

Infrastructure financing in Africa: Overview, research gaps, and urban research agenda

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INFRA STRUCTURE FINANCING IN AFRICA



Alfred
Herrhausen
Gesellschaft

OVERVIEW, RESEARCH GAPS,
AND URBAN RESEARCH AGENDA
Authors: Dr Liza Rose Cirolia,
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About the African Centre for Cities

The ACC, which is based at the University of Cape Town, is a leading knowledge centre conducting meaningful research on how to understand, recast and address pressing urban crises, particularly on the African continent. As most urban challenges, for example, food security, climate change adaptation, economic inclusion, cultural vitality and tolerance, are inherently interdisciplinary and spatially layered, the ACC nurtures the co-production of knowledge favouring and cultivating critical Southern perspectives. Through its research, the ACC aims to develop imaginative policy discourses and practices to promote vibrant, just and sustainable cities. This purpose has become all the more pertinent with the adoption of Agenda 2063 at a pan-African level, which aligns with the 2030 Agenda for Sustainable Development.

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The Alfred Herrhausen Gesellschaft promotes a free and open society and its cohesion. Democracy, the social market economy and sustainability are the foundations of such a society. Our work is based on the values of Alfred Herrhausen: on freedom and responsibility, on competition and compassion. Alfred Herrhausen thought and acted with the aim of crossing and overcoming boundaries. In his memory, the Alfred Herrhausen Gesellschaft creates platforms for discussions to enrich relevant discourses during selected events, and in publications and other media.

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EXECUTIVE SUMMARY

Africa's development requires substantial investment in infrastructure systems, such as water, energy and telecommunications. These systems are essential in ensuring that contemporary processes, such as industrialisation and urbanisation, can be leveraged to create real and sustained value for cities, countries, regions and global networks. One of the key questions underpinning this infrastructure challenge is how to finance these systems. Often focussing on the need for bankable projects and creditworthy institutions, debates about how to finance African infrastructure reflect an important and well-rehearsed argument that the key to addressing the infrastructure finance gap, thereby unlocking Africa's infrastructure challenge, is overcoming the mismatch between investor expectations and the actual risk/return profile of infrastructure programmes and projects. In this mismatch, many useful projects are regarded as simply unbankable, either as short-term returns are too low, or the risks are too high or not easily quantified and costed.

With the sustainable development goals and other global agendas calling for more equality, climate responsiveness and poverty alleviation, the development sector has been compelled to move beyond the frame of bankability to ensure that investments are sustainable and just. This has required deeper engagement with how financial logics, such as rating systems and assessment criteria, shape the sustainability of infrastructural outcomes. It has also required recognising current gaps in knowledge, such as the lack of data on Africa and the weaknesses in our ability to analyse this data in the context of rapid urbanisation, digitisation, demographic transition and other important trends that have unique implications for the continent.

This paper comprises four parts with the intention of demonstrating these gaps and providing a scaffolding for future knowledge production. In section 2, an overview is given of the actors and instruments involved in infrastructure finance in Africa, namely how much different actors are investing, what kinds of financial mechanisms are being used, and into what types of infrastructure sectors. In section 3, the research issues that surface when attempting to analyse that data are outlined, with an indication of where improvements could be made to strengthen documentation and accountability. Building on the insights from section 2 and 3, in section 4, a propositional and forward-thinking research agenda for infrastructure finance research in Africa is presented. The paper is concluded by a presentation of two key areas for collective action. A summary of the main sections in the paper follows.

Although information about investment in Africa is scattered and difficult to consolidate, in this section, an overview is given of the actors involved in financing and delivering infrastructure on the continent, of the emerging trends concerning financial mechanisms and the ways in which they play out in each major investment sector. This high-level overview is an indication that national governments are key actors in infrastructure finance, leveraging their own revenue and loans. Multilateral and bilateral lenders are also major players, but they operate in a complex landscape of geopolitical ties and utilise diverse financial mechanisms that are often difficult to chart. Blended finance and other emerging instruments that combine concessional and commercial elements reveal an increasing complexity of the project packages through which infrastructure is delivered. This brief map shows that existing available information is heterogeneous and cannot simply be portrayed through numbers as richer qualitative reflections are needed to make sense of scattered and diverse documentation.

The gaps in understanding the trends and patterns affecting investment in infrastructure in Africa reflect interrelated and systemic issues. In this part, the paper is focussed on three important obstacles to building shared meanings of sustainable infrastructure financing in Africa, particularly among key financial actors. First, there is an absence of commensurability and, therefore, the interoperability of available datasets. In other words, data collected by different actors use different categories and metrics, making comparability difficult. Secondly, data are rarely collected by autonomous agencies. The need for autonomy and transparency of the research underpinning many of the existing outputs on the topic is clear. Finally, yet importantly, the lack of fine-grained, localised data at the subnational level makes nuanced analyses difficult.

This is particularly evident and important in the context of urban infrastructure, which pays the price of unrealised decentralisation reforms, competing territorial governance, traditional lenders' opposition to funding subnational institutions, and an even greater dearth of data and research.

When researched, many priorities could, each in its own way, address the knowledge problem of sustainable infrastructure financing. The most pressing imperatives are synthesised in this part of the paper. The first is capacitating research centres in Africa to engage the questions of infrastructure finance. As shown in this paper, African research institutions are rarely involved in setting priorities of international lenders and could be capacitated to play a vital interlocutor role. A second necessity is understanding the increasingly important role and unique practices of non-OECD actors, such as China, India and Arab countries. While players such as the World Bank were once regarded as the leaders of the African infrastructure investment agenda, a diversity of lenders and donors, often with divergent and even competing objectives, has proliferated, and needs to be better understood and coordinated, if possible. The third imperative relates to the need to give serious consideration to key continental transitions already underway. Africa is changing rapidly. Urbanisation; climate change; demographic transitions, for example, youth bulge; industrialisation; digitisation and other processes have direct and fundamental impacts on infrastructure, and failure to account for them has its own peril. The fourth imperative relates to the rise of alternative spatial and territorial formations, which may challenge the primacy of the nation state over decades to come. Put differently, multicountry corridors, transborder megacities, and/or regional natural systems reflect the interconnectedness of the pan-African infrastructural project and point to the need for new governance formations that can deal with these infrastructural realities. Finally, the reality of existing infrastructural hybridity and diversity cannot be overlooked. Focussing exclusively on capital intensive mega projects fails to acknowledge the diverse ways services are already being accessed, as well as the wider social infrastructures that support human, cultural and social well-being.

In this paper, two policy responses have been identified, which, in our view, would serve the research agenda identified in this paper. First, by creating collaboration protocols that help Africa-based research institutions, privately and publicly owned financial actors, local government and other stakeholders to join forces and, through dedicated channels, design, define and assess sustainable infrastructure projects over the long term. Secondly, a need has been identified to operationalise urban sustainable infrastructure financing through dedicated tools that respond to the twofold need of using small-scale testbeds and reframing the question of bankability by adopting innovative forms of risk-sharing.

CONTENTS

Executive summary	3
Abbreviations and Acronyms	6
List of Figures	7
List of Tables	7
List of Charts	7
1 INTRODUCTION	8
2 ACTORS AND INSTRUMENTS	10
2.1 Infrastructure finance actors	10
2.2 Infrastructure financing instruments	14
2.3 Trends by sector and delivery mechanisms	17
2.4 Emerging financing mechanisms in the African infrastructure context	19
3 RESEARCH ISSUES IN THE AFRICAN CONTEXT	22
3.1 Issues of commensurability and interoperability	22
3.2 Issues of transparency and autonomy	23
3.3 Issues of territorial mapping	24
4 RESEARCH AGENDA	25
4.1 Capacitating African-based research centres to engage with infrastructure financing	25
4.2 Non-OECD actors such as China, India, Turkey and Arab Gulf nations	25
4.3 Supporting city and metropolitan governments	25
4.4 Mapping continental transitions	26
4.5 Transnational and geopolitical implications of infrastructure financing	27
4.6 Beyond conventional service delivery	27
5 CONCLUSION	29
References	30

ABBREVIATIONS AND ACRONYMS

ACC:	African Centre for Cities
ADB:	Asian Development Bank
AfDB:	African Development Bank
AfCFTA:	African Continental Free Trade Area
ADF:	African Development Fund
AFESD:	Arab Fund for Economic and Social Development
AGFUND:	Arab Gulf Programme for Development
AHG:	Alfred Herrhausen Gesellschaft
AIIB:	Asian Infrastructure Investment Bank
AU:	African Union
AUC:	African Union Commission
AUDA:	African Union Development Agency
CARI:	China Africa Research Initiative
CBI:	Climate bonds initiative
Covid-19:	Coronavirus disease 2019
DAC:	Development Assistance Committee
DIB:	Development impact bond
DFI:	Development finance institution
DRC:	Democratic Republic of the Congo
EBRD:	European Bank for Reconstruction and Development
ECA:	Export Credit Agency
EIB:	European Investment Bank
FDI:	Foreign direct investment
GIIN:	Global Impact Investing Network
IBDR:	International Bank for Development and Reconstruction
ICA:	Infrastructure Consortium for Africa
ICT:	Information and communication technology
IsDB:	Islamic Development Bank
JSE:	Johannesburg Stock Exchange
MDB:	Multilateral Development Bank
MENA:	Middle East and North Africa
MIGA:	Multilateral Investment Guarantee Agency
NDB:	New Development Bank
NEPAD:	New Partnership for Africa's Development
OECD:	Organisation for Economic Cooperation and Development
ODA:	Official development assistance
OECD:	Organisation for Economic Cooperation and Development
OOF:	Other official flows
PIDA:	Programme for Infrastructure Development in Africa
PPF:	Project Preparation Facility
PPFN:	Project Preparation Facilities Network
PPI:	Private Participation in Infrastructure
PPP:	Public-private partnership
RBL:	Resource-backed loan
SDG:	Sustainable Development Goal
SEZ:	Special Economic Zone
SSA:	Sub-Saharan Africa
UCLG:	United Cities and Local Governments
UK:	United Kingdom
US:	United States
UNECA:	United Nations Economic Commission for Africa
WBG:	World Bank Group

LIST OF FIGURES

FIGURE 1:	
Landscape of public funding bodies	14
FIGURE 2:	
Project financing supported by an ECA (Authors' representation)	19

LIST OF TABLES

TABLE 1:	
Taxonomy of debt, equity, and mixed instruments used for infrastructure financing (Simplified from: OECD, 2015)	15
TABLE 2:	
Types of financing tool by sector, US\$ million, 2017 (Excludes ICA, African National Governments and Private Sector) (ICA, 2018)	17
TABLE 3:	
Major research databases on infrastructure financing in Africa (Author's compilation)	22

LIST OF CHARTS

CHART 1:	
Infrastructure financing in Africa by year and source of funding, 2010-2017 (Adapted from: ICA, 2018, 2017, 2013, 2012)	10
CHART 2:	
Infrastructure financing by main actors (2018 US\$) (Adapted from: ICA, 2019)	12
CHART 3:	
Infrastructure funding in Africa by country/institution (US\$ m, 2017) (Adapted from: ICA, 2018)	13
CHART 4:	
ICA members' 2017 commitments by type of funding, US\$ billion (Adapted from: ICA, 2018)	16
CHART 5:	
Infrastructure financing by sector in US\$ million in 2017 (ICA, 2018)	18
CHART 6:	
Private Participation in Infrastructure World Bank, 2010-2019, for sub-Saharan Africa (excludes Middle East and North Africa countries) in US\$ million. (Adapted from: https://ppi.worldbank.org/en/snapshots/region/sub-saharan-africa)	18

1 INTRODUCTION

Common narratives concerning Africa's development range from frontier optimism to daunting pessimism. These extremes fail to account for the diversity, complexity and possibility evident on the continent. Despite all that has been achieved, and notwithstanding this need for nuance, [there is no question that Africa experiences severe deficits in infrastructure and service delivery systems](#). Drawing on commonly used definitions, infrastructure is defined as the medium that allows a country, city or settlement to function optimally. Infrastructure does not only concern fixed investments in hard networks, such as building roads or water treatment plants; a functioning city or country also requires these investments to be used, water to flow through its pipes and energy being transmitted through its cables.

Many challenges are experienced in calculating the infrastructure financing gap (Foster & Briceno-Garmendia, 2010). Deciding what counts as infrastructure spending is the most complex part. While the quantification of the infrastructure gap and its associated financial implications is extremely variable and controversial, the AfDB calculated Africa's infrastructure finance gap in the range of US\$68 billion-US\$108 billion in 2018 (AfDB, 2018a). While a staggering number, this is still a conservative estimate, which primarily focuses on large-scale investment and does not account for many of the softer infrastructures needed to support the everyday functioning, lives and livelihoods of many inhabitants on the continent.

Now more than ever, attention is being directed at mobilising, gearing and leveraging finance for infrastructure in Africa. In the [AU's Agenda 2063: The Africa We Want](#), the development of local and pan-African infrastructure systems is a key component of the vision set out for the next 50 years of multilateral cooperation (AUC, 2015). Flagship initiatives of Agenda 2063 include several infrastructural projects, such as a high-speed train network, energy projects and an Africa-wide broadband backbone (AU, 2021). This focus on infrastructure is reflected in actual infrastructure investment on the continent, which shows a significant growth trend until 2018, and is the last available aggregate official information (ICA, 2018; ICA, 2019). Increasingly important bilateral partners such as China have also emerged to fund infrastructure. Through aid programmes and commercial financial instruments, these newer players are diversifying the actor landscape and tools used for investment (Brautigam et al., 2018). While all of these financing efforts are important, they remain small relative to current and future needs. Moreover, investment agendas between national governments, regional bodies, lenders and donors have often been uncoordinated and overly focussed on specific sectors, leaving numerous gaps in terms of financing and the infrastructure systems being financed.

Mobilising funding to fill these gaps is undeniably necessary. However, [the substantive nature of this gap-filling is of critical importance to the long-term viability of African development processes](#). In other words, [where money comes from, how it is structured, where it is invested and the types of projects it supports all matter](#). The nature of funding, as well as how investments in different sectors interact with one another and with the wider ecological and social systems, has direct implications for the value creation or loss that the continent will face. Moreover, investments made today create lock-ins, setting development pathways in often irreversible ways in terms of material development and debt repayment. This has proven true of colonial investments, as evidenced in the lasting exclusionary impact of poorly maintained systems and will remain true for investments made now and into the future. As such, today's infrastructure investors must be attentive to the long-term impacts of their choices, which set often irreversible pathways into the future.

[As part of a wider project led by the ACC and AHG, this paper](#) is aimed at attending to this need by addressing questions of infrastructure investment in Africa, with a focus on sustainability. The paper is aimed at decision-makers involved directly in infrastructure investment, keen to ensure that their investments contribute meaningfully to Africa's sustainable development. Sustainability, as used in this paper, relates to the types of investments made (sustainable infrastructure), as well as the appropriateness and justness of fiscal and financial arrangements for these investments referred to as sustainable finance.

This project [builds on the REframe Primer](#) (ACC, 2020), whose central question was how to ensure that investment in Africa yields sustainable outcomes. REframe's context focussed on African cities as key sites of urban investment (see an overview of the urban challenges in Africa) (UNECA, 2015). While REframe provides neither a definitive picture of sustainable urban infrastructure across each sector nor a prescriptive roadmap for how to unlock finance, it serves as [a launch pad for a rich conversation](#) about how to break the inertia of the current moment. In other words, how to shift towards investments deploying technological systems that are low- or zero-carbon intensive, resource-efficient, employment-rich, and generative of diverse and just socio-ecological systems.

Underpinning the REframe Primer is an understanding that having failed to attend to the imperative of sustainability, [the current infrastructure investment models used in Africa run the risk of reinforcing path dependencies](#). While the current excitement in African infrastructure portfolios may seem new and opportune, and indeed the world should care about the future of Africa's infrastructural development, common approaches to investment do little to break from the past. For over a century, first as part of colonial empire-building and later under the auspices of global development projects, global investment in Africa has been extractive, leaving in its wake degenerating mega projects, natural resource disasters, social unrest, ballooning debts and fragmented governance structures. From shopping malls to mega highways and mining towns, in the current model, the modern infrastructure ideal is connected with the risk appetite of global capital. In other words, this modernist narrative assumes that the most efficient way to address service demands and develop the continent is by developing large, centralised service networks, administered by semi-autonomous agencies/authorities. According to this simplified narrative, big projects, kept at arm's length from the corrupt politics and slow bureaucracies, incur lower quantifiable risk, enabling economies of scale and amplifying potential returns. Popular with private sector and bilateral agencies, such investment choices oppose principles of sustainability and preclude the likelihood of more emancipatory and productive geopolitical relationships for African states.

It is against this backdrop, and with the intention of improving our shared understanding of what is happening in Africa's sustainable infrastructure finance landscape, that this paper is structured into the following three parts:

- [Section 2](#) synthesises selected/key reports on financing African infrastructure, identifying the key instruments through which investments are made and who is involved. It also outlines some of the forward-looking finance trends and emergent instruments, such as green bonds. This section shows that numerous actors are involved in financing infrastructure.
- Based on the preceding review, [Section 3](#) highlights key challenges related to African infrastructure investment data and research, as well as the major areas of the current knowledge gap. These challenges and gaps include issues such as the incommensurability of data, transparency in reporting, subnational data gaps, and the weak categorisation of investment data.
- [Section 4](#) moves beyond the gaps in the data on finance and flags several areas where collaborative work/research is needed. These proposed areas provide the building blocks for a potential research agenda and include empowering Africa-based research institutions; understanding the modalities of infrastructure; working with key continental transitions, such as urbanisation and industrialisation; and supporting transnational infrastructure configurations and hybrid urban infrastructure investment.

In conclusion, in the paper, [a case is made for developing more robust partnerships for collaboration and experimentation](#), presenting some early thinking on what a finance laboratory is.

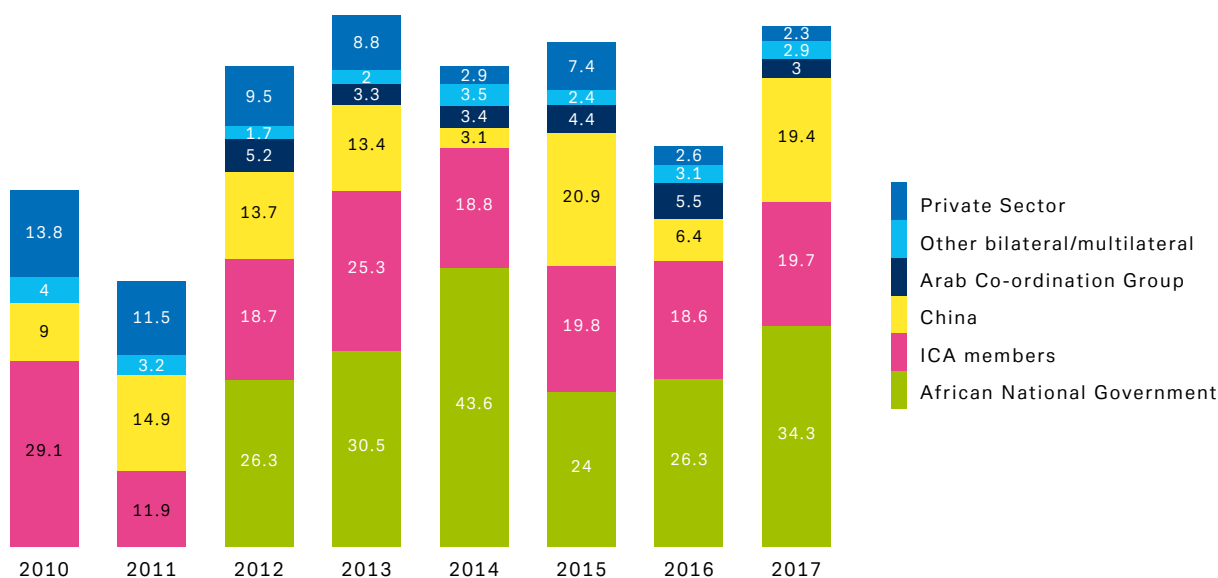
2 ACTORS AND INSTRUMENTS

To provide a high-level overview, this section presents the key actors involved in infrastructure finance in Africa and the financial mechanisms they use to realise infrastructure investment. This section draws on secondary material in the form of accessible data, which has been published by the ICA, the WBG, and other institutions who have attempted to consolidate information on infrastructure finance in Africa. As will be shown, it is difficult to provide a single coherent narrative about who is involved in infrastructure finance, their relative contribution, and the implications of these arrangements.

2.1 Infrastructure finance actors

Many actors are involved in financing and delivering infrastructure in Africa. Chart 1 indicates the relative contribution of different financial actors. It is broken down between African nation-states, members of the ICA, China, non-ICA bilateral and multilateral organisation, the Arab Group, and the private sector. Chart 1 provides one way of grouping actors; however, there are many others. This data shows that despite perceptions of weak African states dominated completely by foreign investments, **national governments are central players in infrastructure delivery**, accounting for between 24% and 44% of spending (ICA, 2018). This trend has been observed since at least 2012 when the ICA started including government-level data in their reporting on infrastructure spend (ICA, 2013).

CHART 1: INFRASTRUCTURE FINANCING IN AFRICA BY YEAR AND SOURCE OF FUNDING, 2010-2017 (ADAPTED FROM: ICA, 2018, 2017, 2013, 2012)



Pre-2012 ICA reports do not account for African government expenditure and do not separate the Arab Group from non-ICA funders

Notwithstanding the quantitative and qualitative importance of State investment, national infrastructure budgets are rarely built solely on local revenues as all African countries have some form of international debt built into their fiscus. Support to national governments in the form of multilateral loans is evident when looking at **national debt statistics**, which documents this lending. In the past 10 years, a general net debt increase has characterised sub-Saharan and Northern African countries (World Bank, 2021a, 2021b). African

nations show highly variable rates of indebtedness. As an example, debt accounts for only 13% of the DRC GDP; in contrast, it accounts for 107% of the Angola GDP (IMF, 2021b). Given the fungibility of these loans, it is difficult to determine clear links between national debt and particular infrastructure investments. However, it is likely in countries with higher rates of national borrowing that there are implications for the role of lenders in the governance and infrastructural decisions of those countries.

As debt statistics suggest, [MDBs](#)¹ are a key group involved in financing infrastructure in Africa (see the grey bar in Chart 1). MDB funding includes loans packaged into national government budgets, as discussed above, and in more direct forms, such as project finance. The best-known multilateral bank is the Washington DC-based WBG, comprising five distinct institutions that provide different forms of financial assistance. Among them is the IBDR, which has a near-universal reach with 189 shareholders. The first loan made to an African country was US\$5 million, lent to the Ethiopian government in 1950 to improve road infrastructure. Since the 1950s, the IBDR has been instrumental in shaping the development trajectory of African nations, for example, through structural adjustment in the 1980s. Despite the well-documented shift away from large-scale investments in the post-structural adjustment period, the World Bank is still an important investor in Africa, accompanied by a range of other multilateral banks. Global MDBs that operate in Africa include the Shanghai-based NDB, the EIB, the ADB, the EBRD, and the AIIB.

Regional development banks, the most notable being the [AfDB Group](#)², are also important multilateral players, shaping the agenda in Africa (AfDB, 2018b). The AfDB was founded in 1964 as an Africa-only institution. In 1973, the AfDB opened a concessional lending arm, the AfDF, which allowed the participation of non-regional countries. In 1982, the AfDB opened its membership to non-African countries. Today, there are 26 non-African members, including major players such as the US and China. The AfDB currently manages several separate funds, including the AfDF, the Nigerian Trust, the Arab Oil Fund, the Special Emergency Assistance Fund for Drought and Famine in Africa, and the Special Relief Fund. The AfDB provides concessional finance to middle-income and creditworthy nations in the region. In contrast, the AfDF is focussed on low-income governments, and the Nigerian Trust exclusively funds projects (not governments) in low-income countries. The AfDB is involved in the AU through its Development Agency and New Partnership for Africa's Development (AUDA-NEPAD) PIDA. Also hosted by the AfDB, as a tripartite association of bilateral donors, multilateral agencies, and African institutions, the [ICA](#)³ was launched in 2005. The ICA has been instrumental in collating data on infrastructure finance in Africa.

In addition to multilateral institutions, [bilateral partners also contribute to infrastructure financing](#) in different ways, namely through the MDBs of which they are shareholders, dedicated bilateral development banks and agencies, export-import banks in support of the private sectors' involvement, direct loans to African governments and through the delivery of turnkey projects. In 2020, bilateral lending was more than double that of multilateral lending to Africa (Baker McKenzie, 2021). China is the world's largest bilateral official creditor, with a huge footprint in Africa. Other smaller bilateral lenders include Russia, India and Turkey. Each country involved in bilateral agreements with African nations does so with its own incentives and long-term objectives, shaping the design of programmes and projects.

Finally, the [African and foreign private sectors participate in the financing of infrastructure in various ways; either through PPPs or fully private investments](#), especially in the ICT sector, in which self-standing private investment in infrastructure such as data centres is more common. Overall, private investment in Africa remains lower than in other regions, particularly in SSA. While there has been an overall rise in investment

¹ MDBs are international financial institutions chartered by two or more countries for the purpose of encouraging economic development, generally in low and middle income countries.

² Other examples include the Islamic Development Bank (IsDB), the Eastern and Southern African Trade and Development Bank (TDB), and others.

³ The mandate of ICA is to encourage and promote increased investment in infrastructure in Africa, from both the public and private sectors (ICA, nd). Members include: G8 countries, two G20 countries (Spain and South Africa), African institutions such as the African Union Commission (AUC) and the African Union Development Agency (AUDA-NEPAD), MDBs (World Bank, AfDB, and others), and other financial institutions, such as Afreximbank. While not being a funding agency in and of itself, the ICA is a key platform that produces knowledge and standards in the financing of infrastructure projects and programmes across the continent. It does so through initiatives such as the Project Preparation Facilities Network and the publication of annual reports on the state of infrastructure financing in Africa (ICA, nd).

as a proportion of GDP – from 10.4% in 1990 to 13.5% in 2017 – the effect is more pronounced in particular countries such as Ethiopia, Ghana and Tanzania. Currently, there is a major drive to have private sector investment mobilised in order to address the shortfall in development finance in the wake of Covid-19 (IMF, 2021a).

According to the most recent ICA data, in 2018, infrastructure spending in Africa **crossed the US\$ 100 billion threshold** (ICA, 2019). Chart 2 below shows that African governments were still the largest source, with commitments reaching 37.2% of the total, followed by China at 25.5%, ICA members at 20%, and the private sector at 11.7%. Following a peak between 2017 and 2018, 2019 and 2020 saw a drop in bilateral and multilateral contributions (ICA, 2019). This drop was driven by the impact of several election cycles across the continent, with more than 20 elections being held in 2019, and the global Covid-19 pandemic in 2020-2021 causing a slump in lending for infrastructure (Baker McKenzie, 2021). Nevertheless, signals of market resilience and recovery are already visible, and changes in the new US administration's foreign relations policies and the new political configuration in post-Brexit Europe will no doubt affect lending and investment patterns for African infrastructure.

CHART 2: INFRASTRUCTURE FINANCING BY MAIN ACTORS (2018 US\$)
(ADAPTED FROM: ICA, 2019)

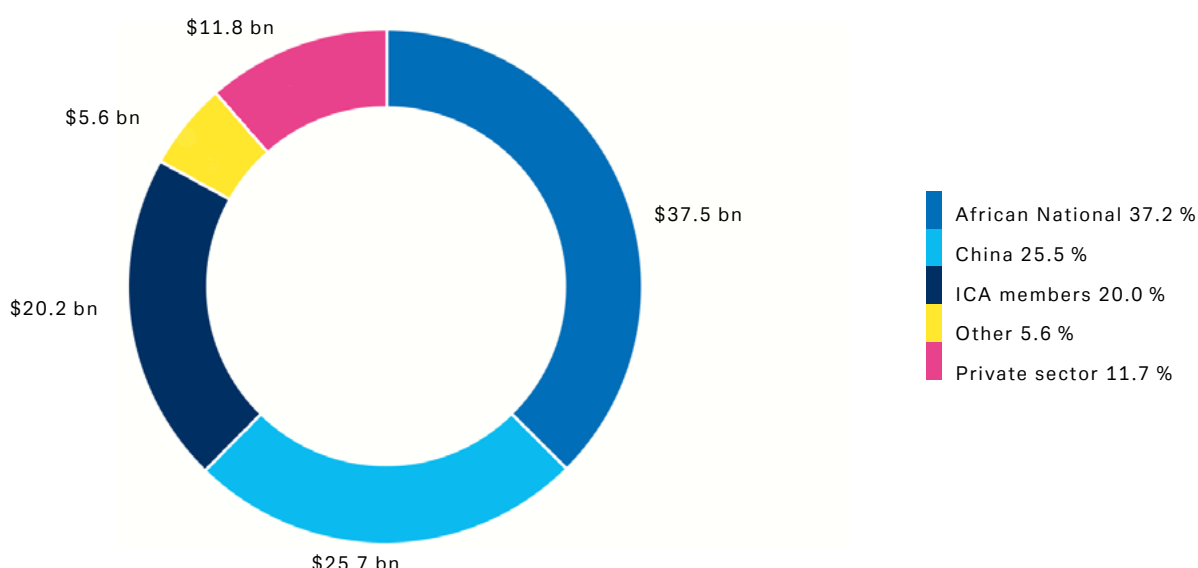
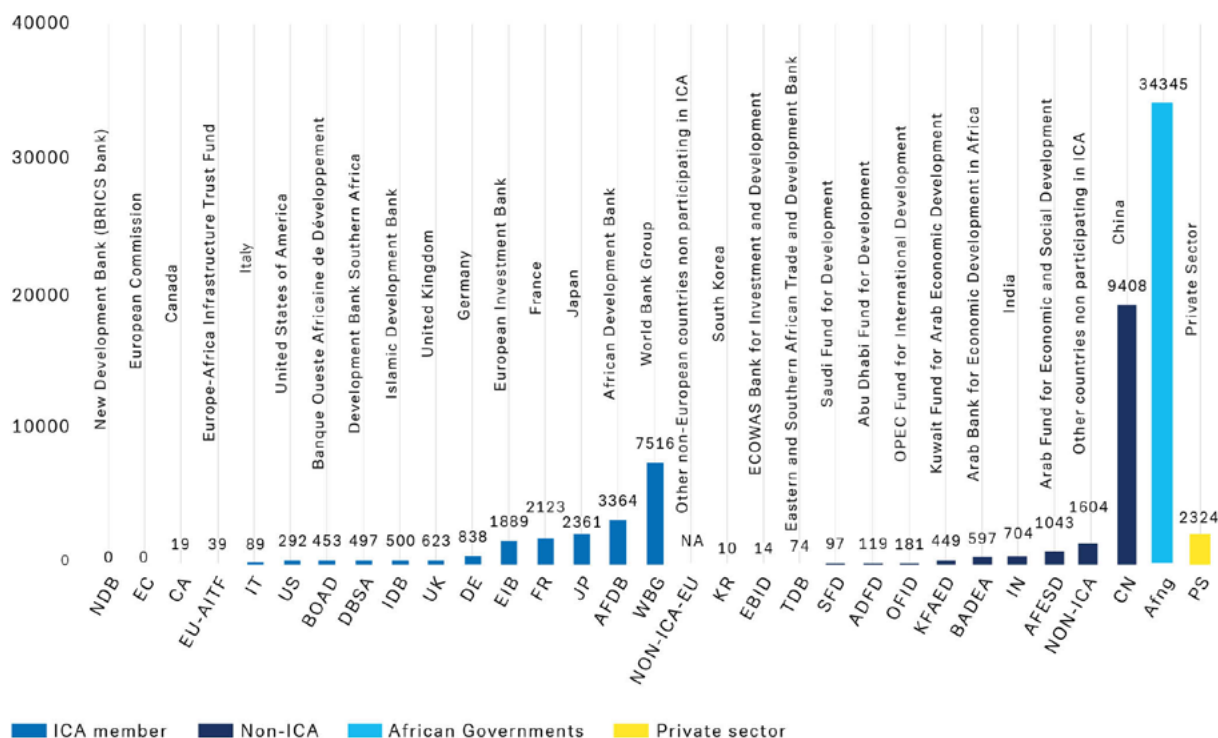


Chart 3 below provides more detail on bilateral and multilateral lending in 2017 (ICA, 2018). In this chart, individual countries and multilateral groupings are represented, which makes it difficult to undertake easy comparison as some countries may be listed individually and again in the groupings. This also points to the need to understand the **geopolitical configurations and groupings** of multilateral and bilateral financing contributions to develop a clear picture of what is happening and why it is happening. International actors can be grouped through transnational collaborative agreements, which shape their investment behaviours, for example, by crafting joint investment agendas or by enrolling members in existing global development commitments, for example, the SDGs⁴, ESG reporting criteria⁵, etc. How these actors are grouped and ungrouped is instrumental in understanding by whom and how infrastructural decision-making is happening in Africa.

⁴ The 17 SDGs were adopted by the UN in 2015 as a universal call to action to end poverty, protect the planet and ensure that by 2030 all people enjoy peace and prosperity.

⁵ Environmental, social and corporate governance refer to the three central factors in measuring the sustainability and societal impact of an investment in a company or business.

CHART 3: INFRASTRUCTURE FUNDING IN AFRICA BY COUNTRY/INSTITUTION
(US\$ MILLION, 2017) (ADAPTED FROM: ICA, 2018)

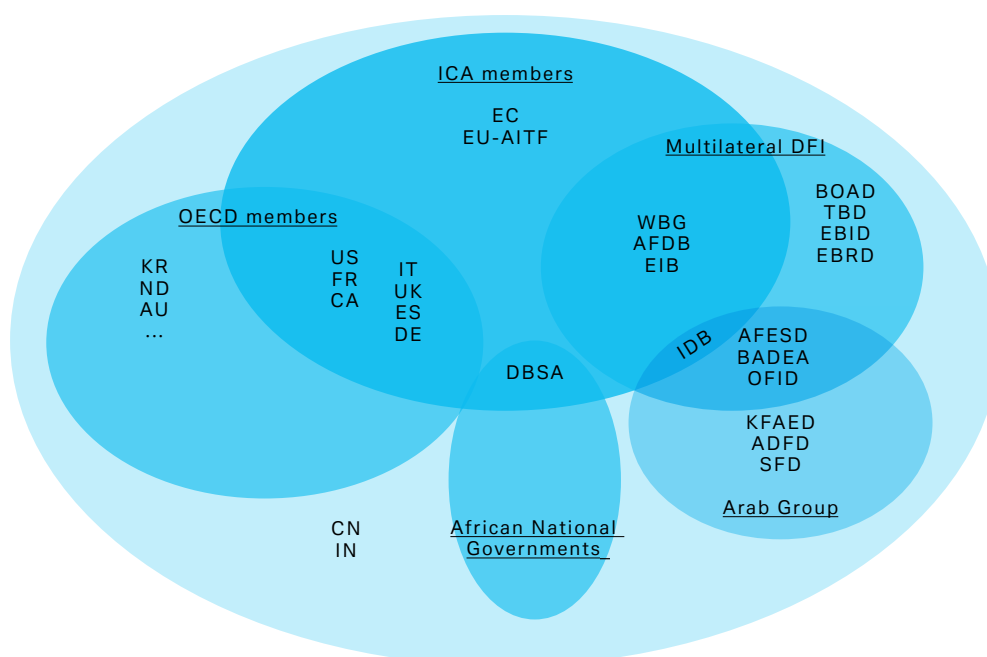


Building on Charts 2 and 3, Figure 1 below provides another way of mapping and grouping infrastructure investment in Africa. These include the OECD members, coordinated by the DAC⁶, the members of the ICA, multilateral banks and the Arab Reference Group⁷. Notably, actors such as China and India do not belong to any of these groupings. Equally important is that some of these institutions can be grouped within different categories at the same time. As an example, the IsDB is a multilateral lending bank, with two African countries among the top five shareholders, namely Libya and Nigeria, a member of the Arab reference group, and a member of the ICA. The implications are that easy comparison among groups is not possible as overlaps blur the picture of relative contribution. It is, therefore, vital to understand how actors are grouped, where there is an overlap, why they are grouped in this way, and where investment patterns are more or less comparable. It is also vital to understand what power and influence, as well as accountability systems and checks, emanate from being part of particular financial and institutional groupings.

⁶ The DAC was created within the OECD in 1960 and features 30 member countries. The current mandate of the DAC is “to promote development co-operation and other relevant policies so as to contribute to implementation of the 2030 Agenda for Sustainable Development, including sustained, inclusive and sustainable economic growth, poverty eradication, improvement of living standards in developing countries, and to a future in which no country will depend on aid” (OECD, nd 1). In practice, the main activities of the DAC include monitoring, assessing and reporting the provision of aid by its members, reviewing policies and setting standards, peer reviews of member countries, and analyses and promotion of best practices to support the current mandate. The standard-setting activity of the DAC is particularly important as it provides the current definition of official development assistance (ODA), as separated from other official flows and foreign direct investments (see Table 1). As part of the harmonisation of ODA measurement, in 2019, DAC adopted the grant equivalent system as standard, making OECD countries’ grants and loans more accurately comparable in ODA statistics (OECD, nd 3).

⁷ Established in 1975 within the Kuwait-based AFESD, a multilateral organisation founded by the states of the Arab League in 1968, the coordination group “developed from the need, identified by the members, to consult and optimize the application of resources and the giving of aid by the various Arab Development Funds” (Arab Fund, nd). The main initiatives of the coordination group include the coordination of financing efforts by Arab multilateral lending institutions, collaboration on programmes that would exceed the capacity of a single bank, and harmonisation of development assistance by Arab League nations. The coordination group also produces standardised model agreements for development projects to be used by its members. Currently, the group includes 11 members, both domestic development institutions (the Abu Dhabi Fund for Development, the Kuwait Fund for Arab Economic Development, the Qatar Fund For Development, the Saudi Fund for Development and the Iraqi Fund for External Development) and six multilateral organisations, including the Arab Bank for Economic Development in Africa, AFESD, AGFUND, the Arab Monetary Fund, the Islamic Development Bank, and the OPEC Fund for International Development.

FIGURE 1: LANDSCAPE OF PUBLIC FUNDING BODIES (ADAPTED FROM ICA, 2018)



* The DBSA is classified as a domestic development bank, but might also be classified as a DFI. The use of ellipsis indicates that there are more members represented than shown in the example.

While these charts and table provide a useful and quick overview of how different players compare in the infrastructure financing landscape, they also expose [reporting gaps](#). As an example, some bilateral partners such as the US or Canada, whose footprint seems relatively small in comparison to others, are key major contributors and shareholders to multilateral banks. In addition, the above data and all the data presented in this paper reflect [particular assumptions about what is and is not part of investors' infrastructure spend](#). As an example, in the ICA dataset, only selective parts of the WBG's finance footprint are calculated. As another example, guarantees provided by the WBG's MIGA are not counted as infrastructure financing by the ICA, despite arguably being a form of financing. Overall, while a high-level comparative overview is possible, care must be taken when approaching the quantitative metrics and comparisons. Clearly, a wide range of actors are involved in financing and funding infrastructure in Africa, but there are significant gaps in our knowledge about the financing these actors provide and their relationship to one another and the countries to which they lend finances. The following section explores the tools used by these actors.

2.2 Infrastructure financing instruments

As indicated previously, infrastructure financing in Africa is made possible by [three forms of financing, namely debt, equity and blended finance](#)⁸. Overall, the cost of debt tends to be lower than equity, with blended finance costs highly variable dependent on its structuring. Table 1 below shows that debt can be further broken down between bonds and loans and equity financing, and between those traded on [a listed market and those that are unlisted](#). Loans and bonds are much more common forms of infrastructure finance in Africa; however, blended finance approaches are attempting to draw the private sector into financing efforts.

⁸ Blended finance refers to capital raised by a mix of debt and equity, or through other instruments (such as convertible bonds) that can be converted into either of the two. In recent years, the concept of blended finance has expanded to characterize financial packages that combine debt or equity with grant or concessional components.

TABLE 1: TAXONOMY OF DEBT, EQUITY AND MIXED INSTRUMENTS USED FOR INFRASTRUCTURE FINANCING (SIMPLIFIED FROM: OECD, 2015)

Asset category	Type of instrument	Examples of instrument	Market vehicles	Example of programme
Debt	Loans	Syndicated loans, syndicated project loans, securitised loans, collateralised loans, direct lending, etc.	Loan indices, debt funds	Most African countries have lending facilities with multilateral organisations such as the World Bank.
	Bonds	Project bonds, municipal bonds, sub-sovereign bonds, green bonds, etc.	Bond indices, bond funds	Cape Town and Johannesburg have used green bonds to develop infrastructure.
Blended	Hybrid	Subordinated loans/ bonds, mezzanine finance, convertible bonds preferred stock	Mezzanine debt funds, hybrid debt funds	China used debt-equity swaps in their infrastructure deals on the continent (Brautigam, 2020).
Equity	Listed	YieldCos, infrastructure and utility stocks, real estate investment trusts, independent investment trusts, master limited partnerships, closed-end funds	Listed infrastructure funds, equity funds, trusts, equity indices, exchange-traded funds	African investment banks offer a number of listed investment options traded on the JSE or elsewhere.
	Unlisted	PPPs, direct or co-investment in infrastructure equity, or corporate equity.	Unlisted infrastructure funds	AfDB's Africa50 fund provides a platform for venture and equity finance in PPI projects.

Another important distinction in order to understand infrastructure financing is the extent to which the cost of borrowing is subsidised. This discussion requires a clarified understanding of the difference between commercial loans, concessional loans and grants. A commercial loan is costed based on perceived market risks and returns, ODA⁹ for infrastructure and more widely can take the form of grants where financial resources are provided free of interest and with no provision of repayment. Regarding concessional loans, the interest rates are lower than commercial rates and/or repayment schedules are longer. These tend to be administered by different agencies, for example, China's foreign assistance comprises the first two types of credits, namely, grants and interest-free loans disbursed by the Department of Foreign Assistance of the Ministry of Commerce (MOFCOM) and concessional loans (you hui dai kuan) disbursed by the Department of Preferential Loans of the Exim Bank of China (Chexim). The former is capitalised by the government's tax revenue whereas the latter mostly uses Chexim's self-raised funds (Chen, 2020).

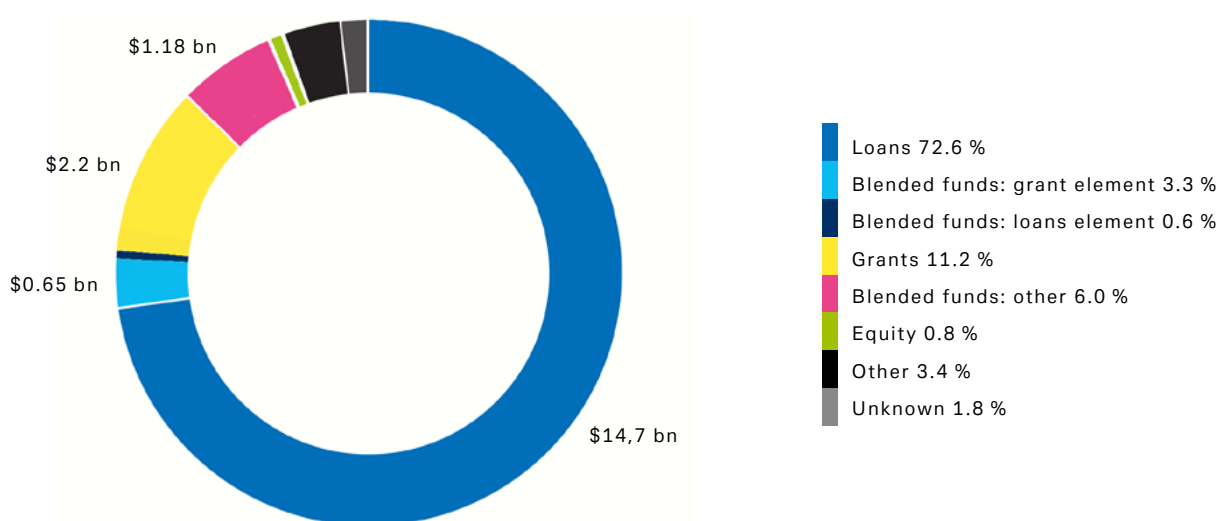
Linked to the issue of subsidisation, blended finance is increasingly important in the infrastructure finance space in Africa. There are two possible definitions of blended finance. The basic definition refers to the blending of debt and equity (see examples in Table 1). The second definition refers to "the strategic use of development finance for the mobilisation of additional finance towards sustainable development in developing countries" (OECD, nd 2). This type of blended finance is focussed on using governments and multilateral lenders' concessional or grant components to de-risk investments, thereby attracting private and commercial funding. In this sense, blended finance is also called catalytic capital and can be structured in a range of ways (Convergence, 2020). This definition is the most commonly used in the infrastructure finance/

⁹ The DAC of the OECD defines four types of financial flows, namely official development assistance (ODA), OOF, FDI, and mixed or hybrid flows. This distinction acknowledges the fact that financial flows are not only differentiated on the basis of their financial characteristics, but also on the basis of the extent to which they are subsidised as a form of development assistance and international aid.

DFI space. According to Convergence (2020), four mechanisms can be identified through which blending takes place, namely public or philanthropic funds at below-market rates within the capital structure, lowering the overall cost of capital; public or philanthropic credit enhancement through guarantees or insurance at below-market rates; a grant-funded technical assistance facility pre- or post-investment; and grant-funded transaction design or project preparation. In other words, the blended element, namely a grant, loan, guarantee, etc., can be part of the structure of the financial mechanism itself, can be within it as insurance or guarantee, or can be entirely external, as in the case of a grant dedicated to project preparation. Defined this way, blended finance always includes a concessional element.

To account for blended finance and make grants and different types of loans comparable, the DAC recently introduced the grant equivalent system, which calculates the concessional element of each financial flow. While the grant equivalent system only applies to the reporting of member countries, it allows for a deeper engagement with concessionality in lending. Chart 4 captures the share of commitments by ICA members in 2017 and shows that at least 20% of financing contained concessions of various sorts.

CHART 4: ICA MEMBERS' 2017 COMMITMENTS BY TYPE OF FUNDING, US\$ BILLION
(ADAPTED FROM: ICA, 2018)



Understanding the role of concessional finance in African infrastructure is important for several reasons. First, Chart 4 shows external funders¹⁰ that provide loans or grants represent the majority of infrastructure investment, even though the major investors remain African governments. In this sense, even if key players such as China do not subscribe to the OECD and are not part of the ICA, their loans and export credits can still be characterised according to their grant component and level of concessionality (see Brautigam, 2011, as an example). Secondly, the conditions attached to concessionality are an important element of infrastructure funding as they determine what kind of project may or may not be financed. Conditions may be very different, from environmental and social impact requirements to procurement rules that each lender may include as a condition for the borrower. Other concessional flows, such as export credits, which do not qualify as ODA concessional loans, can still be used to fund infrastructure indirectly through the conditional purchase of goods and services from the lending country, which is usually called tied aid. Thirdly, the risk

¹⁰ In other words, any funding that is not counted as national or subnational government, such as World Bank loans or instruments that qualify as ODA.

profile of infrastructure projects is highly dependent on the concessionality of their underlying financing mechanisms. Put differently, grant components can be used to leverage other funds, including private investments, by de-risking projects that would otherwise be too exposed for a private equity participation (Convergence, 2020). Lastly, a good percentage of new infrastructure provision by external sources in Africa tend to rely on concessional elements.

2.3 Trends by sector and delivery mechanisms

These [investment types, for example, debt, equity, etc., shore up differently across sectors](#). Different infrastructure sectors attract different types of funding from multi- and bilateral financial institutions. In the sectors where private funding is more consistent, equity is a more significant form of investment than in other sectors dominated by loan and/or grant instruments (ICA, 2018). Table 2 shows equity featuring strongly in ICT projects, in other words, 52.3% of the total according to data from the ICA in 2017. Conversely, in 2017, grants featured most heavily in the transport sector, with US\$287 million in 2017 compared to US\$12 million in the water sector and US\$11 million in the energy sector (ICA, 2018).

TABLE 2: TYPES OF FINANCING TOOL BY SECTOR, US\$ MILLION, 2017 (EXCLUDES THE ICA, AFRICAN NATIONAL GOVERNMENTS AND THE PRIVATE SECTOR¹¹) (ICA, 2018)

US\$ in millions	Transport	Water	ICT	Energy
Loans	5 138	2 664	502	11 241
%	94.7	99.6	57.7	98.0
Grants	287	12	-	11
%	5.3	.5	-	.1
Equity	-	-	550	-
%	-	-	52.3	-
Lines of credit/ export credit/ blended	-	-	-	216
%	-	-	-	2.8

* Notably, these graphs should be looked at in conversation with other datasets.

While useful, this dataset has some limitations. While the above data suggest that there is little or no equity in the energy space, a quick review of energy projects reported in the PPI World Bank database shows the opposite, with equity often being used for financing energy projects. As an example, China uses export credits for road construction, therefore, the fact that these are not counted in the transport category also speaks to the limit of these datasets. This points to the importance of understanding the methodologies used to collect and document spending as there are clearly mismatches between datasets resulting from differential categorisation.

¹¹ This data includes non-ICA members such as the EBRD, Arab Group banks, China, India, Holland, Sweden and South Korea, among others. More information is needed to understand why ICA members and other important contributors were not included in this dataset.

Chart 5 below shows that **different actors prefer different sectors**. As an example, transport investments are dominated by national government spending, whereas energy is dominated by the private sector and China. Consistent with data from the ICA in Chart 5, World Bank data in Chart 6 show the preference of the private sector to partner in energy projects. In the 2010-2019 decade, for example, PPIs for electricity projects listed in the World Bank database amounted to more than US\$36 billion compared to about US\$11 billion for transport, more than US\$2 billion in ICT, and less than US\$500 million in water and sanitation projects.

CHART 5: INFRASTRUCTURE FINANCING BY SECTOR IN US\$ MILLION IN 2017 (ICA, 2018)

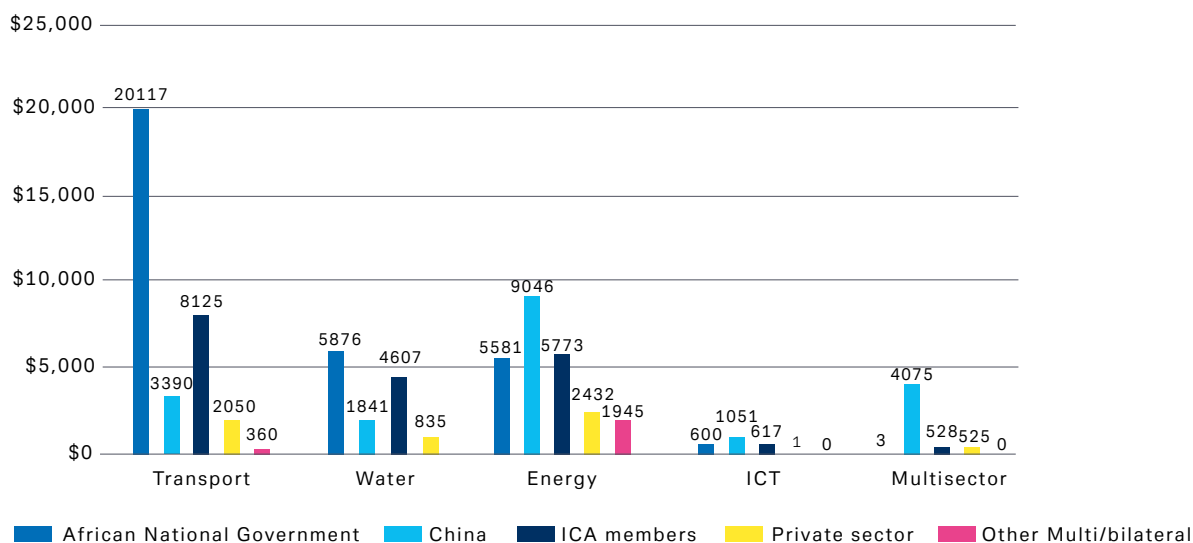
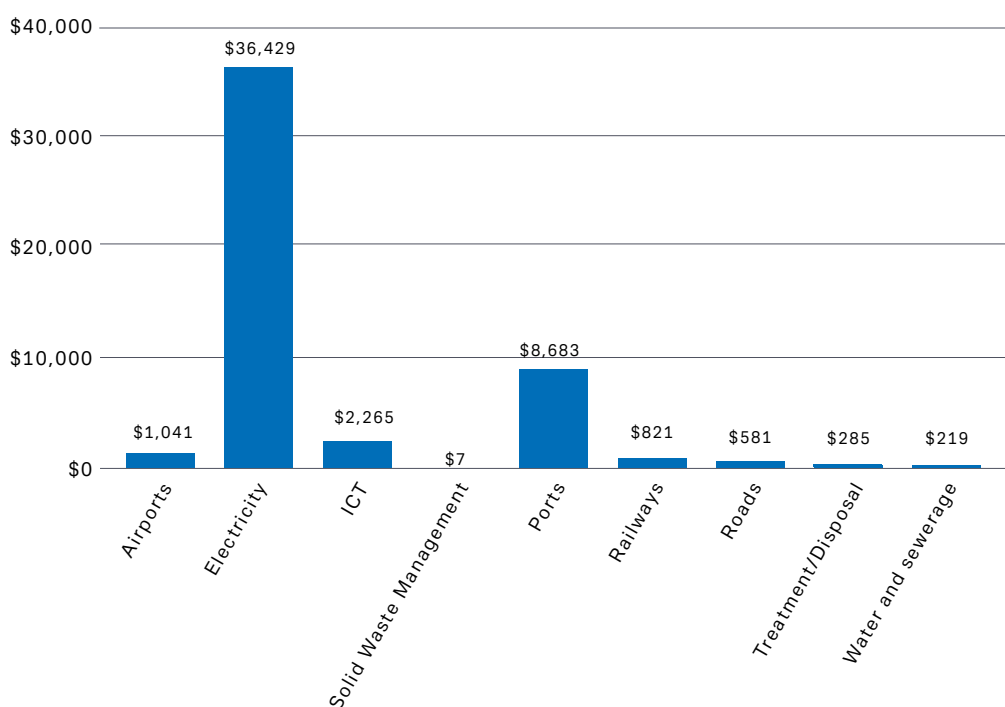


CHART 6: PRIVATE PARTICIPATION IN INFRASTRUCTURE WORLD BANK, 2010-2019, FOR SUB-SAHARAN AFRICA (EXCLUDES MIDDLE EAST AND NORTH AFRICA COUNTRIES) IN US\$ MILLION. (ADAPTED FROM: [HTTPS://PPI.WORLDBANK.ORG/EN/SNAPSHOTS/REGION/SUB-SAHARAN-AFRICA](https://PPI.WORLDBANK.ORG/EN/SNAPSHOTS/REGION/SUB-SAHARAN-AFRICA))



Overall, trends in sector-based investments provide some indication of the types of projects and programmes that are likely to attract lenders and investors and the types of concessionality that might be placed on these loans. However, the quality of the data provides little information about the development effect of these investments. It is also difficult to tell from this data what these sector investments serve, for example, whether new electricity production or increased broadband is primarily in service of logistics and industry, or also aims to serve local economic development. It is also not possible to tell if these investments are in sustainable technologies or conventional resource-intensive modes. More multi-scalar and geographically disaggregated information is needed.

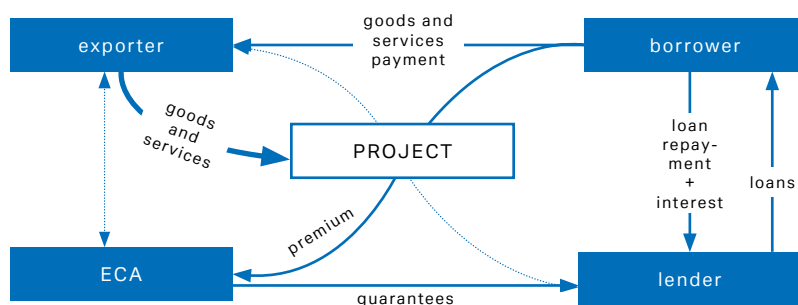
2.4 Emerging financing mechanisms in the African infrastructure context

Given the complex landscape of financing tools, investor preferences and investment patterns on the continent, some of the key emerging mechanisms and trends that deserve further research attention in terms of the instruments, their financial characteristics, risk profiles and possible implications for long-term sustainability are highlighted in this section. These mechanisms are export credits, project preparation facilities, natural resource collaterals and impact finance/patient capital. While this is not a complete picture of all the instruments that are useful to explore, they provide insights into some of the key debates in the contemporary African context.

The role of ECAs in African infrastructure: An ECA provides financial services to facilitate the international exports of domestic companies. While the use of ECAs is new, they may rise in importance in the coming years. As Rundell (2018) outlines, ECA finance “offers a better deal for African sovereigns, beating bonds on tenor and price and tapping long-term, stable credit providers rather than fairweather friends in Africa’s capital markets.”. Many countries have ECAs that provide loans, loan guarantees and insurance to de-risk the uncertainty of exporting to African countries. ECAs can also serve as policy banks as they align to the foreign and domestic policy priorities of a national government. Some of the most important ECAs include the US Exim Bank, China’s Chexim (China Exim Bank), and EU countries’ export credit agencies, all operating under different mandates and fundraising mechanisms. In addition, multilateral and commercial banks provide these types of export credit services. As an example, the World Bank’s MIGA provides political risk insurance in a way that is similar to that provided by national ECAs.

While the primary aim of export credit services, such as loan guarantees and risk insurance, is to facilitate FDI, they can also be used for project finance in other countries. In practice, project finance deals can include ECA services to buy necessary supplies in order to deliver the infrastructure on the ground. Project finance featuring ECAs is increasingly used as a tool of investment, with China’s Chexim at the forefront of this financial trend, particularly for energy projects in Africa. However, there is also documentation of roads, bridges, hospitals and other investments (Rundell, 2018). An example of an ambitious project supported by Dutch ECA Atradius Dutch State Business NV is a land reclamation project in Luanda, Angola, of US\$400 million¹². The most common insurance products used by ECAs to aid infrastructure projects include political risk insurance and/or commercial cover.

FIGURE 2: PROJECT FINANCING SUPPORTED BY AN ECA (AUTHORS’ REPRESENTATION)



¹² <https://www.vanoord.com/en/updates/contract-awarded-land-reclamation-angola/>

In the scheme portrayed in the above diagram¹³, FDIs are promoted through project-based deals, in which the ECA country supplies the raw material used in the project and, in most cases, the contractors who undertake the projects. More research is needed on the terms of these deals, particularly assumptions about risk and its cost.

The increasing importance of PPFs: PPFs are organisations that bridge the technical and financial capacity gap of local and national governments in designing and developing bankable infrastructure projects to access commercial and concessional finance. Some PPFs are directly supported by DFIs, such as the World Bank and the AfDB. The support of a PPF includes a range of different activities, from bankable feasibility studies to the development of compliant procurement documentation, contracts and terms of reference agreements, and impact studies (see CCFLA, 2018). All these steps are usually requirements to access infrastructure finance from DFIs and other institutional investors. Therefore, the role of a PPF is not only technical but might also be financial, in that they provide grants and in-kind support for national and subnational governments to develop investment-ready projects. PPFs may also assist public sector agencies to support the legal and technical advisory necessary to mobilise private investment into infrastructure projects. In other words, PPFs have a big role to play where smaller cities and subnational authorities lack the technical capacity to bring infrastructure projects to the stage of financial feasibility. A network of major PPFs operating in Africa and dedicated to sustainable infrastructure, namely the PPFN, is hosted by the ICA.

Funds and programmes aimed at city governments: There is a strong discourse around city-led borrowing in Africa. Creating bankable urban projects and creditworthy city governments forms part of an increasingly strong narrative within development policy. However, as many lenders note, African urban subnational governments have struggled to access debt finance. Regulatory limitations, high reliance on grants and transfers, low revenue surplus and perceived political complexity shape lenders' attitudes towards subnational governments. In addition, large urban infrastructure projects, and regional projects that affect urban areas, can require much larger organisation, resourcing and brokerage than is possible for subnational governments to achieve. Notwithstanding this, many multilateral donors and lenders have sought to create special investment programmes aimed at local governments. The World Bank, the AfDB, the UNCDF and others have developed funding instruments that support subnational investment. Notably, it is rare that subnational governments take on the full risk of this debt. Generally, these programmes are fully or partially backed by national governments. Unique cases of cities issuing bonds, which mostly happens in South Africa, can be found; however, most cities in Africa are unable to do this legally and financially.

Natural resource-backed infrastructure loans and the Angola mode: Africa's history of natural resource extraction is endemic and continues to play out in the current trend of RBLs. **RBLs are credit lines** provided to a government or a State-owned enterprise, whereby repayment is either made directly in natural resources (in-kind), such as oil or minerals, or from a resource-related future income stream. In certain cases, the terms of the RBL only involve resource-related income streams as a repayment guarantee or as collateral¹⁴ (Mihalyi et al., 2020). RBLs are typically earmarked for specific projects (usually infrastructure or mining explorations) and often include further spending obligations, for example, the involvement of contractors from the same state as the lender. The most well-known case of RBLs in Africa is China's investment in Angola. Based on an undisclosed agreement giving China preferential access to Angola's oil, RBLs are often known as the Angola mode (Alves, 2013). In this model, which in reality varies greatly depending on the country (see Brautigam, 2011), the funding of infrastructure is contingent on two criteria, namely the use of a resource as repayment or collateral and the use of contractors from the lending country. However, it is important to note that although China is the largest actor in RBLs, it is not the only one (Mihalyi et al., 2020). Equally important is that not all RBLs are backed by minerals or fossil fuels. In fact, resource-poor African countries

¹³ Typically, these guarantees protect the lender in the event of any default in payment by the buyer or the borrower under a loan agreement. The premium falls on the borrower, as shown in Figure 2, while the exporter receives some kind of preferential benefit in the financial package, such as contractually obligated percentages of supplies to be bought from the ECA country, or preferential channels for contractors from the ECA country.

¹⁴ In these cases, if the recipient country or SOE cannot meet the terms of the repayment, the resource is used to the benefit of the lender and according to the different possible contractual obligations that designate part of the resource as a guarantee or collateral.

have also received loans guaranteed by other types of commodities, including cocoa, tobacco and sesame seeds (Brautigam, 2011). More research is needed on the medium-term impacts of resource-backed loans, especially the elements that are not transparent, such as the actual financial and political cost of these loans.

The role of impact finance and patient capital: Most infrastructure projects are long-term investments. In the African context, end users' ability to pay for services is also limited, curtailing the scope for financial returns. Typical banks are, of course, not formatted for the requirements of infrastructure in terms of timeline and risk/return ratio. Therefore, another important trend to consider in the landscape of infrastructure financing in Africa is **the role of impact investment**. The spectrum of impact investing is very broad as it involves several different asset classes and return profiles (GIIN, 2016). In general, it can be defined as encompassing all "investments made with the intention to generate positive, measurable social and environmental impact alongside a financial return" (GIIN, 2019:1). What differentiates impact investing from more traditional philanthropic capital is the expectation of a financial return, which is often below market rate, risk-adjusted or delayed. In this sense, one of the key asset groups for infrastructure financing is called patient capital (PC). Generally speaking, PC is equity or debt "whose providers aim to capture benefits specific to long-term investments and who maintain their investment even in the face of adverse short-term conditions" (Deeg & Hardie, 2016). In other words, PC in the context of impact investing for infrastructure reflects 1) a long-term horizon, 2) a high-risk tolerance, and 3) a goal to maximise social and environmental goals alongside financial returns in the investment (Bertha Centre, 2015). Sitting between private and blended finance, impact investing in the various forms of PC is considered suited for infrastructure investments in long-term transitions enabled by so-called low-carbon or climate finance (Campiglio et al., 2017).

In the context of infrastructure financing, **bonds are increasingly being used as impact investing tools**. Without delving into the further classification of bonds, two types of alternative debt instruments deserve attention in the context of sustainable infrastructure financing, namely **DIBs and green bonds**. DIBs are a particular form of social impact bond. With regards to a traditional social impact bond, the government enters into a debt relationship with a service provider whereby an external investor (usually philanthropic) provides the upfront capital (Bertha Centre, 2015). In the case of a DIB, a DFI pays for the outcome through the issuing of a bond instrument. DIBs have mostly been used for small service delivery, rather than for funding large technical systems (CGD & SF, 2013). In contrast, green bonds are generally used to finance green infrastructure projects that are large scale and capital intensive (CBI, 2015). The issuance of green bonds comes with additional expenses in terms of defining the green criteria, monitoring and maintaining the proceeds as green, and transparent communication around performance to investors over the lifetime of a bond (Ernst & Young, 2016). In Africa, the South African case of green bonds is the most advanced. As of 25 October 2017, the JSE has a special green bond segment, which provides a platform for organisations to raise funds ring-fenced for low carbon initiatives (Williams & Blumenthal, 2014). Eligible projects include, but are not limited to renewable energy, energy efficiency, sustainable waste management, sustainable land use, biodiversity conservation, clean transportation, clean water and various climate adaptation projects. It is evident that more research needs to be conducted into how patient capital should be mobilised towards African infrastructure, recognising the need for financial returns, as well as the commitment to impact, however this is measured.

3 RESEARCH ISSUES IN THE AFRICAN CONTEXT

While an overview was provided of infrastructure investment patterns in Africa in the previous sections, drawing on secondary sources, much work is still needed to create a coherent picture of infrastructure investment in Africa. There are several areas where more research on finance would be particularly useful. This section presents key research issues that obfuscate sense-making processes vis-à-vis the African infrastructure space. These issues include the incommensurability of datasets, transparency, territoriality and subnational data gaps and issues related to understanding sustainable investment.

3.1 Issues of commensurability and interoperability

As discussed in the previous section, many different initiatives are aimed at quantifying and cataloguing data on infrastructure investment in Africa. Table 3 shows some of the main organisations that provide collated research on African investment.

TABLE 3: MAJOR RESEARCH DATABASES ON INFRASTRUCTURE FINANCING IN AFRICA (AUTHOR'S COMPILATION)

Initiative	Focus	Funded by	Based in	Database and methodology publicly available	Project-specific data
ICA reports	Africa-wide, key investment trends by region, sector and typology	AfDB	Abidjan, Côte d'Ivoire	Not accessible	No (only selected case studies)
PIDA progress reports/PIDA dashboard	Africa-wide for projects funded under the PIDA programme	AU, AUDA, NEPAD and AfDB	Addis Ababa, Ethiopia; Johannesburg, South Africa; and Abidjan, Côte d'Ivoire	Yes, but many items have undisclosed data.	Yes, but undisclosed data for many projects.
OECD–DAC development finance data, for example, Aidflows	Global; country and sector overviews; combines WB, AfDB and OECD data	OECD countries	Paris, France	Yes	No
World Bank's PPI database	Public–private funded infrastructure projects	WBG	Washington DC, US	Yes	Yes
CARI at Johns Hopkins School for Advanced Studies	Chinese investments, loans and private investments in Africa	Carnegie Corporation of New York	Philadelphia, US	Yes	No
Infrastructure Journal (IJ Global)	Infrastructure project finance globally	Private	London, UK	Paywalled database	Due to paywall, author could not access to confirm level of granularity
Convergence reports	Blended finance globally	Private	Toronto, Canada; Nairobi, Kenya	Not available	No
Disrupt Africa reports and list of funded start-ups	Financial investments in ICT start-ups across six countries	Private	London, UK	Yes (donation required)	Partly

* This is not a comprehensive review.

While supranational bodies such as the AfDB, the World Bank and the DAC of the OECD try to [harmonise and standardise reporting information](#) of their members, data remains scattered. This is because key bilateral partners, for example, India and China, do not belong or report to these organisations and because investment in infrastructure led by private enterprises is more difficult to chart and account for in official datasets, for example, in the World Bank's PPI. Additionally, some institutions such as the European Commission did not share their data with the ICA, as there is no reporting obligation to Africa-based institutions (ICA, 2018). Some multilateral lenders such as the AIIBs, which reported loans to African countries in 2017, are also missing from ICA data, which is unexplained in the documentation. Other funders with ODA are also missing, such as Australia and New Zealand, making it impossible to discern whether the aid budget of these countries to Africa is directly or indirectly involved in the funding of infrastructure.

The issue of data harmonisation among research platforms and actors is exacerbated by differing [terminology related to financial tools](#). One key example is concessional loans. Despite the existence of the OECD–DAC standard, it only applies to countries that subscribe to DAC guidelines. In other words, the terms of concessionality and the conditions attached to those terms can vary across loan-making institutions, making it impossible to frame concessional loans as a single category of financing tools. Another difficulty arises from the complexity of blended finance architectures. Therefore, within different datasets, the same financial component might be classified differently depending on how blended finance is defined or whether or not the single element of a blended package can be isolated.

Relatedly, because of the [scattered and uncoordinated nature of research initiatives](#) currently addressing infrastructure investment in Africa, data standards are inconsistent, making information non-interoperable. Key examples of this issue include the ability to know whether reported funds are pledged funding or actual disbursement, how interests are determined in relation to the financial close of each project, whether Africa-wide data include or do not include MENA countries, what is and is not included in the definition of each sector of investment, etc. Few research initiatives include caveats or footnotes explaining their research methodology and the criteria underlying their data. This issue hampers the possibility of generating additional knowledge from existing datasets by triangulating and comparing different sources to produce the finer-grained perspectives on the African infrastructure financing landscape that are needed.

3.2 Issues of transparency and autonomy

Beyond the consistency and interoperability of data, another problem facing Africa-based researchers addressing infrastructure financing and delivery is the different degrees of openness of the datasets upon which current reports and publications are based. While some research initiatives, such as CARI, and institutions such as the World Bank have open datasets that can be consulted online, the same cannot be said for most overview documents concerning African infrastructure finance. This issue stems from two related phenomena. First, the [lack of transparency](#) of many of the infrastructure deals happening on the continent, which applies to single projects and country-wide data. As an example, most FDI and ODA flows to infrastructure funding in Africa remain unreported when emanating from certain important players such as China and India. Secondly, datasets compiled by researchers often [rely on undisclosed or confidential information](#). Not only does this lack of transparency create inequalities in access to informants and data, but it also contributes to the impossibility of comparing different datasets.

In this regard, another crucial problem concerns [the autonomy and independence](#) of the research that currently takes place on the continent. With many of these initiatives spearheaded by the same institutions operating as funders, lenders, grant-makers, etc., by institutions that are funded by third countries, or by academic projects based in Europe or North America, current data are disproportionately produced by actors who are also interested parties. While it is crucial that DFIs utilise their institutional capacities for research initiatives, those findings must be complemented by independent research, conducted by either, universities, research centres or civil society organisations based in Africa.

3.3 Issues of territorial mapping

The vast majority of investment data is captured and documented at a national scale. This is, of course, a reflection of the level of government at which most financial deal-making and lending takes place. Despite 30 years of decentralisation reform seeking to devolve fiscal, political and administrative powers to subnational territorial units, such as local or regional governments, most debt in Africa is taken on by national, not subnational government. This is true even in the small handful of countries with federal systems, such as Ethiopia (OECD/UCLG, 2019). The majority of debt is, therefore, held by the nation-state, with key projects implemented by national line departments or their respective agencies, such as national utility companies or national road authorities.

While the debate about subnational borrowing (and the extent to which this should be ramped up or controlled) remains much contested, with national-level data providing little information about where investments land in African countries. Failure to collect finer-grained subnational data makes it difficult to ascertain, for example, if investments are rural or urban, coastal or inland, or distributed or highly concentrated. National investment data equally fail to capture trans-territorial investment patterns. While national-level data provides some level of differentiation in terms of geographical spread across the continent, the nature of the investment and the extent to which this investment supports key processes such as urbanisation or industrialisation (discussed in more detail in Part 3) remain unclear. There is a need to better understand how projects land spatially and institutionally, what types of spatial projects are being supported (namely corridors, urbanisation, export economies, etc.) and which institutional configurations are empowered. The latter is particularly needed as key functions have been devolved to lower levels of governments without devolving the requisite resources and financial competencies to deliver on these mandates. The question of whether infrastructure investment systems support the ongoing development of strong and capable institutional configurations will be critical for the long-term viability of these investments, the places they land and the continent at large.

4 RESEARCH AGENDA

Reflecting on the gaps in existing data on infrastructure finance and the pressing infrastructural needs on the African continent, in this section, some key areas are outlined of the future research needed to improve how infrastructure investment in Africa is undertaken.

4.1 Capacitating African-based research centres to engage with infrastructure financing

A significant amount of knowledge on infrastructure generally, and financing infrastructure specifically, is produced either outside of Africa, for example, in think tanks in the UK, or by research arms of Africa-based financial institutions, such as the World Bank. While understanding the continent's future is a global project requiring insights and knowledge consolidated from as many sources as possible, what continues to be missing from this knowledge project is a [strong role and voice for African academic research centres](#) and think tanks. While African universities could play a far more central role in knowledge production and agenda-setting, traditional academic departments, with their heavy teaching loads, underfunding of strategic research, and siloed disciplinary structures, are not well suited to ensure that academics are positioned to engage meaningfully in key conversations. While these issues cannot be addressed easily by the international partners, a keen interest in the unique perspective of African scholars and thinkers, designated funding to support their time on projects and programmes, and shared development of outputs, such as reports, articles and programmes, would go some way in ensuring active participation. A part of the challenge rests on the data side. In the African research context, there is a clear need for data collection, storage and sharing systems that are more robust, accessible and transparent. Equally, there is a serious need for meaning-making platforms and spaces (material, virtual, etc.) where this data can be translated into relevant insights that reflect local expertise and conceptual frames developed by and for the continent. At the intersection between data and meaning-making, there is the potential to fund innovative research programmes and projects that draw global and local expertise into productive conversation.

4.2 Non-OECD actors such as China, India, Turkey, Arab Gulf nations, etc.

Given the increasing importance of [new sources of development assistance, concessional finance, and FDI in the funding of infrastructure](#), a related research agenda that understands investment modalities that escape clear-cut taxonomies, such as the OECD–DAC definitions of ODA, OOF and FDI, is needed. First, it is vital to recognise that many of these actors, despite media hype, are not new. India, China and Gulf states have long been development and commercial partners of several African nations, and they often operate in relation to those historical linkages (OECD–ACET, 2020). Secondly, according to Lee (2017), the ability to conceive how the different varieties of capital operate is a prerequisite to analysing and understanding infrastructure financing meaningfully, which means seeing beyond the patterns of traditional partners, for example, the US and European countries. Thirdly, the geopolitical calibre of platform initiatives such as the Belt and Road, which are territorialising Chinese surplus through infrastructure investment overseas, needs to be studied with a better understanding of Chinese State-owned and private enterprises operating across the continent. To date, the research issues highlighted in Part 2 of this paper have severely impaired capacity to grapple with infrastructure actors that have little to no reporting mandate with reference to frameworks such as the OECD–DAC.

4.3 Supporting city and metropolitan governments

Africa is the last continent to undergo urbanisation and is currently urbanising at a rapid rate. The continent's population is meant to double between 2020 and 2050, with more than two-thirds of this growth taking place in cities (OECD/SWAC, 2020). Urbanisation patterns in Africa are somewhat unique. Most African countries

only have one major city, which tends to be magnitudes larger in population and geographical coverage than the country's secondary cities. A total of 97% of urban areas are small with less than 300 000 people (OECD/SWAC, 2020). These areas are experiencing rapid growth rates, albeit off very low bases (Roberts, 2014). Simultaneously, urban local governments do not have significant levels of control over urban investments. In much of Africa, decentralisation has been partial and fragmented. Local governments remain fiscally weak and are placed under strain by rapidly expanding catalogues of responsibilities without the necessary fiscal instruments to meet these. The design and development of robust systems for local government revenue-raising, grant transfers, and borrowing have been the anomaly. Where they have existed, they have been limited to capital cities, which often have special designations, for example, in Nairobi City County; revenue-sharing arrangements, for example, in Addis Ababa; or revenue-raising capacity, for example, in Cape Town. Critical urban investments are being made by national and international players, often with little engagement with subnational governments. Moving forward, it is important to ask how fiscal decentralisation, urbanisation and metropolitanisation can go hand in hand to support development. It is further important to ask how urban decision-makers can be better supported to engage with these issues.

4.4 Mapping continental transitions

As multigenerational, long-term projects and infrastructure investments require a view to the horizon. Today's investments must be attentive to the many and complex unfolding processes on the continent. There are some distinct certainties and many uncertainties in the unfolding processes that are shaping the future of infrastructure in Africa in uneven and diverse ways. In addition to the trend of urbanisation, which is highlighted in Section 3.6, the following additional transitions that the authors believe will be fundamental in shaping what types of infrastructure investments are possible and desirable have been highlighted.

- **Demographic transition:** A demographic transition resulting in a bulge in the youth population, particularly in urban areas, is underway. Almost 60% of Africa's population was under the age of 25 in 2019, making Africa the world's youngest continent. The youth bulge in African cities and the continent at large has many implications for urban development (Mo Ibrahim Foundation, 2019). To support this, Africa, particularly African cities, requires long-term investment in urban areas to support the lifestyles and ambitions of the youth. Rather than fearing the so-called youth bulge, investors must take the needs, preferences, and capabilities of young people, the future users of long-term investments, seriously. As an example, young people will need jobs in the future and the question to ask is whether contemporary infrastructure investments are able to unlock these work opportunities. Further questions that arise are in what ways young people are tech-savvy and what types of technological disruptions are likely to be possible for this generation.
- **Industrialisation:** The need for semi- and low-skilled job creation in Africa is vital. To attend to the need for economic growth and job creation, several African countries are developing new infrastructure projects in service of national and local industrial strategies. Special industrial zones linked to infrastructure development in urban areas, manufacturing zones along new transport corridors, and provisions for in-situ mineral processing facilities attached to new mining concessions, are a case in point of the revived interest in boosting Africa's manufacturing capacity. As of 2019, for example, there were estimated to be 189 operating SEZs in Africa, many of which, in reality, function as export processing zones for foreign commodities which create problems, rather than helping local industries. While the need for industry and work is well established, the potential of sustainable infrastructure in terms of supporting industrialisation remains unclear. As an example, while the so-called 4th industrial revolution is heralded by the AU as a watershed moment for greener industrial development in the continent, there is also consistent FDI in the construction and mining-related industrial sectors (AU, 2020). While it is clear that Africa cannot follow the same industrialisation trajectory as Europe or even Asia, what this will look like and how to ensure sustainability remains to be determined.
- **Technological transformations (platform and AI):** As indicated previously, the platformisation or platform pivot of many services, including logistics, urban mobility, media, financial systems, and so forth, driven

by digital technologies is a fundamental trend (Barns, 2019; Stehlin et al., 2020). Digital platforms present possibilities and risks for infrastructural governance. As an example, one challenge stemming from the platformisation of infrastructure is that the owners of collective data produced by users are often private companies. Another challenge is that many platforms increasingly rely on AI technologies, and more specifically on various forms of machine learning in order to improve their predictive algorithms. However, research on these protocols shows that predictive algorithms are not neutral, but replicate spatial and social inequalities (Benjamin, 2019; Whittaker et al., 2018). In addition to these data-related pitfalls, many other questions concerning issues of ownership and related digital rights are also critical, particularly given that investment in ICT, as shown earlier, is driven by private companies with equity stakes in the connectivity infrastructure.

- **The changing nature of work:** Linked to the digital turn, the future of work is also changing. Work is directly and indirectly linked to the job and labour market in countries and cities. Work is involved in every aspect of infrastructure, from writing contracts to building technical machines. From the delivery supply chains to the ability to pay for services, the question of work is inseparable from the future of infrastructure. In Africa, as in the world at large, serious questions are being raised about what the future of work will look like as key infrastructure sectors (such as mining) shed jobs. Mechanisation, digitisation and globalisation are some of the drivers of this job-shedding and labour market restrictions. These daunting processes must be read in relation to the other technological and economic disruptions that are resetting labour market dynamics in fundamental ways. The risks to economies and infrastructure if people across all skill levels cannot leverage infrastructure systems to create livelihoods, businesses and wealth are numerous and real. There is a clear need to ensure that new infrastructure delivery models ensure just transitions, creating value and opportunities for economic empowerment across the full supply chain.

4.5 Transnational and geopolitical implications of infrastructure financing

Strengthening Africa's position in the global economy requires investments that transcend nation-states and enhance the regional spatial potential of the continent. Key to this is engaging **transnational governance and geopolitics**. As infrastructure spans jurisdictions and has impacts far beyond the site of intervention, it becomes increasingly important to consider its spatial and political implications. The recent example of the Grand Ethiopian Renaissance Dam, potentially affecting downstream water supply to Sudan and Egypt during the filling-up years, shows how important international cooperation and governance is to the delivery of large-scale infrastructure. More generally, given that AU-based supranational initiatives such as PIDA and AfCFTA currently rely on the idea of integrated regional corridors to achieve their goals of infrastructural and commercial integration, it is vital to consider how national, regional and local government are integrated into the design and realisation of these transnational corridors, whether they are pipelines, electricity networks, railways, highways or broadband. Regardless of scale, such corridors raise questions around multilevel governance at the national level and geopolitical opportunity (PIDA, 2020).

4.6 Beyond conventional service delivery

While megaprojects have their place, there is also a need for different types of infrastructure investment. First, the **informal and hybrid services that currently exist need to be understood better**. Especially where significant infrastructure deficits prevail, people have often found ways of accessing energy, feeding their families, watching their favourite soap operas, staying dry during the rains and disposing of household and business waste. The strengths and weaknesses of these improvised infrastructure and service delivery systems are as important to understand as the classically engineered network systems that are designed to only serve a small proportion of the urban population. It is only once the respective logics driving mega infrastructure investment models and informal service provision are understood that they can be reconciled in effective hybrid infrastructure systems. In addition to attending to infrastructural hybridity in terms of key services, for example, water and energy, most infrastructure data collection and research reports, such as those outlined in Part 1, only cover a small selection of infrastructure sectors. Generally, this includes the key utilities, namely water, energy, waste and transportation, which is generally presented as essential

to GDP growth and economic development. ICT has recently been added and is positioned as a key input into attracting investment and spurring development. While these sectors are essential, there is no sense in undermining the importance of providing water and energy to residents and businesses alike, serious gaps in our infrastructure accounting remain. Many vital infrastructures, necessary for supporting everyday life, are excluded from these assessments, including education and health infrastructure, cultural and social infrastructure, and ecological services, for example, natural systems.

5 CONCLUSION

This paper is the starting point for a discussion in this regard. It asks more questions than it answers, pointing to the many gaps in our understanding and issues on the horizon that further complicate our outlook. Based on the overview and framing provided in this paper, there are several areas of future work that could greatly bolster our collective agenda and aims. These areas of work speak to the intersections between the need for the simultaneous empowerment of African-based institutions, such as local governments and universities; the mobilisation of global finance in just and equitable ways; and the suturing and extending of fragmented and fractured infrastructure systems in African countries and cities. In terms of an agenda for research and action, two areas are suggested and discussed below.

First, there are clear gaps in our [information, without which it is impossible to move forward](#). These gaps are at the intersection between finance and infrastructure, hampering our ability to see either the system as it currently is or where it might be going. As a starting place, key gaps in the data collected on financial flows need to be addressed, namely how they are structured, where they land geographically, and what types of investments they fund. This is partially an issue of transparency and partially one of coordination. Gaps in understanding what sustainable infrastructure investment means for different infrastructure sectors need to be addressed. To clarify what types of investments should be aimed at, it is necessary to have some idea of where the thinking in each sector is, about what is sustainable. The sector papers that are currently being developed will work to attend to the latter, fleshing out an understanding of sustainability. However, the gaps in the data about financial flows require a more coherent effort on the part of those whose flows are being documented, to improve and cohere reporting. In sum, the need for better data sharing is clear.

Secondly, and related to the issue of data sharing, is the question of [shared meaning-making and collective interplay](#). There is a clear need for richer collaborations between actors involved in financing infrastructure in Africa. This collaboration requires coming together not only to share information but also to collectively develop ways of understanding opportunities and legacy constraints in new and different ways. The question of risk, how it is calculated and what its role is in shaping investment decisions are central to the finance challenges at hand in Africa. As such, one of the focus areas of these collaborations may be to rethink and reframe risk. However, other themes might also serve as the basis of creating living laboratories that allow for new knowledge to be created and ideas to be shared. In other words, these ideas need to be developed further through collaborative processes and cutting-edge research that can be tested in the real world. It is only through on-the-ground experimentation with different types of laboratorial projects that the necessary proof-of-concept can be developed to align financial logics to sustainable urban development agendas. To push the sustainable agenda, bespoke innovation in infrastructure is needed, which is unbackable by the currently used metrics of financial viability. Through dedicated laboratories, a portfolio of experiments and localised tests, accompanied by detailed documentation, could assist in developing the necessary precedent to fuel change through incremental replicability and adaptability.

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