive. The chapter asserts that while South Africa’s financial system has strong foundations and features that could potentially advance sustainability transitions, current efforts show this intention is not embedded in the system. Instead, these efforts are operating as specialist products or services. Also, it highlights the importance of learning through experimental approaches like those of the Green Fund and SANBI. The chapter concludes that the extent to which South Africa’s financial system supports sustainability transitions will determine the depth, scale and pace of such transitions.

2.2.3 Research design

The research design comprised mapping the individual components and mandates of South Africa’s financial system (i.e. regulators, public and private banks and institutional investors) and literature reviews relating to the evolution of this system. It also compared the results of three surveys (in 2007, 2011 and 2016) to understand how the nature of engagement and the expectations of financial intermediaries have changed regarding their involvement in sustainability issues in South Africa.

Three examples were chosen to align with the policy focus of the book, to identify specialist public and private sector initiatives directly supporting environmental and social projects in the country. This led to the selection of: i) the Green Fund (a national

fund); ii) SANBI (a recipient of international environmental and climate funds); and iii) a focus on gender-based lending.

2.2.4 Contributions to knowledge

The empirical analysis in Chapter 4 supports the theoretical proposition in Chapter 3 that the structure of financial systems, their origins and interconnectedness are important factors for understanding their ability to support or inhibit sustainability transitions. Some scholars argue that diversity and sophistication in a financial system are prerequisites for support to sustainability transitions – specifically energy transitions (Polzin et al., 2017; Pathania and Bose, 2014). However, the three case analyses showed that, despite South Africa's financial system being both diverse and sophisticated, there are also other factors at play which determine a financial system's ability to meet the demands of sustainability transitions. These include the culture of the financial system – for example, a preference for financing large businesses, speculative investing, and imposing preconditions before providing support for sustainability transitions.

The importance of experimental approaches and learning mechanisms for financing sustainability transitions is also highlighted in the paper, such as those evidenced by the Green Fund. This is an empirical contribution which supports the theoretical proposition in Chapter 3 of the value of "contextual experimentation". The Green Fund designed its activities to build on ongoing testing and learning policy lessons, which later contributed to institutional learnings for the Development Bank of Southern Africa (DBSA) to incorporate into its practices.

SANBI's community engagement approach to programming international climate funding supports the theoretical proposition developed in Chapter 3 of the value of engaging with a "contested social context". The example of SANBI shows that new social drivers of change should be engaged in co-developing their responses to sustainability transitions, and that such engagements improve efficacy of how international climate funds are used in South Africa's sustainability transition.

2.2.5 Research limitations

The scope of the chapter did not allow for in-depth analyses of the financial system in South Africa or conduct in-depth case examples. Appendix F contains supplemental information on the Green Fund, which partially addresses this limitation. The information

mentions the role that the Green Fund played in the DBSA creating dedicated facilities for climate finance.

Though the paper offers useful examples of how the South African government (through SANBI and Green Fund) engages in sustainability transitions, it was outside the scope of this paper to conduct an in-depth investigation of how financial intermediaries engage over time in transition processes. This limitation is addressed in the empirical analyses of Chapter 5.

2.2.6 Areas for future research

The paper raises several research questions about South Africa's financial system and its ability to advance the country's sustainability transition. Chapter 4 (Section 4.9) describes the potential questions for advancing research on relating South Africa's financial system to its sustainability transition. These questions include: correlating the financial needs of the country's transition with the intensity and degree of transition being targeted by the government of South Africa; whether raised awareness among the financial intermediaries contributes to redirecting finance flows towards the environmental and social goals that are implicit in the transition; and what additional government actions may be necessary to encourage a financially inclusive transition. Finally, the paper also raises questions about the type of finance needed to support sustainability transitions.

2.3 Chapter 5 – Transition demands and financial intermediaries: Energy transitions in South Africa (1994 to 2019)

The paper considers the case of energy transitions in South Africa in the period 1994 to 2019, and addresses the research question: *how do financial intermediaries relate to the demands of sustainability transitions?* This paper applies this question to energy transitions in South Africa (1994 to 2019).

2.3.1 Rationale for paper

Chapter 3 establishes the theoretical foundations for the thesis, while Chapter 4 initiates the empirical analysis of South Africa by focusing on the structural features of its financial system. Chapter 5 advances the base established in these chapters by specifically applying the transition demands framework developed in Chapter 3 to South Africa's energy transition.

The focus narrows to South Africa's energy transition as a subject of analysis because the country's transition largely depends on reducing its dependency on fossil fuels as an energy source. The chapter assesses the mutual engagement between energy transitions and the financial system (focusing on the financial intermediaries) over the 26 years between the advent of democracy in 1994 and the current time.

The chapter pays particular attention to how financial intermediaries engaged in the ZAR201 billion financing of the country's renewable energy procurement programme. The paper initially aimed to focus on a limited timeframe (2008 to 2015) due to the specific engagement of financial intermediaries in the SA renewable energy programme. However, when applying the transition demands framework to the evidence, the timeframe was expanded to consider trends and challenges both prior to the launch of the programme and afterwards.

The paper is relevant for the research context described in Chapter 1 in that it studies the direct historical and current relationship between policymakers and implementing agencies involved in the transition process on the one hand, and financial intermediaries on the other. The insights from this paper, therefore, align with the research objectives of the thesis to develop new language to support policymakers and the financial system to strategically engage on transition-related issues.

2.3.2 Paper abstract

The process of shifting energy systems away from unsustainable sources is called energy transitions, which focuses on meeting various environmental and social objectives in the creation of sustainable energy systems. However, research on relating energy transitions and financial systems (defined as intermediaries, markets and infrastructure) is limited, both conceptually and empirically. This paper bridges the research gap through a historical review of South Africa's energy transition (1994 to 2019) and how financial intermediaries relate to such process – with particular focus on the ZAR201 billion renewable energy and ZAR30 billion coal programme under implementation since 2009.

By applying the novel "transition demands framework" developed in Chapter 3 of this thesis, the analyses identify tensions in how financial intermediaries, policy processes and civil society are engaging in shifting South Africa's coal-dominated energy system towards emergent renewable energy investments. These tensions relate to the crisis-imposed conditions underpinning policy responses, disputed framing of energy

transitions, selective and opportunistic investment approaches by the financial intermediaries, contested and unmet expectations of how financial intermediaries relate to each other, and the critical role being played by civil society organisations in shifting the investment policies of financial intermediaries. The paper concludes with policy insights for South Africa specifically, which may also be useful for broader application.

The key findings of the paper include evidence that: i) financial systems significantly influenced the direction and effect of energy transitions; ii) environmental and social goals did not significantly influence how financial intermediaries engaged in the programme; iii) both government and financial intermediaries were focused on project-level investment; and iv) civil society groups were critical in shifting the support of financial intermediaries away from the new coal programme.

The paper also finds that despite the engagements between policymakers and financial intermediaries being essential for that programme, a deeper level of engagement and specific framing is necessary to meet the environmental and social objectives associated with creating sustainable energy systems. The engagements also highlight the importance of learning mechanisms and experimental approaches for enhancing programme objectives. The paper concludes with eight insights for South African policy makers that may be useful for broader application, and suggestions for deepening empirical and theoretical research in this area.

2.3.3 Research design

The research design represents a historical review of the financing of South Africa's energy transition (1994 to 2019), which includes drawing on quantitative and qualitative data. The quantitative data is mainly sourced from the author having being granted access to a confidential database on financial transactions maintained by the Independent Power Producers Procurement Programme (IPP) Office (a quasi-government agency administering the procurement of energy from independent producers), and from the author's research and analysis of this database and related publicly available data.

The qualitative data comes from interviews with 19 senior executives involved in the design and implementation of the South African renewable energy programme (SA renewable energy programme) and 11 experts and civil society organisations involved in the energy transition more broadly. The data is further triangulated through content analyses of confidential documents and exchanges, including archival material, national

government press releases, and industry reports. The paper includes anonymised direct quotes from the interviewees, who are divided into the categories: government, government agencies, financial intermediaries, experts (energy and finance), and civil society organisations (see Section 5.4, Table 5.2). The evidence for this paper was gathered between May 2017 and October 2019. (See Appendix D for further detail.)

2.3.4 Contributions to knowledge

Prior research on South Africa's renewable energy programme credits the mature and sophisticated financial system with playing a significant role in the success of the SA renewable energy programme, and that open and transparent engagement enabled this process (Eberhard and Naude, 2017). This paper contributes to these claims through detailed empirical analyses of: i) the financial intermediaries' engagement with the programme from 1994 to 2019 (subject to the data limitations); and ii) the engagement between financial intermediaries and the SA renewable energy programme from its conception in 2009 to 2019.

The analyses highlight that while the quantity of finance raised (ZAR201 billion) is often cited as a successful feature of the programme, this masks tensions in how the financial intermediaries engaged in the qualitative dimensions of the programme. The paper provides additional qualitative and quantitative evidence that confirms findings by Baker (2015b) that the funding of the SA renewable energy programme was biased towards large businesses.

Further, the analyses show that while diversity and maturity of a financial system is important for supporting energy transitions (Polzin et al., 2017; Pathania and Bose, 2014), such skills are applied selectively by financial intermediaries to certain elements of the sustainable energy transition while they neglect others. Furthermore, the analyses show that when environmental and social objectives are introduced into the transition process, project-level responses and engagement are not well suited for understanding the system-level effects being targeted.

2.3.5 Research limitations

The paper focuses empirically on South African private banks and national development banks (defined as financial intermediaries in the paper). These intermediaries were chosen because they were the primary lenders to the SA renewable energy programme

and directly engaged in the preparatory and subsequent engagements on the SA renewable energy programme with the Department of Energy and National Treasury.

Prior research by Baker (2015b) covers how secondary investors (such as institutional investors) are relating to the SA renewable energy programme. This limitation was not significant given that it represents the first academic study which examines how primary lenders related to the programme and energy transitions from both quantitative and qualitative perspectives.

Further, the paper does not give any detailed account of the precise arrangements of the SA renewable energy programme as this was outside of its scope. The paper addresses this limitation by providing references to research where such arrangements have been comprehensively studied; for example, in Eberhard and Naude, 2017, and Eberhard et al., 2014.

2.3.6 Areas for future research

The analyses highlight opportunities for broadening empirical research on South Africa's energy transition. Specifically, opportunities include further examination of the assumptions and expectations among financial intermediaries of their roles within energy transition processes, and the scope and breadth of changes they would need to make to fulfil these roles. The transition demands framework enabled the tensions of relating energy transitions and financial systems to be identified. Further empirical application of this framework may refine it.

It would be useful to deconstruct the policy design process – specifically, to identify how problems are framed, solutions developed, and making visible their implicit assumptions. Such deconstruction may enable better understanding of the depth of changes to incentives and framing of system-level shifts that are required for impactful energy transitions.

2.4 Summary

As illustrated in Figure 2.1, the first paper in this thesis (Chapter 3) establishes a theoretical foundation for relating sustainability transitions and financial systems. Setting the foundation was a critical first step as the conceptual context for orthodox studies on finance and finance within sustainability transition studies was under-developed and new critical approaches were not yet dominant (i.e. an academic interregnum). The second paper (Chapter 4) studies the structural foundations of South Africa's financial system.

This paper was vital for advancing further investigations of transition processes in South Africa, as it provided context to the country's financial system and highlighted potential challenges. The third (Chapter 5) applies the transition demands framework to the case of South Africa's energy transition. The analyses from the case identifies demands and tensions among financial intermediaries, civil society organisations and policymakers during implementation of interventions (such as the SA renewable energy programme).

Collectively, the papers highlight that the quantity of finance is only one dimension of the financial system's support for transition processes. Sustainability transitions also exact specific *qualitative* demands on the financial system, requiring responses that extend beyond a project-specific focus on energy system-level effects. Achieving such system-level effects requires reflecting on whether the financial system is suited to meeting the demands of transition processes. It also requires evaluating the scope of changes necessary in the financial system to meet such demands. This thesis also proposes design features for financial systems to meet the demands of sustainability transitions.

Chapters 3 to 5 contain the three papers summarised in this section. A synthesis and conclusion section follow in Chapter 6.

3 Relating financial systems to sustainability transitions: Challenges, demands and design features

This chapter focuses on the research question *what demands do sustainability transitions place on the financial system and what do such demands imply for the design of financial systems?*

The chapter appeared as Naidoo, C.P., 2019. Relating financial systems to sustainability transitions: Challenges, demands and design features. Environmental Innovation and Societal Transitions. https://doi.org/10.1016/j.eist.2019.10.004. The version presented in this chapter differs slightly from the published EIST paper to better integrate its contents into this thesis.

3.1 Introduction

The Paris Climate Agreement and the 2030 Agenda for Sustainable Development and its 2015 Sustainable Development Goals represent a turning point in sustainability and climate action (Nerini et al., 2019). These critical agenda-setting and interdependent multilateral commitments draw attention to the urgency and scale of the sustainability and climate breakdown, which affects every nation, every sector and every aspect of modern existence[10,11] (Nerini et al., 2019). In particular, the climate breakdown is framed as an existential crisis (Spratt and Dunlop, 2019) or as a super wicked problem (Lazarus, 2008).

The Intergovernmental Panel on Climate Change Special Report on Global Warming of 1.5°C amplifies the urgency of effectively responding to the sustainability and climate breakdown (IPCC, 2018). Responding to the breakdown requires radical and urgent actions between 2018 to 2030 to limit the global temperature rise to no more than 1.5 degrees Celsius and build resilience to the increasing impacts of climate change (IPCC, 2018). The multilateral commitments suggest grand-scale responses to shift economic development towards sustainability, which extends beyond incremental or quick-fix solutions (Spratt, 2015; Loorbach et al., 2017). Grand-scale responses require finance.

[10] The Paris Climate Agreement and SDGs are interdependent in so far as achieving that agreement's climate goals must happen within the context of the SDGs, not to the exclusion of any of the goals.

[11] The paper adopts the term "climate breakdown" as the preferred reference to the generally used term "climate change". Climate breakdown was first used by Monbiot (2013) to convey the urgency and intensity of response required.

The financial system, therefore, has an indisputable role in responding to the sustainability and climate breakdown.

The financial system, on the one hand, and social and environmental challenges, on the other, have long been associated. For example, in the early 1970s, US and UK banks were the subject of social campaigns that lobbied against their support of South Africa's apartheid regime at that time (Fullwiller, 2016). Around the same time, recommendations relating finance to sustainability were included in the 1972 Stockholm Declaration (UN, 1972) and, 15 years later, the Brundtland Report (WCED, 1987). The recommendations proposed that financial institutions such as the World Bank introduce environmental and social risk into project design and investment appraisal processes (UN, 1972; WCED, 1987).

Further, the UN proposed that countries should work together on integrating sustainability into global trade, development and finance systems (WCED, 1987). The multilateral commitments of 2015 re-emphasise the centrality of the financial system in responding to the sustainability and climate breakdown. They also mark a shift in emphasis. Specifically, the Addis Ababa Action Agenda on Financing for Development (Addis Agenda) and the SDGs call for *integrating* sustainability into trade and finance flows (UN, 2015a; UN, 2015b). The Paris Climate Agreement sets as one of its three *main* objectives making finance flows *consistent* with low emission and climate-resilient development (UN, 2015c). The focus on finance flows having to be consistent and integrated implies both quantitative *and* qualitative role for the financial system in the shift to a new sustainable economic system.

With over US$112.1 trillion global assets under management predicted by 2020 (PwC, 2017), it is unlikely that there is any scarcity of finance to address the sustainability and climate breakdown. The financial system is, therefore, capable of driving radical and transformative changes in the economy through large-scale infrastructure investment (Schumpeter, 1942; Demirgüç-Kunt and Levine, 2009). However, recurrent financial crises also show that the financial system is capable of creating significant economic and social losses (Reinhardt and Rogoff, 2009; Griffith-Jones et al., 2010). This suggests that the financial system is unlikely to sustain and maintain the radical and transformative changes necessary to respond to the sustainability and climate breakdown unless it is disciplined to do so.

Further, the response required from the financial system in the context of the Paris Climate Agreement, the SDGs and Addis Agenda resides within an interconnected global financial system attempting to keep pace with the digital economy, big data and having to build resilience to new risks (Carney, 2018). This global policy context and broader financial system challenges is the backdrop for this paper.

The paper examines the possibilities for relating financial systems to sustainability transitions. The sustainability transitions field represents the primary research domain for this paper. It is an interdisciplinary field within the social sciences, studying the process of transforming systems over the long term due to grand societal challenges and examining the influence and role of different actors within such change processes (Geels, 2004; Smith et al., 2010; Loorbach et al., 2017). Extensive academic research over the last 50 years connects finance and sustainability, with many framings for finance emerging in response, such as climate, green, sustainable, and environmental finance. However, research on finance within the sustainability transition field remains nascent (Köhler et al., 2019).

The paper is organised as follows: Section 3.2 describes the research approach for this paper. Section 3.4 presents the results of a scoping review of sustainability-related finance literature and sustainability transitions research, including relevant research on financial crisis, sustainability-related financial practices, and critical research on these subjects. Section 3.5 presents a framework for identifying the demands that sustainability transitions place on the financial system. Section 3.6 proposes design features for responding to such demands, including further research possibilities. Conclusions are presented in Section 3.7.

3.2 Research approach

The paper applies a scoping review to relate sustainability-related finance literature and sustainability transition studies. The methodology is valid because relating finance to sustainability transitions studies is a new area of research and scoping reviews provide insights on the prevailing themes and state of conceptual development (Peterson et al., 2016). The scoping of sustainability transitions literature commences with reviewing the 12 papers published in the 2013 Special Issue of Environmental Innovation and Societal Transitions (2013 Special Issue). These papers represent the first effort by scholars in the field to engage on finance and the implications of the 2008 financial crisis on sustainability transitions (see Appendix E). Additional literature was identified through

Scopus between 2013 to 2019, based on the co-occurrence of the keywords, “sustainability transitions” and “finance”.

The scoping of finance literature combined keyword searches using Scopus for the co-occurrence of “finance” and “sustainability”, which yielded over 35,000 results. Filtering these results with key phrases such as “environmental finance” and “sustainable finance” reduced the search results to 2,787 papers. These results were later reduced to 14 papers by searching for the co-occurrence of the phrase “sustainability transitions”. The extensive literature on finance and sustainability required prioritising those papers offering systematic and scoping literature reviews on finance and sustainability. Some of these were identified applying a snowballing approach.

The results of the scoping review suggest that an alternate entry point for relating financial systems and sustainability transitions is required. The paper therefore draws insight from sustainability transitions studies to deduce the demands that sustainability transitions place on the financial system and the design features necessary for responding to such demands.

3.3 Assumptions

The paper adopts the view that sustainability transitions concerns the normative goal of achieving reduced greenhouse gas emissions and increased resilience through socially just and inclusive means (Swilling and Annecke, 2006; Silveira, 2016), and the process to achieve such normative goals. This implies that sustainability transitions aim to address the goals of the Paris Climate Agreement and the SDGs.

The dominant approach for framing systems in sustainability transitions studies is that transitions refer to changes in socio-technical systems. However, transitions also refer to changes in other systems, namely techno-economic, socio-ecological, technological innovation systems, social practices, resilience, and human geography (Silveira, 2016). References in this paper to systems change in the context of sustainability transitions apply a broader approach than just socio-technical systems.

This paper applies the description of the financial system as the “central nervous system of the economy” (Crockett, 2011, 3).[12] Three interdependent components exist within the

[12] A recent paper by Urban and Wójcik (2019) applies the sustainability transitions terminology of “socio-technical system” and the multi-level perspective framework to reforms in the financial system. For the

financial system, namely: i) *intermediaries* (public and private banks and insurance companies) directly engaging with households and businesses; ii) *markets* exchanging debt, equity, foreign currencies and commodities such as gold and platinum; and iii) *infrastructure* managing the regulation, supervision, legal and administrative systems that support intermediaries and markets (Crockett, 2011).

References in this paper to finance are aligned with Perez's classification of financial capital as the "agent for reallocating and redistributing wealth in the form of money or other paper assets, through banks and other intermediaries" (Perez, 2002, 71).

3.4 Challenges of linking finance and sustainability transition studies

This section presents the results of the scoping review of finance and sustainability transitions literature and sustainability transitions-related aspects of financial crisis, practice-based, and critical emergent literature.

3.4.1 Finance literature

3.4.1.1 Conceptual framing

Finance is a subset of economic studies, which defines the role of finance in the economy as facilitating the exchange and transfer of funds from households with excess funds to those in need of funds (Bagehot, 1873). A key point of this literature is that banks create new money (out of the deposits of savers, which are mostly households) through lending, rather than just recycling deposits of savers into loans (Werner, 2014). Orthodox finance theories influence how finance engages in the economy based on the assumptions that markets are efficient, and investors behave rationally (Spratt, 2006). These include the efficient market hypothesis and capital asset pricing model theory, which assign variables on the basis of financial risks (Spratt, 2009; Sun et al., 2011; Urban and Wójcik, 2019).

The research methods used in orthodox finance studies apply algebraic, mathematical and econometric approaches, and treat environmental and social factors as externalities (Lagoarde-Segot, 2015; Ansart and Monvoisin, 2017). The quantitative bias of orthodox finance is incompatible with the qualitative focus of sustainability transitions on

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treatment in this paper, the author chose not to adopt this definition due to the emergent nature of the research. A more general definition of the financial system is used here.

environmental and social goals. This incompatibility creates challenges for establishing interdisciplinary linkages. Critical finance researchers recognise the incompatibility of orthodox finance approaches to sustainability and are developing new collaborations to embed sustainability and climate breakdown in orthodox theories.[13]

3.4.1.2 Research themes

Finance research shapes the understanding of the financial system, influences investors and market behaviour, educates future finance and business practitioners, and facilitates policymaking (Diaz-Rianey et al., 2016). The research trends in orthodox finance are therefore important to reflect upon. Several systematic reviews of highly ranked accounting and finance journals show that finance research focuses mainly on the post-2008 financial crisis, covering topics such as asset pricing, bankruptcy, credit issues, governance, and risk management (Lagoarde-Segot, 2015; Aspinall et al., 2018; Diaz-Rianey et al., 2016; Brooks et al., 2018). Despite the climate breakdown and related events being classified as the top three global risks facing the economic system (WEF, 2019), it seems that finance researchers are not engaging on these issues adequately – this is according to four systematic reviews: Goodall, 2008; Patenaude, 2011; Aspinall et al., 2018; and Diaz-Rianey et al., 2016.

While orthodox finance journals may be failing to address finance and sustainability adequately, a Scopus search identified at least 35,000 papers connecting these terms. The search was further narrowed to 2,787 papers, per Table 3.1, by identifying terms associating finance with environmental and social concerns from textbooks on sustainable finance, sustainable banking, social finance and environmental finance (Bouma et al., 2001; Labatt and White, 2002; Ramiah and Gregoriou, 2016; Lehner, 2016).

[13] In September 2019, the Global Research Alliance for Sustainable Finance and Investment hosted a pioneering event at its 2nd Annual Conference in Oxford, UK, entitled “Purpose-Driven Finance: The Manual”. The event aimed to launch an introductory sustainable finance curriculum.

Table 3.1 Results of keyword searches

Terms linking finance and sustainability	Scopus results	Publication period	# Co-occurrence of "sustainability transitions"
Social finance	99	1988, 1999, 2008–2019	0
Environmental finance	88	1989–2019	1
Responsible investment	800	1991–1994, 1996–2019	3
Socially responsible investment	609	1991–1994, 1996, 1998–2019	2
Sustainable investment	300	1992–1995, 1998–2019	6
Sustainable finance	129	1992, 2004–2019	1
Green finance	80	1997, 2005, 2011–2019	1
Impact finance	18	2000–2019	0
Carbon finance	200	2002–2019	0
Climate finance	323	2004–2019	0
Impact investing	141	2011–2019	0
Total papers	**2,787**		**14**

After applying "sustainability transitions" and "finance" as an additional filter, only fourteen of these 2,787 papers show the co-occurrence of these keywords. Google searches to supplement the Scopus results identified a solitary paper in the accounting and finance field – which applies the MLP lens in arguing that niche innovations such as sustainable, climate and green finance potentially destabilise the old regime of finance (Ryszawska, 2016). The low rate of co-occurrence shows that academic associations between the sustainability transitions and finance fields are nascent.

Outside of the Scopus results, the open access Journal of Sustainable Finance and Investment (JSFI) is dedicated to sustainable finance-related issues. According to a systematic review by de Carvalho Ferreira et al. (2016), between 2011 and 2014, the research themes prominent in the JSFI were: i) broadening the definition of investors; ii) building the business case for climate change and socially responsible investment; iii) generating impacts through investment decisions; and iv) mechanisms to institutionally embed environmental and social factors over the long term in financial systems.

The systematic review identifies the following research gaps: i) a lack of research on developing countries' contexts; ii) a lack of common terminologies on finance, investment and sustainability; iii) a need for engaging in theoretical debates to facilitate financial innovations; iv) a need to engage more deeply on the public sector role in finance and sustainability; and v) a question about whether finance and investment tools are suited to the sustainability challenge (de Carvalho Ferreira et al., 2016). These critical research approaches are promising, though they appear to be developing outside the orthodox finance research arena.

The wide range of terms connected to sustainability in orthodox finance represents interpretations of financing aspects of sustainability – be they social, environmental or climate-specific. These interpretations were developed from conceptual and empirical approaches whose exploration is beyond the scope of this paper. Relating finance to sustainability in this way may have validity in terms of specific aspects of sustainability, e.g. governance, environmental, and social approaches. However, finance literature does not yet appear to be drawing on the insights from sustainability transitions studies which address system-level approaches to sustainability.

3.4.2 Sustainability transitions literature

3.4.2.1 Conceptual framing

Sustainability transitions studies is a subset of innovation studies, which classifies finance as a resource and function within innovation systems. As a resource, finance is necessary for systems change, along with other resources such as equipment, skills, supportive infrastructures and institutional support (Clayton et al., 1999). Also, it is essential for achieving strategies enabling long-term systems change (Farla et al., 2012). As a function, finance constitutes one of seven functions necessary for building economic systems (Hekkert et al., 2007).

The multi-level perspective, a widely used qualitative field heuristic for studying socio-technical changes, theorises that transitions occur due to interactions between micro (niche), meso (regime) and macro (landscape) levels of individual agency, and based on rules (Silveira, 2016). The MLP appears to adopt the framing of finance as a resource and function from innovation studies. In particular, Geels (2002) includes financiers in the additional social groups that influence technical trajectories and embeds them, at the regime level, in user practices and application domains (markets).

The framing of finance in sustainability transitions within the market domain aligns with the orthodox economic view of finance, which is later reinforced by classifying transition processes as creating market, infrastructure and transformative failures (Weber and Rohracher, 2012). The failures view is a useful entry point in the short term for developing policies for sustainability transitions (Weber and Rohracher, 2012; Foxon, 2015). For example, a failures view facilitates the selection of financial instruments that lowers project risk (Naidoo et al., 2014; Mathews, 2015; Volz et al., 2015), identifies public and private sources of finance as the ones best suited to absorb such project risk (Spratt, 2015; Mazzucato and Semieneuk, 2018), and considers market and finance instruments as climate policy tools (Gevorkyan et al., 2016).

A market failure approach limits the role of policy to fixing market failures instead of promoting the transformative role policy can play in creating new economic pathways (Mazzucato, 2014). By contrast, justifying policy actions to effect sustainability transitions over the long term requires moving beyond the failures view (Weber and Rohracher, 2012; Foxon, 2015).

3.4.2.2 Research themes

The 2013 Special Issue entitled “Economic-financial crisis and sustainability transitions” published the initial papers discussing finance within the newly established sustainability transitions field. Five themes associating finance and sustainability transitions are interpreted from reviewing these papers. These themes are: i) the recurrence of financial crises which are endemic to system dynamics (Perez, 2013; Geels, 2013; Swilling, 2013; van der Ploeg and Withagen, 2013); ii) divided opinions on the dominance of a green growth narrative (Antal and van den Bergh, 2013; Loorbach and Huffenreuter, 2013; Vergragt, 2013; Witt, 2013; Geels, 2013; Swilling, 2013); iii) the inevitability of poor policymaking due to societal concerns not being reflected in orthodox approaches (Foxon, 2013b; Perez, 2013; O’Riordan, 2013; Swilling, 2013; Geels, 2013); iv) the structural compatibility of the financial system with sustainability transitions (Perez, 2013; Foxon, 2013b; Antal and van den Bergh, 2013; Swilling, 2013; O’Riordan, 2013); and v) policy competition between financial crisis and sustainability challenges (Geels, 2013; Antal and van den Bergh 2013; Loorbach and Huffenreuter, 2013; Vergragt, 2013; Witt, 2013; Swilling, 2013; O’Riordan, 2013; Perez, 2013).

Subsequent research between 2013 and 2019 identifies eight papers with the co-occurrence of the keywords “sustainability transitions” and “finance” within sustainability

transition studies. The research focus of these papers are: i) applying the MLP to understand the financial reforms in the retail banking sector of the UK (Seyfang and Gilbert-Squires, 2019), the emerging storyline of green finance as niche innovation in Italy (Falcone et al., 2018), the contribution of development banks to the energy transition in the UK, Australia and Germany (Geddes et al., 2018); ii) demonstrating the financial policy challenges that the ecological crisis presents for sustainability transitions and the energy sector (Röpke, 2017; Safarzyñska and van den Bergh, 2017); iii) illustrating the structural challenges and financial innovations for achieving a just transition in South Africa (Mohamed, 2019; Naidoo, 2019b); and iv) categorising the financial system as a socio-technical system and the adoption of sustainable finance as a business opportunity (Urban and Wójcik, 2019) and green investment banks as policy instruments (Geddes, 2019).

The 2013 Special Issue mainly highlights the narrative of green growth as a response to the post-2008 financial crisis and the critique that such framing masks the underlying systemic problems of unsustainable production and consumption patterns. The concerns raised by authors in the 2013 Special Issue centre around how green growth narratives affect policymaking and finance innovations. Concerns raised include whether the financial system is fit for the purpose of supporting sustainability transition processes. Subsequent research between 2013 and 2019 that explicitly applies sustainability transition concepts to finance at a systems level mainly use the MLP in different geographies (predominantly global North countries), and at the level of private, state-owned and retail banks. There is no apparent cross-referencing to arguments made in the 2013 Special Issue.

The section shows that research on finance within the sustainability transitions field is embryonic, and researchers generally agree that further conceptual and empirical research is needed to understand the role of finance at a systems level.

3.4.3 Financial crisis research

Sustainability transition scholars writing about the 2008 economic-financial crisis in the 2013 Special Issue describe finance as being ill-disciplined, speculative and blocking the global transition (Antal and van den Bergh, 2013; Perez, 2013; Swilling, 2013). The remedies to avert future financial crises over time are familiar, suggesting more regulation, separation of investment and deposit-taking functions, and calls for global action led mainly by the G20 and other multilateral processes (Griffith-Jones et al., 2010).

Critics argue that multilateral processes are relatively weak in enforcing fundamental changes in the financial system – for example, far-reaching proposals for fundamental shifts in the financial system immediately after financial crises are generally set aside once the financial system stabilises (Griffith-Jones et al., 2010; Turner, 2016). The behaviour of financial intermediaries leading up to the financial crises and afterwards shows that regulation has limited effects on curbing unhelpful and embedded investment behaviours (Spratt, 2009; Griffith-Jones et al., 2010). The concerns raised by these scholars are relevant for sustainability transitions as they suggest financial crisis may slow down such transition processes.

The 2008 financial crisis generated alternative framings of the financial system, which acknowledge the systemic risks to the economy posed by interdependent behaviours of financial intermediaries such as banks. For example, Farmer et al. (2012) and Battiston et al. (2016) categorise the financial system as complex interconnected multi-layered networks rather than single networked systems, recognising the complexities of modern, integrated payment systems within and across global capital markets. While interconnectedness increases competition and improves the way in which resources are allocated by financial intermediaries (Farmer et al., 2012), the interconnectedness also means that instability in one market reverberates in the markets to which it is connected (Aziakpono, 2006). The interconnectedness of the global financial system represents the current context for directing finance to support sustainability transition processes.

The propensity for financial intermediaries to behave in ways that contribute to financial crises is important for understanding the demands being placed on the financial system for three academic reasons. Firstly, for critically evaluating the assumptions underpinning the sustainability-related financial practices and innovations. In the absence of critical evaluation, such innovations may inadvertently contribute towards a future sustainability-related financial crisis and amplify the risk of misdirected and failed transition processes. Secondly, for understanding the influence that finance wields over economic activity, which implies reframing the implicit role of finance (currently, as resource and function) in sustainability transition studies. Thirdly, for evaluating the impact and extent of the financial system's response to sustainability transitions. This suggests having to examine causal linkages between the response and impact of new practices and innovations adopted by financial intermediaries.

3.4.4 Practice-based research on finance and sustainability

Global initiatives encouraging the financial system to respond to the sustainability and climate breakdown include a diverse range of convened and lobbying processes.[14] Convened processes, to name a few, include the Climate Action in Financial Institutions, Central Banks and Supervisors Network for Greening the Financial System, the United Nations Environment Programme Finance Initiative, the Task Force on Climate-Related Financial Disclosures, the International Network of Financial Centres for Sustainability, and the G20 Sustainable Finance Study Group. Examples of lobbying processes include Climate Action+, the Global Investor Coalition on Climate Change, and the Portfolio Decarbonisation Coalition.

An ever-widening range of global initiatives are contributing to mainstreaming the need for the financial system to respond to the global sustainability and climate breakdown. An important example is the Governor of the Bank of England (BoE) recognising that the climate breakdown influences the stability of the financial system. The recognition has led to the BoE engaging with transitions-related risks and designing climate stress tests for the UK financial system (Carney, 2019a).[15] The effects of anti-fossil fuel campaigns targeting investors shows trillion-dollar divestment by investors in fossil-fuel companies (Bergman, 2018), which is starting to devalue the investment ratings of the coal sector (McKibben, 2018).

Investment flows reflect support for new industries emerging from sustainability challenges, for example, with renewable energy investment in 2017 reaching US$333.5 billion (Louw, 2018) and new asset classes termed “green bonds” reaching a total of US$162.1bn in 2018 (CBI, 2018). To appreciate the contribution of these initiatives and investments to promoting sustainability transitions, contextual factors relative to the amount of overall funds invested would be needed. For example, though multilateral development banks are supporting renewable energy, their investment portfolios do not

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[14] During the 2015 Paris Agreement negotiations, 20 institutions launched Climate Action in Financial Institutions for mainstreaming climate change into their operations. https://www.mainstreamingclimate.org/connecting-the-dots/.

[15] The Bank of England classifies climate-related risks as physical (in terms of volatile and unpredicted climate-related events), liability (loss and damage claims among affected parties), and transition (sudden and disorderly adjustment towards low-carbon economy).

fully reflect a transformation agenda aligned to addressing the climate breakdown (Wright et al., 2018).

A scoping paper by Hafner et al. (2019) shows that finance initiatives on the sustainability and climate breakdown are rapidly expanding – at least 31 initiatives exist, including the UNEP Inquiry into the Design of a Sustainable Financial System and the European Union High-Level Expert Group on Sustainable Finance (EUHLEG). The UNEP Inquiry claims a revolution towards a sustainable financial system is underway (UN, 2018a). The EUHLEG says a complete transformation of the "entire financial system, its culture and incentives" is needed (EUHLEG, 2018, 2). Both initiatives separately propose a sustainable finance roadmap for policymakers to consider.

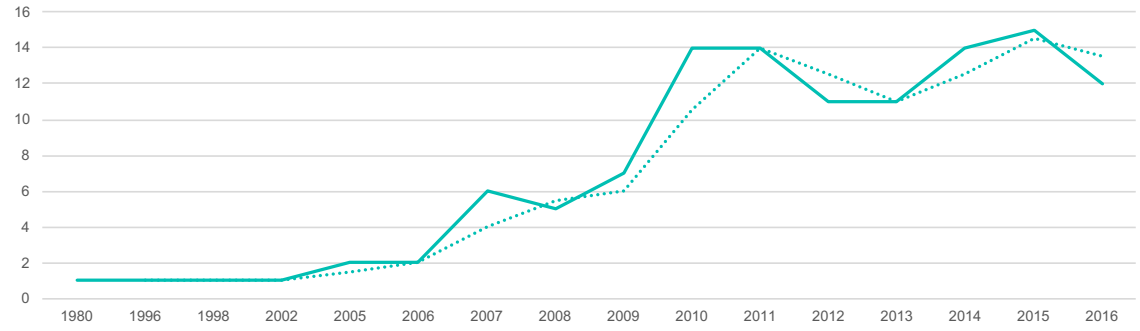
Such practice-based initiatives are useful in contributing towards finance-related sustainability policies and are gaining strategic importance among policymakers, for example, the UK and German governments' Green Finance strategies. At the same time, the rapid emergence of practice-based initiatives highlights the need for independent validation of such claims and proposals as academic researchers are failing to engage adequately with these initiatives (Hafner et al., 2019). This means that the context, assumptions, impact and generalisability of such research is not being examined or challenged.

On contextual factors, for example, Falcone et al. (2018) argue that the UNEP Inquiry recommendations primarily focus on financial systems in the global North. Also, Ahlström (2019) argues that the European Commission's response to the EUHLEG is path-dependent, following the limitations of existing laws and regulations which may undermine achieving a fully sustainable European financial system.

Figure 3.1 illustrates over 200 sustainable finance practices tracked by the UNEP Inquiry between 1980 to 2016. The graph shows a rising trend in such practices but studying the impact of these practices fell outside the scope of the UNEP Inquiry. On generalisability of recommendations, for example, the UNEP Inquiry offers policymakers a useful financing roadmap towards achieving a sustainability-focused financial system (UN, 2017). However, independently engaging on the roadmap's underlying assumptions would strengthen its usefulness.

Figure 3.1 Green finance practices in Middle Income Countries 1980 to 2016

Source: Adapted by author based on extract from UNEP Inquiry database.



The speed at which new sustainability-related financial initiatives are proliferating without critical evaluation can lead to misdirected or failed transitions. For example, on *what assumptions are the financial initiatives based? Is there a common understanding of the problems to be solved? Who is defining the problems? Who is proposing the solution? Is policy guidance relevant for the current context? Are practices creating specialist financing areas or enabling wider systems-level reforms?*

3.4.5 Critical emergent research

As sustainability transitions studies mature, criticisms are inevitable, two of which are noteworthy for this paper. Firstly, Sorrell (2018) and Svensson and Nikoleris (2018) call for greater reflection on the implicit assumptions of the MLP, highlighting its limitations in establishing causal linkages. Secondly, Feola (2019) draws attention to the tacit acceptance of capitalism within sustainability transitions studies and argues this may restrict forward-looking research to create a sustainable pathway. The criticisms are relevant because implicit assumptions about the role of finance (as a resource and function) restricts the ability to conduct empirical research on its role over the long-term in the context of explicitly creating a sustainable pathway.

Questions that could be asked include, *how will new financial practices contribute to long-term systems change? On what and whose assumptions of sustainability transitions are the financial practices based? Will new finance practices create niche areas of finance or create an integrated financial system that is fit-for-purpose?* Who directs and who follows the sustainability-related reforms of financial systems? Such questions are presently difficult to respond to if finance is framed only as a resource and function in sustainability transitions studies. These questions invite more reflexivity on theorising the potential of financial systems to enable transformative system-level changes.

The sustainability and climate breakdown contribute to the growing movement of rethinking the validity and relevance of orthodox economics, which became heightened during the 2008 global financial crisis. Orthodox economic theories fail to account for sustainability and climate breakdown, as they were relevant for the time, place and circumstances that the world found itself in when these ideas originated (Orléan, 2014; Raworth, 2017). Such orthodox economic theories position environmental and social concerns as externalities and currently dominate the policy and educational landscape, which is an inappropriate policy basis for responding to 21st-century sustainability concerns (Raworth, 2017).

Similar research draws attention to the need for capital to have a public purpose (Jacobs and Mazzucato, 2016), developing economic alternatives such as green industrial strategies (Mathews, 2015), and promoting circular economies to reduce materials waste and create employment (Perez, 2016). Although these emergent conceptual debates and concepts are critical, they are still fragmented and are not yet framed coherently as an alternative to orthodox economics (Foxon, 2018). This suggests that orthodox economic approaches still exert influence over sustainability transitions processes.

Rethinking movements are also growing within orthodox finance. Scholars are questioning the epistemological assumptions of finance theory and its compatibility with the demands for sustainability (Gray, 2010; Lagoarde-Segot, 2018), emphasise focusing on social rather than economic purpose for finance (Lagoarde-Segot and Paranque, 2017), and highlight the inadequacy of finance theory to account for climate and social risks (Aspinall et al., 2018; Fullwiller, 2016).

New social forms of finance are also emerging such as crowdfunding as an alternative to relying upon the formal financial system to promote sustainability objectives (Ansart and Monvoisin, 2017). New approaches are emerging outside of orthodox economics in response, for example, developing climate stress-tests of the financial system (Battiston et al., 2016), and considering the impact of climate change on financial stability (Campiglio et al., 2018).

Further, researchers are engaging on the risks that climate breakdown poses to investors and policy makers, especially since economic models inadequately account for such risks (Monasterolo et al., 2019). Additional examples include the critical work on stranded assets which draws attention to the limited lifespan of fossil fuel assets (Caldecott, 2017). In addition, informal networks such as the Sustainable Finance Lab

are bridging theory and practice to facilitate the ways in which the financial system can contribute to averting the sustainability and climate breakdown.

Although coherent theoretical alternatives remain underdeveloped and contested, critical emergent research shows that the sustainability and climate breakdown is agitating the assumptions of orthodox economic and finance theory. Sustainability transitions studies is not immune to this agitation. Even though it is a relatively new field, critical reflection on its implicit assumptions is essential for further conceptual and empirical development. In particular, for relating financial systems to sustainability transitions where research remains under-developed.

3.4.6 Implications for relating financial systems and sustainability transitions

Section 3.4 reveals several research challenges. Firstly, extensive research on finance and sustainability exists covering a wide range of terminologies and specific dimensions of sustainability. However, it is not yet organised under a common approach or mainstreamed in economics and finance. Deciding on which sustainability-related finance framing to follow is complex. For example, justifying the choices of green, climate, impact or social finance requires interrogating the conceptual roots of these framings. Yet each framing may have useful contributions and specific limitations that influences its value for sustainability transition processes.

Secondly, though sustainability transition studies are maturing, finance-related research at systems level remains under-explored. Moreover, sustainability-related finance research appears to be evolving in a way that is not yet incorporating the system-level insights from sustainability transition studies.

Thirdly, critical engagement with practice-based initiatives that claim alignment with the finance-related objectives of the Paris Climate Agreement, Addis Agenda and SDGs is lacking among academic researchers. Lastly, the scoping results in Section 3.4 shows that old theories are being challenged, but new theories have not yet fully developed into coherent alternatives.

For these reasons, this paper inverts the research perspective to consider a new starting point as discussed in Section 3.5 for relating financial systems to sustainability transitions.

3.5 Demands of sustainability transitions on financial systems

This section offers insights from sustainability transition studies for relating financial systems to sustainability transitions and proposes a transitions demand framework to facilitate identifying the demands placed on the financial system by transition processes.

3.5.1 Insights from innovation studies

A review of finance and innovation research by O'Sullivan (2005) shows that limited research existed at the time inter-relating these subjects, except for the seminal work by Perez (2002) on technological revolutions and financial capital. Perez (2002), like Schumpeter (1942), positions the financial system at the centre of driving fundamental economic change through technology, in the context of technological revolutions or techno-economic paradigms (Dosi, 1982).[16] Perez, however, places greater emphasis on the resulting changes in the "*institutions of governance, of society, and even of ideologies and culture"* (Perez 2002, 24–25), implying radical changes to the systems that support the technological revolutions.

Perez makes the important elemental point that the characteristics of a specific technological revolution determines the nature of problems to be solved and the method of solving them. O'Sullivan (2005) reaches a similar conclusion – that advancing conceptual and empirical research on finance and innovation begins with first understanding the characteristics of the innovation process, which in turn informs the resource (finance) allocation. Practice-based research by Köhn (2012) follows a comparable argument that the characteristics of the environmental finance market represents the demands (need) for financial markets.

The arguments of Perez (2002), O'Sullivan (2005) and Köhn (2012) are exceptionally relevant for this paper as research on finance and sustainability transitions is at a similar nascent juncture where conceptualisation of finance is very limited as described in Section 3.4.2.

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[16] Perez (2002, 8) defines a technological revolution as a "powerful and highly visible cluster of new and dynamic technologies, products and industries, capable of bringing about an upheaval in the whole fabric of the economy and of propelling a long-term upsurge of development".

3.5.2 Differentiating features of this paper

Integrating finance into the transitions field is only beginning with contributions by Urban and Wójcik (2019) and Geddes and Schmidt (2020). These works, however, rely upon the MLP as the lens for linking finance to transition processes and are therefore subject to the limitations of how finance is framed within the MLP.

This paper adopts a fundamentally different approach. Firstly, it suspends defining the financial system through the lens of existing frameworks or within the established terminologies specific to sustainability transitions research. Secondly, it proposes that the starting point for conceptualising the financial system in sustainability transition processes is to identify how finance engages with the characteristics of sustainability transitions and understand the demands it places on financial systems. Thirdly, only after such understanding is deepened can further conceptual and empirical work linking financial systems and sustainability transitions be advanced.

3.5.3 Determining transition characteristics and demands

Transition scholars acknowledge that sustainability transitions are complex processes displaying differentiated characteristics across transitions contexts (Berkhout et al., 2004), transition typologies (Geels and Schot, 2007) and transition pathways (Foxon, 2013a). A useful paper by Loorbach et al. (2017) summarises the origins and evolution of sustainability transitions research since its emergence in 1990s, describing its main approaches and relevance to policy challenges. Based on a synthesis of the state of sustainability transitions studies at that time, Loorbach et al. (2017) categorise transition processes as i) being non-linear and disruptive, ii) targeting the goal of achieving a new sustainable economic state, iii) having multi-level and contested interactions, iv) resulting in the co-evolution and emergence of new systems, and v) displaying variation and selection in achieving the new sustainable state (Loorbach et al., 2017).[17]

These descriptors are useful starting point to test the hypothesis of Perez (2002) and O'Sullivan (2005) and achieve the primary objective of this paper – to define a core set of characteristics that then informs the demands placed on the financial system. This was achieved by using Loorbach et al. (2017) as the initial basis to identify further

[17] See: Elzen et al., 2004; Raven, 2006; Geels, 2010; Lachman, 2013 for earlier categorisation of the characteristics of transition processes.

literature relating to characteristics, using a snowballing approach. The transition characteristics defined in Table 3.2 is the result of this iterative literature review process, culminating in the unique categorisations assigned by the author.

Table 3.2 Transition demands framework

	Transition characteristics	**Consequential demands placed on the financial system**
#1	Directional changes	The intermediaries, markets and infrastructure of the financial system consistently direct themselves toward achieving a new sustainable economic system.
#2	Temporal realities	The financial system responds across short-, medium- and longer-term timeframes to address the systemic needs of transition processes.
#3	Co-existent system effects	The financial system generates environmental and social system-level effects by creating new socially inclusive, environmentally sustainable economic systems *and simultaneously* destabilising old environmentally unsustainable, socially unequal economic systems.
#4	Contested social context	The financial system engages with a broad base of stakeholders in developing its response to support the transition process.
#5	Contextual experimentation	The financial system experiments and applies adaptive approaches to address the contextual needs of sustainability transition processes.

Structured in this manner, the transition characteristics facilitate defining the consequential demands that sustainability transitions place on the financial system. These transition characteristics are further elaborated in the sections that follow.

3.5.4 Directional changes

Transitions can emerge through evolutionary changes within an economy (Smith et al., 2010; Silveira, 2016). However, sustainability transitions are different in that they represent a normative goal with a predetermined outcome, being low emission, climate-resilient development that is socially just and inclusive (Swilling and Annecke, 2006). Setting new directions and goals for development are political and contested processes. At a multilateral level, the Paris Climate Agreement, the Addis Agenda and SDGs signal these directional changes. Countries, however, apply varied ambitions in achieving such goals in the midst of competing and contested national processes (Spratt, 2015).

Loorbach et al. (2017) describes sustainability transitions processes as targeting a new sustainable state, which implies two directional shifts – directing *and* redirecting

economic systems towards responding to the sustainability and climate breakdown. Firstly, directing transition processes means such processes are purposive and objective-oriented with some ability to be controlled or directed (Smith et al., 2010; Raven and Verbong, 2009; Geels, 2011; Kemp and van Lente, 2011). Secondly, redirecting means shifting from unsustainable to sustainable practices in production and consumption patterns, structures, sub-systems, cultures and behaviours (Mersmann et al., 2014; Köhler et al., 2019), to meet societal needs in fundamentally different ways (Rotmans et al., 2001).

The demands on the financial system of these directional changes relate to deploying large amounts of resources towards investment that addresses the sustainability and climate breakdown (Geels, 2013). The nature of this demand is not unusual, in that large amounts of finance inevitably flow towards new investment opportunities arising during periods of rapid change (Perez, 2002). However, the directional shifts for sustainability transitions also require ensuring finance flows are consistent and integrated (UN, 2015a, 2015b, 2015c). This means that the role of the financial system has a qualitative aspect. Maintaining a consistent investment direction implies, for example, divesting from existing investments in unsustainable industries (such as fossil-fuel investments) and terminating any new investment in unsustainable industries.

New approaches may be needed to project development and investment appraisal criteria that prioritise environmental and social outcomes (Spratt, 2009). For the infrastructure of the financial system, consistent and integrated finance flows may mean reflecting on the fundamental changes needed within the financial system that address incentives and behaviours. For example, misdirected intermediaries, ill-disciplined markets and poor infrastructure within the financial systems pose a risk to transition processes. The risk of misdirection and short-term profit-seeking is shown by the recurrence of financial crises (Perez, 2013; Geels, 2013; Swilling, 2013). The directional changes implied by sustainability transitions requires assessing whether the financial system is fit for the purpose of directing *and* sustaining such processes.

Financial-economic relationships are biased towards debt, financial returns and resource exploitation and the short-termism of markets (Geels, 2013; O'Riordan, 2013). Therefore, directing the financial system towards sustainability transitions can only occur by dislodging the power of finance (Perez, 2013; Foxon, 2013b; Antal and van den Bergh, 2013; Swilling, 2013). This suggests that measures are required to address investment behaviour and incentives, discipline finance to act in line with societal and

environmental interests, and repurpose finance away from its dominant focus on economic interests.

3.5.5 Temporal realities

The IPCC Special Report argues that a narrow window remains for implementing targeted interventions by 2030, which means the context for sustainability transitions is inherently urgent. Therefore, intertemporal values and issues should be at the core of policy responses to the climate breakdown to avert the mounting societal challenges and address the doubling of infrastructure demands over the next 20 years (Bhattacharya et al., 2016; Stern, 2018).[18]

Transition processes generally unfold over long periods of time and in a non-linear manner (Geels, 2011; Alkemade et al., 2011; Loorbach et al., 2017) as do technological revolutions (Perez, 2002). The longer durations associated with transition processes are problematic for the sustainability and climate breakdown because of the temporal dynamics underpinning the Paris Climate Agreement, the Addis Agenda and SDGs. However, accelerating sustainability transitions is also possible where interests align (Sovacool and Geels, 2016; Sovacool, 2016).

The temporal realities cause tensions as the sustainability and climate breakdown compete for policy and political attention against the risk of a further financial-economic crisis – with each developing over different timeframes with specific causes and solutions (Geels, 2013; Antal and van den Bergh, 2013; Loorbach and Huffenreuter, 2013; Vergragt, 2013; Witt, 2013; Swilling, 2013; O'Riordan, 2013; Perez, 2013). For example, the policy concerns over the course of a transition process differ, with immediate challenges that include how to mobilise large sums of money, initiate policy and institutional changes, and how governments can gain public support and legitimacy during such a time (Geels, 2013).

Accelerated transition processes are critical, given the mounting climate and sustainability challenges – though they also compete with concerns of having to regulate the speed of the transition to maintain financial stability (Campiglio et al., 2018; Carney, 2018). Greater support for accelerated action may arise from initiatives such as the Bank

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[18] The term "intertemporal" relates to past, present and future events and conditions. In this paper, it refers to the time-sensitive nature of climate breakdown and how, for example, choices are made between current and future benefits.

of England's stress-testing of the climate risk of the UK's financial system (Carney, 2019a).

The demands on the financial system mean addressing the temporal realities of transition processes within the narrow window for action identified in the IPCC Special Report and the longer-term impacts of such processes. The primary challenge is instilling a sense of urgency among intermediaries, markets and infrastructure to orient resources towards financing interventions that lower emissions and build resilience to the escalating effects of the sustainability and climate breakdown.

For intermediaries and markets, programming investment priorities across different time scales and providing access to resources when this is needed may be useful. For example, in the short term, investing in rebuilding and repurposing critical infrastructure damaged by climate events without locking in high-carbon options, and facilitating access to emergency reconstruction efforts.[19] Over the medium term, investing sustainable production, consumption and other system-level changes. Over the longer term, maintaining new sustainable pathways through investment that prioritises qualitative (environmental and social) not only economic objectives.

For infrastructure, developing legal, regulatory, monitoring and administrative processes and funding partnerships that ensure resources match with the temporal realities of transitions. This may be achieved by assessing the capabilities and limitations of the national finance system, its interdependence with the global financial system, and developing appropriate measures for accelerating transitions. These factors are relevant especially for the global South, where access to international development support is essential to advance transitions. Innovations among financial intermediaries may be necessary to facilitate the temporal realities – for example, fast-tracking implementation through accelerated lending practices, creating special purpose vehicles for project implementation, and developing alternative funding platforms to provide access to resources. The temporal realities require focused actions.

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[19] Cyclone Idai, for example, resulted in Mozambique having to take out a US$118.2 million emergency loan from the International Monetary Fund because there was no external funding available for reconstruction. The loan was heavily criticised by civil society and climate activists. See, for example, Suffee (2019).

3.5.6 Co-existent system effects

Sustainability transitions processes allow the co-evolution and emergence of new economic systems, address unsustainable practices in economic systems which incremental solutions cannot shift, and facilitate transformational systems-level impacts (Raven and Verbong, 2009; Geels, 2011; Kemp and van Lente, 2011; Mersmann et al., 2014; Loorbach et al., 2017). Unsustainable practices, in this context, refers to the expanding global influence of economic systems which are destructive to the social, biological and geological processes of the earth (Mathews, 2015). Industrial development, in particular, is resource-intensive and directly linked to high carbon emissions and far-reaching system transitions (IPCC, 2018). Spratt (2015) argues that transition processes focused on technology-focused fixes such as carbon emissions trading may implicitly assume that once the environmental impacts are achieved, the underlying systems may continue as before.

Sustainability transitions therefore require broader effects in the economic system that extend beyond technology-directed solutions (Perez, 2002; Swilling and Annecke, 2006; Gower et al., 2012; Mathews, 2015; Spratt, 2015). The systems effect should address environmental *and* social dimensions. The social dimensions raise the risk that sustainability transitions exacerbate existing and unsustainable social inequalities by favouring those with access to resources (Swilling and Annecke, 2006). The environmental dimensions require shifting the incumbent development pathway away from its lock-in of high-emission infrastructure (Unruh, 2002; Foxon, 2011) and resource-intensive production and consumption processes (Antal and van den Bergh, 2013).

Addressing the environment and social dimensions of system-level effects require two kinds of policies to be implemented simultaneously: firstly, policies that cause the new system to emerge, and, secondly, policies that destabilise the old system until it eventually fades over time (Kivimaa and Kern, 2016). The simultaneous creation-destruction process is difficult to achieve in practice due to the lock-in and inertia of incumbent economic, social and political systems and vested interests (Unruh, 2002; Stirling, 2006; Voß et al., 2009; Newell, 2014).

As the “old” and “new” development pathways co-exist, tensions between the two may lead to what Gramsci (1971) called “morbid symptoms”. These symptoms may include inertia and inaction, actions that are taken too late to achieve any benefit for those affected, a struggle for survival by incumbents and retaining practices inconsistent with

new sustainable pathways, the risk of further social inequality, and fear of job losses. The co-existing tensions and these Gramscian morbid symptoms are especially reflected in the resistance to change among incumbents who have structural power and are able to lobby governments to delay or divert the shifts towards more sustainable paths (Lockwood et al., 2019; Ting and Byrne, 2020).

Another potential morbid symptom is the dominance of green growth imperatives for creating the new sustainable pathway, which reflects the high-growth expectations of governments, business and citizens and increases the risk of financial crises (Antal and van den Bergh, 2013; Loorbach and Huffenreuter, 2013; Vergragt, 2013; Witt, 2013; Geels, 2013; Swilling, 2013). The new sustainable pathway is framed as green growth (Jacobs, 2012) and the new industries that emerge represent opportunities for entrepreneurs and venture capitalists (Perez, 2013; van der Ploeg and Withagen, 2013; Swilling, 2013).

Such framing potentially masks the deep systemic and cultural problems of unsustainable production and consumption, and ignores the need to address social inequalities. Bringing a new sustainable pathway to the fore requires social activism and engagement (Voß et al., 2009; Witt, 2013; Vergragt, 2013), as well as the willingness to experiment (O'Riordan, 2013; Mathews, 2015; Kivimaa and Kern, 2016). Navigating these tensions therefore requires political efforts to destabilise the old systems towards the point of crisis and nurturing the new system towards dominance.

The demands placed on the financial system to deliver systems-level impact relate to accepting the inherent duality of the co-existence of old and new economic systems. Firstly, the financial system needs to evaluate its rationale for supporting sustainability transitions, potentially shifting the dominant investment framing of *opportunity* (which incentivises the pursuit of high growth and implies there is an option about whether or not to support sustainability transitions) towards the environmental and social imperative of *necessity*, which conveys the existential imperative of creating new sustainable pathways.

The *opportunity* rationale for transitions contributes to mobilising finance in the short term. While useful for investing in immediate needs, such focus fails to address inappropriate behaviours and incentives among financial intermediaries and markets. The *necessity* rationale requires financial systems to identify and address upfront unsustainable practices within the intermediaries, markets and infrastructure to mitigate

the risk that they will resurface in the new sustainable pathway. Failing to engage on the unsustainable practices within the financial system risks creating a transitions-related financial crisis.

Meeting the social dimension requires, for example, ensuring resources are made available to vulnerable and marginalised groups, such as rural communities, indigenous people, women and youth, which requires reflecting on investment appraisal and lending practices. Meeting the environmental demand means prioritising and incentivising finance to establish a dominant new economic system (Geels, 2013), by investing in environment-focused innovations that reduce harmful emissions such as renewable energy and alternative transport systems, and build resilience to climate breakdown, such as improving port infrastructure for rising sea levels. The financial system should also actively promote practices and policies that destabilise the old development pathways through disincentives for investing and maintaining harmful, high carbon-emitting industries and offer financial innovations to assist such industries to transition.[20]

Disruption to the old development pathways is inevitable and necessary, which is problematic for the financial system. This is evident from the Bank of England's focus on stress-testing and disclosing climate-related risks to manage the pace and scale of the transition process as it impacts on the stability of the financial system (Carney, 2018). However, a complementary focus may be recognising the *necessity* and *inevitability* of the transition process, and creating financial systems that are adaptable and responsive to the environmental and social dimensions of the transition.

3.5.7 Contested social context

Sustainability transition processes result in multi-level and contested interactions among new social drivers of sustainability transitions, which contributes towards different long-term visions of the new sustainable pathway emerging, typified by iterative and non-linear policy-making (Loorbach et al., 2017).

Transition processes bring forth new pioneers of change such as communities, youth and civil society who are promoting visions of the new sustainable economic pathway and demonstrating its desirability, legitimacy, and feasibility (Stirling, 2006; Scoones et

[20] A practice-related example is the transition bonds recently proposed by AXA Investment Managers (2019) to support carbon-intensive companies to finance the transition away from reliance on fossil fuels.

al., 2015). These new pioneers show that governments are not the sole architects of sustainability transition processes. Networks form among these pioneers, bringing together actors that have not worked together before to harness their collective potential to challenge the development status quo (Stirling, 2006).

Broad coalitions emerge from among the networks of different social actors that build support and maintain public pressure until the new development pathways emerge over time (Stirling, 2006; Foxon, 2013a; Scoones et al., 2015). For example, the School Strike for Climate and the Extinction Rebellion activists draw attention to the immediacy of the sustainability and climate breakdown and the need for accelerated responses by government and business. Social movements such as 350.org lobby for divestment from fossil fuels and maintain pressure on the financial system to prioritise the necessary directional changes.

The social dynamics of sustainability transitions mean that policy-making is challenging. Framing the long-term vision for the new sustainable economy requires clear and transparent goals. Such goals should reflect behavioural and institutional shifts, the uncertainties of different pathways, social and other costs, and the barriers and opportunities for implementation (Stirling, 2006; Scoones et al., 2015). The escalating levels of deprivation, degradation and inequality that are a result of sustainability and climate breakdown means framing such a long-term vision becomes even more complicated (Gower et al., 2012). The policy-making process is, therefore, marked by competing and uncertain policy options and demands (Loorbach et al., 2017).

Further, as much as sustainability transitions are viewed positively, the process by which these goals are achieved faces inevitable social contestation with diverging interests and visions of the future (Bradley and Hedrén, 2014). The stark polarity of the divergences requires close engagement with the social aspects of transition processes, and not only its technological dimensions (Avila, 2018; Sovacool et al., 2019). Sovacool et al. makes an important point that "*many of the same actors, economic forces, and rationalities driving [transitions] were benefitting formerly from fossil-led growth*" (Sovacool et al., 2019, 615). These tensions require bridging the social and policy context of sustainability transitions through inclusive, participatory policy processes that draw together broad coalitions and include flexible feedback loops that allow for learning through failures and successes (Stirling, 2006; Smith and Stirling, 2007; Sovacool et al., 2019; Sovacool et al., 2020). For example, incumbents in an energy transition are under pressure during sustainability transition processes to switch from fossil-fuel companies (coal, oil, gas)

and transition towards clean energy sources.[21] These incumbents will display a reluctance due to the loss of revenue and livelihoods, as they are typically labour-intensive industries (Lockwood et al., 2019; Ting and Byrne, 2020).

Open, dynamic and reflexive policy options are therefore necessary (Foxon, 2013b). More precisely, policies that challenge the roles of government and acknowledge the bias of human actions recognise the institutional complexities of banks and financial regulation and acknowledge the dynamic processes shaping technological and institutional changes (Foxon, 2013b; Perez, 2013; O'Riordan, 2013; Swilling, 2013; Geels, 2013). Different policy mixes which allow for studying the feedback effects of transition processes are also necessary (Edmondson et al., 2018).

The financial system is located within a contested social and policy context in which it may be subjected to questions about the legitimacy of its response to the sustainability and climate breakdown. The Paris Climate Agreement, the SDGs and the Addis Agenda require consistent and integrated finance flows to achieve the new sustainable economy. In this context, the demand on the financial system is a willingness to transparently engage in inclusive and participatory processes that collectively frame a shared vision for a new sustainable economy. This would require the financial system to open itself to insights from broad coalitions on its contribution to transition processes through consistent and integrated finance flows as envisaged in the Paris Climate Agreement and the Addis Agenda.

Further, the financial system may need to develop inclusive approaches for designing new projects that prioritise environmental and social effects and support the transition process. Non-traditional business models and new financing arrangements that accommodate different social partners' project development and implementation needs may be useful (Brown, 2018; Bidmon and Knab, 2018).

The policy mixes supporting the new sustainable pathways may be costly to implement in the short term due to low tax bases, immature technologies, insufficient technical capacities, or other barriers (Granoff et al., 2016). This means that short-term policy objectives may take priority over policies focused on achieving longer-term structural shifts. The policy context of transition processes contrasts starkly with the financial

[21] New research that develops a typology of "losers" in the transition process was under review at the time of finalising this thesis. Such research may be useful for future scholars to consider.

system's preference for clear policy signals before it engages in new and untested economic initiatives. Since policy uncertainty is inevitable in transition processes, the financial system may need to focus attention on contributing to sustainability transitions within the prevailing policy context.

3.5.8 Contextual experimentation

The IPCC Special Report reflects the contextual reality of the sustainability and climate breakdown – higher incidence of droughts, famine and wildfires, species and biodiversity loss, increased risks of disease, job losses, food and water shortages, and social conflicts (IPCC, 2018). Designing the range of new sustainable pathways vary with the scientific evidence and require iterative, non-linear, learning-by-doing and innovative approaches (Rip, 2006). These approaches imply experimentation and testing within different contexts. Examples include new technology shifts, new concepts of welfare, new social innovations and alternative forms of international and national cooperation (Mersmann et al., 2014). The Paris Climate Agreement recognises the need for experimentation and learning-by-doing in that countries are required to generate increasingly ambitious climate actions over time (UN, 2015c).

Experimentation and iterative learning that considers a variety of stakeholder views is therefore necessary to develop appropriate context-specific responses to the sustainability and climate breakdown (Loorbach et al., 2017; Foxon et al., 2009). Experimental approaches also require enabling policy interventions to guide and induce innovations that shape future economic states, are transformative, and are designed to trigger deep levels of systems change (Voß et al., 2009; Schot and Steinmueller, 2018).

The demands placed on the financial system may depend on the intensity of the sustainability transition process adopted at a country level. For example, less intense and localised ambitions for addressing the environmental and social aspects of the sustainability and climate breakdown may be more easily financed than more ambitious environmental and social goals (Spratt, 2015). Experimental and adaptive approaches should therefore be applied across the financial system, which support lengthy gestation periods that allows transition processes to unfold and facilitates an ongoing process of learning by doing (Avelino, 2009; Voß et al., 2009). However, such an approach is incompatible with the current imperative to demonstrate immediate and predictable economic results.

Investment by intermediaries and markets may currently be contingent on proven approaches and a given range of certainty regarding return on investment – neither of which may be present in a transition context. Investment may therefore fail to materialise or occur at expensive rates. Public intermediaries (e.g. national development banks, multilateral and bilateral development agencies) may bridge investment shortfalls for transition processes, especially in the global South. However, the quantity of investment required to address the sustainability and climate breakdown means that the financial system may need to re-evaluate its return-on-investment criteria to incorporate environmental and social returns in a sustainability transition context.

3.5.9 Characteristics as basis for financial systems response

Sustainability transitions aim to achieve the goals of the Paris Climate Agreement and the SDGs, that is to shift development towards sustainable paths. The process to achieve these goals has specific characteristics as elaborated in this section. Each characteristic also holds the potential for negatively impacting others. Explicitly, the disputed processes of sustainability transitions carry the risk of misdirecting and delaying or derailing efforts to shift towards new sustainable paths. These negative impacts also carry the risk of creating, replicating and entrenching the injustices of the old system, especially because the same actors, forces and motivations that created the old system are in effect trying to build the new system (Sovacool et al., 2019).

In practice, the transitions demand framework offers policymakers an opportunity to interrogate the characteristics of the transition processes underway in their country. The value of engaging first with the characteristics of sustainability transition is its ability to identify the complexities of this process. As other scholars have mentioned, understanding the characteristics of a process is critical for designing appropriate solutions to engage with that process (Minsky, 1986; Perez, 2002; O'Sullivan, 2005; Köhn, 2012). The rationale applied by these scholars suggests that where a process is overly simplified, the risk of ill-conceived solutions also exists. The transition demands developed in this paper serve as a framework to evaluate the extent to which the financial system can meet these demands. This shifts the focus of enquiry towards the necessity and urgency of creating new sustainability pathways, and on the actions required *from the financial system* to achieve such an outcome.

Once establishing the characteristics of the transition process, the next stage of enquiry is to consider whether the financial system can respond to its demands? Responding to

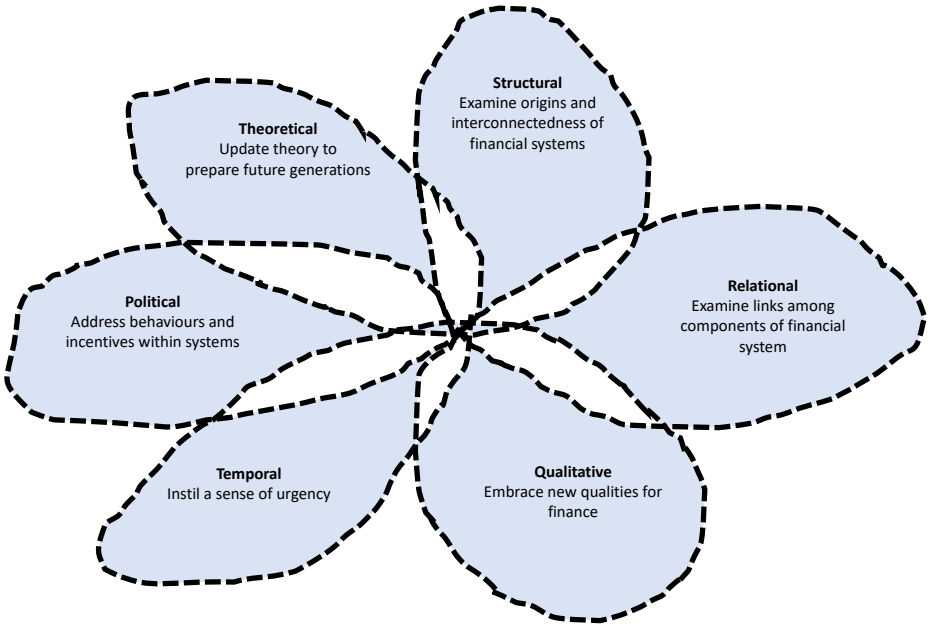
this question requires understanding the scope and intensity of the financial response relative to such demands. The next Section 3.6 explores this question in further detail.

3.6 Design features to enable financial systems response

The sustainability and climate breakdown as framed by the Paris Climate Agreement, the Addis Agenda, SDGs and the IPCC Special Report requires a systems-level response to manifest new sustainable pathways – in every country, every sector, and every household. The transition demands of sustainability transitions discussed in Section 3.5 suggest that the scope of the financial systems response to such demands may require a particular depth and breadth. This section considers the essential features and considerations for designing (or transforming) a financial system that meets the transition demands. The uneven and overlapping shapes of these design features illustrated in Figure 3.2 acknowledge that transition processes are non-linear, interdependent and iterative. No one design feature is more critical than the other. However, each may have different temporal possibilities and implications.

The design features discussed in this section relate to the financial system as defined in this thesis – a network of intermediaries, markets and infrastructure, which are critical to enabling radical shifts necessary for creating sustainable pathways. Therefore, each of the considerations applies in different ways to public and private institutions such as commercial banks, development finance banks, and institutional investors (intermediaries as defined); listed and unlisted platforms where financial instruments such as debt and equity (and variations thereof) are traded (markets as defined); and the regulators, supervisors and other support structures that facilitate the functioning of the financial system (infrastructure as defined).

Figure 3.2 Design features for financial systems response to transition demands



This section also proposes potential research questions that sustainability transition scholars may consider engaging with, to broaden further empirical and conceptual linkages between sustainability transitions processes with financial systems.

3.6.1 Political: Address behaviours and incentives within systems

The demands placed on the financial system by sustainability transitions show that it needs to direct and generate both environmental and social system-level effects while simultaneously destabilising unsustainable development pathways. While finance is a fluid and adaptable resource, it is not a neutral participant in the economy. This lack of neutrality means there is a political dimension to the financial system's responses, raising questions about the scale and nature of the response to achieve the systems-level, directional and other demands inherent in transition processes.

The sustainability and climate breakdown offer many investment opportunities that can drive radical shifts, for example, shifting towards clean energy systems – opportunities framed as contributing to green growth. However, the directional changes and systems-level effects that characterise sustainability transition processes and the implications of the IPCC Special Report carry *temporal necessities*, which extend beyond new investment opportunities. Finance is likely to flow towards the new sustainable technologies, based on the natural ebb and flow that accompany these investment opportunities (Perez, 2002). While new reorientations in investment management such as impact investing, sustainable and green finance exist, pursuing optimal risk-return

investments remains the dominant preoccupation of bankers (Spratt, 2015; Lagoarde-Segot, 2015; Brooks et al., 2018).

The call of the Paris Agreement and the Addis Agenda for consistent and integrated finance flows suggest a deeper response is required beyond making funds available for the new development pathways. Such deeper response raises questions, for example, how does framing the sustainability and climate breakdown as an *opportunity* for green growth affect the *necessity* of what needs to be done to achieve the new economic state? *Who controls the flow of funds? What is funded and what is not?*

Schumpeter (1942) characterised bankers as actors that cause radical changes through their investment behaviours. At the same time, significant economic losses over recurrent financial crises are directly attributed to such behaviours (Reinhardt and Rogoff, 2009; Griffith-Jones et al., 2010). The problem-solving processes of individuals are influenced by their personal and institutional values, their training, and their prior experiences in different cultural contexts (Bronfenbrenner, 1979). Therefore, the ability to enable radical changes depends on the influences acting on these bankers, which relates to the mandate, reward incentives and risk tolerance levels of finance intermediaries and the markets. These influences are formulated into investment positions, which are determined by investment committees, deal-makers and risk managers (Knafo et al., 2018).

The political dimension of the sustainability and climate breakdown, therefore, implies direct and explicit influence on the funding decisions of bankers, asset managers and others who can make finance available.

The response of the financial system to the demands of transition processes depends on how it frames the sustainability and climate breakdown. *Is it about new financial innovations, managing climate or sustainability risks, or pursuing new investment opportunities? What should happen in the short term that has long-term implications for sustaining the new economic system? Is more required?* For example, practice-based research calls for a transformation of the entire financial system (EUHLEG, 2018; UN, 2018a). *Why is that the case? What informs the transformation process? Who will direct the transformation process? What does consistency and integration mean to the financial system relative to policymakers and social drivers of change?*

Directing the institutions and individuals in the finance system towards the sustainability imperative will be an inherently political and contested process, leading to tensions

between the changes the finance system is *willing* to make, and the changes it *should* make. The political dimension requires going beyond discussing the quantum of finance available for investing in the new sustainable economic path. It should recognise that finance may only flow under certain conditions to achieve the new sustainable economic state. Key questions to ask would be, *what are those conditions,* and *what informs those conditions?* The political dimension also draws attention to how the financial system relates to itself, and the social drivers of change, as examined in the next section.

3.6.2 Relational: Examine links among components of financial system

The relational dimension relates to how different components of the financial system (its intermediaries, markets and infrastructure) regard their individual and collective role in responding to the sustainability and climate breakdown. It also relates to how these components contribute towards building a consistent and integrated financial system that responds to the demands of transition processes. Meeting transition demands also require engaging on issues of inclusivity with new social drivers. These drivers contribute towards shared visions of change, and experimental approaches are necessary to achieve new development pathways. *To what extent is the financial system able to meet these demands?* The transition demand heightens the need for critical reflection on how intermediaries, markets and infrastructure of the financial system relate to each other, and how they define their purpose in transition processes.

Among the intermediaries are banks, institutional investors and national development banks who serve as the point of access and exchange of finance with those seeking funds. The relational dimension is addressed directly in the call of the Paris Climate Agreement and the Addis Agenda for consistency and integrated finance flows within the financial system against the background of urgent action required by the IPCC Special Report. The extent to which the financial intermediaries engage with these calls directly affects the degree to which transition demands are met. Further, the financial system's response to the sustainability and climate breakdown depends on the openly stated commitments of individual countries to meet the goals of the Paris Climate Agreement and the SDGs.[22]

[22] For example, the Nationally Determined Contributions for reductions in greenhouse gas emissions under the United Nations Framework Convention on Climate Change.

The demands placed on the financial system and its ability to meet them also depends on the intensity of the environmental and social aspects of the breakdown in specific contexts (Spratt, 2015). Sector-specific changes may be less demanding for the financial system than shifts that address economy-wide transformations. The intensity of these economic shifts will influence the type of financial innovations that emerge, the inclusion of new social players, and how relations between intermediaries evolve (Spratt, 2015).

For example, at the level of designing new financial products and business models, each intermediary offers a range of financial instruments such as loans, shares, guarantees to reduce risk, and grants based on its investment mandates and priorities. Public and private intermediaries relate to each other in country context-specific ways. Their existing relationships determine their investment decisions, collaborations, and support of specific interventions. For example, public intermediaries such as state-owned banks are expected to invest in economic development objectives such as health, social welfare and infrastructure, and support high-risk investment where other forms of finance fail (Mazzucato and Penna, 2016). By contrast, private intermediaries such as banks and institutional investors mainly focus on investment opportunities that minimise risk and maximise returns on investment for their shareholders (Spratt, 2009). Some scholars argue that incentives are required to attract private finance flows towards alternative investments (Spratt, 2009).

However, public institutions can also create and shape new markets to promote new investment opportunities (Mazzucato, 2013; Mazzucato and Semienuek, 2018). Each intermediary offers different types of finance, depending on where they engage in the transition process. For example, different types of financiers engage in the financing renewable energy innovations based on their investment mandate and preferences (Mazzucato and Semieneuk, 2018).

The relational dimension within and between different financial intermediaries also affects the temporal dynamics of sustainability transitions as short-term interventions are required to deliver long-term effects. Several questions arise. *How much finance flows? How accessible is such funding? Will finance flow organically over time to support the transition process? Moreover, who holds the financial system accountable for its response?*

Relating to the social drivers of change requires the financial system to engage in designing interventions that drive the new development pathways. Since systems effects

is a demand placed on the financial system, the scale of interventions implies going beyond the traditional approach of financing single projects and shifting towards portfolio approaches (i.e. recurring combinations of projects and programmes) that support scaled-up interventions. The interventions also require experimental and adaptive approaches due to the uncertainty of their impact on the system and changing policy contexts. An example of an experimental financial innovation is the Green Fund managed since 2012 by the Development Bank of Southern Africa. The Green Fund was designed according to a learning-by-doing approach, and was useful in identifying the developmental needs of green projects and defining their environmental, social, and financial returns (Naidoo, 2019b, 2019d).

Evaluating the traditional roles and mandates of intermediaries, markets and infrastructure relative to their role in creating and sustaining a new development may be helpful for understanding to what degree the financial system should transform itself. Addressing these relational issues also depends on the structure of the financial system as the next section shows.

3.6.3 Structural: Examine origins and interconnectedness of financial systems

The structural dimension relates to a country's national financial system. Why this focus? The evolution of a country's financial system influences its ability to drive radical economic shifts and determines the pace and scale of future development (Schumpeter, 1942; Gerschenkron, 1962). The structural dimension incorporates the degree to which the national finance system is interconnected with the global financial system, which determines its vulnerability to financial crises originating in other jurisdictions (Aziakpono, 2006). The structural dimension also requires consideration of the cultural influences from which financial systems originate and the forces that shape their evolution (Naidoo, 2019b; Urban and Wójcik, 2019). For example, the dominant model for financial systems are British or American banking systems, with differentiated approaches in the Middle East and Asian countries (Urban and Wójcik, 2019).

Given these factors, the structural dimension significantly influences how the financial system responds to sustainability transition processes. This means that any structural impediments or advantages of a country's financial system may either inhibit or promote transition processes.

The impediments or advantages of the financial system in question affect the diversity of financial innovations available for structuring and financing projects and programmes

(Pathania and Bose, 2014; Polzin et al., 2017; Naidoo, 2019b; Urban and Wójcik, 2019). Financial innovations can arise in two ways. Firstly, existing intermediaries in the financial system may collaborate to create new financial instruments. Secondly, new government policies may encourage the creation of new financial innovations (Pathania and Bose, 2014). For example, financial instruments for longer-term funding needs of renewable energy investment may not be available due to the structure of a national financial system (Polzin et al., 2017).

Also, financial innovations are biased towards debt (Turner, 2016; Polzin et al., 2017), and such bias influences how investment decisions are made, what is financed, and by whom (both public and private). Debt bias has potential negative consequences in that mainly incremental investments are made (as opposed to enabling radical changes necessary for shifting to sustainable pathways), these focus on preserving the initial investment, and then only within a narrow range of calculable risks (Polzin et al., 2017). Therefore, critical investments necessary to effect radical changes that enable sustainable pathways may not be made (e.g. a traditional fossil fuel company switching to being a clean energy company). Further, investments with a limited ability to generate income to repay such debt may lag behind (e.g. building the resilience of coastal regions).

Debt bias also relates to how excessive debt within an interconnected financial system has the potential to disrupt the financial stability and generate immense economic and social losses (Luca and Tieman, 2016). Past financial crisis is especially attributed to the overdependence on debt as an instrument driving finance flows in the economy, caused by the issuance of debt-related financial innovations (i.e. home mortgage-backed securities in the 2008 financial crisis) (Turner, 2016).

These dynamics amplify the need for new innovative non-debt-based instruments and models for exchanging and deploying financial resources, such as crowdfunding platforms (Ansart and Monvoisin, 2017).

The Paris Climate Agreement and SDGs are interdependent – requiring responses to both the environmental and social dimensions of sustainability. This implies consistent and integrated financial systems to support the shift to new sustainable paths. For example, the focus of green growth and its associated reward expectations as a response to transition demands (Section 3.5) requires reflection.

Since transition processes require contextual experimentation, creating diverse financial systems may be helpful. Features such as learning-by-doing mechanisms, digital platforms and community finance arrangements may be within the realm of possibility for creating a diverse financial system that is both accessible to, and relevant for, the demands of transition processes.

Structural limitations further influence the extent to which there is equitable access to finance for the transition process. This has an impact on how the directional changes unfold, whether the desired systems impact is achieved, and the level of social contestation. For example, structural limitations in Ghana's finance system inhibit access to finance for renewable energy project developers; project development and entrepreneurial finance is limited (Beggs, 2018). Poor access to finance for vulnerable groups and small to medium-sized firms place may inhibit a just and equitable transition from materialising in South Africa (Naidoo, 2019b).

The structural limitations, therefore, require open engagement between the drivers of change to consider openly how the financial system can be reoriented to the purpose of sustaining the new development pathways. For example, practice-based initiatives led by the UNEP Inquiry, the UK Green Finance Strategy and EUHLEG appear promising. However, these have not yet been subjected to independent academic consideration, so their assumptions of change are not yet visible.

Falcone et al. (2018) observe that the financial system reforms are mainly led by the global North with limited evidence of global South engagement. It therefore worth asking, *whose vision of a sustainable financial system is being advanced? How is the vision constructed to include broader social dimensions? How does the vision relate to the demands of sustainability transition processes? What dimensions are being included or excluded in constructing these visions, and why?*

Systems innovation and co-evolution are inherent parts of sustainability transitions processes (Geels, 2010), suggesting that stagnant and rigid financial systems should be reviewed. This has broad implications. Importantly, it sets a new challenge for finance, including and going beyond the Schumpetarian goal of achieving radical changes in the economy. The challenge is to direct the financial system towards supporting environmental and social sustainability, which requires consistent and integrated approaches to maintaining this direction. An added challenge for the financial system is the lack of time and impending urgencies.

3.6.4 Temporal: Instil a sense of urgent action

The rate of past energy transitions provokes debates about the temporal realities of transitions: need they be lengthy and protracted processes, or should we be asking what it will take to accelerate them (Sovacool, 2016)? Also, accelerated transitions require increasing the pace and scale of public policies that respond to the sustainability and climate breakdown (Stern, 2018). The emerging debate on the temporality of transitions is relevant because transitions depend on a series of actors and forces to forge new pathways (Fouquet, 2016).

The realities of the sustainability and climate breakdown should drive transition processes and the temporal timeframes of responses. This means that the slow pace of sustainability transitions is concerning (Schmitz, 2015; Brown and Granoff, 2018). It therefore becomes important to ask: *how does a focus on the longer term shift the debate on financing sustainability transitions?*

These debates are timely. The IPCC Special Report puts forward the real-world drivers and arguments for accelerated transitions, offering evidence of heightened environmental and social crises unless urgent actions are taken (IPCC, 2018). These debates should be extended into academic and empirical research on relating the financial system to sustainability transitions. *What will it take to deliver finance urgently and at scale? What type of funding and governance models are needed to do so? What does this imply for public and private investment strategies? What type of governance arrangements and financing models can support accelerated transitions? What role can central banks play in ensuring that the financial system moves at the required pace and scale?*

The temporality of the sustainability and climate breakdown evokes a sense of urgency regarding the dimensions discussed so far in this section. The urgency, in turn, leads to questions about the qualitative dimensions of how financial systems respond to transition demands This is explored in the next section.

3.6.5 Qualitative: Embrace new qualities for finance

References to the quality of finance relate to the reluctance of investment managers to invest over the longer term. Calls for reorienting finance towards qualitative dimensions first appeared in the aftermath of the 2008 financial crisis with calls for “patient capital” (Knafo and Dutta, 2016). Such patient capital enables a shift away from the short-

termism of investment allocations and financialisation (finance investing in finance), and a move towards long-term gains (Mazzucato, 2013; Mazzucato and Wray, 2015)[23]. Since transition processes are iterative and experimental, patient capital is essential for learning by doing, which is identified in Section 3.5 as the contextual experimental characteristic.

While patient capital is a useful starting point for the qualitative dimensions for finance, the transition demands also imply considering additional qualities for finance. This paper, therefore, proposes the qualities of consistency, pragmatism, responsiveness, inclusivity and adaptability as additional qualities for the financial system to respond to transition demands:

a) *Consistency:* Consistency addresses the directional shift of finance towards sustainability and away from unsustainable options. This quality links to the Paris Climate Agreement (UN, 2015c) call for finance flows to be consistent with sustainability transition processes and for integration per the SDGs and the Addis Agenda (UN, 2015b, 2015a). This quality also acknowledges tensions and difficult choices inherent in transition processes; regardless, maintaining consistency in the response should always be prioritised.
b) *Pragmatism:* Pragmatism addresses the temporal realities of the breakdown – by considering new business and funding models for accelerated access to finance for sustainability transitions. This includes reducing the lag effects associated with governance delays that slow down the development and implementation of projects. This quality derives from the temporal realities and context of transitions highlighted by various authors (Stern, 2018; Sovacool, 2016; Geels et al., 2017).
c) *Responsiveness:* This quality links to the temporal needs of the sustainability and climate breakdown such as reducing greenhouse gas emissions, increasing resilience and addressing crises such as habitat destruction and displaced people. These needs reflect uncertainty and significant variability of responses. A financial system that is responsive and willing to provide swift access to finance

[23] "Financialisation" relates to profits gained from investing in listed financial instruments (debt and equity) rather than through traditional production. For example, a company can show profit from buying back its shares and yet have losses in its main businesses. This trend has grown significantly over years, curbing investment in traditional economic activities – hence, the expression that economies have become "financialised".

for these needs, and that permits experimentation and learning by doing, is therefore essential.

d) *Inclusivity:* Inclusivity ensures that new coalitions participate equitably in the transition process to address social inequalities in the economy. This is a critical quality to ensure that responses to transitions do not exacerbate existing social inequalities (Vergragt, 2013; Witt, 2013).

e) *Adaptability:* This quality argues for more adaptive approaches to investment decision-making that depend on a social mechanism that influences the behaviour of financiers (Hall et al., 2016). Such a mechanism would accommodate experimentation, learning by doing, and iterative decision processes. The quality of adaptability also addresses the co-existence of creative and destructive elements during transition processes. It also implies focusing adaptability rather than stability as a basis for managing financial systems.

These qualities are especially useful for reflecting on the rationale behind the response of the financial system to the climate and sustainability breakdown. For example, central banks and regulators focus on maintaining stable and secure financial systems to facilitate economic development and avert financial crises. This implies a specific role for central banks and regulators on information disclosures and risk management strategies to reduce and manage the uncertainties linked to sustainability transition processes and the climate breakdown (Campiglio et al., 2018; Battiston et al., 2016; Stolbova et al., 2018). However, alternative debates hold that focusing on stability and managing financial risks is a defensive approach; instead, central banks should offer incentives to the financial system to support green investment (Tooze, 2019).

Reorienting the financial system's focus to include the qualitative issues described above requires deep reflection on the underlying theories and assumptions that drive the investment behaviours, cultures and incentives of financial institutions (Lagoarde-Segot, 2015; Diaz-Rainey et al., 2016), as discussed in the next section.

3.6.6 Theoretical: Update theory to prepare future generations

The theoretical dimension refers to investing in the education of future generations who will be the bankers and policymakers leading the new development pathways of the future. Their responsibility will be to maintain the direction of sustainability transitions and sustain the systems transformation when they make their decisions in the future.

Finance as an academic discipline resides within economic studies, a field in which scholars and students are questioning the ability to address real-world challenges of sustainability and climate breakdown (Orléan, 2014; Lagoarde-Segot, 2015; Raworth, 2017). Early conceptions of finance connect to real economic growth and human well-being, but finance evolved mainly using quantitative approaches (Raworth, 2017). For example, the concept of sustainable finance infers a qualitative approach to finance which is incompatible with orthodox financial models (Lagoarde-Segot, 2018). These mismatched approaches create an epistemological challenge for conceptual and empirical research.

Further, some authors argue that the theories on which financial models are based have no theoretical basis for embedding environmental and social objectives, despite existing framings of what sustainable finance should entail (Lagoarde-Segot and Paranque, 2017). These epistemological challenges lend urgency to evaluating and interrogating the underlying assumptions of financial innovations and practice-based initiatives that claim to support sustainability transitions.

This lack of appropriate theoretical conceptualisation between the sustainability transitions and finance fields raises questions for both the pace and depth of sustainability transitions in the short term. For example, *how do financial theories lock in changes that the financial system is **prepared** to make, rather than the changes it is **required** to make?* The poor conceptual development of finance and sustainability transitions also means empirical research on financial innovations and reforms is limited by current framings of finance and sustainability transitions.

The short-term risk is that sustainability transition processes may be constrained by a financial system that is guided by financial theories incompatible with sustainability transitions. Rethinking the field of finance is therefore essential for long-term systems transformation aligned with responding in a consistent and integrated manner to the sustainability and climate breakdown.

Also, sustainability transitions literature mainly positions finance neutrally by assigning a background role to finance as a function inherent in user practices and as one of the resources critical for advancing transition processes. This neutral positioning masks the broader and multi-layered complexity of the political dimensions of the financial system. It is therefore critical to develop new framings for finance in sustainability transitions studies. Such framings should focus on developing heuristics that can examine causal

linkages, for example how financial system responses to sustainability transitions inhibit or promote such transitions.

Finance-related research in sustainability transitions studies generally apply the MLP as a core heuristic, which frames finance as a resource and function. While the MLP is useful for reflecting the *process* of transitions, its ability to explain the causality of transition processes is limited (Svensson and Nikoleris, 2018; Sorrell, 2018). Causal explanations are essential for answering questions such as that posed by Köhler et al. (2019) about how financial capital restricts or promotes sustainability transitions.

Independently evaluating practice-based initiatives and policy research that claims to advance transition processes is also essential because the seeds of the financial system's responses are planted through these initiatives. While there are no guarantees of success, the future generation of policymakers and bankers will either benefit from what they learn, or be tasked with unravelling misdirected and poorly conceived approaches.

Although new reorientations and conceptual developments may only take effect over time, efforts in the theoretical dimension are critical for educating and laying strong foundations for future generations of bankers, policymakers, entrepreneurs and consumers. Sustainability transitions research is not only about creating new development pathways. It relates to sustaining such paths by putting in place measures that ensure no reversion to unsustainable economic options or investment behaviours. Academia has a vital role to play through the power of ideas and education.

3.6.7 Implications for future research

The discussion invites interdisciplinary approaches to further relate financial systems and sustainability transitions. The implications for future research extend beyond the subject matter of this paper, which started with identifying possibilities for relating financial systems and sustainability transitions.

A recurrent theme stands out in the critical emergent literature on finance and sustainability – the need for explicit assumptions (Section 3.4.5) and, specifically, the relevance and validity of the assumptions of orthodox economic theories to societal challenges (Orléan, 2014; Raworth, 2017; Mazzucato, 2018), and the epistemological assumptions of finance that make embedding sustainability difficult (Aspinall et al., 2018; Lagoarde-Segot, 2018; Diaz-Rianey et al., 2016). For sustainability transition studies,

the research highlights the limitations of the tacit assumptions informing the sustainability transitions field such as accepting the orthodox view of capitalism (Swilling, 2013; Feola, 2019) and the assumptions underlying the ontological foundations of sustainability transitions and the MLP heuristic (Svensson and Nikoleris, 2018; Sorrell, 2018).

Why focus on assumptions? In any change context, explicit assumptions help to articulate expectations and generate effective responses where possible, which enhances the rate, scale and pace of the change process (Stern, 2018). Assumptions contain the underlying elements of that which we accept unthinkingly (Feola, 2019). This means that the design of solutions is inclined to embody the unquestioned and silent assumptions about the cause and effect of a problem. Solutions influence how future conceptual, empirical and policy-making processes unfold. Theory cannot solve the problems of sustainability and climate breakdown. However, the implicit assumptions informing theory-policy-practice exchanges may have the effect of accelerating the breakdown rather than mitigating its effects. This may lead to misdirected and misaligned transition processes and locking in fault lines that would have to be unravelled in future, if this is still possible.

For these reasons, the paper encourages transition scholars to openly examine the assumptions about the problem and the emerging solutions. Feola (2019, 7) describes transition scholars as "not only researchers but also change actors in society" – that is, change actors studying the process of responding to sustainability and climate breakdown. This means that the process of theory and policy research and development in sustainability transition studies carries a duty of care and responsibility towards present and future generations. It requires continually reflecting on, *what is the nature of the problem(s)? What implicit assumptions underpin our ideas and solutions concerning such problems? How may the assumptions we hold be problematic in future?*

By making our assumptions visible, we create space for ourselves, current and future generations of scholars to engage critically. The call to transition scholars for relating financial systems to sustainability transitions is especially important. Current research in this area is limited. Finance is conceptually under-developed, so its causal effects or influences cannot be studied. A sound understanding of the causal linkages between financial systems and sustainability transitions is essential. Such understanding facilitates research on how finance and financial systems inhibit or advance transition processes, so that ongoing improvements can be made in the spirit of learning by doing.

3.7 Conclusions

Sustainability transitions will struggle to materialise without the active engagement of financial systems. However, the role that such systems play extends beyond financing the new sustainable pathways. We know that the availability of finance is not a constraint for sustainability transitions as over US$112 trillion (PwC, 2017) is currently circulating in the global economy that can potentially address the sustainability and climate breakdown. This suggests that calls by the Paris Agreement, the SDGs and the Addis Agenda for the financial system to have consistent and integrated finance flows relates to qualitative rather than purely quantitative roles for financial systems.

This paper set out to explore possibilities for relating financial systems and sustainability transitions. Section 3.4 scopes existing research and finds broad sustainability-related finance literature with limited critical engagement and little cross-engagement with sustainability transition studies. This context together with the underdeveloped conceptualisation of finance at a systems level in sustainability transition studies creates conceptual challenges for connecting with current sustainability-related finance literature.

Section 3.5 argues that relating financial systems to sustainability transitions begins with understanding the nature of the transition process and identifies a framework of indicative demands for the financial system to respond to. This is akin to asking, *what is the nature of the problem being solved?* The transition demands represent explicit assumptions for the financial system to engage with, and the framework may be useful for evaluating the extent to which the financial system can meet such demands. Explicit demands also serve as a point of reference for situating and critically evaluating the response of the financial system relative to such demands. Such ability to critique the responses of the financial system is presently lacking in sustainability-related finance and sustainability transition studies.

Section 3.6 proposes essential design features for responding to the transition demands, which involves multiple overlapping dimensions. These features may be useful for deconstructing the implicit assumptions framing finance and the financial system. This paper does not presume that the financial system has to transform to be compatible with a new sustainable pathway. Rather it argues that if such a transformation is indeed required, then its depth and breadth matter. The paper then identifies critical questions to broaden research in this area.

This paper invites scholars and policymakers to reflect further on the explicit demands that transitions place on the financial system, the process of designing solutions, and the underlying assumptions and critique of such solutions.

In the words of George Harrison, "*If you don't know where you're going, any road will take you there."*[24] It is a timely warning. Although responding to sustainability and climate breakdown requires accelerating rapid and radical changes, in our haste, we may overlook the dangerous assumptions that created the breakdown in the first place. That way we may find ourselves on a road that, sometime in the future, is right back at the same unsustainable place.

3.8 Acknowledgements

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[24] Extract from George Harrison's song "Any Road".

4 Transitioning South Africa's financial system towards sustainability

This chapter focuses on the research question what structural features in financial systems promote or inhibit sustainability transitions?

The content was published as Chapter 6 in Mohamed, N. (ed.), 2019. Sustainability Transitions in South Africa. Taylor & Francis, London. The version presented here differs from the published chapter in respect of adjusted titles, and is aligned for consistency with terms used elsewhere in this thesis. Also, the version in this thesis contains two figures (4.2 and 4.3) which do not appear in the published book chapter.

4.1 Introduction

South Africa is not a homogenous country and varieties of sustainability transitions are evident across and within national, provincial and local levels of government, including differences among actors and intermediaries within the country (Death, 2015). The financial system plays an important role in navigating such differences and can support the emergence of new development pathways, yet policymakers generally overlook its strategic role in achieving sustainable outcomes (Jeucken, 2001; Naidoo et al., 2014). On the other hand, the financial system has historically been unaware of the motivation and pressures of transitioning to more sustainable development pathways *and* oblivious to the key role it can fulfil in achieving this (Jeucken, 2001).

To be fair, these views have advanced as more financial intermediaries recognise that greening finance opens new market opportunities (Ramiah and Gregoriou, 2016). But doubt still exists about the pace, rate and scale of change within the financial system to support sustainability transitions. Only time will tell whether current efforts will facilitate the process of sustainability transitions, yet time is something the world does not have (Schmitz, 2015). In the timeless words of William Shakespeare (1602):

"*if money goes before, all paths do lie open*".[25]

which implies that unless money is put towards the process of sustainability transitions, transitions will not materialise or, at best, will not result in transformative changes.

[25] The Merry Wives of Windsor, Act 2 Scene 2.

This chapter briefly outlines the global context of financing sustainability transitions, presents insights from academic literature, and offers a historical background to South Africa's financial system and its structural challenges.

The chapter draws on three examples which provide useful insights into the early learnings of finance mechanisms seeking to improve access to finance to individuals and small firms wanting to participate in South Africa's sustainability transition. They include: i) the Green Fund which is managed by the Development Bank of Southern Africa; and ii) the role of the South African National Biodiversity Institute as a financial intermediary of international environmental funds. The third example highlights a potential blind spot in South Africa's financial system, that of inadequate access to finance for women. The chapter concludes with reflections on the ability of the financial system to support sustainability transitions in future and proposals for further work.

4.2 The global context – past and present

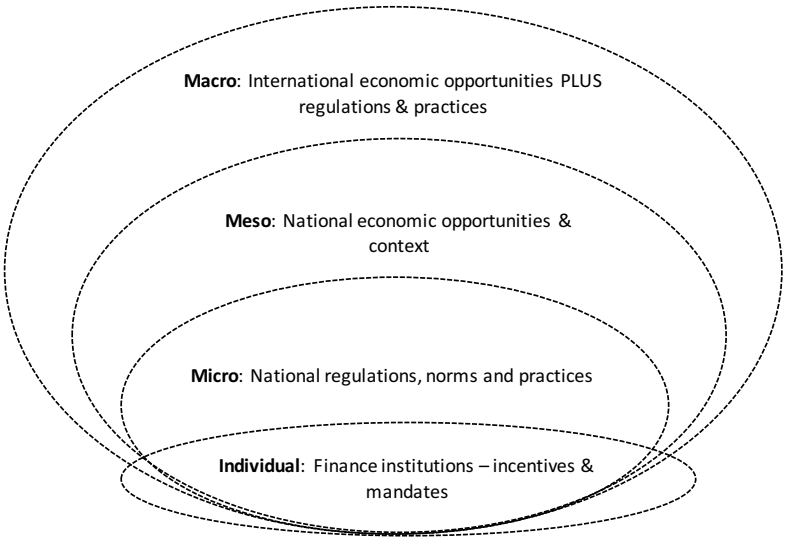
Economists such as Schumpeter believed that the financial system has the potential to drive radical and transformative changes in the economy (Schumpeter, 1939 cited in Mathews, 2015; O'Sullivan, 2005). But what is this financial system and how does it operate? In 1864, Walter Bagehot described it as an organisation of credit which allocates finance among those with excess finances to those that require it (Bagehot, 1873). Over 150 years later, this description remains useful as a basic textbook description; though we also need to consider the connections between national and international financial systems that organise such credit flows.

Figure 4.1 offers a view of the broader connections and nesting of finance intermediaries within micro, meso and macro contexts.[26] Regulations and industry standards govern risk allocation, protect providers and users of finance and maintain the stability of the financial system. Economic opportunities and performance of investment determine the organisation and accessibility of credit (Spratt, 2009). This means the guiding light of investment decisions by these individual financial intermediaries is maximising return and minimising risk. Such risks are largely measured against financial dimensions, i.e. risk-adjusted rates of return per unit of lending or investment over a prescribed time period (Spratt, 2009).

[26] This figure is a simplified version of Figure 1.2 for the purpose of the publication.

While the nested positions influence the incentives and mandates of the finance intermediaries, it is also important to recognise that they have the power to significantly impact national and international economic and regulatory contexts, as the 2008 financial crisis demonstrated.

Figure 4.1 Nesting of financial intermediaries within national and international influences



Environmental and social dimensions within the financial system were viewed as obstacles to investment in the early 1990s and therefore did not feature prominently as part of lending or investment decision-making (Jeucken, 2001). This view is changing as "green economy" and "green growth" paradigms are adopted as a response to global concerns of poor growth quality, loss of livelihoods and climate change. Seen in this light, these global shifts represent new economic opportunities to create greener jobs and promote clean technologies (Stern, 2007; Death, 2015).

Sustainability transitions towards an inclusive economy are uncontested and common goals of multilateral processes led by the United Nations in recent years – in 2015 alone, the Paris Climate Agreement, the SDGs and the Addis Agenda were agreed upon. Embedded within these agreements is a central role for financial systems in achieving sustainable development and climate goals.

Awareness efforts to green global and national financial systems, led by among others, the United Nations Environment Programme and the G20 Green Finance Working Group have escalated. Green finance is growing as a niche field, driven mainly by green and climate-aligned bond issuances – with US$895 billion issued by September 2017 (CBI,

2017). New green multilateral organisations such as the Green Climate Fund are growing in prominence while green finance pacts by insurers, pension funds, national and international development financial intermediaries are proliferating.

Evidence of the changing response of the financial system is the 2017 Global Risks Report published by the World Economic Forum. It states that failure to mitigate and adapt to climate change, the increased incidences of extreme weather events and water crises around the world are among the top five interconnected risks, which also links to conflict and the migration of people (WEF, 2017a). Investment flows seems to be shifting too – as reported by Bloomberg New Energy Finance, US$266 billion was invested in renewable energy in 2015, twice that of new coal investments for the same year (BNEF cited in WEF, 2017a).

There is much talk, some action – but is money flowing towards sustainability transitions at the scale and pace required? Let's explore – compare the US$74 trillion managed by institutional investors globally to the estimated US$440 billion to US$989 billion per year to support sustainability transitions (UN, 2014) or the estimated US$5 to US$7 trillion per year for climate-smart investments (UN, 2015d). The majority of required investment for sustainability transitions remains unfunded despite the availability of such funds (Morel et al., 2016). Some scholars argue that this funding gap may be attributed to poor investment incentives, unavailability of appropriate finance, low willingness to shift investment flows and insufficient public expenditure – while, others argue that project pipelines are of poor quality despite finance being available (Foxon, 2015; Mazzucato, 2015; Volz et al., 2015).

Efforts are currently focused on bridging the funding gap through special financial products that crowds in new investors, especially the private sector and on divestment from fossil fuel industries. Special green financial instruments (e.g. green bonds or green credit lines) are also criticised as insufficient to support a sustainability transition as it creates new asset classes, without impacting the entire investment portfolio of some asset managers (Mathews, 2015). Multilateral and bilateral development finance agencies also play an important role, especially among countries in the global South.

Generally, however, most efforts lack a sense of urgency (Schmitz, 2015). Will the growing reality of economic, social and environmental breakdown in many countries shift finance flows along the path of sustainability transitions?

4.3 Sustainability transitions and finance

Links between financial systems and sustainability transitions is underdeveloped in academic literature (O'Sullivan, 2005; Mazzucato, 2014; Mathews, 2015; Spratt, 2015; Naidoo, 2019a). However, studies exist arguing that well-functioning financial systems support economic development (Demirgüç-Kunt and Levine, 2009 and Levine, 2005 cited in Mohamed, 2014). However, sustainability transitions entail broader focus than economic development because environmental and social aspects are heightened priorities for the future.

In support of the distinction between transitions and economic development, Spratt (2015) argues that the financial system's response to sustainability transitions depends on the intensity of a country's ambition and response to environmental and social aspects.

Table 4.1 Typologies of the intensity of environmental and social responses
Source: Adapted from Spratt, 2015

		Intensity of environmental response	
		Low	**High**
Intensity of social response	**Low**	**Light Green** Restructure of economic systems e.g. energy with zero/low interest in social issues – with green growth as a solution.	**Dark Green** Precautionary approach prioritising human quality of life, with low interest in social issues.
	High	**Light Green & Red** Dominant approach to sustainable development in terms of income inequality and poverty with concern for environment.	**Dark Green & Red** Precautionary approach combined with interest in income distribution and wealth.

According to Spratt (2015), a "light green approach" (per Table 4.1) focusing on sectoral reform (e.g. transport or energy) implies loan and equity for project financing with low interest in social impact. In comparison, "light green and red" and "dark green and red" approaches such as those adopted by China, Ethiopia and Rwanda require substantial restructuring of the financial incentives and decision-making capabilities, new intermediaries and the inclusion of environmental and social risks as well as active divestment from fossil-fuel industries.

This is a useful framework to situate South Africa's sustainability transition process which appears to fall within the "light green and red" quadrant. This positioning is based on the example of the country's primary focus on diversifying its energy sector, and creating a sectoral renewable energy programme. Also, that programme has specific social aspects that investors are obliged to comply with, i.e. using local suppliers and manufacturers where possible, and the inclusion of previously disadvantaged communities as beneficiaries of the programme.[27] These communities are a focus due to attempts by the South African government to redress the economic and social imbalances created by the country's apartheid legacy.

One the one hand, South Africa's financial system supported the majority of investment, including the participation of previously disadvantaged individuals and communities. On the other hand, this support is criticised for favouring larger investors at the expense of the programme's social objectives (Baker, 2015b).

What types of finance is necessary to support sustainability transitions? The financial system is not homogenous – it is made up of different actors that offer different types of finance and would interpret the new economic opportunities offered by sustainability transitions based on their risk-return perceptions. The implication is that the type of finance available to support sustainability transitions depends on the actors within that financial system (Spratt, 2015; Mazzucato and Semieneuk, 2018).

We could argue that a particular quality of finance is necessary for sustainability transitions such as firstly, longer-term and more patient capital applied towards e.g. project development, early stage investment and capacity building (skills, policies); secondly, short-term funding in the form of working capital; and thirdly, ensuring broad and diverse access to finance to facilitate the social aspects of the sustainability transition, especially for marginalised groups (Mazzucato, 2014; Spratt, 2015). Some aspects of sustainability transitions are difficult to finance, especially for the global South countries such as the prototyping, research and development and commercialisation of new technologies and concepts. In this regard, multilateral and bilateral development agencies – in partnership with government and private sector – can help to finance technical assistance (Mazzucato, 2015).

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[27] The term "previously disadvantaged communities" is analogous to the term empowerment shareholders mentioned in Chapter 5.

During the transition period, policy makers need to break down the practices and norms linked with the old system, while simultaneously nurturing new greener systems (Voβ et al., 2009). This is a key feature of transitions management, also discussed elsewhere with reference to the need for system innovation while concomitantly undertaking system improvements. This destabilising transition period may place new demands on the financial system that challenge the status quo. Can the South African financial system respond to the demands of sustainability transitions?

4.4 The South African financial system – past and present

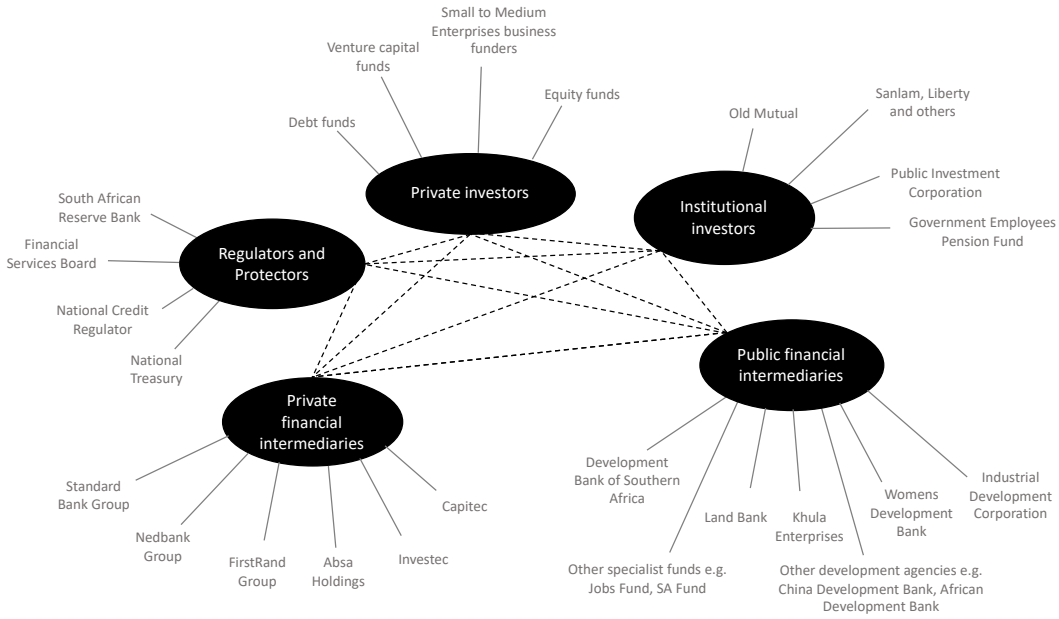
The foundation of South Africa's financial system was laid by its colonial and apartheid legacy which created financial intermediaries and practices that served the ruling party interests of the time (Mohamed, 2014; Verhoef, 2009). Initially dominated by British-owned banks, the discovery of gold, diamonds and other precious minerals led to the emergence of imperial banks to support British business and settler interests (Mohamed, 2014). These mineral discoveries made South Africa an attractive destination for European capital and British institutional investors who sought assurance that their investments were secure (Kubicek, 1979; Mohamed, 2014).

Five imperial banks entered South Africa in the nineteenth century – each bringing with them strong banking practices and norms developed in England to ensure the stability and protection of British investors (Jones, 1996). By the time the Union of South Africa was formed in 1910, these imperial banks dominated the banking sector. As the Afrikaner nationalist movements grew in strength, by 1948 new intermediaries had emerged such as Sanlam and Volkskas Bank to support business interests and households of the Afrikaners (Fine and Rustomjee, 1996; Mohamed, 2014;). Although banking deregulation since the mid-1980s aimed to reduce the concentration of the banking sector, it only served to liberalise the market operations. About 90% of banking assets were held by a few banks in 1910; that is still the case in present-day South Africa (Verhoef, 2009).

South Africa's financial system is viewed as a mature and well-regulated banking sector with deep capital markets guided by prudent and conservative regulation that meets international standards (Naidoo and Goldstuck, 2016a, 2016b). The banking sector has high levels of institutional concentration with six banks holding 90% of banking assets and an insurance industry equally dominated by four large companies (OECD, 2017). Other non-bank lenders also play a role in allocating resources including institutional

investors, private equity firms, development finance intermediaries and the Public Investment Corporation. Figure 4.2 illustrates the network within South Africa's financial system.

Figure 4.2 Illustration of South Africa's financial system



This depth of financial intermediaries and expertise supports South Africa's ranking as the most innovative financial system in the region (WEF, 2017b). The country has also made efforts to redress its apartheid legacy through the Financial Sector Charter introduced in 2004 which supports increased access to finance for previously disadvantaged South Africans. Its content is seen as innovative but there are lessons to be gained from the challenging process of mainstreaming social issues into the banking sector (Naidoo and Goldstuck, 2016a).

South Africa is, in principle, able to mobilise significant domestic resources for its sustainability transition. This is best demonstrated by the financing of the country's renewable energy programme valued at ZAR201.8 billion between 2011 and 2016, of which 76% was funded by domestic investors and 24% of from foreign investors[28]. South Africa has two major development finance intermediaries that support investment in industrial development and infrastructure. The Industrial Development Corporation committed ZAR25 billion to financing green industries over a three-year period up to

[28] Based on data provided by the IPP Office during fieldwork and their quarterly reports.

2015, and the DBSA committed ZAR20 to ZAR30 billion over the same period for green energy projects. Since these commitments were made, both intermediaries have significantly contributed to South Africa's renewable energy investment programme.

Importantly, direct and indirect allocations in the national budget have played an important role in financing the country's sustainability transition. Preliminary work in 2013 by the National Treasury and DBSA suggests that between ZAR14.7 billion and ZAR18.7 billion were allocated towards environmental objectives within the national budget for 2012/13, including allocations for climate, transport, water, sanitation and environmental protection (Hemraj, 2012 and Naidoo, 2012 cited in Montmasson-Clair, 2013).

Although South Africa benefits from official development assistance, this historically only accounts for 1% of the government budget (OECD, 2011). In the context of international multilateral funds supporting environment and climate issues, South Africa has benefited from the Global Environment Facility (GEF), Clean Technology Fund, Adaptation Fund, and the Green Climate Fund.

4.5 Progress towards financing sustainability transitions

There are promising features within the South African financial system that support future investment in sustainable development and climate action. These include new investment principles introduced in 2011 under revisions to Regulation 28 of the Pensions Fund Act ("Regulation 28"). These revisions were motivated by the 2008 financial crisis and intended to encourage investors to shift from short to longer term investment horizons. Among the revisions is the need for funds to understand the environmental, social and governance characteristics of all investments being made.

Supporting Regulation 28 is industry guidelines which may be voluntarily adopted – the Code for Responsible Investing in South Africa (CRISA) which encourages institutional investors to develop sustainability policies and considerations in their investment analysis and activities. These soft regulatory and governance measures have raised awareness and enhanced reporting standards among investors, but capital allocations are still not shifting decisively towards sustainable alternatives (Naidoo and Goldstuck, 2016b).

The King III Code on Corporate Governance was adopted in March 2010 and required listed companies to integrate sustainability and financial reporting into a single annual report – reflecting companies' contributions to economic, social and environmental

challenges in South Africa. Integrated financial and sustainability reporting by listed companies improves the transparency of listed companies' efforts and complements the efforts by the Johannesburg Stock Exchange's Social Responsibility Investment Index. This exchange was launched in 2004 to highlight companies that integrate a focus on environment, social and governance in their business operations.

Active engagement on sustainable development and climate policy is facilitated through among others, the Banking Association of South Africa and National Business Initiative. For example, the National Business Initiative, supported by a grant from the Green Fund, ran an action learning project bringing together policy makers, project developers and financiers to define and understand the variables involved in setting policy priorities for greening South Africa's economy (Nichols et al., 2016).

From a policy perspective, the National Climate Change Response Policy (DEA, 2011) commits to a series of eight actions to enhance participation and partnership with the financial system in South Africa. These actions were meant to be addressed over the short, medium and longer term and include: i) contributing to multilateral debates and reforms to secure funding for the region; ii) attracting new sources of international assistance; iii) creating tracking mechanisms for finance; iv) forging domestic funding partnerships; and v) designing a long-term national financing strategy to ensure a sustained transition. While some of these policy proposals are in progress, some are yet to be activated, in particular the longer-term financing issues (Montmasson-Clair, 2013; Mughogho, 2017).

4.6 Needs of South Africa's financial system to support transitions

Observations from surveys among financial actors in South Africa conducted in 2007, 2011 and 2016 show that there has been a progressive shift in understanding of environmental, social and governance factors within the financial system. The survey of 2007 aimed to understand the awareness levels among investment practitioners of environmental, social and governance considerations in their investment decision making and determine the future prospects for responsible investment in South Africa.[29] The results showed that this view was not reflected in their investment allocations, although most regarded environmental, social and governance factors as marginally

[29] The CRISA code defines responsible investment as that which takes account of environmental, social and governance factors when making investment decisions.

material. The barrier to investments cited at the time was lack of demand from their institutional and retail customers which more legislation could potentially unlock (UN, 2007).

A 2011 survey among the public and private financial intermediaries to inform the National Climate Change Response Policy (Van Zyl et al., 2011) identified three critical barriers limiting investment in sustainability transitions. These were: i) lack of a long-term policy framework and legislation which creates uncertainty for investors; ii) a poor regulatory environment to approve and implement untested technologies, which limits new investment and innovation; and iii) a lack of consumer understanding of benefits of green/climate friendly products and services. Financial stakeholders were also asked to identify what role they could play in the country's sustainability transition process.

The survey showed that, in 2011, banks, insurers and development finance intermediaries in South Africa were aware of challenges of sustainable development and climate action, but were restricted in their ability to act voluntarily and required clear policy signals from government. The responses to this survey was high among the four major banks and the country's development intermediaries, yet the microfinance intermediaries did not participate. Their absence at the time reflects low recognition of the economic opportunities for small and medium-sized businesses in sustainability transitions.

By comparison, a 2016 survey identifies a heightened consciousness among institutional investors and banks with suggestions from such investors to promote their engagement. These include: i) strengthening fiduciary duty among financiers; ii) the packaging by government of green project pipelines and facilities; iii) new models to quantify environmental and social risks; iv) developing frameworks for lender liability; v) instituting reforms for unlisted assets; and vi) creating a common vision for a sustainable finance system (Naidoo and Goldstuck, 2016b).

The 2007, 2011 and 2016 surveys shows a progression in understanding of investors from being marginally aware of the importance of environmental, social and governance factors (2007) to appreciating that existing investment practices are insufficient to promote sustainability transitions (2016). This positive trajectory may have been influenced by the investment experience of the Department of Energy's renewable energy programme and bodes well for the future.

4.7 Potential structural challenges for financing transitions in South Africa

Despite these positive signals, there are still structural challenges within the financial system to overcome. South Africa has a concentrated banking sector (i.e. few large banks) which generally means that firms (especially small and medium-sized) have low access to financial services (Beck et al., 2009). Therefore, broadening the country's access to finance should be a major priority (OECD, 2017). Failure to address this challenge implies inadequate access to finance for smaller firms and the risk that the sustainability transition only benefits some firms and individuals. South Africa also lacks a market standard-bearer among its private banking sector that focuses on access to finance for women. Positive developments to broaden access of finance are new online banks and crowdfunding platforms to support small and medium-sized businesses and entrepreneurs.

The financial system in South Africa is highly interconnected with non-banking lenders (i.e. "shadow banking") including informal saving schemes such as community banks and stokvels which means that instability in one part of the system will impact all other lenders in the system (Kemp, 2017).[30] While the non-bank lenders broaden financing sources and lower the cost of funding through increased competition among lenders, if left unregulated, the risk for financial instability remains high (Kemp, 2017). The imminent changes in regulation in the country led by the South African Reserve Bank may address these risks (OECD, 2017).

South African banks are criticised as operating on the same basis as those in developed countries – where they speculate on their financial assets to increase their income (i.e. financialisation) rather than increasing lending volumes to deliver real economy outcomes (Mohamed, 2014). This raises a few questions – what role should South African banks play in advancing sustainability transitions in South Africa? To what extent can financialisation trends be reversed or regulated? The latter question may be addressed through imminent South African Reserve Bank regulations (OECD, 2017).

There are innovative examples to draw from, showing that some banks are actively engaged with responding to government's long-term development goals. One example

[30] Stokvels are self-organised informal community groups to address poverty and income insecurity among poor communities. They collectively save, and members are able to draw down on these savings as needed (Matuku, 2014).

is Nedbank which, since 2015, has been piloting its Fair-Share 2030 Programme. This initiative is designed to invest in the future of the environment, society and their business, targeting new lending of ZAR6 billion from 2015 to 2030 towards long-term development goals and in sectors of relevance for sustainability transitions (Nedbank, 2016).

In summary, the extent to which the South African financial system, including its public finances, is fit for purpose to support sustainability transitions will determine the depth, scale and pace of the country's transition. Ongoing work by the National Treasury's Green Finance Working Group to assess sustainable finance in South Africa will help shape a vision on how the financial system in South Africa can evolve to achieve this transition. This will be an important development to watch. For the time being, a focus on broadening access to finance is an important priority.

4.8 Examples of financial innovations and issues

This section presents examples of financing mechanisms and arrangements in South Africa supporting its process of sustainability transitions.

The first example outlines the formation and early experiences of the national Green Fund, designed to catalyse investment in a green economy. The second example describes SANBI's role in mobilising international finance mechanisms to promote climate resilience and social inclusivity. The third example highlights the risk that women may be left behind in South Africa's sustainability transition as no significant efforts are being made towards their inclusion. The section concludes with reflections on each example in the context of South Africa's financial system.

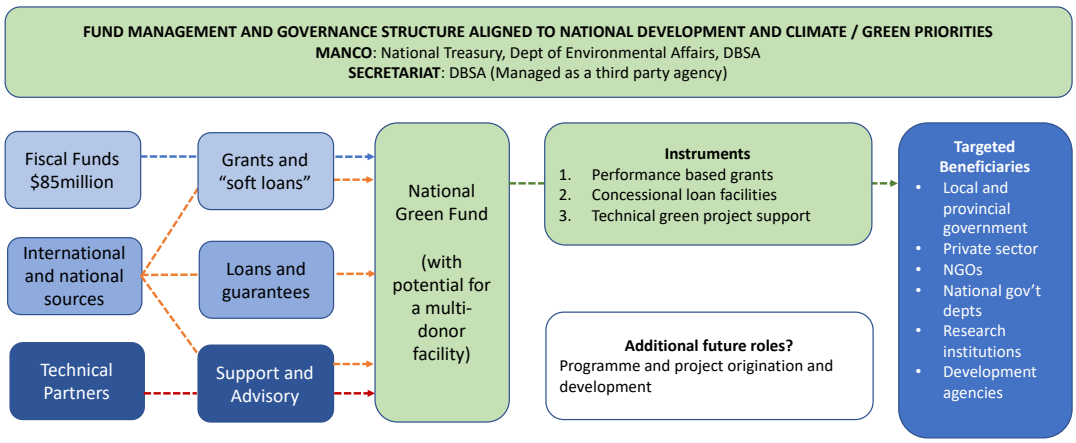
4.8.1 The Green Fund: Designed for "learning by doing"

The Green Economy Summit in May 2010 identified a need to demonstrate what is meant by a green economy. In response, the Department of Environmental Affairs (DEA) issued a call to determine the level of public interest in green projects.[31] The response was overwhelming, with over 300 respondents offering ideas on renewable energy, energy efficiency, waste management, water, transport, natural resource management and the built environment.

[31] The department was renamed the Department of Environment, Forests and Fisheries with effect from May 2019.

Figure 4.3 Design features of the Green Fund

Source: Naidoo, 2019d.



Followed by a series of focus groups in August 2010, interest in government-led green economy programmes was firmly established and the need for specific public budget allocations was expressed.

4.8.1.1 Overview of the Green Fund

In 2011, the national budget assigned ZAR800 million to DEA to establish a national Green Fund, subsequently increased to ZAR1.195 billion for use up until 31 March 2019 (National Treasury, 2011). The DEA, National Treasury and the DBSA worked together to design and operate the Green Fund by 2012. The design features of the Green Fund are illustrated in Figure 4.3.

Box 4.1 Learnings from South Africa's Green Fund

Contributors: Jenitha Badul and Michelle Layte

The establishment of a dedicated national Green Fund came at an opportune time in South Africa's history. It coincided with a period during which DEA was advancing implementation of green economy projects, which built upon legacy projects and event greening projects that emerged after the successful hosting of a low-carbon FIFA Soccer World Cup in 2010. The Green Fund was designed to promote investment through appropriate financial support and attract additional funders, particularly the private sector and sources of international development assistance. It was also designed to offer policy feedback to inform government's future policies and programmes on green economy, climate and sustainable development. The Fund also sought to support research,

development and innovation, and capacity development. These objectives are reflected in the capital allocation of its three functional areas, being:

- *Green investment*: 75% for green projects and programmes, either as non-recoverable grants, recoverable grants or as concessional loans (up to 4% less market-based rate);
- *Capacity building*: 20% for capacity building in green initiatives, through grants; and
- *Policy and research development*: 5% for policy and research development grants.

The target beneficiaries of the Green Fund include small to medium-sized businesses, and policy and research intermediaries which responded to specific calls for proposals by the Green Fund. A total of 55 projects were approved across these functional areas: investment (31), capacity development (8), and research and development (16). Most of these projects are active, and several have been completed (mainly research and policy). The portfolio is valued at ZAR679.8 million – with economic and development gains becoming evident, for example, direct investments in projects including private sector contributions co-investments of approximately ZAR89.1 million.

An unpublished impact evaluation commissioned by DEA of ten of the investment projects currently under implementation indicated that all projects contributed positively to pursuing the green economy agenda and demonstrating low-carbon development options (DEA, 2017). Development gains include approximately 24.5 tonnes of recyclables diverted from landfill and sold for re-use, 6,981 individuals being trained, 6,620 direct new jobs created, and 21,230 hectares of land restored. These early results uphold the objectives of the Green Fund: to harness ideas, contribute to development in different parts of the country, encourage job creation, grow South Africa's green economy through experience and knowledge, and identify replication opportunities through new financing partners.

The impact evaluation considered the degree of change before and after implementation of the projects. The ten projects predictably reflected a gap between expectations at approval when compared to delivery during implementation. The gap was due to the short timespan since implementation, low ability to monitor transformation, and the implementation capacities of the proponents. Despite challenging socio-economic contexts and implementation conditions, certain projects have caused major shifts towards sustainability, i.e. farming fish in the Karoo, creating a profession for shepherds, solar power supply to informal settlements, and waste generation from abattoir waste. Among the success factors of these projects are that they made economic, social and

environmental sense, received access to appropriate finance from the Green Fund, and saw committed project proponents and communities working together.

Further important impacts of the Green Fund identified by the impact study include:

- Job creation and capacity development, especially in communities where pilot projects led to localised economic diversification and there were new opportunities for skills development and sector growth;
- Awareness of the diversified green skills base needed to support sustainability interventions across sectors and within industries was amplified, supporting industry bodies, and strengthening institutional capacity.

New insights into the development of a domestic green economy were developed, ranging from new market concepts to strategic assessments to influence policy and investment. This support bridged an important research funding gap.

According to DEA, the Green Fund's future positioning needs to evolve from these early experiences. Priorities for change include: i) attracting external development partners and private investors which was not possible due to its legal status as a programme within the Ministry for Environmental Affairs; ii) buying down the risk of national projects and securing an adequate return on its investment; iii) creating a transparent governance structure focused on generating a strong pipeline of bankable projects, preferably at scale to attract potential investors; iv) applying strong monitoring and evaluation systems; and finally, v) diversifying its product and services to ensure future financial self-sustainability of the Green Fund (e.g. possibility of adding more complex debt and equity instruments).

4.8.1.2 Reflections on the Green Fund's impact

The Green Fund shone light on a blind spot in the South African financial system that was not fully apparent in 2010 when the DEA issued its call for green economy projects and programmes. Such projects were not on the investment horizon of the major banks at the time. It is clear from the impact study that the majority of the projects supported by the Green Fund to date would not have been financed.

The structural barriers to the South African financial system, mentioned above, offer insight why this may have been the case. The higher concentrated banking sector means that medium and small projects in general have limited access to affordable finance; new projects have high opportunity costs which may mean higher risk profiles (untested

technologies, new entrants with limited track record); and further, uncertainty on the returns that may be derived relative to “business as usual” projects.

Taking these factors into account, the South African government through its Green Fund could be viewed as an entrepreneur. The framing of “entrepreneurial state” comes from Mazzucato (2014). The Green Fund, using public funds, fulfilled the function of stimulating new green markets, offering appropriate finance, facilitating partnerships to unlock co-financing, and promoting policy and research to better understand green project requirements. The impact of entrepreneurial ventures is not usually visible in the short term. Yet the Green Fund has, through its thematic programmes, demonstrated how to catalyse and create demand for green economy projects, promote the uptake of new and emerging technologies, and support research and development alongside capacity development.

The longer-term benefits from the Green Fund’s role in South Africa’s sustainability transition will unfold as the projects mature and offer further learnings. The process of sustainability transitions is strongly focused on learning by doing (iterative, uncertain, testing new concepts and entrants). This means that both the successes and failures of the Green Fund are important for its learning and future positioning. It also highlights the need to design metrics to measure impact over the short, medium and longer term.

Now that the initial funding period for the Green Fund is nearing its conclusion, is the financing support it provides still necessary? The Green Fund played a significant role in breaking ground in collaboration with certain private and other financing partners. It can build on these learnings to ensure that the sustainability transition gathers momentum. The effectiveness of the next phase of the Green Fund’s contribution can be enhanced if the current and future needs of green economy projects and programmes are defined. This would ensure that the Green Fund is significantly distinguishable from other sources of funding in the country, and is well-positioned to harness other international environment and climate funds broadening access to the private sector – including small and medium-sized businesses.

4.8.2 SANBI: Role in international environment and climate mechanisms

South Africa’s annual adaptation investment and planning costs are estimated to be between US$3.8 billion and US$29.9 billion between 2021 and 2050 for water, forestry, energy, agriculture, biodiversity and disaster risk reduction (DEA, 2015). Some sectors requiring adaptation support such as energy, mining, public infrastructure and transport

have not yet been costed. Although the demand for funds for resilience and adaptation efforts in South Africa is significant, the impact on poor and marginalised communities is not fully accounted for.

Project development for adaptation and resilience can only happen at a community level, through participatory vulnerability assessments and co-developing associated response strategies. Projects are mainly community-led and require extensive stakeholder engagement and access to grants and technical assistance for implementation. These projects do not yield immediate financial returns that can be serviced through debt or equity. These are among the issues being considered in the national adaptation strategy under development by the DEA.

4.8.2.1 Overview of SANBI's role as financial intermediary

As a national entity, SANBI supports the Department's adaptation efforts by focusing on projects in areas and communities where it is difficult for private finance to be engaged. SANBI has achieved this through accessing finance from various sources, including international environment and climate funds. Until recently, such funds were only accessible through multilateral agencies such as the United Nations Development Programme or the World Bank. To access these funds directly, entities are required to undergo a rigorous due diligence process after which they are then accredited to serve as financial intermediary of a particular fund. This example explores SANBI's experience as a national financial intermediary of the Adaptation Fund and Green Climate Fund which offer technical assistance through concessional loans and grants to global South countries for climate and environment programmes.

Box 4.2 Enhancing the impact of international funds at the national level

Contributor: Mandy Barnett

Although formally established in 2004, SANBI's origins date to 1989. It is aimed at conserving and studying South Africa's diverse fauna and flora, through research and policy support in partnership with other stakeholders. Since 2002, SANBI is executing a project portfolio in excess of US$30 million, with the GEF, United Nations Development Programme and the World Bank as intermediaries. These projects primarily focus on management, conservation and restoration of biodiversity, and the policy and regulatory systems necessary to support these efforts. The location of the projects was mainly in

underserviced and vulnerable rural locations. These experiences built institutional capacity within SANBI to expand its project development and implementation roles.

This proven capacity prepared SANBI to successfully apply and be appointed as a national accredited entity of the Adaptation Fund (in 2011) and Green Climate Fund (in 2016) at the request of the Minister of Environment. In setting up the Adaptation Fund, SANBI harnessed the institution's long traditions of extensive stakeholder engagement, participatory approaches to programme development, inclusive and diverse governance structures and transparent project prioritisation criteria. Proposals presented to the Adaptation Fund through SANBI would thus reflect the most urgent and pressing needs within the identified communities.

SANBI also developed a unique investment framework for Adaptation Fund projects. This framework adapts international funds for local use by embedding South Africa's national development objectives of job creation, gender, marginalised communities and geographic balance directly into investment criteria. A National Steering Committee supports SANBI's work programme. The investment framework was put into practice in developing SANBI's application to the Adaptation Fund. This led to the Fund successfully raising US$10 million to deliver local adaptation responses within the context of local government development priorities. The impact of this financial support is significant as it allows for mainstreaming climate in development programmes of the district municipalities where these projects are located. These impacts include: i) building individual capacities of officials to practically integrate climate into different sectors; ii) catalysing partnerships among officials from different sectors and line departments that can identify and consider the multiple stressors influencing local-level vulnerabilities; iii) building high-level support to address climate within municipal and service delivery programmes; and iv) providing an evidence base that international funds are useful to support future local-level interventions.

SANBI was accredited to the Green Climate Fund in 2016, for grant-based projects of up to US$50 million. This level of accreditation is a major boost to financing adaptation interventions in South Africa, especially for those projects reliant upon grant funding. It increases SANBI's capacity to support adaptation and resilience five-fold, allowing it to develop a work programme more closely aligned to South Africa's national adaptation priorities.

SANBI is one of two financial intermediaries to the Green Climate Fund in South Africa. The other is the Development Bank of Southern Africa, which is also accredited by the Global Environment Facility. SANBI intends to focus only on the grant-based programmes,

and will work synergistically with other financial intermediaries on projects requiring other forms of finance.

SANBI actively engages with a wider community of financial intermediaries from other global South countries to enhance developing country agency and capacity by exchanging common challenges and aspirations, tools and approaches.

4.8.2.2 Reflections on SANBI's experience as a national intermediary

International environment and climate funds such as the Green Climate Fund, Global Environment Facility and Adaptation Fund are useful to bridge funding gaps in the financial system. However, certain preconditions exist for such funding to be used effectively so that they have longer-term impacts beyond the support of individual programmes. SANBI's process of engagement as a financial intermediary to international funds illustrates how such funds can be used more strategically. The deliberate planning, engagement and design processes it embarked on ensured that the national and local government priorities are embedded within the investment criteria of these funds.

As a national finance intermediary, SANBI effectively made international funds locally available, and significantly enhanced the quality of the programmes and projects it developed. Poor quality project pipelines are cited as one of the reasons for funding gaps. SANBI is addressing this upfront through its investment framework, participatory community engagement, integration of development and climate, and transparent governance structures. These processes support the capacities necessary for a long-term sustainability transition.

This strategic consideration of how to utilise international assistance within the national financial system is already increasing the effort, rigour and focus of South Africa's climate change response programme in anticipation of future investments. This should be extended to private finance intermediaries to develop a co-financing strategy so that public, private and international assistance can be effectively deployed towards funding the country's climate response strategies.

As a financial intermediary of international funds, SANBI should be guided by a clearly articulated vision for South Africa's sustainability transition. However, to enhance the effectiveness and impact of international finance, South Africa would need to consider a

few critical questions. The response to these questions can identify the range of programmes and projects necessary for its transition, costing and ideal implementors:

- *What are the future political, economic, social, technological, organisational, legal, and environmental systems necessary for its sustainability transition?*
- *What type of intermediaries, arrangements and capacities are needed to create these systems?*
- *Who are the important actors in the future systems, and how can their capacity to participate be built?*

Although South Africa has a mature and diverse financial system, it also has structural barriers and funding blind-spots that threaten the financial inclusivity of its sustainability transition. While not all forms of finance are able to act in the same way, a financing strategy that articulates the optimal use of international funds informed by the funding gaps in the national financial system would be very helpful. This would also benefit the private finance intermediaries to define their own place in supporting the country's sustainability transition, and especially its adaptation and resilience efforts.

4.8.3 Financial inclusion of women in sustainability transitions

Financial inclusion can be described as "a state in which all working age adults have effective access to credit, savings, payments and insurance from formal service providers" (Dema, 2015, 2). Effective access in this context means that such services should be delivered conveniently, responsibly and at an affordable cost (CGAP, 2011). With over 80% of its adult population holding an account at a formal financial institution (Fanta and Mutsonziwa, 2016), South Africa is considered to have a high degree of financial inclusion. Yet the numbers tell a different story – only 20% of women have active bank accounts, 54% are excluded from credit, and 65% are excluded from savings strands (Fanta and Mutsonziwa, 2016). In the case of men, only 40% hold active bank accounts, 54% are excluded from credit, and 63% excluded from savings strands. The numbers also show that financial intermediaries are not the major source of funding, especially for informal small and medium enterprises.

Of the total of 1,517 registered enterprises with sales under ZAR1 million, over 44.6% are run by women. Funding sources are mainly savings from their own resources (72%) and limited support from non-bank lending through stokvels (Stats SA, 2013). Several reasons are cited for why women face barriers in accessing finance for their businesses,

including insecure land rights, discriminatory societal and customary practices, lack of knowledge, and the practices of financial intermediaries (AfDB, 2015).

Based on this background, what are the chances that women in South Africa will be able to actively participate in the new economic opportunities offered by the process of sustainability transitions? What implications does this have for a financially inclusive transition?

4.8.3.1 Overview of financial inclusion issues

This section of the chapter describes initiatives in South Africa that have emerged in response to the barriers faced by women in accessing finance through traditional banking channels.

Box 4.3 Improving access to finance for women in South Africa

Contributor: Malango Mughogho

Financial intermediaries have practices that present barriers to the inclusion of women, according to the Alliance for Financial Inclusion (Dema, 2015). These barriers include: i) lack of gender-disaggregated data which means that gender-specific products and services are difficult to design; ii) risk aversion by banks to lend to smaller enterprises (most commonly run by women); iii) complexity of financial terms; and iv) maladapted service delivery in terms of the interface between women and bank staff (Dema, 2015). The discussion below examines how these barriers are being responded to in the South African context.

a) *Lack of gender-disaggregated data and market response:* First for Women is a short-term insurance company established in 2004 and developing products and services for women, including business insurance. The company applies a gender lens to its business model based on empirical evidence that women are statistically proven to be safer drivers than men, taking fewer risks, claiming less often than men, and at lower claim values. The First for Women's business model supports findings in other countries which shows that financial products and services can be tailored for women and women-led enterprises through gender-disaggregated data (GBA, 2014).

b) *Risk aversion of banks:* Smaller to medium-sized businesses have higher collateral requirements (i.e. assets that can offset losses in the event of loan default) due to perceived risks of higher business failure rates when compared to

larger enterprises. This creates a funding gap which non-bank lenders such as co-operative financial intermediaries can bridge by broadening access to finance. Through a membership-based banking model, they offer loans to members based on deposits received from members on flexible terms and at lower interest rates than banks. Despite relatively small deposits of ZAR233.8 million (CBDA, 2016) compared to ZAR3,451.7 million held by banks at February 2015 (SARB, 2015), they support an underserviced market segment which requires smaller loans.

c) *Complexity of financial terms:* Financial knowledge measured in terms of "financial literacy" for women in South Africa was 57.2 out of 100 in South Africa and 58.9 for men. In response, sector education and training authorities specific to the finance sector raise awareness among consumers, and support financial literacy training programmes funded by corporate payroll deductions, corporate social responsibility programmes and industry-level initiatives. While training is useful, certain aspects of financial literacy are dependent on macro-economic factors, i.e. the ability to exercise financial control over their affairs and future financial planning (Struwig and Gordon, 2016). Current efforts are unlikely to increase financial literacy levels among women and women-led enterprises.

d) *Maladapted financial service delivery:* Business Partners is partly owned by the South African government and supports women enterprises through its Women in Business Fund. The service offering to women includes no minimum contribution from its clients, access to a female investment team to support the loan application process, information and networking opportunities, access to a web-based library and electronic newsletters, mentorship, networking and seminars, and technical assistance grants. The Women in Business Fund demonstrates the findings of the Global Banking Alliance for Women that women clients require accessible collateral and unbiased loan decisions, linkages to buyers/ markets, financial information and product understanding, and networking through peer to peer collaboration and mentoring (GBA, 2014).

4.8.3.2 Reflections on ensuring the financial inclusion of women

These examples show that the barriers faced by women to accessing finance are partly being responded to within the South African financial system. Business models have arisen in response to financing gaps and using gender-disaggregated data to develop market-based strategies that ensure women are included in the economy. The growth of cooperative financial intermediaries and specialist funds allows small and micro women-

led businesses to participate in the economy, while financial literacy efforts build knowledge and awareness.

Among the four major banks in South Africa, there are incubator programmes to support women-led businesses, specialist women funds, and the hosting of annual events to honour women in specific industries. Among the statutory development finance intermediaries, the Industrial Development Corporation tripled its loan approvals to "women-empowered" businesses in 2017. These are encouraging foundations on which the financial inclusion of women in South Africa's sustainability transition can be built.

Females account for 51% of South Africa's 56.5 million population at present (Stats SA, 2017), this means that women entrepreneurs are critical to creating new sustainability paths. Examples exist of how they are already doing so across the African region, where female "ecopreneurs" are starting up new sustainable businesses related to energy efficiency, renewable energy, green building design and materials, and waste management.[32] These examples highlight that the direction of investment towards sustainability paths is also essential for a financially inclusive transition to create new development paths.

The direction of investment is essential to enable a transition towards sustainability in South Africa, as discussed in Chapter 3, section 3.5.3. That section highlights the dual challenge for financial intermediaries to both direct investment towards sustainability paths and direct investment away from unsustainable paths. South Africa's transition process may become financially inclusive through incentives offered by financial intermediaries to small and women-led businesses through special loan programmes to start companies focused on sustainability.

The South African financial system and government should therefore consider: *What can be done increase access to appropriate finance for women to enable them to participate in the country's sustainability transition? What types of regulation and governance can be embedded within the banking and institutional funds to ensure representation of women in investment allocations? What types of incentives can be offered to entrepreneurs to encourage them to shift to sustainability-focused businesses rather than unsustainable ones?* The responses to these questions are essential for ensuring

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[32] See: http://www.lionessesofafrica.com/blog/2016/2/14/meet-20-african-women-ecowarriors-building-companies-and-community-projects-to-save-the-planet.

that a financially inclusive transition supports the participation of women and women-led enterprises.

4.9 Furthering progress

The extent to which the South African financial system, including its public finances, is fit for purpose to support sustainability transitions will determine the depth, scale and pace of the country's transition. South Africa has strong financial foundations due to a mature and sophisticated financial system with many useful features and initiatives that could promote sustainability transition processes. New governance measures, regulatory requirements, policy responses and financing mechanisms have emerged from within government and the private sector as described in this chapter.

There is a growing awareness and responsiveness among financial actors since 2007 to account for environmental, social and governance factors in their investment allocations. What is less certain is whether these raised awareness levels are translating to a redirection of finance flows. Despite the positive foundations, financial inclusion remains a concern, particularly the necessity to ensure that women and smaller businesses benefit from the new opportunities offered by sustainability transitions. Although the cases demonstrate strong efforts through gender-informed products and services and the Green Fund, these efforts lack scale as they are not embedded within the financial system.

Finance intermediaries both act and are acted upon by international and national influences (Figure 4.1). Theoretically, this implies that government actions should encourage other financial actors to participate in new economic areas. This chapter describes how the Green Fund pioneered access to finance for new green sectors, especially smaller businesses, and secured access to international assistance for rural adaptation interventions. In addition, government created dedicated institutional support for the renewable energy sector.

To further progress, two questions arise here: firstly, what further actions may be necessary by government to encourage a financially inclusive transition; and secondly, with government having laid the initial foundations, to what extent will private finance intermediaries organically respond to the (financing) needs of South Africa's sustainability transition? A frank conversation among the financial actors may be useful, based on existing learnings.

As a developing country, South Africa has the ability to access international climate and environment funds. Can these funds be strategically deployed to maximise their national relevance and impact? The SANBI case study provides a useful example of how this may be achieved. Aligning international assistance to bridge domestic funding gaps offers a useful example to build on in the development of a national financing strategy for sustainability transitions. This strategy should define roles for each of the financial actors within the financial system and identify the optimal use of international development funds to complement national sources. This was one of the objectives of the National Climate Change Response Policy (DEA, 2011) and remains relevant.

Further work is needed to correlate the financial needs of South Africa's sustainability transition process with the intensity and degree of transformation that the country is aiming for. This raises questions – whether the South African financial system is compatible with the government's vision and policies on sustainability transition, what needs to change in this system, can it change, what would it take to change? These are areas for future research. Since South Africa is part of a globalised financial system, there are elements which depend on international developments, but the country should not tarry in doing whatever remains within the national realm of control.

This chapter reflects on a journey in progress. There is a long road ahead of learning through uncertain and iterative processes that will test the mettle, responsiveness and resilience of the country's financial system and policymakers. It is a story that is still being written. As with many other countries, time is a good teacher if we choose to learn.

4.10 Acknowledgements

The editor, Dr Najma Mohamed, invited the author to contribute a chapter to the book on sustainability transitions in South Africa focusing on financial issues. Three case examples are included in the chapter. Dr Mandy Barnett contributed the initial work for the case on South African National Biodiversity Institute, Dr Jenitha Badul and Michelle Layte for the case on South Africa's Green Fund, and Malango Mughogho for the case on financial inclusion of women in sustainability. The author reviewed and, where necessary, rewrote these initial contributions. The analysis and implications of these examples is the sole work of the author. Figure 4.2 benefited from the comments of Lawrence Madzwara, an ex-colleague of the author. The chapter was peer reviewed by Dr Najma Mohamed, the contributors, Routledge editors, and the author's supervisors. No funding was made available for the preparation of this chapter.

5 Transition demands and financial intermediaries: Energy transitions in South Africa (1994 to 2019)

This chapter responds to the research question *how do financial intermediaries relate to the demands of sustainability transitions?* This chapter applies the transitions demand developed in Chapter 3 to the empirical context of South Africa, and builds on the empirical discussion of South Africa's financial system in Chapter 4. The research question for this paper was adjusted to focus on energy transitions as an example of a sustainability transitions process.

5.1 Introduction

Shifts in energy systems are critical for reducing harmful greenhouse gas emissions (IPCC, 2018), and for creating a sustainable energy system (defined in this paper as an energy system that meets environmental, social and development goals of present and future generations).

Energy transitions refer to the process of making such shifts from unsustainable sources of energy (such as fossil fuels) to sustainable ones (such as renewable energy) (Leach, 1992; Sokona et al., 2012). The process has four key characteristics. Firstly, the urgency of technological shifts; secondly, contestation and trade-offs among its environmental, social and economic goals; thirdly, the necessity of innovation for sourcing, delivering and utilising sustainable energy (Araújo, 2014); and lastly, the necessity for just and inclusive transition recognising the influence on livelihoods (Newell and Mulvaney, 2013; Jasanoff, 2018). These characteristics represent the context for the implementation and financing of energy transitions.

The financial system (defined as intermediaries, markets and infrastructure) facilitates the exchange of essential finance flows, generating economic activity and enabling radical investments (Dosi, 1982; Perez, 2002). Schumpeter (1934, 74) called the financial system the "ephor" of the economy, a word referring to the leaders of an ancient Spartan council whose members wielded significant power. Such power reflects in the expectations placed on the financial system for global climate and sustainability goals, particularly for energy transitions. On the one hand, the financial system is expected to deliver the required US$1.7 trillion between 2015 and 2030 for investment in new sustainable energy sources (IRENA, 2019). On the other hand, the financial system is expected to go beyond investment – and become consistent and integrated with the

climate and sustainability objectives of the Paris Climate Agreement, the 2030 Agenda for Sustainable Development Goals and the Addis Ababa Action Agenda (UN, 2015a, 2015b, 2015c).

This paper considers the research question: *how do financial intermediaries relate to demands of energy transitions?* The research is relevant because while the financial system – financial intermediaries in particular – is essential to energy transitions, few studies explore how financial systems promote or inhibit transition processes (Köhler et al., 2019).

This paper draws insights from sustainability transitions studies – an interdisciplinary field of social science studying systems-level changes to societal challenges such as the climate breakdown, and the role and influence of actors during such change processes (Geels, 2004). The paper focuses specifically on financial intermediaries as they represent one of the "*institutions of governance, of society, and even of ideologies and culture*" that enable radical shifts in the economy (Perez 2002, 24–25). In particular, the paper applies the transition demands framework developed in Naidoo (2019a), which relates financial systems to sustainability transitions. The framework derives from the characteristics of transition processes, and practical considerations of the financial objectives of the Paris Climate Agreement and the Addis Ababa Action Agenda (i.e. making finance flows consistent and integrated). This paper is the first empirical application of the transition demands framework.

Prior research related to the research questions suggests that the relations between financial systems and transition processes depend on the intensity of the social and environmental objectives (Spratt, 2015). A country's social and cultural context affects how its financial system engages in transitions (Hall et al., 2016). Also, the diversity and maturity of financial systems influence the type of financial innovations that can support energy transitions (Pathania and Bose, 2014; Polzin et al., 2017; Beggs, 2018). Further, transitions impose demands on financial systems that should inform their response (Naidoo, 2019a). These conceptualisations, however, lack empirical examination. This paper contributes to bridging this research gap.

The paper follows a case study approach by examining South Africa's energy transition from 1994 to 2019 – focusing specifically on the Renewable Energy Independent Power Producers Procurement Programme (SA renewable energy programme) launched in April 2011 and its engagements with financial intermediaries (defined in this paper as

local private banks and national development banks).[33] The examination offers novel insights based on data sourced from confidential financial and programme reports, and direct engagements with 19 senior executives engaged in design and implementation, and 11 other senior experts and civil society organisations closely involved in SA's energy transition.[34]

This paper contributes to existing finance-related literature on energy transitions in several ways. Firstly, the innovation of the financial intermediaries investing in the SA renewable energy programme confirms the conceptual positions by Hall et al. (2016) and Polzin et al. (2017) that social and cultural factors, diversity and maturity of financial systems influence the financing of energy transitions. Secondly, the empirical evidence in this paper identifies potential reasons for the criticisms by Baker (2015a, 2015b) that financial intermediaries are financialising the renewable energy sector. Thirdly, the paper derives new conceptual insights for the roles that financial intermediaries can play during transition processes. Fourthly, it identifies implications for designing and implementing future policies associated with SA's energy transition, especially for future procurement under the SA renewable energy programme and the inclusion of just transitions as an imperative to South Africa's climate response.

The paper is structured as follows: background to case (Section 5.2); description of transition demands framework (Section 5.3); research methods applied (Section 5.4); analysis of empirical results (Section 5.5); insights and relevance for policy and broader applications (Section 5.6); conclusions (Section 5.7); and, acknowledgements (Section 5.8).

5.2 Background to the case of South Africa

The example of South Africa is relevant for three reasons. Firstly, there is an urgency associated with the country's energy transition as the world's 14th highest emitter of greenhouse gases and one where fossil fuels remain the primary source of energy (WEF, 2019). It also ranks among second last out of 115 countries as being least prepared for

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[33] The term "financial intermediaries" as used in this paper, excludes explicitly international private banks and development finance institutions. This recognises that international private banks were excluded from directly participating in the programme (Eberhard and Naude, 2017).

[34] The cut-off date for quantitative-related fieldwork at the Independent Power Producers Procurement Programme (IPP) Office was December 2016; however, this paper also includes qualitative data up to and including October 2019. The data is not exhaustive.

its energy transition (WEF, 2019); and faces losses of at least US$120 billion (between 2013 and 2035) if it fails to diversify its fossil-fuel dependent economy (Huxham et al., 2019). Secondly, South Africa is the world's most unequal country with 50% of the population living below the poverty line (World Bank, 2018). This means that its energy transition risks are widening existing social inequalities as many industries remain fossil-fuel-dependent (Montmasson-Clair, 2019; Godinho, 2019).[35]

Thirdly, the country began implementing investment programmes for renewable energy in 2011 and new coal in 2014, which enables ongoing reflections of an investment-related transition process. Fourthly, the national government departments of Mineral Resources and Energy, and of Public Enterprises, announced new energy transition-related policies in October 2019, which includes making the country's energy transition and climate response co-dependent on a just transition, an updated integrated energy resource plan, and the restructuring of the state-owned power utility, Eskom (SA, 2019a, 2019b).

These new policies require framing the future of SA's energy transition and specifically, the SA renewable energy programme in ways that reflect such policy shifts and learnings. The framing includes blending them with the country's existing social inclusion policies that include employment equity, preferential procurement and black economic empowerment (BEE) through the Broad-Based Black Economic Empowerment Act and its codes of good practice (empowerment codes). South Africa is, therefore, a country whose energy transition is observable over time, with an investment track record, emerging lessons and new policy directions relevant for framing, or rather reframing its future direction.

Access to secure and affordable energy in South Africa largely depends on Eskom because of its prominent position as the country's only power utility. "*Eskom generates 95 per cent of South Africa's electricity, with around 75 per cent coming from coal. The large size and vertically-integrated structure of Eskom mean that any challenge experienced by one part of the business threatens the entire company and places the country's electricity supply at risk*" (National Treasury, 2019, 2).

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[35] Source: World Bank Poverty & Equity Data Portal http://povertydata.worldbank.org/poverty/country/ZAF.

A further challenge is Eskom's growing debt of ZAR450 billion, which it struggles to service and finance its operating costs.[36] These challenges imply that Eskom is experiencing difficulties in fulfilling its primary responsibility to provide reliable power to the country and those within the Southern African Power Pool.[37] Presently, Eskom relies on the National Treasury for financial support (bailouts) to continue its operations.[38] Such reliance also means Eskom is unable to invest in new power stations or maintain its current power stations.

The instability of South Africa's energy system affects the political, economic and social fabric of the country, dampening investor confidence (local and international), contracting job and development opportunities, heightening social discontent, and undermining the country's ability to address urgent environmental and social challenges (Montmasson-Clair, 2019). In particular, South Africa's dependency on coal means significant amounts of GHGs and harmful pollutants with severe impacts on health will continue unabated for the foreseeable future.

Though the President and his ministers of Finance, Public Enterprises, and Mineral Resources and Energy recognise the need to transition and modernise South Africa's energy system to reduce the harmful effects of GHG emissions, there is ambiguity about the need to reduce the country's dependence on coal (Burton et al., 2018; Mohamed, 2019). Current transition efforts are also criticised as being technocentric, with limited consideration of the social tensions and trade-offs, e.g. the effect on livelihoods through job losses (Mohamed, 2019). Further, the energy transition, coupled with just transitions, means specifically allaying the fears of the social costs of any such transition (i.e. job losses from coal mining and related jobs). These challenges co-exist with approaches for modernising South Africa's energy system, such as smart grids.

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[36] An unprecedentedly severe round of "load-shedding" (rolling power blackouts to protect the Eskom electricity grid from collapsing as a result of unplanned breakdowns) took place in December 2019. See, for example, Speckman, A., 2019. Eskom: SA counts the cost. Business Times, 15 December. Available at: www.businesslive.co.za/bt/business-and-economy/2019-12-15-eskom-sa-counts-the-cost/.

[37] See, for example, Business Day, 2019. Editorial: Companies going green not in Eskom's best interest, 12 December. Available at: www.businesslive.co.za/bd/opinion/editorials/2019-12-12-editorial-companies-going-green-not-in-eskoms-best-interest/.

[38] See, for example, Merten, M, 2019. 'We are in trouble': National Treasury DB Dondo Mogajane on "Eskom – and then there's the SABC". Daily Maverick, 29 August. Available at: www.dailymaverick.co.za/article/2019-08-29-we-are-in-trouble-national-treasury-dg-dondo-mogajane-on-eskom-and-then-theres-the-sabc/.

Though many policies and processes exist in support of sustainability in South Africa, these are typified by fragmentation and incoherence, which makes implementation challenging (Mohamed and Montmasson-Clair, 2019). The SA renewable energy programme is unique in that it represents a focused implementation effort by what was then called the Department of Energy to introduce renewable energy into the energy system and broadly distribute its economic benefits (Baker and Wlokas, 2015; Eberhard and Naude, 2017).[39]

The SA renewable energy programme attracts mixed responses. On the one hand, the programme attracts recognition for its robust implementation by the Department of Energy and National Treasury and ability to secure investment at a large scale within an accelerated timeframe (Eberhard et al., 2014). On the other hand, the programme is criticised for favouring only large and established renewable energy project companies and of short-termism in the refinancing of debt (Baker, 2015b).

Several sustainability-related finance measures are evident in South Africa's financial system – such as prescribed allocations for pensions funds to invest in environmental and social infrastructure, and sustainability-related index on the Johannesburg Stock Exchange (Naidoo and Goldstuck, 2016a). However, the influence and contribution of these measures in promoting sustainability-related investment are unclear. For example, surveys conducted in 2007, 2011 and 2016 among financial intermediaries reflect a marked shifted in how they engaged on environmental and social risks. In 2007, the view was that such risks are marginally material. By 2011, intermediaries believed they were unable to act voluntarily on environmental and social risks and required policy signals from the national government. By 2016, environmental and social risks had become a material issue for financial intermediaries, and there were specific suggestions on how to make South Africa's financial system more suited to respond to sustainability challenges (Naidoo, 2019b).

While support for sustainability and climate challenges is also accessible through international climate and environmental finance mechanisms, these funds contribute less than 1% to the sustainability and climate objectives of the country (OECD, 2017).[40] Their

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[39] The Department of Energy was renamed the Department of Mineral Resources and Energy. This paper refers to the Department of Energy because it only merged with Mineral and Resources in May 2019.

[40] These include the Green Climate Fund, Adaptation Fund, Global Environment Facility, and Clean Technology Fund.

influence in accelerating climate investment in South Africa is, therefore, marginal (Nakhooda et al., 2014).

Prior finance-related research on SA's energy transition suggests that finance presents no challenge, rather the more critical matter is addressing issues of policy coordination and technology choices (Winkler, 2005). Such confidence stems from the financial system being mature and diverse with well-established capital markets, and sound regulatory environment aligned with international standards (Naidoo and Goldstuck, 2016a, 2016b). These features have a historical precedent as five British-owned banks established a base in South Africa in the late 1800s to serve and secure the mining interests of large corporations (Kubicek, 1979; Mohamed, 2014).

These structural and cultural roots continue to be reflected in the current financial system, which remains mainly concentrated around large business interests (Verhoef, 2009; Mohamed, 2014). While large businesses are well-served, there is limited access to finance for small and medium-sized enterprises, women and other vulnerable groups (Beck et al., 2009; OECD, 2017). Therefore, broadening access to finance in South Africa is ranked as critical for financial sector development in the country (OECD, 2017). These features also suggest that achieving a just and fair transition may be challenging (Naidoo, 2019b).

Research on the SA renewable energy programme specifically credits the financial system with playing a significant role in its success and attributes such success to the maturity and sophistication of the South African banking system (Eberhard and Naude, 2017). The role of finance in the renewable energy programme has also been explored from a political economy perspective, highlighting the trend of refinancing (Baker, 2015a, 2015b).

Prior research on the SA renewable energy programme also suggests that the Department of Energy and National Treasury engaged openly and transparently with the private sector, advisors and financial intermediaries (Eberhard and Naude, 2017; Eberhard et al., 2014). However, such engagements have not yet been the subject of empirical research.

The next section describes the analytical framework applied in this paper.

5.3 Analytical framework

Sustainability transitions have definable characteristics, which are useful for examining the role of financial systems in transition (Naidoo, 2019a). This prior research examines these characteristics and derives the demands they place on the financial systems, developing the findings in a "transition demands framework". This framework focuses attention on what sustainability transitions need from the financial system and argues that the nature and scope of the financial system's response should derive from such needs.

Table 5.1 Transition demands framework

Source: Naidoo, 2019a (rearranged for this paper).

Transition characteristics	Consequential demands placed on the financial system
Temporal realities	The financial system responds across short, medium and longer-term timeframes to address the systemic needs of transition processes.
Directional changes	The intermediaries, markets and infrastructure of the financial system consistently directs itself toward achieving a new sustainable economic system.
Co-existent system effects	The financial system generates environmental and social system-level effects by creating new socially inclusive, environmentally sustainable economic systems *and simultaneously* destabilising old environmentally unsustainable, socially unequal economic systems.
Contested social context	The financial system engages with a broad base of stakeholders in developing its response to support the transition process.
Contextual experimentation	The financial system experiments and applies adaptive approaches to address the contextual needs of sustainability transition processes.

Temporal realities refer to the extended and non-linear periods over which transition processes evolve (Perez, 2002; Geels, 2011; Loorbach et al., 2017). By contrast, shifting to sustainable energy systems requires acceleration, especially to limit the global temperate rise to below 1.5°C – based on the findings of the Intergovernmental Panel on Climate Change Special Report on Global Warming of 1.5°C (IPCC, 2018) and the objectives of the Paris Climate Agreement (UN, 2015c). Radical and urgent action across accelerated timeframes is therefore critical to mitigate environmental effects and address social challenges associated with the sustainability and climate breakdown (Bhattacharya et al., 2016; Stern, 2018). Empirical evidence shows that accelerating

energy transition processes is possible under the conditions of precise policy alignment and implementation strategies (Sovacool and Geels, 2016; Kern and Rogge, 2016). The financial intermediaries' response to these dynamics requires examining their behaviour as the transition unfolds over time.

Directional changes refer to transition processes targeting two types of shifts, i.e. a simultaneous shift away from an unsustainable state towards a sustainable state. Targeting sustainability requires that transition processes are purposive, objective-oriented, and directed (Raven and Verbong, 2009). Directional changes also mean that significant changes may arise in the underlying structures and sub-systems, cultures and behaviours associated with the transition process (Mersmann et al., 2014; Köhler et al., 2019). From a finance perspective, the directional changes require directing investment towards sustainability, divesting from existing unsustainable investments, and not making any new unsustainable investments. These directional changes infer consequential changes to how financial intermediaries originate (source new investments) and appraise their investments, such as incentivising bankers (especially those sourcing investments) to focus on sustainable investments and prioritising the avoidance of environmental risks.

Co-existent system effects refer to the dominant unsustainable paths co-existing with emerging sustainable paths (Kivimaa and Kern, 2016; Naidoo, 2019a). Creating a sustainable path requires disruption, as it prioritises environmental and social benefits over economic and financial returns. Navigating such co-existence is difficult for financial intermediaries, but disruption is essential for creating new sustainable paths. The co-existent system effects also require recognising the necessity of creating and sustaining new sustainable paths and aligning the processes and practices of financial intermediaries with the desired directional changes that support the sustainability transition. Why is this critical? Since financial intermediaries shape the economy by their investment decisions (Schumpeter, 1934; Perez, 2002), what they fund and do not fund influences how transitions unfold.

Contested social context recognises that transitions towards sustainability paths emerge; driven by new drivers of change, such communities, youth and civil society. These groups craft visions of sustainable paths and apply public pressure through which transitions emerge (Stirling, 2006; Scoones et al., 2015). Armed with these visions, social groups are critical for interrogating the legitimacy, desirability and adequacy of solutions, policies and processes that evolve in response to the transition imperative. Through

social activism, they apply critical public pressure on parts of governments to ensure that new sustainable paths reflect social visions (Vergragt, 2013; Jasanoff, 2018). While financial intermediaries mainly engage with their shareholders and those seeking finance to invest in specific projects, the transition imperative implies that social groups are likely to interrogate their approaches to financing transition-related projects.

Contextual experimentation refers to iterative and innovative approaches to create a new sustainable path, and a willingness to experiment during the transition process. Such experimentation is essential for developing context-specific responses to the climate breakdown. It may include building on new technologies and concepts of welfare and learnings from prior efforts (Rip, 2006; Mersmann et al., 2014; Schot and Steinmueller, 2018). Experimental approaches imply unpredictable and uncertain contexts. The extent to which financial intermediaries are required to experiment also depends on a country's ambition (Spratt, 2015). Such ambitions may shift as learnings from implementation are incorporated into future planning. Financial intermediaries may have to employ adaptive approaches to the evolving transition process, which also raises questions about whether such ambitions can be met within the current structure and diversity of the financial system, or whether broader system-level changes are needed.

The paper uses this framework to analyse the data, which was collected as described in the next section.

5.4 Research methods

The paper applies a case study approach to the SA renewable energy programme, which is useful for exploring "how" and "why" questions and observing research problems within a real-world context (Yin, 2004), which allows for incorporating and iteratively engaging with different perspectives and sources of information. The rationale and background for selecting South Africa as the focus for this paper is described in Section 5.1 and 5.2. This section describes the research design, based on the following aims: i) explicit efforts to identify themes; ii) triangulation of findings; and iii) pre-specification of an analytical framework (see Section 5.3) (Teddlie and Tashakkori, 2010).

5.4.1 Data collection

The paper draws on both quantitative and qualitative data, which facilitates an iterative inductive-deductive identification of emerging themes and discrepancies (Teddlie and Tashakkori, 2010). Four research principles guided the study, namely: i) credible data

quantitative data sources; ii) knowledgeable persons to interview; iii) triangulating the quantitative and qualitative evidence; and iv) identifying any confounding factors.

The quantitative evidence originates from restricted access to a confidential database which includes financial data of the 102 renewable energy project companies supported by financial intermediaries in South Africa. The database is held by the implementing agency of the renewable energy programme, the Independent Power Producers Procurement Programme Office. The author's access was subject to a confidentiality agreement, which meant that information was examined on-site only and periodically between May and October 2017, and again in January 2019 to address data gaps.

This quantitative evidence is complemented by qualitative evidence comprising 30 semi-structured interviews carried out between May 2017 and October 2019 (Table 5.2) with senior executives and management in relevant organisations.

Table 5.2 Profile of interviews and discussions

Organisational categories	Position in organisation	Source code	# Persons
Government agencies	Senior to executive	GA	8
Financial intermediaries	Senior to executive	F	8
Government departments	Senior to executive	G	3
Energy and finance experts	Senior to executive	E	7
Civil society organisations	Senior to executive	C	4
Total number of interviews and discussions			**30**

These interviews lasted between 1 and 1½ hours each. Twenty-four interviews were conducted in person by the author and six through Skype, Zoom and WhatsApp calls. The interviews were structured around the questions, *how did the financial intermediaries influence the SA renewable energy programme,* and *how did that programme influence the financial intermediaries?* A further question was asked, *how did each think they influenced the other* to triangulate the subjectivity of the responses.

The interviewees were key informants from government agencies, government, financial intermediaries, and experts selected for their direct engagement with the SA renewable energy programme and identified using a snowballing approach (i.e. obtaining leads from interviewees on who else would be a good key informant). Only four interviewees permitted the recording of interviews. These recordings and the notes from all the interviews were transcribed. In addition, the interviews were supplemented by over 30

unstructured discussions between June 2019 and October 2019 with experts and civil society groups on how South Africa's energy transition is evolving and their perspective on the renewable energy programme. These unstructured discussions were not transcribed verbatim, but notes were kept of the key issues that emerged.

Data was further triangulated by performing analysis of relevant documents, including news articles, national government press announcements, programme reports and archival online videos about the SA energy transition. These documents were either identified through the interviews and through Google searches using a snowballing approach – mainly based on the phrases "South Africa energy transition", "renewable energy", "just transition", "sustainable energy transition" and "Eskom". The focus for reviewing the documents and archival material was identifying new insights and triangulating the evidence from interviews and quantitative research.

The footnotes appearing in this paper indicate the author's information sources, including insights from the interviews and discussions (Table 5.2 alludes to applicable source codes).

5.4.2 Data analysis

The quantitative data was aggregated based on debt commitments by financial intermediaries to SA's energy transition between 1994 and 2016. The aggregation differentiates, where necessary, between commitments made to renewable energy and coal by financial intermediaries. It also provides details of technical assistance by international development banks to support the SA energy transition programme where these details were available (see Figure 5.1).

The interviews were first categorised according to the timing of the engagements, i.e. before April 2011, during the procurement and subsequent to financial close (i.e. once the financial negotiations had been concluded). Thereafter, each interview transcript was manually coded applying the characteristics of the transition demands framework (see Table 5.1), as D1 (temporal realities), D2 (directional change), D3 (system effects), D4 (social contestation), and D5 (contextual experimentation). The analysis also benefited from the significant background knowledge of the author who worked at financial intermediaries in South Africa between 2000 and 2012, and who supported setting up the SA renewable energy programme from 2009 to early 2010.

The paper frames a narrative of the relations between financial intermediaries and SA's energy transition around the coding described above by drawing together the elements of financial, interviews and document analysis, as presented in Section 5.5 below.

5.5 Analyses of transition demands and financial intermediaries' responses

This section applies the transition demands framework (Table 5.1) to the evidence developed for this paper (Section 5.4).

In addition to financial intermediaries and SA renewable energy programme which are defined above, this analysis also refers to renewable energy project company (defined as the company operating the power plant), and empowerment shareholders (defined as community trusts and black economic empowerment companies). The term "BEE companies" refers to shareholders with operational and management interest in the daily affairs of the renewable energy project company, and community trusts are beneficiaries from local communities living within a 50km radius of the new power plants.[41]

5.5.1 Temporal realities

The paper divides South Africa's energy transition into four periods, based on policy activity and these finance flows from 1994 to 2019, as depicted in Figures 5.1 to 5.4, which include policy milestones and finance flows over that time.[42] The finance flows include new debt commitments by financial intermediaries to coal and renewable energy, and international development assistance, but excludes bond issuances and government support through guarantees or direct budget allocations for new sustainable energy alternatives.

5.5.1.1 1994 to 2006 – Seeding of policies and small-scale initiatives

The first period reflects a seeding of policies after the country's first democratic elections in 1994. These policies include the 1998 White Paper on Energy and the 2003 White Paper on Renewable Energy, which both acknowledged the need for diversifying South

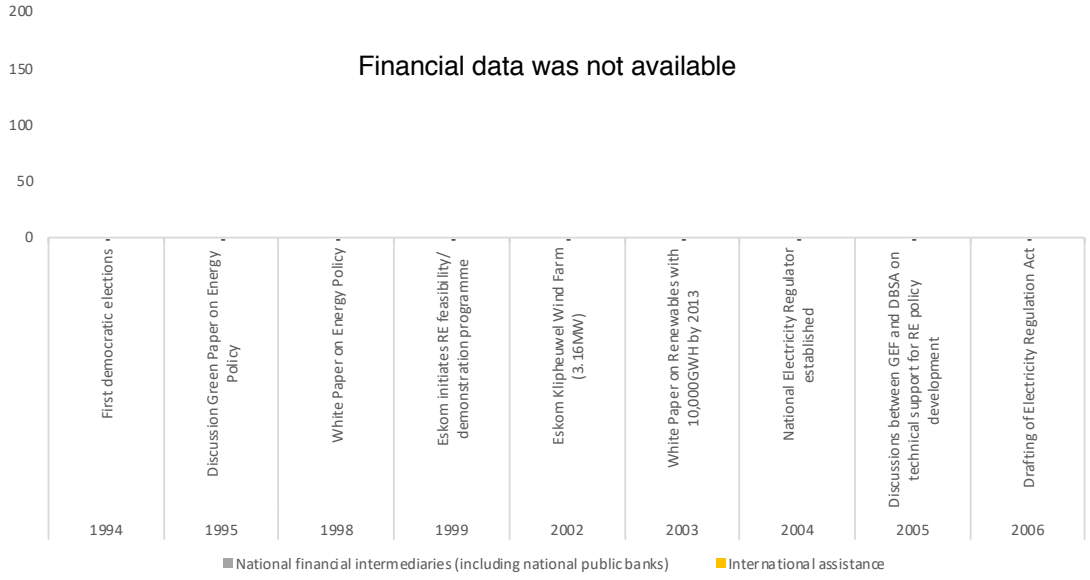
[41] Based on data provided by the IPP Office.

[42] The milestones and finance flows referred to here is not an exhaustive list of key events or funding commitments. Figures 5.1 to 5.4 and Figure 5.10 were constructed based on information sourced from secondary research, in particular Naidoo et al., 2014 and Martin, 2016, the author's own research at the IPP Office, by scanning publicly available information, from discussions with experts, and from the interviews conducted for this research. Missing intervals on the y-axis indicates that no data points for either policy or finance flows were identified for those years.

Africa's energy mix and the environmental risks of the country's dependence on fossil fuels. Implementation, however, remained nascent for over 12 years (Winkler and Marquand, 2009; Sebitosi and Pillay, 2008a, 2008b; Sebitosi, 2008; Pegels, 2010; Naidoo et al., 2014). During this time, development assistance through small grants from countries such as Norway, Denmark and Germany, international public banks, and environmental-related funds supported the Department of Energy in building technical knowledge of renewable energy including study tours, developing the initial energy policy papers and small-scale pilot projects, and drafting the Electricity Regulation Act.[43]

Figure 5.1 Policy initiatives and development support between 1994 and 2006

(Number expressed in ZAR millions)



This support was critical for seeding South Africa's energy transition – as an interviewee noted *"… development assistance is useful for making policy adjustments, which are difficult to finance. Advanced countries gave access to their experience*" (GA3). Precise data on the amount of development finance provided to the South African government over this time was, however, difficult to trace. No evidence of investment by financial intermediaries was found.

5.5.1.2 2007 to 2010 – Turning point triggered by energy power cuts

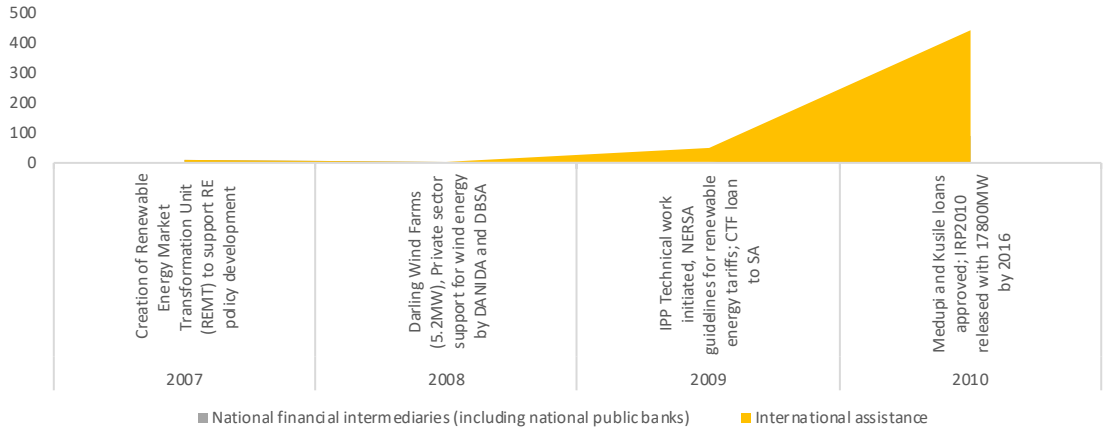
An energy crisis triggered a turning point in SA's energy transition when Eskom was forced to curtail energy supply for protracted periods. As a result of the energy supply

[43] Interviewee GA3, GA6, G3 and author's own research.

curtailments, negotiations for financing the building of two new coal power stations (Medupi and Kusile) began between Eskom, the National Treasury and the World Bank. Firstly, with the World Bank for a US$1.7 billion loan to build Medupi and related infrastructure, and secondly, with a consortium of mainly foreign funders for US$1.18 billion to build Kusile.[44] The National Treasury and Eskom also secured a US$50 million loan from the Clean Technology Fund, which is administered by the World Bank, for investing in new renewable energy technologies (Nakhooda et al., 2014).

Figure 5.2 Turning point between 2007-2010

(Number expressed in ZAR millions)



Simultaneously, coalitions of support were also building pressurising the Department of Energy to accelerate its renewable energy policies (Martin, 2016). In particular, the deference to coal as a technology choice led to public outcries by entrepreneurs, civil society and international environmental groups, placing pressure on the South African government to begin implementing the 2003 White Paper on Renewable Energy (Pegels, 2010; Baker, 2015b; Martin, 2016).

Also, international pressure was mounting for South Africa to demonstrate its efforts to reduce GHG emissions when it hosted the UN climate negotiations in Durban in December 2011. As one interviewee said, "*COP17 added pressure on government to*

[44] Project documents from the World Bank are available here: http://documents.worldbank.org/curated/en/126361469672138599/pdf/534250R20101005914.pdf

fast track the renewable programme to demonstrate the country's mitigation efforts, which was up until that time unimpressive" (F6). [45,46]

These factors contributed to the Department of Energy and National Treasury urgently designing the SA renewable energy programme in April 2011, and which was administered through a joint programme arrangement (later called the IPP Office) with the Development Bank of Southern Africa.[47] The design process included appointing experts and advisors to develop technical, financial, legal and policy aspects of implementation – funded by the DBSA and later reimbursed by the National Treasury.[48,49]

The design process also included engaging with financial intermediaries, based on a long-standing tradition of the National Treasury which began upon South Africa's democratic election in 1994. This tradition relates to actively engaging the financial intermediaries on infrastructure programmes and was initiated to "*strengthen the ability of government to meet the development challenges of a post-apartheid state*" (GA6). For the renewable energy programme, the engagements aimed to "*ensure the programme was successful, and that the banks understood what was required of them*" (G3). Also, to explicitly identify "*the respective concerns of each intermediary and how they would evaluate the risk of the programme*" (GA7).

The pre-April 2011 engagements focused on the technical and contractual elements of the programme, focusing on the objectives of the programme – managing South Africa's energy demand, diversifying its energy mix through renewable energy sources, and promoting social participation in the programme.[50] Initially, engagements were bilateral, and then shifted to meetings every second Friday of the month at an independent

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[45] COP17 means the 17th Conference of the Parties of the UN Framework Convention on Climate Change.

[46] The SA renewable energy programme was launched in April 2011, the request for proposals for the first bid window was released in August 2011, and first bids were due by November 2011. The government announced who the preferred bidders were at COP17 in December 2011.

[47] The Department of Energy was the official name of the government department throughout the analysis. With effect from May 2019, the portfolios of energy and mineral resources were merged under the name Department of Mineral Resources and Energy.

[48] Eberhard and Naude (2017) offer a detailed explanation of the design features of the SA renewable energy programme.

[49] Interviewees GA5, GA6, G3 and F7.

[50] Interviewees GA4, GA7 and G3.

location in Johannesburg.[51] These engagements contributed to the launch of the SA renewable energy programme by April 2011.

The Department of Energy and National Treasury's placed emphasis on engaging with the financial intermediaries to ensure "*the local banks would invest in the programme without hesitation*" (GA6).[52] Support from local banks (i.e. private banks and national development banks) was crucial as international private banks would have exposed the programme to foreign currency-denominated loans and risks – an exposure that the government was not willing to accommodate at the time, and therefore excluded such banks from participating (Eberhard and Naude, 2017).

5.5.1.3 2011 to 2014 – Golden age of renewable energy investment

By April 2011, the SA renewable energy programme was launched, and implementation accelerated until 2014, at which time strict procurement rules observed. For this reason, engagements with the financial intermediaries were focused on project-specific issues. The renewable energy programme had two components – one for procuring projects greater than 10MW (Large programme), and the other for procuring projects between 5 and 10MW (Smalls programme). This period in SA's energy transition represents a golden age of renewable energy investment, with investment levels rapidly reaching US$20 billion.

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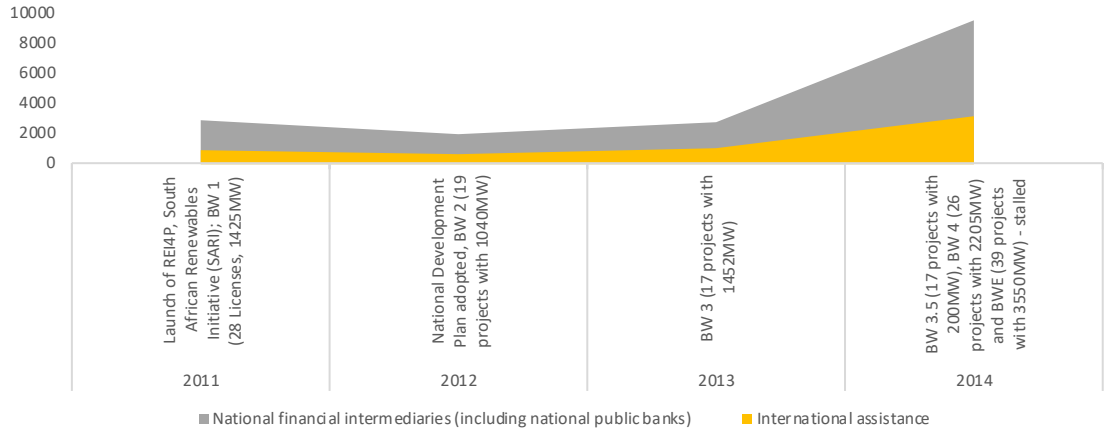
[51] Interviewees GA4, GA6, GA7, GA8 and G3.

[52] Interviewees GA6, GA7 and G4.

Figure 5.3 Renewable energy investment between 2011 and 2014

(Number expressed in ZAR millions)



The financial intermediaries provided 76% of the funding requirements to project companies, and the balance was funded from international sources.[53] Interest in the programme was significant with 390 bids received, which far exceeded the 102 licences awarded (Eberhard and Naude, 2017). Although this was a golden age of investment for renewable energy, there were Eskom power cuts during this period.

The financial success of the SA renewable energy programme is attributed to the early engagements between financial intermediaries, the Department of Energy, and National Treasury.[54] The financial intermediaries unanimously expressed appreciation for the early engagements and level of transparency and openness offered by the National Treasury and Department of Energy. One senior manager explicitly stated that it was "*a time of learning and awareness-raising because renewable energy was a new investment class for South Africa and gave us time to prepare our investment committees*" (F1).

The appreciation also stems from the chance to engage in tense debates around issues related to: i) contractual and governance arrangements linked to the generation licences to be issued; ii) timing of the final award of licences for the new technologies; iii) timing of any refinancing and exit of investment from the projects once established; and iv)

[53] Author's calculation from data provided by the IPP Office.

[54] Interviewees F1, F2, F3, F4, GA6, GA7 and GA8.

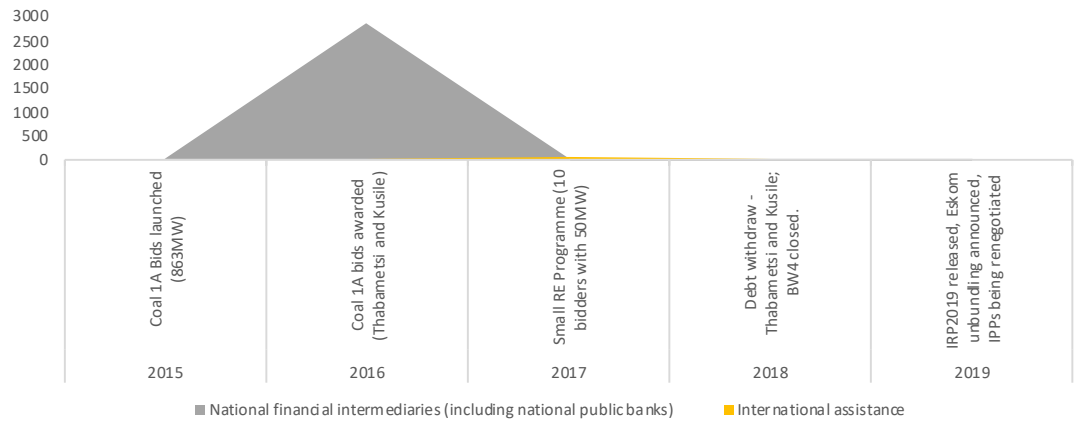
providing standard documentation for the projects, which would be non-negotiable after the licences were awarded.

Some financial intermediaries engaged more deeply than others in the debates, and apparently "*pushed back hard*" (F3) on certain social objectives. The main challenge for the IPP Office and the financial intermediaries during the early engagements was ensuring that the standard documentation would be implementable and able to withstand the scrutiny of investment and credit committees appraising the projects. During this time 6,328MW of renewable energy was contracted over five procurement rounds. Two procurement rounds had not reached financial close by the beginning of 2015.

5.5.1.4 2015 to 2019 – Malaise in implementation

South Africa's energy transition slowed down significantly, due to uncertainty and contestation on energy policy and tariff-related issues, but compounded by other factors (Makgetla, 2017). In particular, Eskom hesitated to sign the legal agreements necessary for finalising two bidding rounds of the SA renewable energy programme.[55] Furthermore, Eskom continued with periodic power cuts, leading to continued uncertainty around energy security, and its financial condition was steadily deteriorating, requiring direct government monetary support.[56]

Figure 5.4 Malaise in policy and investment activity between 2015 and 2019
(Number expressed in ZAR millions)



[55] Interviewees GA4, E1 and F4.

[56] Author's analysis from documents and press releases.

Also, political concerns were escalating in South Africa, which ultimately led to leadership changes in the ruling African National Congress. These circumstances also meant that future procurement under the SA renewable energy programme were suspended, and new debates and critiques arose. According to an interviewee, "*technology choices were creating tensions in terms of the progress on the programme, however the real issues were not being made evident"* (GA7). These "real issues" related to alignment – in particular, "*for implementation to work, it needs to be aligned with the pace and scale of state policies"* (GA7).

The malaise appears to have dampened the confidence of financial intermediaries in the SA renewable energy programme.[57] In particular, one financial intermediary noted "*the slowdown was not well-received by the banks or global investors – as resources had been set aside and deal flow was now minimal"* (F1). Such "deal flow" existed through the coal programme in 2016, which most financial intermediaries participated in, committing ZAR30 billion to two independent power projects (Thabametsi and Khanyisa). A second deal flow opportunity arose through the Smalls programme – however, only a single investment was made in the amount of ZAR1.6 billion from the Industrial Development Corporation (a national development bank).[58]

Positive benefits also arose for SA's energy transition during this time. There was time for reflection on the programme's emerging results as the IPP Office resumed engaging the financial intermediaries on their concerns around the financing of the SA renewable energy programme. Such concerns became apparent as a result of the ongoing critical assessment of the financial, economic and social results of the programme. In particular, the IPP Office investigated investment trends and preferences among financial intermediaries, including how these entities structure the financing and refinancing of renewable energy project companies and the equity participation of empowerment shareholders.

After a change in South Africa's political leadership early in 2018, the remaining two procurement rounds were finally resolved – one was cancelled, while the other reached financial close, although this also meant renegotiating the initial debt commitments.[59]

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[57] Interviewees F1, F2, F3, F4, E2, E3, E4 and GA6.

[58] Based on quantitative data from IPP Office.

[59] Interviewees GA6 and GA7.

Despite the malaise, groundwork continued for improving the conditions for developing future renewable energy projects, in particular, amending the required environmental approvals, and designating eight special renewable energy development zones in 2018, with three more scheduled for late 2019.[60] By October 2019, the malaise appeared to be lifting.

5.5.1.5 2020 – Turning point potential related to new policies

South Africa's energy transition potentially faces a second turning point with the release of several energy transition-related policies in October 2019. Firstly, the long-awaited Integrated Resource Plan (IRP) 2019 provides updated targets for the country's energy generation mix, reducing planned new coal capacity to 1,500MW (a reduction from 6,300MW in the IRP2010) (SA, 2019a). Secondly, the Eskom Restructuring Plan details institutional measures to attain operational efficiencies, which include creating separate entities for generation, transmission and distribution.

The Eskom restructuring is premised on the intention to: i) modernise the country's energy system to abide by environmental standards and new technologies; and ii) simulate competition among existing facilities to achieve operational efficiencies (SA, 2019b).[61] Thirdly, the President of South Africa has positioned a just transition as a precondition to the country's climate change response (including the energy transition), assigning an oversight role to the Presidential Committee on Climate Change to ensure this is attained (SA, 2019a). Also, the National Treasury's economic plans recognise that the energy transition needs to be managed to minimise and compensate those that are likely to experience losses as a result of the transition (SA, 2019b).

Regaining momentum in SA's energy transition, therefore, means aligning these new developments, achieving social cohesion around the proposed solutions, and accelerating implementation. These developments suggest that there may be new considerations for financial intermediaries: i) developing mechanisms for structuring and financing just transitions at the project level; and ii) whether the potential refinancing of Eskom may be in conflict with their policies around fossil-fuel investment.

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[60] Interviewees E5 and C4.

[61] The Eskom Roadmap was endorsed by the South African cabinet on 30 October 2019. www.gcis.gov.za/newsroom/media-releases/statement-cabinet-meeting-30-october-2019

The next section discusses the directional changes related to SA's energy transition.

5.5.2 Directional changes

Among the temporal realities of South Africa's energy transition, four policies were essential to setting the direction for the South Africa's energy transition. These also represents the policy context that financial intermediaries would consider when evaluating future investment.

Firstly, the Integrated Resource Plan 2010 planned for adding 17.8GW of clean technologies to the national grid by 2030. The IRP2010 set out the Department of Energy's policy for diversifying the country's energy mix, planning for adding 17.8GW renewable energy, 6.3GW coal, 9.6GW nuclear and 8.9GW of other generation sources to the energy grid by 2030 (SA, 2011). Secondly, the National Energy Regulator of South Africa established the financial basis for the programme by setting renewable energy tariffs.

Thirdly, the empowerment codes contributed to the social direction for the programme – which entails ensuring participation of persons of colour, women, rural communities and those with disabilities in shareholding, management and as service providers to the renewable energy project companies (DTI, 2016). Fourthly, for the first time, South Africa launched procurement programmes for renewable energy programme, coal, gas and co-generation – all of which the IPP Office was mandated to administer and implement.

By having independent renewable energy and coal programmes, South Africa's energy transition offered financial intermediaries an opportunity for investing in sustainable and unsustainable energy sources. Figure 5.5 also shows the original debt of ZAR28.8 billion committed by the World Bank and other funding consortia to Eskom for two new coal power plants – Medupi (US$1.7 billion/ ZAR17.5 billion) and Kusile (US$1.1billion/ ZAR11.3 billion). The costs for these plants have significantly escalated, but these escalations are excluded from Figure 5.5 as the precise annual distribution of these escalations was not available.[62].

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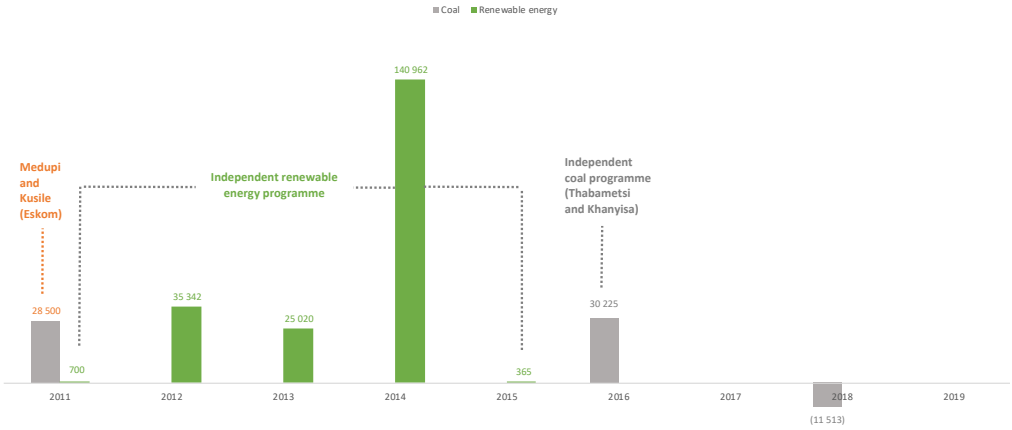
[62] The official cost of Medupi per the Standing Committee on Public Accounts is ZAR146 billion, and for Kusile is ZAR161 billion. These amounts are disputed by energy expert Chris Yelland who said the cost is closer to ZAR234 billion for Medupi and ZAR460 billion for Kusile (https://mybroadband.co.za/news/energy/318251-here-is-the-true-cost-of-eskoms-medupi-and-kusile-power-stations.html)

The aggregate investment for the coal programme (ZAR30 billion) is less than that of the renewable energy programme (ZAR193 billion) as is visible from Figure 5.5. However, the two plants – Thabametsi and Khanyisa – add significant cost to the environment, increasing emissions by at least 205.Mt$C0_2$eq to 217Mt$C0_2$eq between 2015 to 2032 (Ireland and Burton, 2019).

The response to the renewable energy programme, in particular between 2011 to 2014, reflects a keen interest by financial intermediaries and prospective licence-holders. The SA renewable energy programme attracted 390 fully-funded bids. Of these, only 92 licences were awarded for the Large programme and 10 for the Smalls programme.

Figure 5.5 Coal and renewable energy debt commitments

Source: Author's research, analysis from IPP Office database, numbers expressed in ZAR millions.



As can be seen in Figure 5.5, the financial intermediaries responded by making debt commitments between 2011 and 2016 of US$20.5 billion (ZAR193 billion) for renewable energy.[63] By 2014, 6,328MW of renewable energy had been procured – as one interview remarked the "*volume of the programme made it successful, it was well-run and on time*" (F2). The objective of the Department of Energy and National Treasury in engaging with the financial intermediaries appears to have been achieved, as they aimed "*ensuring the programme would be financially supported*" (GA6). From the financial intermediaries' perspective, the engagements facilitated the building of technical capacity among project finance teams, internal approval structures (e.g. credit, risk and investment committees) and their shareholders.[64]

[63] Author's analysis of information provided by the IPP Office.

[64] Interviewees F1, F2, F3, F4, F5 and F6.

The coal programme resulted in two licences being awarded in 2016 for new coal of 863MW, amounting to US$2.1 billion (ZAR30 billion). This programme was fully supported by the majority of the financial intermediaries.[65] These intermediaries appeared to have been indifferent to the environmental benefits of the renewable energy programme. As one financial intermediary observed, "*the greenness of the renewable energy programme had nothing to do with us investing – the renewable energy programmes were well structured and all risks to private sector were mitigated*" (F3).

While financial intermediaries initially supported the coal programme, three financial intermediaries (Nedbank, FirstRand and Standard Bank) later withdrew their support for the coal programme (per Figure 5.5). The remaining two funders, DBSA and Absa, have not made any public announcements suggesting that they may withdraw their funding as well.

The SA renewable energy programme also appears to have placed no unexpected pressures on the financial intermediaries – as one explained, it "*required standard project finance considerations, with nothing exceptional being demanded other than having to engage in appraising new technologies*" (F4). This view resonates with interviewees from among the government agencies, in that "*the systems of government and finance were not under pressure to do anything different* [for the energy procurement programmes]" (GA6).

These responses suggest that the design and implementation of the energy programmes signalled infrastructure investment, which aligns with the National Treasury historically engaged financial intermediaries – rather signalling a new direction for financial intermediaries to target the specific transition-related objectives of prioritising environmental and social objectives in their investment decisions (current and future).

The next section reflects on South Africa's co-existing energy systems, and the specific system-effects targeted by the renewable energy programme.

5.5.3 Co-existent system effects

Two energy systems co-exist in South Africa. On the one hand, the country's dependency on coal means provision for adding new coal capacity is consistently

[65] Author's analysis from information provided by the IPP Office.

included in its energy planning, even though coal is a major contributor to GHGs. In particular, the coal programme contracted new capacity of 863MW for Thabametsi and Khanyisa in 2016 and the IRP2019 includes new coal capacity of 1,500MW – while also providing a decommissioning schedule up to 2050 for existing coal plants (SA, 2019a).

At the same time, the IRP2019 provides for procuring 2,500MW of hydropower, 6,000MW of solar photovoltaic, 14,400MW of wind and 3,000MW from natural gas – including the designation of renewable energy development zones – both of which bode well for developing the new sustainable energy system (SA, 2019a). Further, the IRP2019 shows that by 2030, coal will still account for the majority energy mix – with South Africa's Minister of Mineral Resources and Energy Gwede Mantashe having been quoted as saying "*ours is not a lobby group for a particular energy technology*" (Winning, 2019).

This means that, for the time being, two energy systems co-exist – the old, unsustainable coal-dominated system alongside the new sustainable system.

Such co-existence led to stalled implementation as described in Section 5.1, and also influences the choices and modes of implementing the new sustainable energy system. In particular, policy signals on technology choices and what constitutes sustainable energy in South Africa remain unclear, with differing views on nuclear, clean coal and gas.[66] The SA renewable energy programme was not immune to these tensions around the intended system effects.[67] The engagements with financial intermediaries were, therefore, essential to "*make them understand the programme had to have certain impacts"* (GA6).

The SA renewable energy programme intended to have two system-related outcomes. Firstly, procuring new technologies through renewable energy into the grid at affordable costs, and secondly, creating broad social benefits when procuring these new technologies.[68]

The technology outcomes relate to adding new technologies to the coal-dominated energy grid through solar photovoltaic, concentrated solar power, wind, biogas and small

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[66] Interviewees E5, GA7 and G4.

[67] Interviewees GA6 and GA7.

[68] Interviewees GA6, GA7, GA8 and G4.

hydro-power plants. As the programme matured, the costs of technology per kilowatt hour reduced significantly (Eberhard and Naude, 2017). A specific concern raised by the financial intermediaries during their engagements prior to the launch of the programme was the lack of experience in evaluating different technologies – therefore, the "*bid windows were designed to be technology-specific*" (GA6) which had the effect of focusing on evaluating only one type of technology at a time.

At least two of the financial intermediaries cited prior experience in evaluating renewable energy technologies. However, the SA renewable energy programme was different in that it offered standardised documentation upfront which meant engaging more precisely during the design phase of the programme.[69]

The social outcomes relate to redressing the country's apartheid legacy by prescribing minimum levels of ownership by empowerment shareholders (12.5%), preferential procurement and making contributions towards social upliftment in local businesses and social enterprises within the vicinity of the new power plants.[70] These social outcomes were co-developed by the National Treasury and Department of Energy based on principles in the empowerment codes, which were under revision at that time.[71] These proposals were discussed during the early engagements with financial intermediaries and were heavily contested.

As mentioned elsewhere, the debates between the Department of Energy, National Treasury and the financial intermediaries were intense, and one interviewee commented, "*not everything the banks asked for was there, but what was included we could live with"* (F1), in particular, using the social objectives to build momentum for creating local manufacturing capacity to build components of the renewable energy power plants.[72] Some financial intermediaries believed such outcomes would be difficult to implement in the short term and required a phased approach.[73] Regardless, the social outcomes

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[69] Interviewees F1 and F2.

[70] The empowerment dimensions and outcomes of the SA renewable energy programme are extensively documented by Eberhard and Naude (2017).

[71] The empowerment codes were under revision when the programme was launched. Once the programme was promulgated by government, certain elements of the SA renewable energy programme were adjusted to fit the requirements of the new codes.

[72] Interviewee GA2.

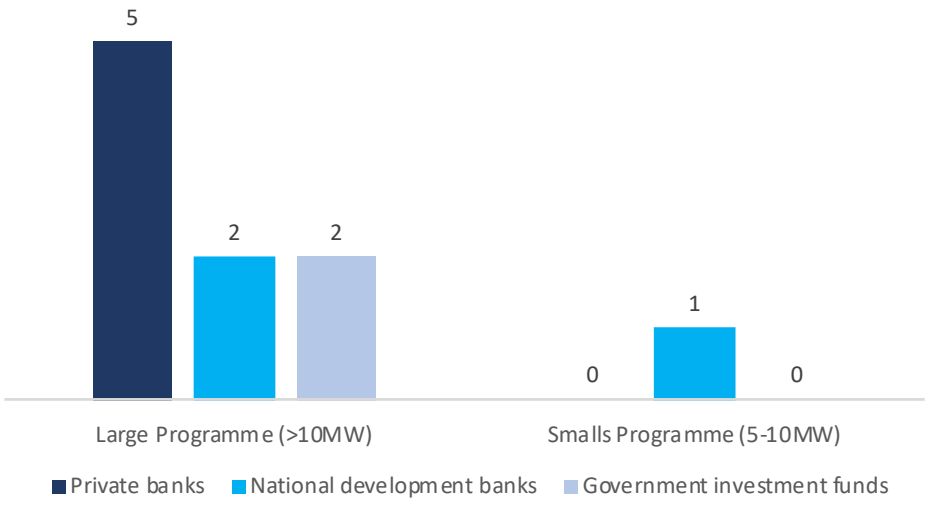
[73] Interviewees F1, F2 and F4.

largely remained as originally designed by the Department of Energy and National Treasury.[74]

The SA renewable energy programme designed two sub-programmes to accommodate certain social and technology outcomes. The Large programme focuses on new power plants in excess of 10MW and targets established (largely foreign) firms to help build South Africa's renewable energy capabilities, subject to majority ownership by empowerment shareholders. The Smalls programme focuses on new plants of between 5 and 10MW, targets local operators, and encourages partnering with established operators to facilitate skills-capacity transfers. Figure 5.6 shows the aggregate investment by financial intermediaries – disaggregated into private banks, national development banks and government investment funds across the two sub-programmes.

Figure 5.6 Number of intermediaries supporting the Large and Smalls programmes

Source: Author's construction based on information provided by IPP Office. Numbers refer to the number of intermediaries that supported each programme.



Though aggregate investment in the programme tallies to US$20.5 billion (ZAR193 billion), financial intermediaries displayed a preference for supporting the Large programme as can be seen in Figure 5.6.[75] While the annual reports of these financial intermediaries indicate the financial commitments and associated social benefits derived

[74] Interviewees GA6 and GA7.

[75] Based on data from the IPP Office.

from their support of the SA renewable energy programme, it also masks the fact that such support was mainly provided to the Large programme.[76] The preference was unexpected, considering the level of engagement with the intermediaries upfront, as one government official noted, "*the banks are not supporting the Smalls programme and we do not understand why*" (G4).

Prior work suggests the lack of support for the Smalls programme relates to the higher transaction costs associated with smaller projects (Eberhard and Naude, 2017). While such costs may be a consideration, interviewees revealed alternate explanations – "*in reality, the commercial banks paid very little attention to the Smalls as they were spoilt by the Large programme. There was nothing wrong with the structure or intention of the Smalls, and it would have gone a long way if it was launched first*" (F1).

Evidence for this lack of attention to the Smalls programme is the fact that only a single financial intermediary supported that programme – a national development bank, which suggests project developers in the Smalls programmes struggled to access funding. The data also appears to support criticism that financial intermediaries have been opportunistic, with financing and refinancing only of larger players, with limited support for small to medium-size companies (Baker, 2015b). Where such funding was provided, interest rates were high compared to those for funding large projects.[77] The higher cost of funding appears due to the perceptions that the Smalls programme had, "*higher transactional costs so it is understandable that they attract the higher funding rates because the participants are untested*" (GA8).

However, the Smalls programme is recently becoming of interest to investors – especially late entrants to South Africa's renewable energy sector.[78] As one interviewee stated, "*the market has moved from opportunistic to competitive*" (F3). Such competition is most evident in the Large programme, where the return on investment is lower than when the programme was first launched. The lower risk-returns profile in the Large programme also means that *"interest in that programme is waning"* (F1) – especially for foreign project developers who still regard South Africa as an emerging market investment destination. Further, if South Africa's credit rating falls to below investment

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[76] Based on author's review of the 2018 integrated annual reports of Nedbank and Standard Bank.

[77] Interviewees GA3, GA4, GA5 and GA6.

[78] Interviewees F1 and F2.

grade, then foreign funders would be obliged to withdraw their investments, although such signals were not yet evident among the existing investors in the programme.[79]

Several financial intermediaries predict that first-time investors or other latecomers to South Africa's renewable energy programme would now turn towards the Smalls programme because it offers higher returns on investment due to the less established project developers.[80] This means that the Smalls programme is essentially regarded by the financial intermediaries as an opportunity to obtain a higher return for taking a higher risk rather than it also being an investment in an inclusive energy transition which builds local industries. The findings here are consistent with prior research, which primarily frames investor interest in the climate and sustainability breakdown as pursuing green growth and investment returns (Jacobs, 2012; van der Ploeg and Withagen, 2013).

The underlying growth objective of the financial intermediaries reflects the reality of South Africa at the time. The SA renewable energy programme was the largest investment available to financial intermediaries between 2011 and 2015. As one interviewee said, "*it boosted domestic investment, because alternate investment opportunities in South Africa were scarce at the time"* (F1). This suggests that investors may have regarded the environmental and social benefits of the programme as inconsequential. An interviewee from among the financial intermediaries confirmed this deduction, noting that "*the greenness does not have much to do with it – it is a useful framing for unlocking funding from foreign development finance institutions, but any well-structured programme will get attention from the banks*" (F3).

Narrowly pursuing a growth objective, however, masks the underlying problems which need addressing – such as continuing patterns of unsustainable consumption and production, and perpetuating social inequalities (Naidoo, 2019a).

The financial intermediaries may also have been "spoilt" by the SA renewable energy programme, in terms of the expectations it set for future sustainable investments required to transition to sustainable paths. Comments such as "*the deals have to be good and well-structured, so government has to create the right programme"* (F3)

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[79] Interviewees F1, F2 and GA4.

[80] Interviewees F1 and F4.

suggest that there may be a lack of voluntary support for sustainable investments among the financial intermediaries.

This position is contrary to views expressed by some government officials that the early engagements with the financial intermediaries would ensure their commitment to meeting the technology and social goals of the SA renewable energy programme.[81] Views among government officials on expectations during the engagements are, however, divided. Some anticipated that the financial intermediaries "*on their own are not likely to act and require incentivising*" (GA3).

Prior research cautions that the structure of SA's financial system would affect how the transition to sustainable paths unfolds in South Africa, given that a few large banks dominate access to finance and historically favour lending to large businesses (OECD, 2017; Naidoo, 2019a; Mohamed, 2019). Further, despite openly and transparently engaging the financial intermediaries throughout the SA renewable energy programme, "morbid symptoms" are emerging.[82] Specifically, financial opportunism on the part of financial intermediaries competes with providing resources for the sustainability-related necessities of South Africa's energy transition.

An interviewee described the dilemma as relating to "*energy not being about electrons, but about the economic and social fabric of the country*" (GA3). This implies that the engagements between the Department of Energy, National Treasury and financial intermediaries around financing the programme are inadequate for the energy transition to take effect. Other influences and signals are necessary.

The next section discusses the contested social context surrounding SA's energy transition.

5.5.4 Contested social context

Where two systems co-exist, social contestation is inevitable. South Africa is no stranger to such contestation. In particular, civil society groups in the 1970s lobbied against UK and US banks to divest from South Africa as part of anti-apartheid protests (Fullwiller,

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[81] Interviewees GA2, GA3 and GA4.

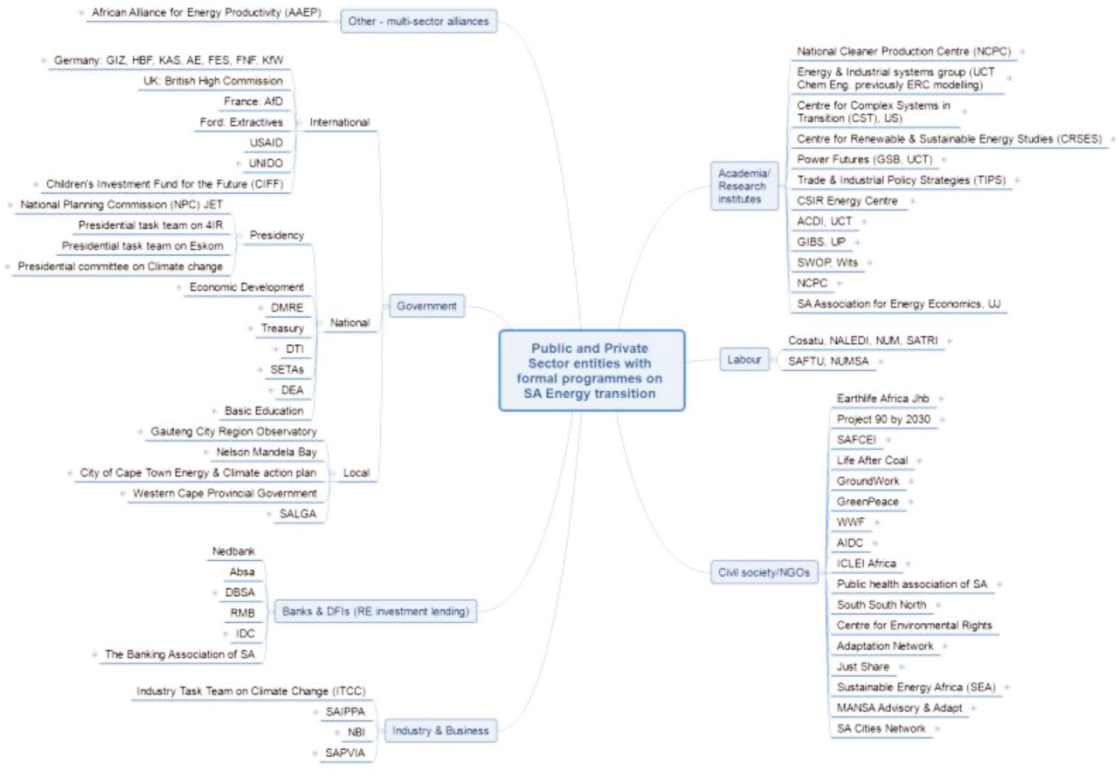
[82] Gramsci (1971) used the phrase "morbid symptoms" to describe the uncertainties and behaviours arising during the uncertain phase (interregnum) between an old system (which is dying) and a new system (which is emerging).

2016). Civil society groups were embedded in the fabric of the country, actively engaged in enabling the democracy of 1994 and holding the democratically elected government accountable in terms of governance, health, education, corruption and many other issues (Gumede, 2018).

Figure 5.7 illustrates the range of stakeholders involved in SA's energy transition process, including financial intermediaries, civil society groups and industry associations among others. While the map is not exhaustive, it demonstrates the social context in which South Africa's energy transition is evolving.

Figure 5.7 Stakeholders involved in SA's energy transition

Source: Martin, 2019 (reproduced with permission).



Several civil society groups are engaged in South Africa's energy transition – leading campaigns on air pollution (e.g., Deadly Air), rapid shifts to sustainable energy (e.g., Life After Coal), divestment from fossil fuels (e.g., Fossil-Free Africa, 350Africa - Divest-

Invest) and youth campaigns on urgent climate action (e.g., Africa Climate Alliance).[83] In particular, the divestment campaign against fossil fuels is premised along the same principles of campaigns against apartheid: to act against those who profit from fossil-fuels, expose the fossil-fuel industry as being unsustainable and destructive to society, and mobilise broader support to fight against the climate injustice (McKechnie and Ratcliffe, 2015).

Civil society pressures were instrumental in pressurising the Department of Energy during the 2008 to 2010 turning point to accelerate renewable energy deployment in South Africa and lobbied for the IRP2010 to reflect strong support for sustainable energy sources (Martin, 2016). This led to ambitious inclusions for adding 17.8GW of renewable energy by 2030, despite the continued planning for 6,300MW of new coal at that time (Martin, 2016).

This means that directional signals linked to implementing SA energy transition following the IRP2010 still make provision for the co-existence of coal and renewable energy programmes. Civil society responded to such co-existence in SA's energy transition in very specific ways, most evidently between 2015 and 2019.

Firstly, litigation was brought by civil society groups (Earthlife Africa and Groundwork represented by the Centre for Environmental Rights) against the Minister of Environmental Affairs, successfully opposing the award of environmental impact assessments for the three proposed coal-power stations because these assessments failed to take the long-term effects of the climate breakdown into account.[84]

The Thabametsi case, decided in 2017, establishes an important precedent in environmental and constitutional law in South Africa and lays the foundation for challenging any new coal-power stations in the country. The judgment requires climate assessments to be mandatory for future environmental impact assessments, upholding an individual's constitutional right to a healthy environment (Humbly, 2018). As a direct result of this judgment, the Thabametsi and Khanyisa power plants now face significant

[83] Interviewees E2, C1, C2, C3 and C4.

[84] Grantham Research Institute on Climate Change and the Environment litigation summaries: https://climate-laws.org/cclow/geographies/165/litigation_cases.

construction delays, so much so that they are unlikely to ever be built (Arnoldy, 2018; Jansen van Vuuren, 2018).

Secondly, financial intermediaries financing Thabametsi and Khanyisa (DBSA, Nedbank, Standard Bank and Absa, aggregate debt commitments of ZAR35 billion) were subjected to pressure from civil society groups. As a direct result of this pressure, between September 2018 and October 2019, three private banks (Standard Bank, Nedbank, and FirstRand) publicly withdrew financial support to Thabametsi, and some also withdrew from Khanyisa – representing 33% of the total debt committed to these projects.[85]

While the financial intermediaries cite compliance with new internal coal financing policies as the basis for their withdrawal, the role of civil society was crucial to these decisions. The judgment in the Thabametsi case opened an engagement platform between the financial intermediaries and civil society groups, bringing their attention to the inherent climate risks that had not been accounted for when the plants were approved. Such discussions seem to be instrumental in shifting the position of private banks in respect of continuing to lend to this new coal programme.[86]

The Thabametsi case appears to have been instrumental in triggering shifts on lending policies for future new coal projects. For example, Standard Bank is the biggest lender to the oil and gas industry across Africa. At its June 2019 board meeting, two resolutions were tabled by activist shareholders – one requiring disclosure of lending to fossil-fuel industries, and the other requiring disclosure of lending policies for fossil-fuel investments.[87] At the same time, civil society groups were protesting outside the building in support of these resolutions (Figure 5.8). Although only the second resolution was passed, the first resolution secured 38% of shareholder votes. This suggests that the need for such disclosure carries significant support compared to the usual support levels for similar resolutions in other countries (5%)[88].

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[85] Estimate based on author's research on data provided by the IPP Office.

[86] Interviewee C4 and review of data from Standard Bank, FirstRand and Nedbank.

[87] https://350africa.org/standard-bank-shareholders-vote-on-south-africas-first-ever-climate-risk-related-shareholder-resolution/.

[88] Interviewee C4 and review of data from Standard Bank, FirstRand and Nedbank.

Figure 5.8 Civil society groups outside Standard Bank headquarters

Source: Earthlife Africa (reprinted with permission).

FirstRand published a thermal coal policy on its website, and its shareholders have tabled a similar climate risk-related resolution to disclose its policies on fossil-fuel lending.[89] In early 2019, Nedbank made a statement that it is "*committed to a clean-energy future and as such will no longer provide project financing or other forms of asset-specific financing where the proceeds will be used to develop a new coal-fired power plant, regardless of country or technology*" (Paton, 2019). By contrast, FirstRand said it would continue to fund coal projects, Standard Bank was not prepared to rule out such projects, and DBSA, whose funding mandate on the Thabametsi and Khanyisa projects had expired, said it would be willing to consider new proposals from the investors (Paton, 2019).

The remaining funders of Thabametsi and Khanyisa, Absa and DBSA, have not made any announcements as yet, and continue to face social pressure. DBSA specifically faces a divestment campaign (Fossil-Free Africa and 350Africa) – calling for the bank to

[89] See Just Share shareholder resolutions https://justshare.org.za/investor-hub/shareholder-resolutions-agms.

abide by its development mission to “make change happen”.[90] While the public position of the DBSA on divesting from coal remains unclear, an insider said that the campaign is “*shifting conversations among colleagues within the bank – in the corridors and tea areas, people are engaging”* (E7). These conversations relate to how the DBSA can better integrate the climate breakdown in financing the development agenda of South Africa and the Southern African region.[91]

Signs of DBSA scaling up its activity internally is the formalisation of a Climate Finance Unit in 2018 to develop projects using international climate funds (Green Climate Fund and Global Environment Facility) and the national Green Fund,[92] the bank is being criticised by civil society groups for not being transparent about how these funds are being utilised.[93] A recent request by the DBSA for technical inputs to develop an energy investment framework that incorporates climate risks also suggests that further internal shifts may be happening.[94] These actions show that the financial intermediaries are being forced to engage with stakeholders and be accountable for the broader effects of their financing actions. Given South Africa’s strong civil society foundations, the pressure is unlikely to abate in the foreseeable future.

The expansive social context of South Africa’s energy transition depicted in Figure 5.7 shows business and industry, civil society groups, other local and national governments, international support and labour. While not exhaustive, the complexity of engaging on energy transitions in South Africa is apparent, as each of these stakeholders is likely to be influencing the country’s energy transition. Within this dynamic, non-linear and iterative context, coalitions form and contestations are inevitable. This context suggest that the national government of South Africa is unlikely to be the sole architect of its energy transition, related policies, or how implementation unfolds. In particular, a study by Martin (2016) highlights the tensions between different government actors and other actors when forging the renewable energy policies that emerged between 2007 and 2011.

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[90] https://350africa.org/thumamina-dbsa/.

[91] Interviewees F8, F9 and E5.

[92] Based on author’s research.

[93] Interviewee F8.

[94] Author’s research of technical research being commissioned by DBSA.

The next section discusses experimentation and learning through the SA renewable energy programme.

5.5.5 Contextual experimentation

Transitions are iterative processes, which require experimental approaches to policy, implementation and financing, and mechanisms for learning to embed learning from such approaches in future efforts (Naidoo, 2019a). This section focuses on examples of experimental approaches and learnings from the SA renewable energy programme.

The first instance of experimentation in the renewable energy programme lies in its standardised documentation. The technical advisors supporting the Department of Energy and National Treasury cautioned that such "*standardisation would never work as it had never been done before*" (GA6). However, the Department of Energy and National Treasury persisted, since their focus was to rapidly scale up investment in renewable energy for South Africa. Views appear divided among financial intermediaries on the relative effects of the standardisation. While one emphasised, "*the challenge was that South Africa was not using international best practice but pushed the model of a standardised deal*" (F2) – another appreciated that such standardisation accelerated investment, "*energy project finance deals were being concluded within 2 years, whereas rest of the region was taking over 7 years*" (F1).

The second instance of experimentation is the level of support from the National Treasury for the renewable energy programme at two levels. The first was a legal requirement that Eskom had to acquire the renewable energy generated by the new power plants (no curtailment of renewable energy was allowed). The second was backing up Eskom's obligation with a Government Support Framework Agreement. In the event that Eskom could not acquire the renewable energy generated through the programme, National Treasury's guarantee would be activated, and this would protect the income of the renewable energy project company.

These support measures were essential to reassure financial intermediaries who raised a primary concern during the engagements around "*the credit standing of Eskom*" (F2). Since a key focus was on building renewable energy capabilities in the country, the support features were essential to "*making the programme sustainable and designed for government involvement in the long run"* (GA6). Interestingly, financial intermediaries barely mentioned the financial support provided by National Treasury when interviewed, other than general comments that the renewable energy programme was robust, well-

structured and all risks for the private sector had been mitigated.[95] Other categories of interviewees commented that, "*we need new ways of giving investors comfort without placing further pressure on the state*" (GA4).

The third instance of experimental approaches relate to the attempts by the Department of Energy and National Treasury to secure finance for the empowerment shareholders in renewable energy companies. Access to finance for such shareholders has been historically challenging, ever since the empowerment-related legislation was passed in 2003. The National Treasury and Department of Energy requested two national development banks to prepare an offer to finance the debt for equity participation needed by empowerment shareholders and included this offer in the standard renewable energy project documentation. By doing so, their expectation was that "*no excuses should remain to accelerate implementation as funding was made available by the national banks*" (GA6). In the end, the offer was "*taken out of the standard documentation after the first two procurement rounds as it was not working*" (GA6).

This third instance of experimentation appears to be a burning issue among financial intermediaries, government and government agencies.[96] Interviewees repeatedly voiced their discontent around the lack of access to affordable finance for the empowerment shareholders, including the view that funding for these shareholders from the national development banks was too high.[97]

Figure 5.9 illustrates the typical shareholding structure of a renewable energy project company, with the green dotted lines representing the debt provided by the financial intermediaries for equity, operations and construction.

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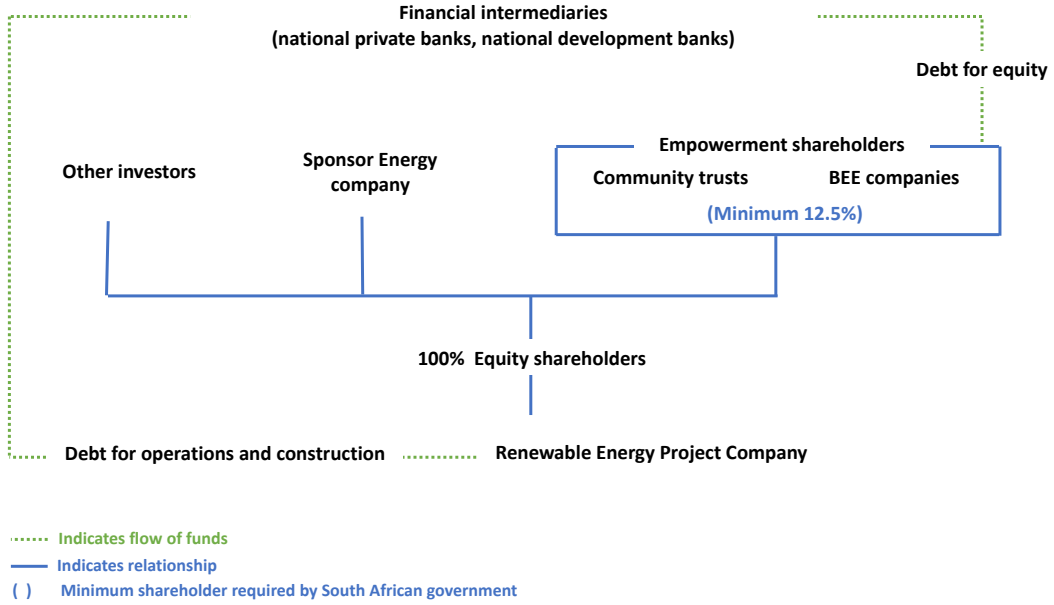
[95] Interviewees F1, F2, F3 and F4.

[96] Interviewees F1, F2, F3, F4, GA2, GA3, GA4, GA6, GA7, GA8 and G3.

[97] Interviewees GA3, GA4, GA6, GA7, F1, F2 and F4.

Figure 5.9 Typical shareholding structure of renewable energy project company

Source: Author's reconstruction based on information from the IPP Office.



Per Figure 5.9, the funding structure for the empowerment shareholder, historically, is loans to acquire equity in a target company (in this case, the renewable energy project company). In the case of the SA renewable energy programme, the length of the loans to the empowerment shareholders matched those to the renewable energy project company, which was between 15 to 20 years. Any dividends paid to empowerment shareholders would first be allocated to repay debt for at least the first 15 years. Although a small dividend (called trickle dividend) would accrue to the empowerment shareholders before this period had elapsed, it was inadequate for embedding South Africa's inclusive growth objectives in the renewable energy programme.

The IPP Office set up ongoing learning mechanisms to critically evaluate the experimental approaches and results of the programme, and to translate these results into policy recommendations for the attention of the Department of Energy, National Treasury, and other departments. These learning mechanisms mean the IPP Office is actively monitoring the quality and accessibility of finance for the SA renewable energy programme, offering feedback on policy, and engaging in new financial innovations to improve the beneficial outcomes of the programme.

These functions are in addition to its roles as facilitator of new procurement rounds and managing existing 20-year contracts. The IPP Office is funded through an innovative 1%

once-off project development fee levied on the project cost which each renewable energy project company pays on financial close. In this way, the private sector is paying for the ongoing administration of the SA renewable energy programme, and in drawing learnings from the programme for future improvement.

The most pressing challenges for the IPP Office are, "*addressing the compensation around empowerment shareholders*" and securing "*affordable and accessible funding for these shareholders (which is difficult to attain in the SA financial system)*" (GA8). These issues are critical for the future of the SA renewable energy programme. The IPP Office is now re-engaging financial intermediaries around its main findings, focusing on: i) securing more affordable funding for the empowerment shareholders; ii) restructuring the empowerment shareholders participation in the project companies; and iii) financing the Smalls programme.[98]

The learning mechanisms of the IPP Office on the renewable energy programme is bringing to light broader issues such as how different financial intermediaries relate to each other in financing the energy transition, and how debt refinancing benefits are shared among government, electricity consumers and private sector.

The first issue around relationships relates to how national development banks contribute to developmental and social agenda of the programme. On the one hand, some suggested that, "*the development banks should have played a bigger role, they were supposed to support government's empowerment goals, but they were the worse in terms of pricing*" (GA6). Also, that "*the development banks are not doing their part, they are failing – their position on financing has not changed over the life of the programme*" (GA4).

On the other hand, others recognised that the development banks bridged a gap in the beginning of the renewable energy programme that the private banks could not fill, while adding that they "*were never cheap and took people for a ride because they had a captive market*" (F1). As the programme matured, in subsequent procurement rounds, the private banks and sponsors of the renewable energy project company were financing

[98] Interviewees GA3, GA4, GA5, GA6, GA7, GA8, F3, F4 and E4.

the empowerment shareholders instead of the development banks, but the affordability of their financing was a concern.[99]

To bridge affordability gaps, the IPP Office is brokering arrangements with international and bilateral development agencies. For example, a German development agency and a national private bank created the ZAR1 billion FIRST facility for financing small to medium-size enterprises in the Smalls programme. Additional remedies for the concerns observed include considering a Refinancing Debt Fund for the empowerment shareholders' existing interests in the programme, and a BEE Fund for future participation and potentially using the social contributions made to the renewable energy programme as a means of funding the empowerment shareholders.[100] These arrangements are drawn directly from the experimental and learning approach being taken by the IPP Office – which analyses financing structures per bid, terms and conditions of debt repayment, and ease of access to funds for potential bidders.[101]

The second issue pivots on refinancing debt to the renewable energy project companies. The pre-launch engagements from 2009 to 2010 among financial intermediaries, the Department of Energy and the National Treasury were beneficial for this process. During this time, private banks sensitised institutional investors (pension funds) to the programme, building their capacity and confidence to also participate in the programme.

The long-term loans (15 to 20 years) to the renewable energy projects suited the investment portfolio of the pension funds. The private banks engaged these investors in refinancing the renewable energy project debt through a sell-down strategy – that is a strategy to sell portions of their 100% debt commitments to the renewable energy project companies after construction or earlier.[102] The sell-down strategy was a mandatory requirement from the investment committees of the private banks due to risk parameters imposed by Basel 2 banking regulations (which require that banks not be unduly exposed to one client or sector as such exposure would increase the risk weighting of the bank).

As the renewable energy matured, institutional investors began refinancing the private banks' debt commitments before construction ended and, in limited instances,

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[99] Interviewees F1 and F4.

[100] Interviewee GA8.

[101] Interviewee GA3.

[102] Interviewees F2 and GA3.

participated from the beginning.[103] The sell-down strategies potentially explain the prolific refinancing trends noted by Baker (2015b). As the refinancing is at a lower rate to the original loan (due to technology and other risks being understood, and construction having concluded – in some instances), the challenge to the IPP Office is ensuring that government and electricity consumers benefit from such arrangements (hence, the idea of a Refinancing Debt Fund).

The third issue relates to innovation by the South African financial system. In particular, new debt products linked to the Consumer Price Index (CPI) now constitute the primary basis for lending. New specialist financing firms are forming to lend such CPI products to the private banks.[104] Two green bonds were issued – a publicly listed bond of ZAR5 billion by Nedbank in 2019, and an unlisted bond of ZAR5.2 billion by the Industrial Development Corporation in 2012.[105]

Separately, the DBSA blended international climate finance facilities to create a new equity financing option for the Smalls programme.[106] Also, an active secondary market (for refinancing the debt of project companies) is developing as institutional investors are refinancing the private banks before construction of the renewable energy power plants are concluded.[107] However, there is discontent that limited or selective innovation is being applied to the financing the empowerment shareholders and the Smalls programme.[108]

The next section considers the analyses relative to the research questions of this paper.

5.6 Insights for South Africa and beyond

This paper set out to answer *how do financial intermediaries relate to the demands of energy transitions?* The transition demands framework was useful for considering this question in the context of South Africa. This section presents insights for energy

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[103] Interviewee F1.

[104] Interviewee F2.

[105] Information sourced from press reports by Nedbank and the Industrial Development Corporation.

[106] Interviewee F8.

[107] Interviewee F3.

[108] Interviewees GA3, GA4, GA6, GA7, GA8 and G3.

transitions in South Africa (5.6.1), insights that may be useful beyond South Africa (5.6.2), and insights for further academic work (5.6.3).

5.6.1 Insights for energy transitions in South Africa

The analyses identified tensions between the demands of South Africa's energy transition and the response of financial intermediaries, leading to insights for advancing energy transitions. These insights are summarised in Table 5.3 and discussed after that, including reflections for policymakers.

Table 5.3 Policy insights for South Africa

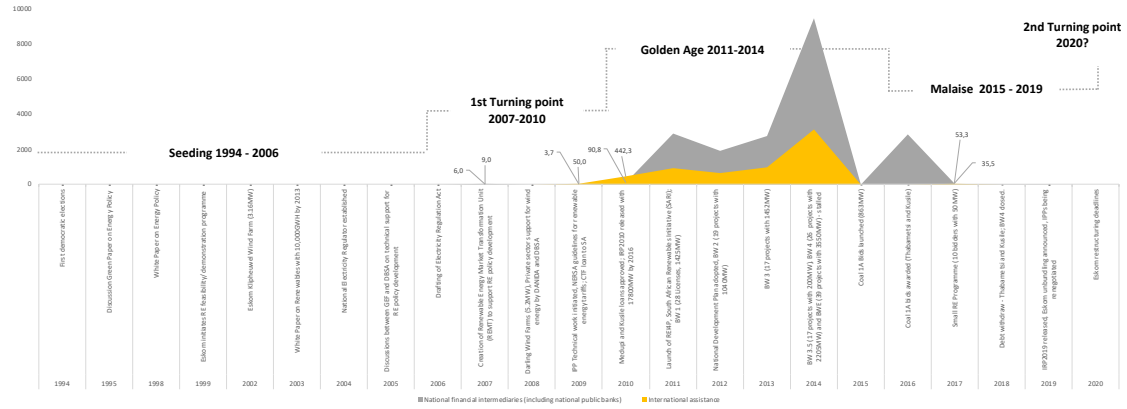
#1	Crisis-imposed responses are driving the country's energy transition
#2	Ambiguity exists about the direction of energy transitions
#3	Engagement with financial intermediaries only addresses project-level issues
#4	Reliance on government support is unrealistic for future energy investment
#5	Financial practices exist that are incompatible with sustainable energy systems
#6	Expectations gap exists between policymakers and financial intermediaries
#7	Financing ambiguous policies will reach a crossroads due to civil pressures
#8	Inadequate policies exist for aligning social objectives with energy transitions

5.6.1.1 Crisis-imposed responses are driving the country's energy transition

While South Africa's evolving energy transition is consistent with prior research that defines such processes as non-linear, unfolding over long periods (Geels, 2013), the historical pace of the last 26 years is incompatible with the country's energy challenges.

Figure 5.10 deconstructs the timeline of South Africa's energy transition and makes visible some of the conditions under which key policy turning points occurred. Triggers for the first turning point (2007–2010) and, possibly, the second (2020) mainly relate to crisis responses – pivoting on power cuts and Eskom's financial sustainability. The malaise between 2015 to 2019 is also attributed to Eskom's reluctance to conclude legal and tariff-related disputes, with broader debates involving technology choices also playing a role.

Figure 5.10 Policy and finance milestones of SA energy transition 1994 to 2019 *(Number expressed in ZAR millions).*



Relying upon crisis-imposed conditions to accelerate the energy transition will be problematic in the long run for meeting the environmental, social and economic goals of a sustainable energy system in South Africa. The many economic, social and environmental challenges facing South Africa (as described in Section 5.2 and which will require engaging with the IPCC Special Report) mean there is a narrow response window to address these matters systemically.

While accelerating the pace of the energy transition is essential given these challenges, it is critical to understand the factors underlying the repeated systemic issues leading to the ebb and flow of the transition process. *What would it take to break this cycle? What would it take to re-establish momentum in this process?*

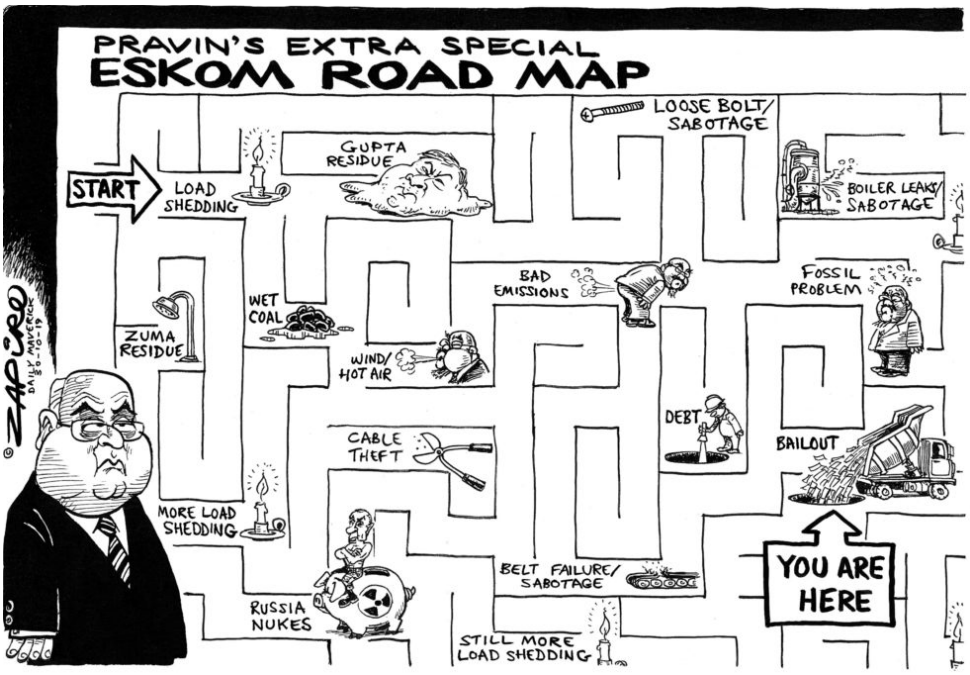
South Africa's energy transition is, therefore, at critical though dangerous crossroads. *Critical* because it is a time to deeply and honestly reflect on the realities the country faces and extract insights from the past 26 years. It also needs to create a new sustainable energy system without compounding existing social inequalities or adding further financial burdens. *Dangerous* because in the face of mounting and urgent challenges adopting expedient or narrowly-framed approaches may lock in, misdirect or stall South Africa's energy transition even further.

The SA renewable energy programme offers an example of expedited solution as it was partially accelerated to coincide with the country's hosting of the UN COP climate negotiations in 2011. The urgency left limited time for broadly framing how the programme fits into South Africa's energy transition, and for addressing known or anticipated policy inconsistencies.

Expedient or narrowly framed approaches are especially dangerous as they make possible piecemeal solutions which lack full consideration of their underlying assumptions or potential contribution to creating a sustainable energy system. The key question to ask is, *what part of the problem is being solved with which solution and for what purpose?*

Figure 5.11 Disconnect between starting points of addressing energy challenges

Source: Eskom Road Map © 2019 Zapiro. Originally published on Daily Maverick. Re-published with permission.



For example, new policies and directions were announced by the Ministers of Mineral Resources and Energy, and Public Enterprises to resolve the country's energy system issues. One of the responses (Figure 5.11) shows the potential disconnect between how government and broader public interpret the priorities to be addressed. It appears from this illustration that the Minister of Public Enterprises' decision to restructure Eskom ("bailout") is not well understood relative to solving the crisis of power cuts ("load-shedding").[109]

The repeated cycle of crisis-imposed conditions and related contestation among stakeholders in South Africa also suggests that time-bound or managed transition

[109] Zapiro is an internationally acclaimed political satirist.

processes may be difficult to achieve in practice. The SA renewable energy programme proves this point. Despite its planning, engagement and long-term procurement targets, implementation has stalled. Honest reflection on the systemic reasons and consequences of such delays would be critical for advancing the energy transition in future.

Contestation around what constitutes acceleration is inevitable, particularly given the historical engagement among the many stakeholders in South Africa's energy transition. Regardless, significant and honest engagement remains critical for shifting the crisis-imposed conditions of transition towards more system-level and forward-looking approaches. It is also critical for shifting the response of financial intermediaries and broader financial system towards creating financing conditions that produce a sustainable energy system in the short, medium and long term.

5.6.1.2 Ambiguity exists about the direction of energy transitions

Framing is a way of setting the transition agenda, which influences how others engage and respond to different agenda items (Haxeltine and Seyfang, 2009). Such framing is not homogenous, as the many drivers of transition processes suggest that different long-term visions of transitions arise (Loorbach et al., 2017). The analyses show that the demands of South Africa's energy transition are ambiguously framed. There are policies, programmes and government support to build renewable energy capacity through, for example, the SA renewable energy programme. However, this could be stymied by the fact that there are also policies, programmes and financial support for investing and supporting coal and other fossil-fuel energy sources into the foreseeable future.

The SA renewable energy programme offers insight into how such ambiguity influenced its direction and effects. The engagements between financial intermediaries, the Department of Energy and National Treasury, particularly in the period leading up to April 2011, reflect different framings and interpretations of the programme.

For the renewable energy programme, the Department of Energy and National Treasury framed two distinct demands – attracting investment for renewable energy technologies, and broadening social participation in these opportunities. The model of engaging the financial intermediaries throughout the SA renewable energy programme was essential for framing the demands of that programme.

The example of the renewable energy programme shows that financial intermediaries have the power to influence the direction of South Africa's energy transition. They are not mere respondents to the framing provided by the Department of Energy, National Treasury, or civil society groups.

The analyses show that financial intermediaries framed the SA renewable energy programme as a substantial investment opportunity, given the paucity of alternative opportunities in South Africa at the time. Other factors supporting the opportunity rationale include the longer lead times for similar investments in the rest of Africa. From the analyses, green and social elements appear mostly inconsequential. While financial intermediaries positively responded to the investment, the analyses highlight that they applied their existing preferences. Specifically, the intermediaries displayed a preference for Large projects, and admitted to being "spoilt" by larger project sizes, even though the Smalls programme was also well structured. Renewed interest in the Smalls programme is now mainly driven by finance intermediaries seeking higher returns on investment. Their response shows that finance is not neutral – financial intermediaries apply their discretion in choosing between investment alternatives, and their choices directly affect the economy.

Civil society groups frame South Africa's energy transition as meeting social, environmental and health benefits and are holding government and financial intermediaries to account for commitments made under the Paris Climate Agreement. These civil society groups are shifting how financial intermediaries are engaging in transition processes by pressurising them to withdraw their support for the coal programme. Their role in directing and maintaining focus on these goals is critical for developing sustainable energy system, especially given the ambiguous policy context.

How can financial intermediaries be guided towards consistently supporting the direction of South Africa's energy transition? It is critical to consistently direct the response of financial intermediaries and the financial system more broadly towards generating a sustainable energy system which meets environmental, social and economic goals. In the case of South Africa, this is difficult for two reasons. The first is that the policy context remains ambiguous, and secondly, the financial intermediaries self-select their investment preferences, regardless of the framing with which they are presented.

The ambiguous policy context raises several questions. There are various frames of the energy transition. Can they be reconciled, or are some frames more critical than others?

And who decides which frame is the dominant one? These issues require sincere and honest reflection, as policymaking processes are often complex and require paying attention to a variety of views.

The indifferent investment behaviour of financial intermediaries reflects a preference for decisions based on risk and reward trade-offs. This approach shows that creating financing conditions to produce a sustainable energy system cannot be left to the financial intermediaries alone. It requires engagement from other parts of the financial system, for example, the South African Reserve Bank, which recently joined the Network for Greening the Financial System. To achieve system-level effects requires system-level engagement. This means all of the financial system – its intermediaries, markets and infrastructure – should consistently be directed towards producing a sustainable energy system.

5.6.1.3 Engagement with financial intermediaries only addresses project-level issues

The analyses show that the relations between South Africa's energy transition and financial intermediaries vary in scope and intensity as the focus and priorities of South Africa's energy transition shifted over time (Table 5.4). These engagements mainly focused on project-specific financing needs and preparations.

In particular, between 2008 to 2014, the Department of Energy, National Treasury and financial intermediaries focused on accelerating investment for projects under the SA renewable energy programme. The early meetings leading up to the programme launch in April 2011 laid important foundations for that programme, resulting in significant investment activity such as the design of new financial products (e.g. new ways of providing finance), and refinancing of certain projects.

Table 5.4 Engagements with financial intermediaries in SA energy transition

Time phase	Private banks	National development banks
1994-2007 *Seeding*	No specific engagement identified[110]	Development support for renewable energy policies and pilot projects

[110] The data gathered for this paper did not identify any specific engagement between the Department of Energy, National Treasury and other government departments with the private banks related to the energy transition. This does not mean that no such engagement took place. The private banks may have been

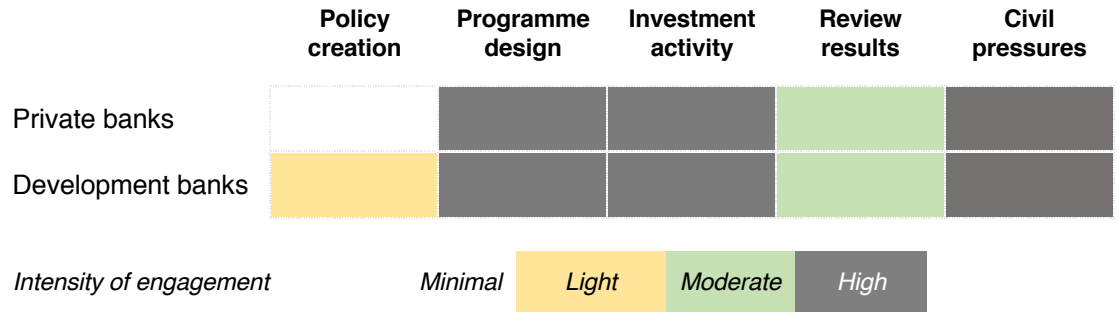
Time phase	Private banks	National development banks
2008-2010 *Turning points*	Programme consultations Investment preparations	Programme consultations Programme support for IPP Office Investment preparations
2011–2014 *Golden age*	Investment in programme New financial product development Refinancing of debt commitments	Programme support for IPP Office Investment in programme
2015-2019 *Malaise*	Refinancing of debt commitments New financial product development Review results (funding anomalies) Divestment pressure from civil society	Development finance innovations Review results (funding anomalies) IPP Programme support (DBSA only) Divestment pressure from civil society

The IPP Office fulfilled an important function by constantly reviewing the results of the programme which led to meeting financial intermediaries again between 2015 and 2019 to consider funding anomalies in the programme as these became evident, and to consider remedial actions. This suggests that the SA renewable energy programme was dynamically administered by the IPP Office, providing feedback to the Department and Energy and National Treasury on the efficacy of programme design and interrogating the response of the financial intermediaries.

Table 5.5 offers an alternate thematic way of analysing engagements in the energy transition process – policy creation (1994–2007); programme design (2008–2010); investment activity (2011–2019); and review and reflection (2015–2019).

engaged in the initial review of renewable energy policy documents in 1995 and 1998, but no evidence for this was found.

Table 5.5 Intensity of engagements with financial intermediaries[111]



These aspects relate mainly to financial intermediaries engaging with the relevant government departments, and their response to the SA renewable energy programme. Pressure from civil society groups (marked "civil pressures" in Table 5.5) mainly questioned the legitimacy of the actions of government and the financial system.

The weighting assigned to the engagement derive from the frequency of meetings, extent of finance flows, and other confidential stakeholder exchanges reviewed by the author.

Going forward, it is useful to ask whether these type and intensity of engagements remain valid and adequate for shifting South Africa's old coal-dominated energy system towards a sustainable energy system. The analyses show that financial intermediaries and government are mainly engaging at the level of financing individual projects. By contrast, civil society groups are engaging at the systems-level to support shifts in South Africa's energy system by questioning the consistency and legitimacy of government and financial intermediaries' actions.

These questions are critical to prompt discussion around what the demands of South Africa's energy transition are. *Is the financial system ready to support such demands consistently and what would be required to embed such consistency?* Though project-level engagements are necessary to advance investment, addressing systems-level issues is critical to identify consistencies and inconsistencies that may inhibit or misdirect the transition process. This applies particularly to the financial system as its intermediaries have power as primary lenders to direct energy transitions and determine

[111] The indications of intensity are based on data from the interviewees, and debt commitments (Sections 5.1 to 5.5) relating to the topics and focus of the respective engagements in the transition process with government and its agencies.

how other parts of the system such as the markets (through institutional investors) engage through secondary lending. The systems-level engagements should recognise that energy transitions have dynamic needs, which require adaptive policy and financing responses.

5.6.1.4 Reliance on government support is unrealistic for future energy investment

South Africa's energy transition context, direction and implementation efforts evolved since 1994, and so did its financing needs (Table 5.6).

Table 5.6 Evolution of financing needs of SA's energy transition

Phase	Focus	Financing needs	Type	Sources
1994–2007 *Seeding*	Government policy development and piloting technologies	Establish policy foundation for diversifying energy system and supply	Grants	Public budget, bilateral and multilateral support
2008–2010 *1st turning point*	Regulation, legal, technology choices	Ensure the SA renewable energy programme is fully financed	Grants	National development bank, government
	Eskom	Securing new power supply	Loans	Multilateral, other
2011–2014 *Golden age*	SA renewable energy programme	Ensure funding of SA renewable energy programme, launch new technology at affordable costs, access to finance for empowerment shareholders	Loans, equity, guarantees	Financial intermediaries, project sponsors, government
2015–2019 *Malaise*	SA renewable energy programme	Secure affordable finance for empowerment shareholders, ensure financial benefits accrue earlier, consider risk-reward sharing	Loans, equity, guarantees	Financial intermediaries, project sponsors, government
	Eskom	Address debt burden	Budget	Government
2020– … *2nd turning point*	Eskom restructure	Enhance its sustainability and competitiveness	Budget, other sources	Government, other (uncertain)

Phase	Focus	Financing needs	Type	Sources
	SA renewable energy programme	Integrate lessons learned, refinance empowerment shareholders, examine limitations on government guarantees	Loans, equity, guarantees (uncertain)	Financial intermediaries, project sponsors, government (uncertain)
	Just transition	Support affected workers and communities	Under discussion	Under discussion

Table 5.6 shows the shift from the seeding phase (1994–2007) where establishing policy foundations after the country's democratic elections was the priority to the golden age of renewable energy investment (2011–2014). Table 5.6 also shows that from 2010 to 2014, renewable energy project companies and empowerment shareholders were seeking funding to participate in that programme. These lead to the present time of 2019–2020, where the financing needs relate to structural challenges around Eskom and addressing social (just transition) issues.

As the financing needs and context of SA's energy transition shifts over time, it is timely to consider whether the government-led support to financial intermediaries should remain the same. The commitments of financial intermediaries were secured by experimenting with structural and implementation approaches. For structuring, the National Treasury offered support for mitigating the risks identified by the financial intermediaries, and for implementation, the Department of Energy and National Treasury standardised documentation and offered technology-specific procurement rounds to ensure a rolling procurement schedule. In particular, the government support addressed concerns of counterparty risk (i.e. the risk that Eskom would not buy the energy from the renewable energy project companies).

However, South Africa now faces a markedly different economic context, with deteriorating fiscal conditions, high government debt, and persistent pressures to financially support state-owned companies such as Eskom and South African Airways (IMF, 2019). With over ZAR59 billion already allocated for supporting these companies in 2019 and 2020, other development priorities such as addressing its water, housing, unemployment, health and education crises are at risk.

The economic outlook for South Africa is difficult and the International Monetary Fund specifically suggested urgent reforms to contain the levels of debt levels (IMF, 2019).

This means government support for South Africa's energy transition path, especially for creating the new system through renewable energy and other forms of investment, needs to be redesigned to be independent or substantially less reliant on government support. This means it is critical to create new business models for creating South Africa's future energy system.[112]

In aggregate, the government's remaining unallocated guarantee capacity is only ZAR109 billion (SA, 2019c). This is for all state-owned enterprises and represents a potential debt that may be called in for repayment if the country's credit rating deteriorates. Government support for independent power producers (other than Eskom) is currently budgeted at ZAR200 billion, of which ZAR146.9 billion is utilised – potentially constraining future procurement under the SA renewable energy programme (SA, 2019c). Therefore, alternative approaches which reduce dependency on government guarantees are essential for creating a sustainable energy system. New critical challenges lie ahead linked to reducing dependency on the government-led investment model such as embedding and financing the just transition dimensions of South Africa's energy transition.

Alternative approaches might be difficult to develop in practice. Despite the economic context, the analyses show that financial intermediaries still expect the same degree of government support previously given to SA renewable energy programme.

There are strong foundations for considering alternative approaches to meeting the new financing context. South Africa has the most sophisticated, mature and innovative financial system in Africa (WEF, 2017b) and access to international development and climate finance. Aside from international finance, South Africa is also home to the largest pension fund in Africa – the Government Employees' Pension Fund – with assets worth over ZAR1.6 trillion (US$122 billion). The sophistication and diversity of South Africa's financial system should, therefore, be put to work to support the energy transition.

By articulating the demands of South Africa's energy transition, the financial system is placed into the position of having to engage and respond to such demands. However, the framing of the demands of a sustainable energy transition should be articulated at a

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[112] See for example: "Financing energy projects in Africa: the traditional business model needs to change" https://www.iol.co.za/business-report/energy/financing-energy-projects-in-africa-the-traditional-business-model-needs-to-change-22363122

systems-level with a long-term perspective in mind. In that way, the demands of the transition would be driving the response of the financial system rather than the financial system being left to decide what role it plays in how transitions unfold.

5.6.1.5 Financial practices are incompatible with sustainable energy systems

The analyses reflect contradictions within South Africa's financial system. On the one hand, innovative approaches for financing and refinancing the renewable energy project companies are proliferating (e.g. CPI-linked debt and green bonds). This supports the arguments of Perez (2002) that during times of technological opportunity (in this case, renewable energy), financial creativity heightens as investors hasten to take advantage of new investment opportunities. On the other hand, prohibitive financing structures with expensive funding charges for empowerment shareholders and the Smalls programme were developed by the same diverse, mature and innovative financial system.

The observations identified in this study for these differences are striking. In particular, the analyses show that only one financial intermediary supported the Smalls programme and seven supported the Large programme. While prior research attributes the limited interest in the Smalls programme being to higher transaction costs (Eberhard and Naude, 2017), the analyses expose other motivations. Financial intermediaries had become accustomed to the relatively larger project sizes of Large programme and preferred focusing on that programme (Eberhard and Naude, 2017). Their deliberate preference for the Large programme supports prior research that the structure and culture of South Africa's financial system favours large businesses (Naidoo, 2019a). These observations raise questions about the paradox of finance in South Africa – there is finance available, but there are access, awareness and incentive issues regarding the financing of comparatively small businesses (Padayachee, 2019).

The prohibitive financing structures for empowerment shareholders would have been evident to the financial intermediaries from the beginning when these structures were negotiated. Detailed financial models were mandatory submissions for participating in the procurement process. However, the financial intermediaries appear to be overlooking the injustice of locking empowerment shareholders into financing structures that will run for 15 to 17 years before these shareholders gain any tangible benefit. Other shareholders were extracting their benefit much earlier.

The analyses suggest that the financial intermediaries were expected to do more than simply mobilising the required amount of investment for specific projects. This is evident

from comments that reflect growing frustrations, such as, "*there is no financial innovation from the private sector, it is a one-way street of innovation only by the state*" (GA3) and, "*the market is not working*" (GA6).[113]

The preferential investment and selective innovations by the financial intermediaries in the SA renewable programme suggest that unsustainable practices within financial intermediaries will negatively affect the creation of a sustainable energy system and response to the climate breakdown. Financial intermediaries will be expected to contribute, especially remedying the lack of social inclusion of existing projects, addressing just transitions, and compensation for losses. As Insight 4 shows (see Table 5.3), the National Treasury will be hard-pressed to constantly design interventions to mitigate the risks faced by financial intermediaries. What can these intermediaries do on their own or through innovative business models or collaborative partnerships to support the sustainability transition?

Leaving any unsustainable practices unaddressed and implicitly assuming that financial intermediaries will support transitions is risky. In particular, these unsustainable practices may undermine new sustainable paths. Where innovation, sophistication and diversity are present within financial systems, *how can such a system be made to focus on the critical development agendas of the country? What is the purpose of the financial system within a country? What is expected of such system to support transitions? What incentives are driving how the financial engages during energy transitions?* Questions such as these are vital when considering the financing of energy transitions.

The analyses suggest that South Africa's energy transition cannot be left entirely to financial intermediaries to direct without continually and explicitly framing, refocusing and correcting how they engage. The South African example is therefore useful in terms of its ability to show how policymakers are learning from the evidence of its renewable energy programme. In particular, the monitoring of the programme makes visible what effects are being achieved and those that are not. By analysing the vital data of the renewable energy programme over time, the response of the financial intermediaries to the programme also becomes evident. The learning mechanisms developed by the IPP

[113] Interviewees GA3, GA4, GA6, GA7 and GA8.

Office are essential to apply more broadly to advance energy transitions and the climate response in South Africa. It is also an example that other countries may learn from.

The aggregated data enables insight into responses and biases regarding how the programme is being funded by the financial intermediaries. The IPP Office uses this data to engage with financial intermediaries to develop alternative financing approaches and with various government departments to reflect on the programme. While these approaches are useful for the funding of the programme, it needs to be expanded to set system-level expectations for how financial intermediaries can contribute towards a creating new sustainable pathways (including energy) over the medium to long term.

5.6.1.6 Expectations gap exists between policymakers and financial intermediaries

The analyses bring to light that financial intermediaries experienced no pressures upon them by the Department of Energy and National Treasury through the SA renewable energy programme beyond having to evaluate a standard project finance transaction. For them, the technology and social goals were inconsequential to their investment decisions. These findings resonate with views expressed by interviewees from government agencies – though only in hindsight – that no pressure was placed on the financial intermediaries to do anything substantively different from their usual banking practices.

On the one hand, government and government agencies consider the SA renewable energy programme to be building new capacities and skills among financial intermediaries, therefore, "*it should be easier do so such deals beyond the programme and regional space"* and *"having now been strengthened, they should engage*" (GA7). On the other hand, financial intermediaries consider their support to the programme to be positive and recognise some internal skills have been built on renewable energy project finance. While being appreciative of the prior engagements with the Department of Energy and National Treasury, some financial intermediaries suggested, "*private sector will respond to what it needs to, and no more"* (F4), and future investment of this scale "*needs to be government-led to more effective*" (F1).

The polarity of these responses suggests that there are tensions between what the financial intermediaries are *willing* to do, and what is *expected* of them in supporting South Africa's energy transition.

The analyses show that the Department of Energy and National Treasury expected the national development banks to finance the empowerment shareholders' participation in renewable energy project companies. The expectation was that these banks offer affordable finance, and therefore pre-approved funding was initially included in the procurement process. However, no such affordable finance materialised. The findings also show discontent regarding national development banks and how they support the developmental agenda in South Africa – their funding terms, structuring and innovation abilities. Specific comments were made about whether the development banks in South Africa are "*playing their part*" (GA3).

An expectation gap appears evident which raises several questions. If a national development bank is expected to fulfil a particular role within a transitions context, is it able to do so? The answers depend on the mandate of such banks, how they are funded, and whether they pass on the benefits of any concessional finance (lower than market rates) at their disposal. From a policy perspective, higher expectations of financial intermediaries also require assessing their capability to meet such expectations, identifying their limitations, and making the necessary adjustments to enable them to meet such expectations.

The analyses also show that expectations are low and static in relation to private banks – as reflected by comments such as "*private banks will only focus on making money*" (GA8) and that "*private banks are there to make money based on their risk appetite, and that cannot be changed, and development banks are supposed to support government policies"* (GA6). To create a sustainable energy system, is it reasonable to hold these expectations of the private banks? Or should more be expected of them? The analyses in the paper suggests that more is expected from them by parts of government, while other parts accept that government has to incentivise private banks to invest in the new sustainable energy technologies.

Maintaining these expectations is potentially *dangerous* for South Africa's energy transition because the financial system, particularly financial intermediaries, have significant influence over such a transition. Should the financial system (its intermediaries, markets and infrastructure) not also have to adapt to meet the needs of a sustainable energy system in the future? These are vital policy questions to consider.

While the Department of Energy and National Treasury may not have placed high expectations on the financial intermediaries other than the mobilising finance, civil

society groups do. In particular, pressure is mounting for financial intermediaries to disclose their exposure to fossil-fuel investments. However, private banks are reluctant to do so.

This reluctance by financial intermediaries may be remedied by engaging the financial system more broadly, for example, engaging the South African Reserve Bank which has recently joined the Network for Greening the Financial System. By joining this network, the Reserve Bank may be signalling its recognition that South Africa's financial system requires adjustment to respond to climate breakdown more effectively. However, there are no firm indications to this effect at the time of submitting this thesis.

5.6.1.7 Financing ambiguous policies will reach a crossroads due to civil pressures

The study shows that shifts in energy systems are not solely dependent on transition-related policies or the response of financial intermediaries. Civil society groups are critical for pressurising financial intermediaries to prevent investing in any new coal projects. This occurred in the absence of explicit and ambiguous government policy. Such pressure may potentially extend to financial intermediaries who are financing corporate acquisitions in coal companies.[114]

South Africa's energy transition may be moving towards a crossroads. Will the financial intermediaries maintain the current positions of not investing in new coal to appease civil society groups and follow international divestment trends? Or will they support the policies of a government which is unclear about how a sustainable energy system is being created? South Africa's financial system is mature, but highly concentrated around six large banks and two national development banks. If these intermediaries are not financing the coal aspects of governments policies, then which organisations will?

5.6.1.8 Inadequate policies exist for aligning social objectives with energy transitions

The demands of energy transitions are also influenced by the coherence between policy and implementation for meeting the environmental, social and developmental goals of sustainable energy systems. As one interviewee stated, "*for implementation to work, then its pace and scale has to be the same as per* [pace of] *state policies*" (GA7). The paper shows the SA renewable energy programme to be an experimental approach to

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[114] The acquisition by empowerment shareholders (BEE companies) of the large mining company interests in thermal coal plants in South Africa is being financed by some of the private banks.

policy and implementation. For example, the social components of the renewable energy programme were premised on familiar territory – the empowerment codes adjusted by the Department of Energy and National Treasury.

Over successive rounds of procurement, it became apparent that the empowerment codes were unsuited to infrastructure-related projects. However, there appears to be limited awareness and traction among policymakers for adjusting these codes.[115] The analyses suggest that SA renewable energy programme, "*needs to be reconsidered from a transitions perspective"* (GA6).

This means reviewing existing policies and programmes to account for the disruptive nature of transitions and new policy directions that co-joins energy and just transitions.

5.6.1.9 Limitations of this study

The study primarily examined the direct engagement between financial intermediaries with SA renewable energy programme, focused on private banks and national development banks. Not all financial intermediaries involved in the financing responded to requests for an interview, but six of the eight major national funders were interviewed. Other investors (institutional, international or corporate sponsors) were not engaged for this study.

Future research may consider broadening the scope to consider how the financial system is relating among its constituent parts to the energy transition in South Africa. An in-depth analysis of coal finance and related finance was out of this paper's scope since the focus fell on the renewable energy programme as the primary area of enquiry. Regardless of these limitations, the insights of this paper may be useful for researchers and policymakers to enhance the contribution of financial intermediaries in meeting the environmental, social and economic demands of creating a sustainable energy system and responding to the climate breakdown more broadly.

5.6.2 Insights beyond South Africa

The insights derived from applying the transition demands framework to South Africa may be relevant for other countries. In particular, the case of South Africa shows tensions between implementing energy transition processes and financing them. These tensions

[115] Interviewee E6.

are not confined to the quantity of finance required for investment, but address issues of investment quality. Specifically, this entails considering what types of sustainable energy investments receive support and which do not, the degree to which financial innovation supports specific goals, and mismatched expectations between government, civil society and financial intermediaries.

The example of South Africa also demonstrates that active engagement between energy transitions and financial intermediaries supports the implementation of programmes to advance renewable energy investment. However, there is no firm evidence that such engagements led to fundamental changes in South Africa's financial system to make it more amenable to prioritising environmental and social risks associated with energy transitions (and the climate breakdown more broadly). This implies that the nature and focus of these engagements are influenced by how the investment programme is framed, its inherent objectives, and how financial intermediaries interpret their role and direct their resources and efforts. This means that it is essential to define the scope and depth of such framing and its implicit expectations of financial intermediaries.

The frustrations expressed by certain interviewees that the financial intermediaries focus only on their investment returns relative to the risk they are taking represents how the financial system generally engages in investment programmes. The propensity to support some but not all sustainable energy options highlights the limitations of traditional investment approaches. In particular, financial intermediaries are geared towards limited or selective innovation based on existing risk-based preferences and standard ways of engaging in investment. Unless external pressure is brought to bear through civil society groups, policy or regulation, financial intermediaries will continue to respond in the same way rather than innovate.

The transitions demand framework applied here may be helpful for identifying similar tensions affecting the financing of sustainable energy systems in other countries. These tensions are useful for further enquiry into the scope and nature of changes to the financial system. Such an enquiry should focus on identifying any unsustainable practices in the interests of creating a sustainable financial system that complements and meets the demands of the sustainable energy system.

5.6.3 Insights for future research

The transitions demand framework was developed in response to a conceptual gap relating orthodox finance and sustainability transition studies. This gap is

comprehensively addressed by Naidoo (2019a). In summary, it highlights that sustainability-related finance research is fragmented with no reference to transitions, and finance-related research in sustainability transitions studies requires further conceptualisation and empirical support. Further, practice-based research is proliferating without any academic engagement, which means that the adequacy of the response of the financial system relative to the needs of transition processes remains unexamined.

This first application of the transition demands framework was useful for deconstructing the relations and tensions between financial intermediaries and energy transition processes. The deconstruction process is critical for articulating transition-related observations and expectations among different actors involved in these processes. This, in turn, assists in understanding the extent to which policymakers and financial intermediaries support or inhibit transition processes. Such insights pave the way to consider the scope and breadth of changes that may be needed in the financial system, and the clarity required from policy processes to advance energy transitions.

5.7 Conclusions

This paper set out to understand how energy transitions and financial intermediaries relate to each other by applying the transition demands framework to the case of South Africa. The framework considers the demands that transitions place on the financial system and their response to such demands. The research question for this paper was themed in the same way – *how do financial intermediaries relate to the demands of energy transitions?*

The framework highlighted tensions and challenges between financial intermediaries and energy transitions at a country level. Specifically, the analyses show that South Africa's energy transition over its 26 years is marked by contestation with non-linear and iterative processes. The transition process is largely being led by crisis-imposed conditions evident in the time phases which this paper identifies (seeding, turning points, golden ages, and malaise – see Table 5.6).

The paper specifically follows the evolution and engagement of financial intermediaries with the SA renewable energy programme, tracking the nature and intensity of such engagement, and its effect in promoting the investment and social outcomes targeted by the Department of Energy and National Treasury. The analyses show that both government and financial intermediaries are engaging in energy transitions at the level of financing project-specific issues, and not yet framing the engagement in terms of

creating a sustainable energy system. However, pressure from civil society groups and shareholder activism is leading to certain financial intermediaries terminating their investment in new coal projects. The paper also identifies insights for policymakers to consider, which include developing transition-relevant policies, framing the transition explicitly, and focusing the financial system on energy systems change.

The analyses and insights from this paper are relevant for other countries, as they highlight how the responses of the financial intermediaries to energy transitions depends on a variety of factors. The paper offers empirical evidence that financial intermediaries, within the broader context of the financial system, exercise significant influence over transition processes. In addition, standard, risk-based and opportunistic approaches to investment are unsuited to transition towards the creation of sustainable energy systems.

Mark Twain allegedly said that "*history does not repeat itself, but it often rhymes*". In the case of relating energy transitions and financial system, it is essential to break the rhythm of implicit assumptions, unframed expectations, opportunism, acting on preference rather than necessity, and crisis-imposed conditions with expedient solutions. By applying a transition demands perspective, this paper shows that transitioning towards sustainable energy systems requires more than quantity of finance. The quality of finance also matters to meet the qualitative aspects of the environmental, economic and social objectives that are critical for creating sustainable energy systems, and the process for achieving these objectives.

5.8 Acknowledgements

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6 Policy insights for design features of financial systems

This section synthesises the third research objective of this thesis to *develop policy insights for relating financial systems and transition processes* based on the conceptual and empirical work presented in Chapters 3 to 5.

The previous Chapter 5 applies the transitions demand framework to the case of South Africa's energy transition (see section 5.6.1) presents comprehensive policy insights relating to how policymakers and financial intermediaries related between 1994 and 2019. This chapter reflects further on those policy insights specifically from the perspective of designing financial systems that are supportive of sustainability transitions. In Chapter 3, this thesis developed six design features for the financial systems response to the demands of transition process – these are:

i) Political – address behaviours and incentives within financial systems.
ii) Relational – examine links among components of financial systems.
iii) Structural – examine origins and interconnectedness of financial systems.
iv) Temporal – instil a sense of urgency.
v) Qualitative – embrace new qualities for finance.
vi) Theoretical – update theory to prepare future generations.

These design features are considered here in the context of developing policy insights for financial systems at the national and multilateral level (including UNFCCC negotiations and its financial mechanisms).

6.1 Insights at the national level

Based on the exploratory research described in Chapter 1, policymakers view finance mainly from the perspective of projects and sourcing appropriate financial instruments (e.g. debt, equity, guarantees or grants). This focus may obscure the systems-level effects that characterise sustainability transitions, depending on the specific country context, and the scale of such projects in a particular country. The case of South Africa's renewable energy programme, for example, shows that the project-level focus enabled large investment. However, it was apparent that financial intermediaries did not undergo any fundamental shifts in terms of being willing to support smaller and future sustainability-related investment programmes. Shifting the policy focus to the underlying characteristics of the transition process allows policymakers to consider immediate needs at a systems level.

The focus on transition processes evokes a systematic thought process focused first on what is required for sustainability transitions to occur, and then on designing and implementing interventions for such transitions to take place. These questions could include, *what are the transition needs, how can they be met, what changes are necessary to meet such needs*, and *in what ways can policy or regulation enable the changes necessary to meet such needs?*

The last question is essential as policies and regulations or government support (in the case of South Africa) establish precedents for future transition-related interventions, which may lead to the expectation that governments should always initiate or support the transition process. Therefore, it is critical to undertake careful deconstruction of the transition needs and examine the precise assumptions about how policies are expected to contribute to meeting such needs.

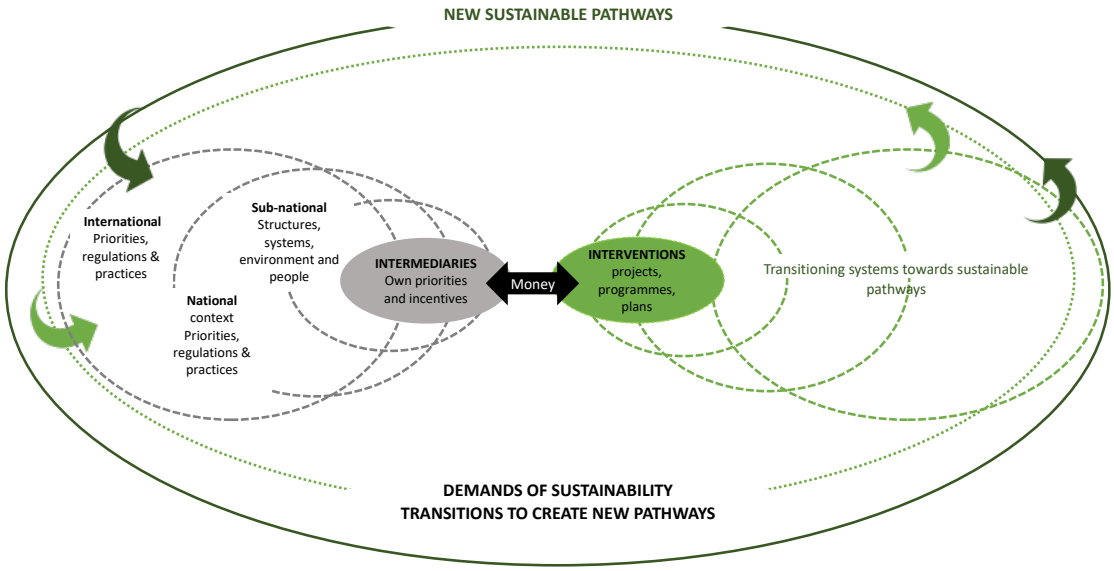
6.1.1 Political incentives and framing

Chapter 3 (Section 3.5.1) hypothesises that the response of financial systems to sustainability transitions depends on how they frame such processes. Chapters 4 and 5 show that financial systems have certain expectations of how policymakers are supposed to support the transition. The case of South Africa's energy transition shows that policymakers responded (either implicitly or explicitly) to these expectations by offering incentives, structuring large programmes, and developing risk-mitigation measures to attract large scale investment. This exchange between policymakers and financial intermediaries in South Africa confirms the context presented in the introduction to this thesis (Chapter 1). This highlights that financial intermediaries largely frame sustainability transitions as new investment opportunities, with limited appreciation of the necessity for transitions or the need for such transitions to be socially inclusive.

While governments have an important political role to play in setting the direction for the transition process, the inherent preferences and practices of financial systems also determine the pace and scale of such processes. Where governments offer political and policy support to initiate the transition process, they should reflect on how long such support will be offered, and whether there is a risk of creating a long-term expectation that government will always lead the transition process. The climate science and sustainability challenges impose collective obligations on all parties within an economic system to shift and adjust their incentives and behaviours towards supporting the transition process.

Assuming that policymakers can explicitly state their expectations of financial intermediaries during transition processes, there is a further challenge of understanding and interrogating the incentive structures for individuals operating *within* the financial system. Understanding the incentive structures of these individuals is critical for shifting towards sustainable paths as financial intermediaries are primarily responsible for originating (finding) and financing new investment opportunities. The incentives of individuals (i.e. their remuneration, bonuses, promotion criteria) would need to reflect how financial systems are responding to the demands of sustainability transitions.

Figure 6.1 Learning from the transition impacts of projects



As Figure 6.1 demonstrates, embedding energy transition and related demands within the influences that act upon financial intermediaries is critical for influencing how finance is ultimately made available for projects and programmes. There are many elements that act upon financial intermediaries that need to be aligned to facilitate the appropriate quality of finance for creating new sustainable pathways – including the incentives that drive the system. Figure 6.1 expresses a normative direction for finance through the lens of exchanging money between financial intermediaries and interventions (projects) in such a way that broader transition effects are made possible to move from unsustainable to sustainable systems. An intervention (project) is a channel for achieving the ultimate goal of a sustainable energy system (as part of new sustainable pathways). These loops (arrows in Figure 6.1) may become possible by creating mechanisms for learning about how the exchange of money between intermediaries is linked to the impacts of the interventions they fund.

Policymakers at the national level need to interrogate the framing of the financial system, and consider the feasibility and the extent to which ongoing government support is provided for transition-related interventions. As an alternative to being offered ongoing support from government, policymakers may re-assess the investment models being proposed for transition processes. This may assist them to identify ways of engaging with the broader financial system to help ensure the full potential of finance flowing through these systems is directed towards sustainability transitions.

The framing of sustainability transitions and the creation of incentives for such transitions can benefit from the participation of broad coalitions that include government, business and communities. Together, such coalitions can co-create a vision built on recognising the political imperatives for increasing the pace and scale of responses to global climate and sustainability challenges.

6.1.2 Relating intermediaries, markets and infrastructure

Chapter 3 (Section 3.6.2) highlights the importance of how different components of the financial system regard their individual and collective role and contributions towards sustainability transitions. Chapter 4 refers to three surveys conducted in 2007, 2011 and 2016 which reflect how South Africa's financial system appears to be deepening its awareness over time to sustainability and climate issues. The 2016 survey offers insight regarding the expectations of financial intermediaries that the South African government should continue structuring large-scale programmes to secure their investment interest. These expectations are inconsistent with the need for social inclusivity in South Africa, i.e., the recognition that smaller programmes are critical for enabling a just and inclusive transition. Chapter 5 demonstrates that sustainability and the "greenness" of the renewable energy programme did not influence the investment decisions of the financial intermediaries whose conduct was examined in that study.

The South Africa case demonstrates that, although large quantities of investment flowed over a short time, policymakers appeared to expect more than the flow of funds. They expected investors to meet the social objectives of that programme. The South Africa case highlights the discontent of policymakers with the way in which the financial intermediaries (private banks and national development banks) executed their roles. This suggests that policymakers need to make explicit their assumptions and expectations of the financial intermediaries within the specific national context. Policymakers may wish

to consider evaluating the traditional roles and mandates of different actors within the financial system, and consider to what extent they can be expected to fulfil these roles.

6.1.3 Structural origins of financial systems

Chapter 3 (Section 3.6.3) suggests there is a need to examine the origins and interconnectedness of the financial system to understand whether it is able to meet the demands of the transition process. In the case of South Africa, its origins as a highly concentrated financial system focused on large businesses appears to be the root cause of why the intermediaries preferred funding large renewable energy projects instead of small ones.

Policymakers should consider how compatible national financial systems are with advancing the sustainability transition processes. If a socially inclusive and just transition is the aspiration, the realisation of this in practice may be hindered if the structure of the financial systems limits access to funding for smaller businesses and vulnerable groups. This implies the need to diversify and broaden access to funding through new financial intermediaries that can indeed deliver on the imperative for social inclusivity.

6.1.4 Temporal pressures of transition processes

Chapter 3 (Section 3.6.4) considers the urgency of the sustainability transition process and what actions policymakers can take to accelerate investment in the transition. Policymakers in South Africa engaged extensively before they launched the SA renewable energy programme, and this led to financial intermediaries making large quantities of finance available. However, these intermediaries preferred investing in the Large programme and did not pay much attention to the Small programme. For policy objectives to be precisely met, the engagements would need to be explicit and pitched at the level of system effects, not only at the project level.

The pace of investment slowed, largely because of debates within government around the validity and technology choices of the renewable energy programme. This shows that the pace of a transition depends on the directions set by government, especially where the transition process is government-led. Policymakers could consider developing a portfolio of transition responses to sustain momentum that combines actions led by citizens, financial intermediaries, and others (Scoones et al., 2015). The portfolio approach would be especially helpful for demonstrating that government does not bear the sole responsibility for leading the transition process.

Policymakers, especially ministries of finance, may consider engaging their central banks more actively to monitor the transition process and tracking whether sustainability concerns are consistently embedded in the financial system. Among their primary concerns are maintaining the stability of the financial system which is at risk due the uncertainties of the climate breakdown (Bolton et al., 2020). Central banks categorise climate risks as a threat to financial stability due to its physical risks (i.e. climate events such as droughts and floods) and transition risks (i.e. instability caused by rapid shifts towards sustainable pathways) (Carney, 2018).

6.1.5 Quality of finance for sustainability transitions

Chapter 3 (Section 3.6.5) refers to new qualities of finance – specifically, finance that is patient, consistent, pragmatic, responsive, inclusive and adaptable. Chapter 4 demonstrates how the South African government led financial innovation by launching the Green Fund that was designed to provide responsive and adaptable finance through experimental approaches and learning-by-doing. Chapter 4 also shows examples of inclusive sources of funding through SANBI's focus on engaging vulnerable communities to co-develop projects to build resilience to the effects of climate change. The examples in Chapter 4 are led by national development banks and government agencies, but not mainstreamed into the broader financial system in South Africa. Policymakers may consider how these examples could be extended more broadly or assess which parts of the financial system provide the qualities of finance that match the sustainability transition process in a particular country.

In relating the transition process to financial systems, policymakers should reflect on the quality of finance necessary to address the environmental and social objectives of the transition. This could influence the relational and structural design features of the financial system. The way financial intermediaries relate may depend on how useful the quality of finance they offer is for sustainability transitions, which in turn should influence the structure of the financial system. Policymakers should therefore deeply engage with appropriate design features so that they can ensure the national financial system is compatible with creating a sustainable pathway.

6.1.6 Theory and developing future generations

Chapter 3 (Section 3.6.6) raises the matter of educating future generations who will, in time, assume the roles of policymakers and financial intermediaries. This particular design feature was not addressed in the papers developed for this thesis. However,

critical researchers recognise that orthodox finance and mainstream economics are not aligned with the sustainability challenges of modern times. Policymakers in Kenya are already considering mechanisms for ensuring that awareness of climate and sustainability challenges are included in the undergraduate finance curriculum (Naidoo, 2019d).

6.2 Insights on multilateral finance negotiations

This thesis began from the perspective of the multilateral context of the Paris Climate Agreement, SDG Agenda, and Addis Agenda. The historical origins of how finance and sustainability originated evolved throughout the UN multilateral process was out of scope for the primary content of this thesis (Appendix A contains some detail). Article 2.1.c of the Paris Climate Agreement has resonance with similar wording in the 1987 Brundtland Report relating to the integration of the global trade, development and finance sectors to achieve consistency and embed sustainable development in economic and finance sectors (WCED, 1987). This means that Article 2.1.c reintroduces an important objective and serves as a potential instrument for enabling systemic changes in the financial system to support the climate goals. Whether member states interpret it as such will only become evident when future global stocktakes are done.

A key observation that also was out of the scope of this thesis relates to the historical direction set by the multilateral processes. Specifically, a limited review of selected decisions of UN multilateral processes shows how the 1972 Stockholm Declaration positioned the role of the private sector in responding to environmental action. That Declaration frames the private sector as being the party which the public sector needs to compensate for the additional risks they will assume to respond to environmental and sustainable development concerns (UN, 1972). Further, the 1987 Brundtland Report established the foundation that the efforts of multilateral and other agencies be focused on creating financial mechanisms to mitigate, reduce and compensate the private sector for the additional costs they assuming that the government cannot (WCED, 1987).

Considering that the Brundtland Report is titled “Our Common Future”, it appears an anomaly that the narrative suggests that the responsibility to act falls upon governments only who have to compensate the private sector for the additional risk they assume in responding to sustainable development. This thesis is only able to identify these observations. Deeper investigation is essential. These issues are mentioned here as the multilateral process itself, the implicit assumptions within Article 2.1.c itself, would need

to be deconstructed to understand how past framings of private sector are situated with the future expectations of how financial systems respond to climate and sustainability challenges.

This thesis has so far highlighted the interregnum between old and new sustainable pathways, and the interregnum between old and new theoretical concepts and ideas. The same challenge between old and new approaches may apply to the UN's multilateral processes. Transcending the multilateral interregnum may mean shifting focus to cooperating on climate and sustainability action. It may also mean recognising and deconstructing past narratives that are incompatible with creating new sustainable pathways.

6.3 National engagement with multilateral processes

The empirical analyses in this paper show that the multilateral context does not feature prominently in the concerns or motivations of policymakers and financial intermediaries engaged in the design and implementation of South Africa's renewable energy programme. The South African example shows that financial intermediaries default to applying risk-based and opportunistic investment strategies. The necessity of urgent action towards sustainability and addressing the climate breakdown is not yet embedded in the fabric of its financial system, despite the fact that South Africa's financial intermediaries are all signatories to multilateral pacts such as the UN-inspired Equator Principles.

Instead, the empirical analyses show that civil society organisations are more focused on the multilateral context and South Africa's responsibility to lower its greenhouse gas emissions, improve air quality, and ensure that the transition process is just and fair. Also, it is civil society organisations that are challenging the continued investment by financial intermediaries in unsustainable energy sources. Through protests and shareholder activism, some changes in South Africa's financing landscape are evident as reflected in three of the largest banks withdrawing their support for new coal projects and considering energy investment policies that give effect to sustainable energy.

The multilateral agreements suggest that policymakers initiate the finance-related objectives of Article 2.1.c of the Paris Climate Agreement (consistent finance flows) and the Addis Agenda (integrated finance flows). The challenge with assigning responsibility to policymakers is that a potential conflict of interest may exist as public finance flows may not be consistent or integrated with climate and sustainability objectives. Therefore,

the extent to which policymakers are able to facilitate the finance-related objectives depends in part on their governments' ambitions to shift towards sustainable pathways and the extent to which they are willing to make the necessary changes to meet these ambitions. This may be difficult to achieve in practice, especially in countries like South Africa that depend on fossil fuels as their primary energy source and on fossil fuel exports.

Practice-based finance initiatives like policy think tanks and global programmes refer to Article 2.1.c to claim they are aligned with the Paris Climate Agreement. This thesis demonstrates that researchers have not yet critically engaged with these claims. The lack of independent interrogation by researchers carries the risk that new solutions and adjustments are based on the same assumptions that supported unsustainable pathways. The risk is especially pronounced for countries in the global South where financial systems are less advanced. These countries are typically recipients of technical assistance from international agencies and global policy think tanks which introduce solutions that are developed in the global North.

An important question to raise is: *how can such policymakers assess which solutions are appropriate for the country context?* Policymakers should be encouraged to define and engage with these finance-related objectives and in ways that take the specificities of their national contexts into account. The risk of multilateral finance objectives is that countries (mainly in the global South) interpret these in the context of monitoring and evaluation of finance flows, rather than as a strategic mechanism to increase the pace and scale of their transition processes. Policymakers should consider that the financial system should evolve to support the transition process by enabling and maintaining new sustainable pathways. This requires reflecting on the problems and assumptions inherent in the current system that do not support such evolution.

The analyses in this thesis show that civil society organisations are critical engineers of sustainability transitions, especially at the national level where the actions of policymakers and financial intermediaries are not aligned with multilateral objectives. Its theoretical and empirical contributions regarding the transition demands framework and the related design features for financial systems may help such organisations to engage critically with the financial system and its response to sustainability transitions.

6.4 Insights for multilateral funding mechanisms

Multilateral institutions such as the Green Climate Fund are well placed to support policymakers in the global South to develop responses to the finance-related objectives of consistency and integrated finance flows. The GCF offers technical assistance to national governments to develop policies, generate long-term climate investment plans, and develop financing strategies for their climate responses. This modality may be useful for assisting countries to examine and align the structure and capacity of their national financial systems with the national climate response.

It could be especially important for the GCF to support policymakers to critically engage with financial innovations and recommendations for greening their financial systems to ensure compatibility and effectiveness. Before solutions are proposed, it is important for policymakers to engage more deeply with how problems are constructed, what their underlying assumptions are, how relevant to specific national circumstances the proposed solutions are, how such solutions may best be introduced and integrated into the national context, and what consequential changes need to take effect for such solutions to be supportive of the country's sustainability transition.

A key risk for global South countries is adopting the solutions developed for financial systems of global North countries, which may not be compatible with their own. At the same time, the assumptions and solutions for creating sustainable financial systems should also be interrogated and evaluated by policymakers, and citizens alike.

6.5 Summary

These policy insights on the design features of financial systems through the lens of the South Africa example may offer useful reflections for other countries. It shows that the transition process was largely focused on the needs of the financial intermediaries. It also highlights expectations for future transition efforts in that country.

The transition demands framework and design features developed in this thesis offers policymakers the opportunity to reconsider their approach to financing sustainability transition processes and maintain complexity – i.e. developing an in-depth understanding of the nature of the transition process and engaging the financial system to effect the necessary changes within their structures to align with such demands.

7 Conclusions and contributions

This thesis opened with predictions of climate scientists cautioning that a small window remains to respond to the growing climate and sustainability challenges. The pace and scale of response thus far of governments and financial system is increasingly being criticised, leading to growing calls for rapid action (IPCC, 2018; Carney, 2019b). This context requires dynamic engagement among policymakers, financial intermediaries and others.

This thesis primarily aimed to provide conceptual and empirical contributions that can support policymakers in engaging with the financial system during the transition from currently unsustainable pathways to sustainable ones. Its multilateral context is the Addis Agenda, SDG Agenda, and Paris Climate Agreement (UN, 2015a, 2015b, 2015c). The thesis interprets these agreements as creating challenges for policymakers. In particular, these agreements suggest radical shifts to development pathways rather than incremental changes; emphasise broad coalitions in the transition process rather than relying on them being government-led; and differentiate between quantitative and qualitative objectives for financial systems to engage with in creating sustainable pathways.

The thesis explores how financial systems and sustainability transition processes relate during transition processes (the interregnum). Sustainability transition studies, in particular, align with the intent of the multilateral agreements to shift development pathways towards sustainability. This field also focuses on the process and policy challenges required for such shifts to take place. The research process involved conceptual and empirical work to derive policy insights, as reflected in the three papers presented in Chapters 3 to 5. These papers were designed to meet three research objectives: a) understand theoretical links between financial systems and transition processes; b) analyse how financial systems respond during transition processes; and c) develop policy insights for engaging financial systems in transitions processes.

This Chapter 6 builds on the initial summary of the papers and their contributions in Chapter 2. It first discusses the overall contributions of the thesis to academic literature (Section 6.1); derives further policy insights in addition to those within each paper (Section 6.2), identifies limitations of the study (Section 6.3); identifies areas for further research (Section 6.4); and concludes with a personal statement (Section 6.5).

7.1 Contributions to academic literature

7.1.1 Theoretical contributions

The research questions *what demands do sustainability transitions place on financial systems* and *what do such demands imply for the design of financial systems* are addressed in the paper presented in Chapter 3. These research questions were formulated to meet research objective A: understand the theoretical links between financial systems and transition processes.

Based on an extensive scoping review, Chapter 3 finds that the theoretical links between financial systems and sustainability transition studies are limited. A key finding of the scoping review was the fragmented nature of conceptual approaches. On the one hand, orthodox research on finance is not engaging with sustainability-related issues. On the other hand, critical research on sustainability-related finance reflects methodological and conceptual challenges to advancing further study. These approaches co-exist despite extensive research on sustainability-related finance and framings. The status of sustainability-related finance, therefore, represents an interregnum in terms of dominant, orthodox approaches compared critical approaches not yet being mainstreamed into coherent alternatives.

This thesis also finds that finance is under-conceptualised within sustainability transition studies, which represents a critical gap in the field. Finance is positioned as a resource and function supporting changes at the niche, regime and landscape levels (which are key concepts in the MLP heuristic commonly used in transition studies) (Geels et al., 2016). The framing of finance as a resource and function is rooted in innovation studies from which sustainability transition studies evolve. The association with innovation studies suggests that an implicit underlying assumption is that financing transition processes follows the same path as financing innovations.[116]

The potential presence of implicit assumptions relating to finance in sustainability transition studies represents a key finding of this thesis. It also highlights the need to question where else such assumptions exist, and to continue to deconstruct the characteristics of transition processes even further, as well as to deconstruct the likely

[116] A discussion with Prof. Johan Schot, a leading author in this field, confirms that Dutch scholars who constructed the founding principles of sustainability transition studies had not explicitly considered roles for finance.

response of financial intermediaries. The risk of implicit assumptions in sustainability transition studies have been highlighted by Svensson and Nikoleris (2018), Sorrell (2018), and Feola (2019). In particular, Feola (2019) questions whether the market framing (which is where finance is situated) with predominant capitalist assumptions is a valid foundation for constructing sustainability transitions.

The limitations of the conceptualisation of finance primarily became apparent when considering broader research questions such as evaluating the role of finance in transition processes at a systems level. Chapter 3 of this thesis establishes that sustainability transition studies have limited heuristics and an under-developed framing of finance and that this limits the field's ability to conduct evaluative research on how financial systems promote or inhibit transitions. Defining finance within the construct of the MLP has facilitated empirical research on specific policy instruments (Geddes, 2019), and types of finance flows (Urban and Wójcik, 2019). While recent research also identifies finance as under-conceptualised in the MLP literature (Geddes, 2019), this thesis broadens the scope of the under-conceptualisation beyond the MLP to the field as a whole.

The research objective to understand the theoretical links was achieved by applying an elemental hypothesis first mentioned by Perez (2002) and O'Sullivan (2005) in innovation studies. They hypothesised that the characteristics of the innovation process determines the role of finance, but neither author explored this approach further, conceptually or empirically. Chapter 3, therefore, represents the first paper that studies the transition process from the perspective of the demands it places on the financial system. Also, Chapter 3 distinguishes between quantitative and qualitative demands. The approach culminates in a transition demands framework and design features for the financial system (as described in Chapters 2 and 3).

Studying the characteristics of the transition process was useful as it describes the necessarily disruptive nature of transitions, and identifies the challenges such disruption presents to the financial system. This thesis builds on the fundamental characteristics of transition processes identified by Loorbach et al. (2017), which it expands upon by adding new characteristics and interpretations based on the Paris Climate Agreement, the SDGs and the Addis Agenda. The transition demands approach was primarily helpful in suspending any assumptions or constraints of what the financial system can and cannot do based on its current structure and existing mandates. Instead, the discussion focuses on the normative responses from the financial system in respect of achieving

the environmental, social and economic objectives that create new sustainable pathways. Chapter 3 describes the expanded characteristics and interpretations that transition processes place on the financial system.

This thesis, therefore, contributes a new method in transition studies through the transition demands framework. This method can facilitate future empirical research on financial systems and transition processes. While the long-term contribution of this framework is uncertain, the author is aware that researchers are engaging on its insights in a study evaluating the extent to which different practice-based initiatives are supporting transformative investment. Appendix D offers insight to the type of questions that facilitated the application of the transition demands framework and its design features in an empirical context (for Chapter 5).

Building on the transition demands identified in Chapter 3, the thesis also examines what such demands imply for the financial system. The design features define the level of introspection needed within the financial system to meet transition demands. The six design features (political, relational, structural, temporal, qualitative and theoretical) contribute toward understanding the scope of changes that may be necessary within the financial system to meet the demands of sustainability transitions. They also represent a basis for advancing a comprehensive research agenda on finance and sustainability transitions. The research agenda calls for deconstructing problems, solutions and their implicit assumptions to ensure that the financial system does not inadvertently misdirect sustainability transitions.

In summary, the theoretical contributions of this thesis primarily create a new foundation for exploring the role of financial systems. They do so by relating the characteristics of transition processes to the response required from the financial system (the transition demands framework). Also, the thesis derives the potential scope of changes within the financial system to meet the demands of transition processes (design features). Against the background of limited work on finance in sustainability transition studies, the thesis also proposes a broad and comprehensive research agenda derived from the transition demands framework and its design features. The thesis further adds to calls by transition scholars for identifying implicit assumptions in sustainability transition studies that may be problematic in the creation of new sustainable pathways.

7.1.2 Empirical contributions

The research questions *what structural features in financial systems support or inhibit sustainability transitions* and *how do financial intermediaries relate to the demands of transition processes* are addressed in the papers presented in Chapters 4 and 5 respectively. These research questions were formulated to meet research objective B: analyse how financial systems respond during transition processes.

The first empirical contribution of this thesis is that it is the first financial and sustainability transitions research study of a country in the global South (South Africa). All previous country-based empirical research on finance and sustainability transitions has focused on creating systems for countries located in the global North (Australia, Italy, the United Kingdom, and the United States).

The second empirical contribution of this thesis (Chapters 4 and 5) is its application of a broader viewpoint on finance based on the characteristics of the transition process. Prior empirical studies since the 2013 Special Issue of Environmental Innovation and Societal Transitions have mainly directly applied the MLP heuristic when engaging on finance research. Prior to the publication of the paper in Chapter 3 (Naidoo, 2019a) only eight empirical papers have been published since the 2013 Special Issue on finance and sustainability transitions-related research. Chapter 4 of this thesis was only one of two papers among those eight papers that considered a broader approach in its analysis.

The third empirical contribution of this thesis relates to it being the first study to focus on analysing the historical engagement of financial intermediaries over the course of a specific (energy) transition process (in this case a period of 26 years). The empirical papers for this thesis examine the case of South Africa's financial system (Chapter 4), and its energy transition and how financial intermediaries engaged in that process (Chapter 5).

The analysis in Chapter 4 established the historical origins and evolution of South Africa's financial system. The analysis in Chapter 5 shows that these origins have influenced the trajectory of subsequent transition processes, and potentially define the path along which such transitions unfold. In the case of South Africa, the result was preferential support for larger businesses, and limited interest in investing in small businesses. A key finding of this thesis was that the historical context of country-specific financial systems potentially predisposes intermediaries to behave in particular ways. The historical context of a financial system, therefore, is a useful indicator to anticipate

potential challenges to creating new sustainable pathways. The contributions of these papers, therefore, offer empirical support for similar observations made by Hall et al. (2016) and Polzin et al. (2017).

Chapter 5 presents a detailed account of how financial intermediaries engaged in South Africa's energy transition over a 26-year period. The subsequent response by financial intermediaries suggests three ways in which financial intermediaries are currently engaging in transition processes.

Firstly, the empirical analyses describe how policymakers explicitly engaged the financial system when designing investment programmes to support sustainability transitions. The benefits that such engagement offered to the success of the SA renewable energy programme was the raised awareness among financial intermediaries of the investment requirements and objectives of forthcoming programmes. They responded by preparing internal processes to support investment in these programmes.

Secondly, the empirical analyses show that financial intermediaries can be involved in the learning processes on the programme to offer feedback on their efficacy, and support redesigning and remedying unintended consequences of the programme (e.g. where social objectives are not being met). This can be achieved through financial innovations and collaborations with other financial intermediaries, including development agencies (in the case of the global South countries).

Thirdly, the analyses show that the structure of financial systems within a country context may influence the behaviour of financial intermediaries to such an extent that they default to their investment preferences. The default to preferences of the existing financial system in South Africa implies that, despite intense engagement during transition processes with government and their agencies, the longer-term demands of sustainability transitions may not be voluntarily met. The precondition for continued government support largely remains. This suggests that the time horizon for how financial systems engage in transition processes needs to extend and the nature of their response needs to deepen to create a sustainable financial system compatible with the evolving demands of transition processes. These points are discussed in Chapter 3 and 5 from a theoretical and policy perspective.

While the empirical results of South Africa are specific to that context, they are generalisable to the extent that they highlight the tensions among government, its agencies, financial intermediaries and civil society during transition processes. These

tensions generate policy insights as extensively discussed in Chapter 5, together with potential applicability for other countries.

The empirical contributions also highlight that the field of sustainability transitions studies has a duty of care to continually question the construction of problems and the underlying assumptions upon which policy and other solutions are developed. In this way, empirical analyses can inform theoretical understanding, and vice versa. The empirical contributions support similar analyses by Feola (2019) that transitions research should be focused on fundamentally driving processes of change.

In summary, the empirical contributions described here and in Chapter 2 demonstrate that the role of the financial system has a quantitative dimension in terms of investing in transition-related programmes and developing unique financial products to support transitions. The empirical contributions also highlight the qualitative dimensions, in that several factors co-exist that influence the trajectory and investment choices of financial intermediaries. These factors are likely to be problematic for the ongoing and longer-term demands of transition processes, and for creating new sustainable pathways. Transitions research on finance should continue to highlight the tensions in ensuring that financial systems are compatible with the demands of creating new sustainable pathways.

7.1.3 Methodological contributions

Transition scholars suggest that methods in transition studies are underdeveloped, despite the field attracting more scholarly attention. This indicates the need for reflecting on how transitions are studied (Zolfagharian et al., 2019; Köhler et al., 2019). This section briefly reflects on the research methodology and methods applied in this thesis. The primary unit of analysis for transition studies is the socio-technical system, and it focuses on societal functions channelled through such systems (Zolfagharian et al., 2019; Shove and Walker, 2010). When applying the MLP, one has to first define hierarchies and boundaries relative to niche, regime and landscape of societal functions. An alternative approach is shifting the unit of analysis to social practices (Shove and Walker, 2010). This thesis offers a third approach to possible units of analysis.

This thesis contributes to the methodologies of transitions research by focusing on the characteristics of the transition process as a unit of analysis to research finance. This viewpoint facilitates the study of how characteristics differ from context to context, and the consequential responses of different actors involved in the transition process. This

thesis, therefore, contributes a new approach to thinking about transitions research and its design. To the best of the author's knowledge, focusing on the characteristics of the transition process as a basis for researching finance in sustainability transitions studies has not been applied in prior work.

While this thesis applied standard research methods (mixed methods), what makes it unique is the broad perspective derived from the characteristics of the underlying transition process it adopted and applied to its empirical and conceptual research.

7.2 Limitations of thesis

This thesis has opened up a pathway into exploring potential research avenues which build on the origins of finance, the disconnection from social concerns, the expectations and inertia in how the finance system is engaged, and the power to direct change that finance holds in an economy.

The broad research perspective focusing on the characteristics of transition processes as the unit of analysis opened several possibilities for further research and engagement. In addition to the research limitations identified in Chapter 2, the overall limitation of this thesis was having to limit the scope of the research. Specifically, Chapter 3 was originally designed to study the UNEP Inquiry's recommendations and relate these to sustainability transition studies. As discussed in Chapter 2, the scope narrowed to focus on establishing theoretical foundations first. In Chapter 4 and 5, the scope was limited in that only a part of the financial system in South Africa was considered. The case examples in Chapter 4 focused on public finance innovations. Private banks and national development banks were the focus of Chapter 5. These decisions were made to enable an in-depth investigation of these interactions, but also because these financial intermediaries represent the primary interface with sustainability transition processes in that country.

In summary, the scope limitations were managed by maintaining focus on the practical context of the research objective to offer policy support. The next section presents areas for further research to address elements of these limitations.

7.3 Areas for future research

Financial systems and finance are significantly under-developed within sustainability transitions studies. This creates immense scope for advancing a comprehensive and expansive research agenda in this area.

This thesis is an initial exploration of the role of financial systems in sustainability transitions, and it contributes theoretically and empirically towards a better understanding of this role. These contributions have also generated questions which were beyond the research objectives of this thesis. Some of these questions are raised within the individual papers (Chapters 3 to 5) and in the summary (Chapter 2). They are helpful for guiding the author's future research aspirations, and are divided below into theoretical and empirical priorities.

7.3.1 Theoretical priorities

The design features of financial systems (Section 3.6) proposes six elements and related questions for advancing research on financial systems and sustainability transitions. Each of these elements (political, structural, relational, temporal, theoretical, and qualitative) warrant further research. A recurring theme of this thesis is the need to critically deconstruct problems, interrogate underlying assumptions, and the basis and power dynamics of how solutions are designed. These elements are captured in the research questions proposed in Section 3.6 of the thesis.

Also, the transition demands framework (Section 3.5) is an initial contribution to enable policymakers to relate the process to the responses from financial systems. It would be useful to build and refine demands both conceptually and through further empirical analyses. For example, empirical and conceptual research comparing the transitions and innovation processes may highlight the differentiated responses of financial intermediaries to these processes.

The historical review of South Africa's energy transition highlighted different phases of that country's process, which the empirical analyses in Chapters 4 and 5 describes in detail. However, an in-depth analysis mapping the historical review to the literature on transition phases and how financial intermediaries engage in each phase would offer useful insights. In particular, it would be helpful to identify indicators of how financial systems are aligning themselves with the demands of transition processes.

Sustainability transition studies also considers transition pathways as an alternative to specific phases. It would be useful to explore conceptually whether pathway concepts can be applied to developing financing pathways for meeting the demands of sustainability transitions. Aligned to this area of research would be exploring how the narratives of risk and opportunity influence financing pathways, and how these narratives promote or inhibit sustainability transitions.

The penultimate theoretical priority would be comparing the transition demands framework as a potential tool for policymakers with policy narratives such as mission-oriented finance in Mazzucato (2015), and transformative innovation policy in Schot and Steinmueller (2018). The aim would be to better understand how these narratives fit into policy design and implementation processes, given the close alignment between innovation and sustainability transition studies.

Lastly, a critical priority aligned to tools that policymakers adopt during policy design process is to build on the work of Stirling (2010) and Jasanoff (2018). Both authors emphasise the need for maintaining complexity when engaging in issues of sustainability. This includes studying how policy options are opened up and closed down, and what factors influences these choices. This would be especially helpful for understanding how financial intermediaries are engaging with the issues of complexity, and may be relevant for studying the risk-based approaches being adopted.

7.3.2 Empirical priorities

Firstly, critical research relating to interpreting Article 2.1.c of the Paris Climate Agreement would be useful, specifically, understanding the interpretations of policymakers and financial intermediaries. This priority is relevant because the UN guidance per the 2018 biennial assessment does not offer sufficient guidance for member states to effectively interpret their response to Article 2.1.c.

Secondly, critically engaging on practice-based initiatives from the financial system may be useful. As Falcone et al. (2018) have said, there is a risk that a hegemony of green finance is being created as the large financial centres of the world are developing specialist green finance approaches and these are being exported more broadly. Empirical research on the UNEP Inquiry, for example, would offer a longitudinal perspective of the evolution of the broad range of initial ideas and these have translated into their current proposals. It is also essential to test the effectiveness of the green finance measures in specific country contexts cited by the UNEP Inquiry.

Thirdly, further empirical research on the market-specific expectations by South African policymakers of the financial intermediaries in that country warrants further investigation. The specific aim would be to understand why expectations are so limited, and why policymakers are failing to question purpose, role or contribution of the financial system. The engagement process of policymakers in the South Africa renewable energy programme was largely focused on appeasing the financial system. It would be helpful

to understand why and where these embedded expectations originate from. Such analysis would facilitate research on concerns raised by Feola (2019) that market assumptions may be embedded in how sustainability transitions unfold, and an earlier observation by Foxon (2015) that market failure approaches may be insufficient for advancing sustainability transitions.

Finally, the scope for further empirical research on financial systems and sustainability transitions that is similar to that done in South Africa in this thesis is immense. Research on finance and sustainability transitions could be conducted in different countries in the global South and the global North, among different financial intermediaries, and in other contexts, e.g. sub-national contexts. Such empirical work could be helpful for building and refining existing frameworks and bring new approaches for evaluating and relating financial systems to sustainability transitions to light.

7.4 Concluding personal statement

This thesis is titled "*Transcending the interregnum*" to convey the tensions between old and new observed during my research. I discovered that the interregnum exists at many levels. This thesis reflects that which academic analyses partially makes visible, but it remains insufficient relative to what remains invisible and how that affects the authentic creation of new pathways. I observed the interregnum reflected in the limited – almost non-existent – interrogation and deconstruction of transition processes, the deeper origins of problems, implicit assumptions that frame these problems, their associated solutions, and the unquestioned behaviours and expectations of policymakers and financial intermediaries. I also observed the pressure and fatigue faced by civil society groups in pressuring financial intermediaries to go beyond their fossil-fuel lending policies. These observations lead me to the conclusion that old ways of thinking about problems are infusing the solutions of the new pathways. *So what is genuinely new?*

This thesis ends with the end of a decade. 2020 is about to begin. The news is awash with references to the climate emergency – including calls for every component of the financial system to have a plan, and for governments to lead the way (Carney, 2019b). The language driving the financial systems' response remains coloured by risk, opportunity, and the expectation of governments leading the way. The doctoral journey has made me realise that taking action is insufficient. The depth and breadth of the actions matter immensely. Any action needs deconstructing, so that it identifies and then transcends its biases, assumptions and filters, in order that the new can truly be created.

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Appendix A. Additional history on UN finance-related objectives for climate

The information provided below is a summary of additional research conducted the author. The research process included textual analysis of historical UN decisions, key word searches, engaging with the UNFCCC staff members, three climate finance negotiators and key members of the French Presidency for the Paris Climate Agreement. These discussions were held at times between July 2017 and November 2019.

The UNFCCC finance-related decisions are a combination of market-based mechanisms and finance flows which relates to obligations between countries in the global North (referred to as developed countries within the UN processes) and those in the global South (called developing countries within the UN processes). The obligation is for the global North to provide adequate resources to enable global South countries to respond to the effects of climate change. The market-based mechanisms derived from UNFCCC decisions include the Kyoto Protocol and carbon emission trading schemes.

A key word search of the UNFCCC's founding documents identifies instances of "finance" (1), financing" (2), "financial" (15) and "consistency" (0). These key words were selected based on the Paris Climate Agreement's references to finance and consistency and related variations. In the UNFCCC, those instances of finance-related themes refer to the following:

- Developed countries to provide "new and additional" finance to cover the full costs of developing countries in meeting their obligations, including transfer of technology.
- Commitment by developed countries to finance transfer of environmentally sound technologies to developing countries to enable them to implement the UNFCCC goals.
- Coupling the ability of developing countries to meet their obligations with the ability of developed countries to fulfil their financial obligations under the UNFCCC.
- Mobilising of financial resources to meet commitments made under the UNFCCC.
- Making provision for a financial mechanism for the UNFCCC (i.e. a mechanism through which grant or concessional finance, and transfer of technology can be effected).
- Reporting guidelines for member states to submit communications to the UNFCCC of their climate actions and their financial resource needs.

- Establishing the Global Environment Facility as an interim financial mechanism of the UNFCCC subject to its restructuring (it was a pilot programme launched by the World Bank in 1991).

The same exercise was applied to the 1972 Stockholm Declaration, 1987 Brundtland Report and the 1992 United Nations Conference on Environment and Development. Similar themes relating to finance were notable. These include calls for new financial mechanisms, the need to harmonise, complement and improve access to finance for developing countries, and the importance of developed countries providing “adequate, predictable, reliable and stable” finance flows to enable developing countries to meet their obligations. These are ongoing themes within the UNFCCC negotiations.

Since 1994 when the UNFCCC came into force, the finance-related objectives focus mainly on providing finance to global South countries through bilateral and multilateral development finance institutions. This has resulted in specialised programmes for climate and environment such as the Climate Investment Funds. These programmes are in addition to the UNFCCC financial mechanisms such as Global Environment Facility, Adaptation Fund, Clean Development Mechanism and the Green Climate Fund. There is a network of multilateral and bilateral funds, each with different application and access procedures and climate and environment focus areas. This network requires monitoring and reporting frameworks to track whether funding is adequate and predictable, which is specific to each institutional channel, and which is developed country governments.

General oversight for finance-related reporting at the UNFCCC resides with its Standing Committee on Finance which focuses on long-term finance issues. In 2011, member states signed the founding documents of a new financial mechanism of the UNFCCC, thereby establishing the Green Climate Fund. Its primary role was support global South countries to respond to climate change and be the primary channel for the annual US$100 billion funding to be mobilised. This amount was agreed at COP15 in 2009 as the amount of new and additional funds required by global South for an effective response to climate change. The finance related themes in the 2015 UN Paris Agreement uphold the status quo of prior UNFCCC processes as they relate to:

- Obligation of developed countries in providing finance to developing countries.
- Mobilisation of scaled-up finance from various sources, instruments and channels.
- Progressive efforts needed for mobilising finance and scaled-up resources.
- Monitoring of finance through global stocktake.

- Access to finance for capacity building, innovation and transparency initiatives, especially for developing countries.

The above themes have endured throughout the UNFCCC processes and are traceable to the 1992 UNFCCC finance-related themes which upholds the financial obligation of developed to developing countries and emphasises the mobilising of new and additional resources. In addition to the above, there are two other finance themes associated with the implementing the objectives of the 2015 Paris Climate Agreement. Firstly, a resolution confirming that the financial mechanisms of the UNFCCC (being the GEF and GCF) act in service to the Paris Climate Agreement. Further, that the mitigation targets set by member states (i.e. the Nationally Determined Contributions) should be done in an integrated and holistic manner. The reference to integration and holistic approaches recognises that the Paris Climate Agreement is to be implemented in the context of the SDG Agenda by 2030.

The final theme is Article 2.1.c of the Paris Climate Agreement, which is one of the primary research interests of this thesis. The Article is prominently positioned as one of the three objectives of the 2015 Paris Agreement which recognises that reducing greenhouse gas emissions and building climate resilience are not achievable without a concomitant consistency in finance flows. Three climate finance negotiators (who preferred not to be named and key persons within the French Presidency for COP27 in 2015) highlighted that Article 2.1.c was intended as a global policy measure to recognise that the whole financial system needed to be engaged in the climate response. The article was contested prior to being introduced and initial drafts referred to “all finance flows”. In the final ministerial negotiations of the Paris Climate Agreement, the word “all” was removed to recognise and acknowledge the concerns from global South countries that such wording would affect their access to development finance flows and international development assistance.

The Paris Climate Agreement set in place principles and guidance for global North and South countries to pursue within their national contexts. Rules were agreed for countries to abide by in the decisions of COP24 known as the Katowice Package. For Article 2.1.c, the Katowice Package rules state that the Standing Committee on Finance would map relevant information relating to this objective every four years as part of its biennial assessment and overview of climate finance flows (UN, 2018c).

Appendix B. Update of Colombia's strategic approaches to finance

This information provided below is an extract from a discussion paper (Naidoo, 2019c) prepared for the United Nations Department of Environmental and Social Affairs (UNDESA). The research process to secure this information was interviews with two key informants selected for their current and past experience of working in the Colombian government. The interviews were conducted in October and November 2018. The italicised text with quotation marks denotes direct quotes.

A key motivation of the Government of Colombia's approach to climate change is behavioural change, which it regards as the missing Goal 18 of the SDG Agenda. The country aims to achieve three levels of transformational changes in its climate response and financing strategies:

- impact on development planning that the climate goals must also have an impact on its sectoral and territorial plans e.g. transport, health, energy, conservation;
- paradigm shift on climate finance by shifting how financial models of climate change projects are being formulated, to secure national counterparties and focus on the effective use of resources and generating alternatives of financial sustainability; and
- capacity building for national project developers and entities, with specific focus on education and awareness as these are essential for behavioural change.

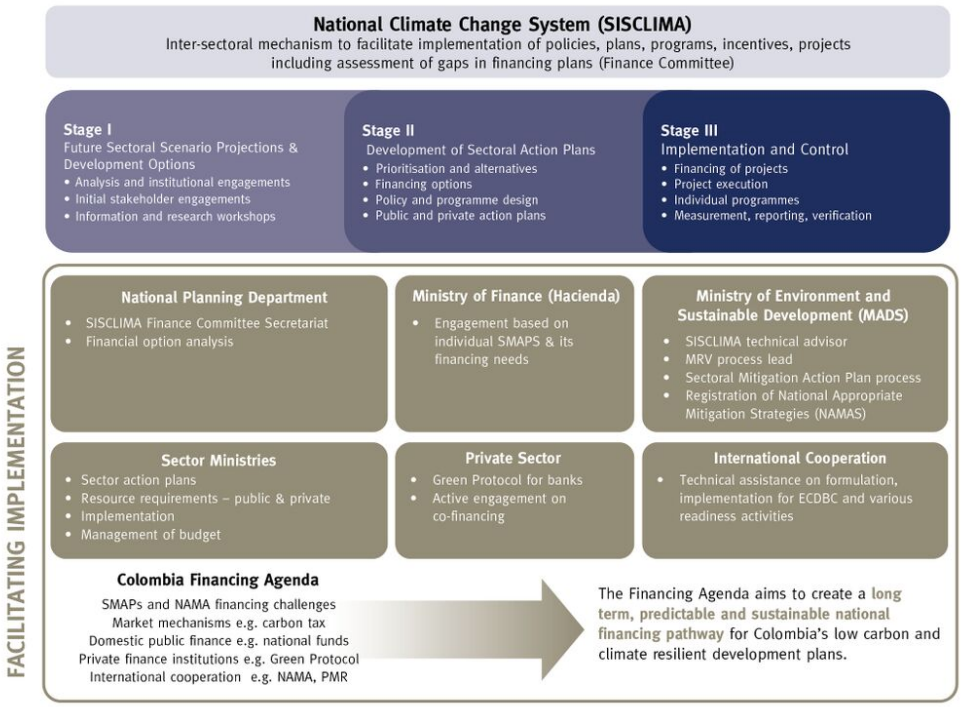
In 2014, the Government of Colombia aimed to create a long-term, predictable and sustainable national financing pathway for climate action in Colombia (Naidoo et al., 2014). Four years later, in 2018, the focus remains sharply focused on the technical dimensions of the climate response which then determines the financial response; as illustrated by a Department of National Planning official the rationale for Colombia's climate finance strategy "*is not about how much money we are mobilising, but how accurate are we about implementing the actions we are considering*".

The National Climate Finance Strategy is integrated within the National Policy on Climate Change in the context of climate change management planning, where the two main objectives are: i) to consolidate strategies and plans that enable implementation at the national, territorial and sectoral levels; and, ii) to mobilise resources in sustainable manner and at scale to achieve the goals of its National Policy on Climate Change. The National Climate Finance Strategy is embedded within the national climate change

system called Sisclima, which coordinates and integrates climate change into national development plans.

Sisclima's response follows systematic and structured stages which shows how the behavioural focus has been operationalised as depicted in Figure B1. below; Stage 1 initiated a process of future climate change scenario and projection process to identify the core technical elements of its climate response, engaging local scientists and other technical experts to develop strong technical and science-based foundations (Naidoo, et al., 2014). After Stage 1, the Government of Colombia then developed sectoral action plans which includes prioritisation of initiatives, policy and programme designs; financing options; and public and private engagement. It is now at Stage 3 of its process, focused on implementation and control; evidenced by its technical capacity focus on monitoring, reporting and tracking the effectiveness of finance in meeting the technical responses determined in Stages 1 and 2.

Figure B1 Colombia's climate technical, governance and financing processes
Source: Naidoo, et al., 2014.



The Climate Finance Committee is the most active and mature unit of Sisclima supported by the Department of National Planning which serves as the Secretariat. The Sisclima defines precise terms of reference for the National Climate Finance Committee. The

Sisclima envisions a climate-responsive development agenda in Colombia, and developed policies and engagement processes to build the foundation for future implementation.

The effects of this vision are now materialising, as the Department of National Planning's official describes; "*one of the exciting things is seeing people talk about things that were thought to be only a dream. Seeing people talking about things that were not imagined in the beginning of Sisclima are now materialising through specific examples*". The effects of its strategic approach to climate finance are evidenced by the following examples:

Creating systems for learning-by-doing. By establishing an integrated governance structure around the country's climate response, the Government of Colombia shifts the focus towards the planning process, including the quality of inputs and partners necessary for implementation. It then positions finance in terms of impact and effectiveness in meeting its climate goals.

Integrated and devolved climate management. The Regional Node Committees are responsible for engaging with climate change at the regional and local levels. This allows accountability and responsibility for climate action to be devolved into regional level, empowering local communities to engage and participate in the programme, and project development process and directing finance flows towards sectoral and regional priorities.

Building local awareness. The Sisclima facilitates building local awareness, and integrating the climate agenda into the national development pathway and establishing links to different sectors. The process of learning and engaging between national, sectoral and regional structures has been valuable in building awareness, including collaboration programmes among different institutions and sectors.

Dialogue. Through Sisclima, the Government of Colombia is embarking on a year-long dialogue with the national finance stakeholders to understand the climate risks they face and how to best address them.

Community of national experts. Colombia has committed and talented national experts that have supported different dimensions in creating Sisclima, and remain therein taking on different roles to continue supporting the country's climate response.

Creating competition among development partners. The Government of Colombia launched a competitive bidding process to identify an appropriate partner for advancing

its National Adaptation Planning. The competitive bidding process allows Colombia to identify the development partner best qualified to support the country in its goals for a specific project; and allows the partners the platform to objectively present their credentials for consideration.

Climate finance event. The Climate Finance Day is a flagship event led by the National Climate Finance Committee of Sisclima. At its 2018 event, 400 delegates attended drawn from "*different worlds*" coming together to speak about how the Colombia economy and financial response can support climate action.

Innovation pilots with the private sector. The Banking Association of Colombia through the Protocol Verde is implementing a series of pilot projects in support of the national climate agenda. The pilots aim to build capacity in the banking sector through new green credit lines, and understanding the climate risk of new infrastructure projects.

The Banking Association of Colombia is leading the pilots with government support through the Protocol Verde Secretariat. Interest in participating in the Protocol Verde is not just found among public and private banks, insurance and investment banks are also interested in joining the Protocol Verde.

Financial innovations. In July 2017, Bancoldex with support from the Inter-American Development Bank issued the country's first green bond through the Bogota Stock Exchange, and several local banks are planning to do the same.

Sustainable Colombia Initiative. This initiative responds to integrating the country's response to the SDGs and climate change, focused on addressing rural development, climate change, environmental sustainability and social inequality in conflict-ridden areas of the country established in 2015.

Appendix C. Inventory of thesis data

This appendix highlights the different data sets developed for this thesis and how they were used across the papers. The papers only offer a limited insight into these data sets relative to the research objectives and questions of this thesis. Future research will build on this further.

	Paper 1 *Ch3*	**Paper 2** *Ch4*	**Paper 3** *Ch5*	**Synthesis** *Ch1,2,6*
1. Review of UNEP Inquiry policy proposals and country case studies (64 papers) and the coding of these proposals in NVivo.	•	•		•
2. Adjustment of UNEP Inquiry database of 296 green finance measures.	•			•
3. Scoping review of finance and sustainability transitions literature	•	•	•	•
4. Mapping South African financial system's green finance specific interventions.		•	•	•
5. Review of academic literature on South Africa's renewable energy programme, focus on finance.		•	•	•
6. Interviews and on-site fieldwork at IPP Office, and observing challenges.			•	•
7. Interviews with financial intermediaries, experts and government.			•	•
8. Summary document on financial information related to SA renewable energy programme.			•	•
9. Mapping the finance flows and policy interventions from the 1998 to 2019 and related insights.			•	•
10. Interviews with key persons and experts on aspects of energy transitions in South Africa.			•	•
11. Review of UN climate-related financing work and decisions since 1972 to 2019.	•			•
12. Study of Kenya and Colombia climate finance strategies and relevance for integrated national financing frameworks per Addis Agenda.	•			•
13. Historical review of DBSA greening process from 1984 to 2019.			•	•

Appendix D. Interview questions and inventory of meetings

a. Interview questions

The 30 interviews referred to in Chapter 2 and 5 were semi-structured, and concentrated on the broad theme of how the financial system influenced the SA renewable energy programme, and how the programme was influenced by the financial system. The author had access to confidential quantitative information, which is not possible to present in detail in this thesis as it is subject to a confidentiality agreement.

The focus for evaluating the **quantitative data**:

- What were the aggregate investment by different financial intermediaries across the whole programme (for national and international funding)?
- How much was invested by which financial intermediaries for each bid window, and by technology?
- What financing structures were used to finance projects, how did these shift over time?
- What type of refinancing is happening and what project impacts does this have?
- What funding is offered to the empowerment shareholders (including community trusts)?
- What financing differences exist between the coal and the renewable energy programme?

The interviews with **government and government agencies** were guided by the questions:

- How are different intermediaries engaged in the programme?
- What is the extent of the intermediaries' influence in shaping the future renewable energy procurement by government?
- What are the policy and implementation challenges from IPP Office perspective?
- How does the IPP Office capture lessons learned from the programme?
- How does it engage with policymakers on these lessons learned?
- What is the institutional set up of the IPP Office and how does it fund its daily operations?
- How does the government/ government agencies believe it contributed to the financial intermediaries' support of the programme?

- How does government consider the programme to have influenced the intermediaries?

The following questions guided discussions with **financial intermediaries and experts:**

- How are different financial intermediaries engaged by government on the programme?
- How have such intermediaries continued to be engaged and what is the extent of their influence in shaping the future renewable energy investment propositions of government?
- What policy feedback is given by the IPP Office to financial intermediaries?
- What capacity did financial intermediaries have to build to invest in the programme?
- How did the financial intermediaries' financing of the programme shift as the programme matured?
- What lessons have the financial intermediaries learned in engaging in the programme?
- Are financial intermediaries willing to voluntarily invest in future sustainable programmes?
- What influenced financial intermediaries to invest in the renewable programme?
- How is South Africa's economic (credit rating downgrade) affecting the ability to invest or refinance the renewable energy programme?
- What are the current constraints of the intermediaries in financing green programmes?
- What needs to happen (and who needs to act) to address these constraints?
- What do financial intermediaries believe they contributed to the programme?
- How do intermediaries consider their support to have influenced the government?

b. Interview schedule

The following interviews were conducted, names of all individuals are anonymised for confidentiality reasons.

Code	#	Company	Position	Date
GA1	1	IPP Office	Executive management	16/5/2017
GA2	2	IPP Office	Executive management	16/5/2017
GA3	3	IPP Office	Executive management	18/5/2017
GA4	4	IPP Office	Executive management	18/5/2017

Code	#	Company	Position	Date
GA5	5	IPP Office	Executive management	15/9/2017
GA6	6	IPP Office	Executive management	4/10/17, 9/8/19
GA7	7	IPP Office	Executive management	18/01/18
GA8	8	IPP Office	Executive management	13/06/18
G1	9	National Treasury	Deputy Director	5/08/18
G2	10	Dept of Trade & Industry	Senior government	11/6/17
G3	11	Dept of Energy	Executive government	7/7/16-6/10/19
F1	12	Financial institution	Senior executive	6/2017
F2	13	Financial institution	Senior executive	19/01/18
F3	14	Financial institution	Treasury	5/10/17
F4	15	Financial institution	Senior executive	2/10/17
F5	16	Financial institution	Ex-executive (2008-12)	5/5/19
F6	17	Financial institution	Ex-executive (2007-12)	7/5/19
F7	18	Financial institution	Senior manager	9/5/19
F8	19	Financial institution	Environmental expert	12/5/19
E1	20	Ex advisor to SA government	Expert (finance)	16/4/18
E2	21	Independent	Expert (energy)	2/2 – 6/10/19
E3	22	Ex Eskom	Expert (energy)	2/2 – 6/10/19
E4	23	Advisor to government	Expert (empowerment)	6/9/19
E5	24	Ex financial institution	Expert (environment)	4/03/19
E6	25	Ex Eskom	Expert (energy)	2/2 – 6/10/19
E7	26	Independent	Expert (energy)	8/10/19
C1	27	Civil society group	Executive director	15/11/19
C2	28	Civil society group	Executive director	10/10/19
C3	29	Civil society group	Senior executive	25/10/19
C4	30	Civil society group	Executive director	24/10/19

Appendix E. Article summaries of 2013 Special Issue on finance

Supplemental information to Scoping review of 2013 EIST Special Issue Volume 6: The financial crisis of 2008 and its effects on sustainability transitions

Authors	Main arguments by authors	Positions deduced from text
Antal and van den Bergh, 2013	The framing of growth as an imperative in the economy system is problematic. The structure of the financial-economic relationships is biased to debt and financial returns, meaning that the financial system is not fit-for-purpose.	The structure of the financial system requires re-assessment to facilitate different choices in the allocation of capital, i.e. to move investment into sustainable options.
Loorbach & Huffenreuter, 2013	The framing of green growth upholds the dominant growth imperative. This is not helpful because it masks the systemic problems of the current economic system which inevitably produces unsustainable development pathways.	There is a need to address the underlying deep systemic problems of economic-financial systems because any policy decisions in support of sustainability transitions go against the framing of growth as the most important economic imperative.
Foxon, 2013b	The financial crisis shows the inability of mainstream economic theories to adequately understand how economies really work. The author proposes a new economic pathway called “complexity economics” which utilises four schools of economic thought to create a dynamic and open economic system: i) ecological economics rather than seeing the main goal of government as promoting economic growth; ii) behavioural economics to factor in the bounded rationality and bias of human actions; iii) institutional economics to recognise the institutional complexities of banks and financial regulation which are currently absent in economic models and disregarded in policy making; iv) evolutionary economics to acknowledge the dynamic processes that shape technological and institutional changes, rather than the use of equilibrium models, which dominate mainstream economics.	By blending mainstream economics with the four schools of thought, a dynamic and open economic system is possible with agents having the ability to learn and adapt over time, interacting across different networks with feedback and interaction. Dominant mainstream economic theories fail to offer policy insights for modern day challenges. Fragments of a new economics for sustainability exist, but have not yet been developed into a coherent, alternative framework.

Authors	Main arguments by authors	Positions deduced from text
Vergragt, 2013	The real crisis behind the 2008 financial crisis is one of social inequalities. Societies with large income disparities perpetuate consumerism. Support is needed from social groups with the political will to build a strong social movement. The author argues that having access to decent work, moderate to low income growth and better quality of life would help avoid future financial crises. The “wicked problem” is the pursuit of growth and the existence of a consumerist culture.	Building strong social movements is necessary to address social inequalities in a radical way that works with movements such as Rethinking Economics. Proponents of green growth pin their hopes on ecologically oriented and energy-efficient technologies, but this will lead to rebound effects and disappointing social impacts. This raises questions about whether the transition will result in societal shifts that are deep enough to address inequality.
Perez, 2013	Financial crises are a natural part of economic cycles that recur over time. There are opportunities to unleash a golden age that promotes new green innovations and real prospects for green growth.	Realising this potential depends on enabling conditions for green growth, such as appropriate government intervention, reorienting and directing global finance towards new opportunities, and regulation to limit the “casino effect” of finance.

Authors	Main arguments by authors	Positions deduced from text
Geels, 2013	The paper attempts to expand the discussion beyond environment, incorporating the financial crisis, and shifting the emphasis towards diffusion and take-off of technologies rather than the emergence of such technologies. The author argues that: i) the financial-economic crisis reflects deep cultural problems, such as debt-biased economies, an obsession with growth, and resource exploitation; ii) crisis is an essential part of long-term change, which means that the current crisis could be a "green wave"; iii) framing green growth in terms of opportunities and rewards rather than as the cost of responding to deep cultural problems is problematic. The paper further argues that the financial-economic and sustainability crises have different time frames, causes and solutions, and these will compete for political attention.	Transitions are non-linear processes that move forward and backward, with periods of stagnation. Challenges during the take-off phase are as follows: i) Having to mobilise large sums of money, which depends on financial-economic conditions, investor confidence, and financial regulation. ii) The need for government to create an enabling policy and institutional framework because private actors have no incentive to address societal problems. iii) Having to obtain public support and establish legitimacy for the changes emerging from the crisis, which could be mapped across an "issues lifecycle".

Authors	Main arguments by authors	Positions deduced from text
Swilling, 2013	The financial crisis reflects the ebb and flow of systems dynamics. The persistence of economic crisis is a result of" blocked transitions" – the failure to dislodge the hegemonic role of finance capital, and the failure to break carbon lock-in. The paper critiques long wave theory and sees its danger as techno-economic determinism where innovations do all the "acting", and socio-political institutions do all the "reacting". Swilling argues that finance capital will not voluntarily drive a green technology revolution, because: i) there is a massive build-up of unspent cash in several major economies; and ii) the sustainability commitments of large investors is undermined by the short-termism of capital markets, which makes long-term funding unavailable.	Transitions are only possible if three conditions are in place: i) finance capital has been disciplined; ii) productive capital leads digitising of production and consumption; and iii) finance capital drives the acceleration of green technologies as a response to the growing ecological crisis. The paper proposes a framework to balance the "act-react" imbalance between technology and socio-political institutions, by adding socio-metabolic transitions, technological revolutions and long-term global development cycles. These collective insights are necessary to reorient the technology storyline to transitions based on the sustainable use of material and energy flows.
Witt, 2013	The paper argues that the financial crisis is only financial on the surface, it actually veils a growth crisis. There is need to rethink current growth expectations and political priorities because these divert attention away from sustainability transitions. Despite the financial reforms that have been made to respond to the crisis, the narrative of green growth and its investment opportunities are not helpful. Such narratives mask the deep systemic problems of unsustainable production and consumption patterns, as well as social inequalities.	While engaging the broader public in discourse towards sustainability transitions and introducing policies that promote a less expansionary view of growth would be useful, this raises a political question: would the public be willing to vote for transition policies if they knew these were likely to negatively affect economic growth? The primary challenge is the future of employment in a sustainability transition context: either reducing labour supply or creating new jobs. New jobs are the preferred option for a just and equitable transition.

Authors	Main arguments by authors	Positions deduced from text
van der Ploeg and Withagen, 2013	Boosting green growth in a global economic crisis may be possible through government intervention and policies. Crises expose the inefficiencies of the system, and the potential for redirecting and engaging in new approaches.	Appropriate price signals (e.g. carbon taxes), and innovations are essential to stimulate green growth, including strategies for not exploiting fossil fuel resources.
O'Riordan, 2013	Identifies four failures arising from the financial crisis: i) an inability to anticipate tipping points, ii) an over-optimistic corporate sector, iii) an immoral market, iv) the undermining of democracy by oligarchs of power.	

Appendix F. Additional information on the Green Fund

The following information is an extract and adaptation from a report on the greening journey of the DBSA from 1984 to 2019 developed for a "green bank" project led by Third Generation Environmentalism. The research process giving rise to the information involved interviewing eight key informants (past and present employees of the DBSA) and those more closely involved with operating the Green Fund on a day-to-day basis.

The DBSA was assigned the role of a fund manager and was responsible for setting up the institutional infrastructure of the Green Fund. It was ringfenced within the DBSA, meaning it had an independent governance and reporting structure directly to the National Treasury and Department of Environmental Affairs through a joint investment committee. The Green Fund mainly relied upon the DBSA's institutional infrastructure such as the financial management and reporting systems. The DBSA developed project appraisal and evaluation criteria specific to the Green Fund, reflecting national development priorities and the green economy objectives of South Africa. The bespoke criteria were adapted using the DBSA's environmental, social and governance safeguards as a basis for redesign.

Due to the experimental nature of the Green Fund, its staff was limited to 12 persons. The core skills prioritised for the experimental phase was investment management, environmental analysis, financial analysis, portfolio management and policy analysis, with technical oversight by senior managers and divisional executives of the DBSA. Also, the Green Fund's activities are independently evaluated, and the Department of Environmental Affairs and National Treasury recognise the positive contribution of the Green Fund portfolio to developing South Africa's green economy agenda and demonstrating a diversity of project options.

The Green Fund was designed as a catalytic and experimental fund and offered important lessons for understanding the challenges and dynamics needed for financing South Africa's sustainability transition. However, the Green Fund was also subject to the tensions of generating traditional returns on investment, which runs against the notion of experimentation. For example, so-called failures in an experimental financing mechanism offer valuable insights into what works and what does not. These insights relate to the level of project development required, the tensions in meeting both developmental and green goals, and understanding the monitoring impacts (lag and lead factors) related to green economy projects.

From the Department of Environment's perspective, taking the Green Fund further required a reflexive approach. Specifically, to re-engage on attracting external funders, risk buy-down on national projects and programmes, determine the expected returns on investment, as well as reconsider the governance structure of the Green Fund.

An added contribution of the Green Fund is its direct contribution towards deepening the DBSA's experience and standards for environmental safeguards and monitoring standards. In the long-term, the Green Fund experience was valuable in addressing gaps in the institutional infrastructure of the DBSA. These gaps became apparent when DBSA was being assessed by the evaluation panels of the GEF and the GCF. In particular, the Green Fund's experimental approach had created new systems necessary for focusing on green projects (e.g. different forms of project development, environmental, economic and social indicators and measured in terms of project-level and system-level impacts). These experimental approaches satisfied the evaluation panels of the multilateral climate funds that the DBSA was actively engaging with specific themes of environmental action.

The Green Fund built significant internal expertise and capacity among DBSA and the operational team, which led to proposals for redesigning the investment proposition of the Fund to consider the critical lessons. In particular, the staff members interviewed attribute the acceleration of climate finance efforts within the DBSA to the early learnings from the Green Fund. The funding cycle for the Green Fund closed in 2017, and the DBSA now manages the remaining investment portfolio on behalf of the Department of Environmental Affairs and National Treasury.