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The Declaration on the Right to Development at 40: Africa's 'infrastructural turn'

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Abstract: *Four decades have passed since the adoption of the United Nations Declaration on the Right to Development (DRtD). Yet, a significant disparity remains between the objectives of the DRtD and the developmental realities experienced by millions of Africans. While mainstream literature attributes this gap to external factors, such as unfavourable terms of trade, financial dependence and unequal technology transfer, these elements do not tell the whole story. This chapter argues that a central, less-examined barrier to realising the right to development (RtD) is the deficit in productive capability, institutional capacity, and strategic infrastructure within African states themselves. Moving beyond traditional calls for technology transfer, this chapter proposes an 'infrastructural turn' in RtD studies, centred on infrastructural sovereignty and co-constitutive ownership. By analysing the African Union's digital strategies alongside the Pan-African Payment and Settlement System (PAPSS), the Programme for Infrastructure Development in Africa (PIDA) and the African Internet Exchange System (AXIS), and drawing comparative lessons from East Asia, the chapter offers concrete recommendations to strengthen African developmental agency and translate technological access into sustained capacity over the next 40 years.*

Résumé : *Quatre décennies se sont écoulées depuis l'adoption de la Déclaration des Nations Unies sur le droit au développement (DRAD). Pourtant, un écart significatif subsiste entre les objectifs de la DRAD et les réalités du développement vécues par des millions d'Africains. Si la littérature dominante attribue cet écart à des facteurs externes tels que des termes de l'échange défavorables, la dépendance financière et un transfert de technologie inégal, ces éléments ne reflètent pas toute la réalité. Ce chapitre soutient qu'un obstacle central, mais peu étudié, à la réalisation du droit au développement (DaD) réside dans le déficit de capacités productives, de capacités institutionnelles et d'infrastructures stratégiques au sein même des États africains. Au-delà des appels traditionnels en faveur du transfert de technologies, ce chapitre propose un « tournant infrastructurel » dans les études sur le droit au développement, axé sur la souveraineté infrastructurelle et l'appropriation co-constitutive. En analysant les stratégies numériques de l'Union africaine parallèlement au Système panafricain de paiement et de règlement (SPPPR), au Programme de développement des infrastructures en Afrique (PDIA) et au Système africain d'échange*

Internet (SAEI), et en tirant des enseignements comparatifs de l'Asie de l'Est, ce chapitre formule des recommandations concrètes visant à renforcer l'autonomie de l'Afrique en matière de développement et à transformer l'accès aux technologies en capacités durables au cours des quarante prochaines années.

Key words: *right to development; infrastructural turn; co-constitutive ownership; infrastructural sovereignty; digital public infrastructure*

1 Introduction

Four decades after its adoption by the United Nations General Assembly, the right to development (RtD) remains contested in international human rights law.[1] The Declaration on the Right to Development (DRtD), adopted in 1986, aimed to bridge the long-standing divide between civil and political rights and economic, social and cultural rights by defining development as a human right and not as a mere act of charity or a measure of economic growth.[2] The DRtD requires states to cooperate with one another to create an environment for the full realisation of the right.[3] To date, there is still no agreement on the nature of this right, the obligations it creates for states or how to realise it in practice.[4]

Post-colonial struggles in the Global South and the movement for a New International Economic Order (NIEO) generated the RtD.[5] Senegalese jurist Kéba M'Baye first articulated the concept in his 1972 lecture at the International Institute of Human Rights in Strasbourg, connecting development as a human right to the right to life.[6] Drafters codified his argument in article 22 of the African Charter on Human

1 K Arts & A Tamo 'The right to development in international law: New momentum thirty years down the line?' (2016) 63 *Netherlands International Law Review* 221.
2 UN General Assembly Declaration on the Right to Development, Resolution 41/128 (4 December 1986).
3 DRtD (n 2) arts 1 & 3(3).
4 SD Kamga 'Realising the right to development: Some reflections' (2018) 16 *History Compass* 1-10.
5 D Whelan '"Under the aegis of man": The right to development and the origins of the New International Economic Order' (2015) 6 *Humanity: An International Journal of Human Rights, Humanitarianism, and Development* 93.
6 K M'Baye 'Le droit au développement, comme un droit de l'homme' (1972) 5 *Revue des Droits de l'Homme* 503.

and Peoples' Rights (African Charter) in 1981, making the African system the first to give the RtD binding legal force.[7]

A wide gap divides the promise of the RtD from its realisation despite these legal developments. An international economic system that continues to reproduce inequality and dependency has tempered the optimism that followed decolonisation.[8]

This chapter contends that the traditional understanding of the RtD has reached an *impasse*. For 40 years, scholarship has focused on the norm itself, debating the right's legal validity, justiciability and legitimacy, and less on its practical implementation.[9] Critics such as Alston have questioned the legal and normative utility of the RtD, particularly in the absence of clearly defined duty bearers and effective mechanisms of enforcement.[10] Other scholars, including Sengupta, have sought to strengthen its normative content by specifying corresponding obligations, mechanisms of implementation and indicators.[11] Within African scholarship, Viljoen, Kamga, Rukare and Ngang have examined how the RtD can be incorporated into the regional and national legal and governance systems.[12] Ngang, in particular, develops a model of right to development governance that translates the RtD from a political claim into a framework for public governance and local capacity building.[13] Related scholarship has also examined the practical limits of regional human rights enforcement and the structural inequalities shaping

7 African Charter on Human and Peoples' Rights (1981) art 22.

8 Y Ndasauka 'Decoding the digital revolution' in Y Ndasauka *African mind, culture, and technology* (2024) 17-36.

9 B Ibhawoh 'The right to development: The politics and polemics of power and resistance' (2011) 33 *Human Rights Quarterly* 76.

10 P Alston 'Making space for new human rights: The case of the right to development' (1988) 1 *Harvard Human Rights Yearbook* 3.

11 A Sengupta 'The human right to development' (2004) 32 *Oxford Development Studies* 179.

12 F Viljoen 'Contemporary challenges to international human rights law and the role of human rights education' (2011) 44 *De Jure* 220; see also D Rukare 'The right to development in East Africa: A review of the constitutional and policy framework' (2017) 47 *Africa Insight* 95-111.

13 CC Ngang 'Towards a right-to-development governance in Africa' (2018) 17 *Journal of Human Rights* 107-122; CC Ngang 'Right-to-development governance: An alternative development model for Africa' (2024) 32 *Journal of African Law* 1; CC Ngang 'Systems problem and a pragmatic insight into the right to development governance for Africa' (2019) 19 *African Human Rights Law Journal* 365-394.

Africa's position within the global political economy, such as Ebobrah[14] and Kamga.[15]

Yet, as Marks observed, a persistent gap remained between the rhetoric surrounding the RtD and its practical realisation.[16] While this literature has advanced the normative and operational understanding of the RtD, little attention has been paid to the material, institutional and infrastructural conditions through which developmental capabilities are built and sustained, or to the way in which ownership of those infrastructures is shared among states, regional institutions and other actors. The chapter addresses this gap by examining infrastructure not simply as an input into development, but as part of the institutional and productive systems through which the capacity to realise the RtD is constituted.

Looking towards the next 40 years, the chapter therefore calls for greater attention to the conditions through which the RtD can be implemented and sustained, including the development of institutional, productive and infrastructural capabilities. In this sense, the infrastructural turn offers a forward-looking framework for strengthening African developmental agency and contributing to the realisation of the ambitions of Agenda 2063.[17] This argument is particularly relevant as digitalisation, data-driven economies and platform-based forms of economic activity are currently reshaping the material and institutional requirements of development.[18] Digital public infrastructure (DPI), cross-border data systems, algorithmic platforms and regional connectivity regimes increasingly form part of the infrastructure through which contemporary economic and public life is organised.[19]

14 ST Ebobrah 'A rights-protection goldmine or a waiting volcanic eruption? Competence of and access to the human rights jurisdiction of the ECOWAS Community Court of Justice' (2007) 7 *African Human Rights Law Journal* 307.

15 SD Kamga *The right to development in the African human rights system* (2018) 1-5.

16 SP Marks, 'The human right to development: Between rhetoric and reality' (2004) 17 *Harvard Human Rights Journal* 137-168.

17 African Union Agenda 2063: The Africa we want (2015); African Union 'The African Continental Free Trade Area', https://au.int/en/african-continental-free-trade-area (accessed 19 September 2026).

18 M Kwet 'Digital colonialism: US empire and the new imperialism in the Global South' (2019) 60 *Race & Class* 3-24; M Kwet 'The digital tech deal: A socialist framework for the twenty-first century' (2022) 63 *Race & Class* 63-84.

19 WE Forum 'Why digital public infrastructure is key to building a connected future', https://www.weforum.org/stories/2025/04/digital-public-infrastructure-

The chapter proceeds as follows: Part 2 explains the methodology of the chapter, part 3 sets out the conceptual and theoretical framework. Part 4 reframes the analytical problem, from technology transfer to infrastructural capability. Part 5 examines the digital and infrastructure initiatives of the African Union (AU), namely the Pan-African Payment and Settlement System (PAPSS), Programme for Infrastructure Development in Africa (PIDA), African Internet Exchange System (AXIS) and African Union Development Agency-New Partnership for Africa's Development (AUDA-NEPAD) and the East Asian comparison. Part 6 draws out the legal implications for the RtD, and part 7 concludes with recommendations.

2 Methodology

This chapter adopts a qualitative, doctrinal and interpretive approach to examine how the discourse on the RtD can be extended through an infrastructural turn to promote its realisation. It draws on legal and policy instruments, institutional frameworks and academic literature to examine the relationship between the RtD and the institutions, capacities and material systems through which development is pursued.

The chapter uses selected African development initiatives and infrastructure projects as illustrative sites of analysis rather than as empirical case studies measuring developmental outcomes. It demonstrates how questions of infrastructure, institutional capacity and African agency can expand the analysis of the RtD beyond its formal recognition towards the conditions of its practical realisation. The analysis distinguishes between binding and non-binding instruments and between legal recognition and implementation, recognising that development practices do not necessarily constitute compliance with the RtD as a legal right. The methodology, therefore, is analytical rather than evaluative. Its purpose is to examine what becomes visible when the RtD is considered through an infrastructural lens, particularly in relation to the capacity of African actors to shape, govern, adapt and sustain the systems through which development occurs.

building-connected-future/ (accessed 13 June 2026).

3 Conceptual and theoretical framework

3.1 Concepts

The *infrastructural turn* is developed through two related concepts: infrastructural sovereignty and co-constitutive ownership. As used here, infrastructural sovereignty refers to the capacity of states and regional institutions to exercise meaningful agency over critical infrastructures by shaping their design, governance, regulation, development and long-term sustainability.[20] It is therefore broader than formal ownership. A state may legally own an infrastructure while lacking the technical, financial or institutional capacity to determine how it is designed, operated or developed, and meaningful agency may be exercised through regional, public-private or other arrangements in which formal ownership is shared or distributed. It is a matter of degree and of particular functions, including design, finance, operation, maintenance, adaptation, governance, improvement and replacement, not a status that a state either has or lacks.[21]

The second concept, *co-constitutive ownership*, recognises that ownership and governance of critical infrastructures are increasingly constituted through relationships among states, regional institutions, private actors and other stakeholders. Ownership is therefore not understood as a fixed relationship between a state and an asset, nor primarily as legal or physical ownership of infrastructure. Rather, it refers to the extent to which African states, institutions and peoples have the agency, participation and decision-making authority to shape and govern the systems through which development occurs and to derive developmental benefits from them. Such arrangements can either strengthen or constrain developmental agency, depending on the extent to which they enable African states and regional institutions to retain meaningful influence over infrastructures on which development depends. Ownership is thus understood as a form of developmental agency: Those affected by development should have meaningful capacity

20 A Ishkhanyan 'Digital colonialism, techno-sovereignty, and infrastructural power' (2026) *Frontiers in Political Science* 1-9.

21 S Cruzes 'Sustainability-Constrained Workload Orchestration for Sovereign AI Infrastructure: A Joint Compute-Network Optimization Framework' (2026), https://arxiv.org/abs/2602.10900 (accessed 20 September 2026).

to participate in determining its priorities, institutional arrangements and modes of implementation.

Co-constitutive ownership is informed by polycentric governance literature, which understands governance as distributed across multiple centres of decision making.[22] It extends this perspective by bringing questions of asymmetric power into the analysis, drawing on dependency and structural power literature. The concept therefore asks not only who participates in governing infrastructure, but also how power is distributed among the actors who participate and whether African actors retain meaningful capacity to shape the terms on which critical infrastructures are developed, governed and sustained.

The two concepts are related but not interchangeable. Infrastructural sovereignty focuses on the capacity to shape and govern critical infrastructure, while co-constitutive ownership examines the ownership and governance arrangements through which that capacity is constituted and exercised. The influence runs both ways: The capabilities that African actors hold shape their position within an arrangement, and the arrangement shapes the capabilities they can build.

3.2 Normative legal theory of the right to development

The first theory is the normative legal theory, which builds on the work of Kéba M'Baye[23] and Arjun Sengupta[24] to treat the RtD as a human right. Sengupta defined the RtD as the right to a development process that progressively realises all human rights and fundamental freedoms. This theory frames the RtD as an independent right to an equitable, inclusive and fair development process. It rejects neoliberal views that measure development solely by gross domestic product (GDP) growth, placing human beings at the centre of developmental justice instead.[25] In addition, international cooperation to realise the right is framed as a

22 M Polanyi *The logic of liberty* (1951) 1-10; V Ostrom, CM Tiebout & R Warren 'The organization of government in metropolitan areas: A theoretical inquiry' (1961) 55 *American political science review* 831-842; E Ostrom *Governing the commons: The evolution of institutions for collective action* (1990) 1-3; M Stephan, G Marshall & M McGinnis 'An introduction to polycentricity and governance' in A Thiel, W Blomquist & D Garrick (eds) *Governing complexity* (2019) 21.

23 M'Baye (n 6).

24 Sengupta (n 11).

25 DRtD (n 2) art 2(1).

legal duty under the United Nations (UN) Charter, the DRtD, and the draft Convention on the Right to Development.[26] The infrastructural turn builds on this existing foundation but introduces a forward-looking dimension to the RtD. Thus, rather than continuing to focus primarily on defining, defending and elaborating the normative content of the right, we should consider shifting the RtD scholarship towards its practical realisation, which has been the main challenge facing the right for over four decades.

The idea is not to displace the RtD's normative foundation, but to treat it as the starting point for a forward vision of development in which the right informs the institutions, capacities and material systems through which development is pursued. This requires bringing the RtD into the design and implementation of development agendas, as well as into infrastructure development undertaken to advance sustainable development and the objectives of Agenda 2063. The significance of human rights and development objectives must be borne in mind. A development goal may express an aspiration or policy priority, but a right carries corresponding legal obligations and creates a basis for participation, accountability and scrutiny. Therefore, to achieve a sustainable development that benefits humankind, the RtD should not disappear when development strategies move from legal principle to infrastructure, investment and implementation. Rather, its normative content should continue to shape those processes. The infrastructural turn consequently seeks to carry the RtD forward, from recognition of the right to the institutional and material conditions through which the right can be realised, while highlighting the need for a clearer legal connection between African development practice and the right itself.

3.3 Governance and implementation theories

The second body of thought is governance and implementation theories, which build on the normative foundation above. However, it directs attention to the institutional processes through which normative commitments are translated into practice. This perspective builds on the work of writers writing from the global perspective and practical

26 Charter of the United Nations (1945) arts 55-56; DRtD (n 2) art 3.

implementation of the RtD, such as Sengupta[27] and Marks,[28] writing from the global perspective, and Viljoen[29] and Ngang[30] and others who brought the concern to the African context.[31] Together, these authors provide the analytical lens for examining what the RtD requires and through which institutions it is to be realised in practice. This line of thought recognises that a right can be firmly recognised in law and policy and still fail to improve people's lives if the state lacks the mechanisms, resources and accountability structures to give it effect.[32]

3.4 Dependency and structural power

The third body of thought combines two related but distinct traditions, namely, dependency theory and structural power theory, which together provide a framework for examining the external and structural constraints within which African infrastructural development takes place. Dependency theory, rooted in Prebisch's structuralism and developed in different directions by Frank and, separately, by Cardoso and Faletto,[33] draws attention to the unequal organisation of the international economy and the ways in which relations between centre and periphery can reproduce underdevelopment and dependence.[34] Recent restatements caution against treating the tradition as a single or purely deterministic doctrine.[35] Rodney developed a related critique in the African context, showing how colonial economic relations extracted

27 A Sengupta 'On the theory and practice of the right to development' (2002) 24 *Human Rights Quarterly* 837.
28 Marks (n 16).
29 F Viljoen *International human rights law in Africa* (2012) 162.
30 CC Ngang 'Towards a right-to-development governance in Africa' (2018) 17 *Journal of Human Rights* 107-122; CC Ngang 'Right-to-development governance: An alternative development model for Africa' (2024) 32 *Journal of African Law* 1.
31 ES Nwauche & JC Nwobike 'Implementing the right to development' (2005) 2 *Sur – International Journal on Human Rights* 93.
32 SD Mekonnen 'The right to sustainable development in article 43(3) of the Ethiopian Constitution' (2021) 21 *African Human Rights Law Journal* 10.
33 FH Cardoso & E Faletto *Dependency and development in Latin America* (1979); AG Frank *Dependent accumulation and under development* (1979)1-6; AG Frank *Capitalism and underdevelopment in Latin America: Historical studies of Chile and Brazil* (1967) 1-6.
34 R Prebisch *The economic development of Latin America and its principal problems* (1950).
35 IH Kvangraven 'Beyond the stereotype: Restating the relevance of the dependency research programme' (2021) 52 *Development and Change* 76.

resources from the continent and contributed to its continuing economic subordination.[36]

The implementation of the right also depends on the policy space that trade, investment and financing rules leave to states to pursue their own development strategies and to develop the productive and technological capacities they need.[37] Strange's account of structural power draws attention to the ability of actors to shape the structures and rules within which others operate,[38] and Barnett and Duvall's typology, which distinguishes compulsory, institutional, structural and productive power, makes a similar point about the constitutive effects of structures and rules.[39] The issue is not simply whether a state has formal sovereignty, but whether it has sufficient capacity to determine the terms on which development resources and technologies are acquired and used.

Sell's work on the political construction of international intellectual property rules, together with Drahos's and Braithwaite's account of 'information feudalism', shows how control over knowledge can become embedded in international legal and economic arrangements.[40] Stiglitz similarly identifies the imbalances in the global innovation system that affect access to knowledge and technology.[41] These perspectives suggest that technology transfer should not be understood simply as the movement of technology from one country or firm to another. Stevens's work on the RtD and the multilateral trading system is useful in this respect because it shows that international legal arrangements can also provide opportunities for pursuing developmental interests.[42]

36 W Rodney *How Europe underdeveloped Africa* (1972) 205.

37 R Wade 'What strategies are viable for developing countries today? The World Trade Organization and the shrinking of development space' (2003) 10 *Review of International Political Economy* 621.

38 S Strange *States and markets: An introduction to international political economy* (1988) 20-25.

39 M Barnett & R Duvall 'Power in international politics' (2005) 59 *International Organization* 39.

40 P Drahos & J Braithwaite *Information feudalism: Who owns the knowledge economy?* (2002) 222; SK Sell *Private power, public law: The globalization of intellectual property rights* (2003) 2-4.

41 JE Stiglitz 'Economic foundations of intellectual property rights' (2008) 57 *Duke Law Journal* 1694.

42 C Stevens 'Reviving the right to development within the multilateral trade framework affecting (African) countries to actualise Agenda 2063' (2019) 19 *African Human Rights Law Journal* 470-493.

Dependency and structural power theory raise a question that is central to this chapter: whether access to technology and infrastructure necessarily produces greater technological and developmental autonomy. A country may acquire infrastructure or technology without acquiring the capacity to design, reproduce, adapt, maintain or govern it. Dependency and structural power scholarship have paid considerable attention to trade, finance, technology, knowledge and economic power, and less attention to infrastructure as a distinct object of analysis. Yet, infrastructure is not only a means through which development occurs, but also a site at which control over technology, knowledge, data, standards and productive systems is exercised, and at which that control can be contested. Conversely, the *infrastructural turn* adds further questions: who controls these systems and on what terms, and whether African actors are building capacities needed to shape and govern them. It does not replace the earlier accounts of external constraint. It directs their concern to the technical and institutional layer at which that constraint is operated, and it leaves open, as the cases in part 5 examine, whether a given initiative widens or narrows African agency.

3.5 Decoloniality

Third, the decolonial theory brings historical and continuing relations of power into the analysis. It extends the analysis of dependency by asking how colonial forms of knowledge and power continue to influence what counts as knowledge, whose expertise is recognised, and which models of development are treated as legitimate. A central concept in this literature is Quijano's notion of the 'coloniality of power', which refers to the persistence of racial, epistemic and labour hierarchies established through colonialism beyond the formal end of colonial rule.[43] Ndlovu-Gatsheni develops this analysis in relation to Africa, through his work on African subjectivity and subalternity, where he insists that political independence does not necessarily produce epistemic or material autonomy.[44]

43 A Quijano 'Coloniality of power, eurocentrism, and Latin America' (2000) 1 *Nepantla: Views from South* 533-580.

44 SJ Ndlovu-Gatsheni *Empire, global coloniality and African subjectivity* (2013) 1-10; SJ Ndlovu-Gatsheni 'Coloniality of power in development studies and the

The chapter proceeds on the view that, while the RtD originated in anti-colonial and New International Economic Order struggles, it has been drawn into technocratic and market-based development models.[45] That shift concerns not only who receives resources or technology, but also whose categories define what counts as development, and decolonial thought bears on it because it treats epistemic authority as inseparable from material arrangements. Mignolo's account of the decolonial option is one statement of that position.[46] The chapter argues that decolonial critique must also extend into the material and infrastructural realms, because the systems through which knowledge and economic life are organised can reproduce the hierarchies that decolonial thought seeks to disturb. This does not mean that African states must own or control every layer of digital and physical infrastructure. The argument concerns their capacity to shape the terms on which those systems are built and run, and so to pursue both epistemic and material autonomy.

The literature on 'data colonialism' draws attention to the extraction and commodification of data from the Global South within global digital economies.[47] Couldry and Mejias describe this process in terms of the appropriation of data from everyday life and its incorporation into forms of value creation that are largely controlled by powerful economic actors.[48] Data generated in the Global South can become a resource for technologies and services developed elsewhere and be made available to African users through proprietary platforms, so that access to digital services does not necessarily provide control over the underlying systems, data or value generated through their use. For these reasons, the chapter treats the infrastructural turn as a material dimension of decolonial thought and extends it by considering whether African-led infrastructure initiatives create greater space for locally and regionally defined priorities, capabilities and forms of institutional agency.

impact of global imperial designs on Africa' (2012) 33 *The Australasian Review of African Studies* 48.

45 Whelan (n 5) 93-94; Ibhawoh (n 9).

46 WD Mignolo 'Epistemic disobedience and the decolonial option: A manifesto' (2011) 1 *Transmodernity: Journal of Peripheral Cultural Production of the Luso-Hispanic World* 44.

47 VH Lantyer 'Data colonialism: The geopolitics of information' (2025) *SSRN Electronic Journal* 1.

48 N Couldry & UA Mejias *The costs of connection: How data is colonising daily life and providing it to capitalism* (2019) 187.

Consequently, to attain development justice, Africa should not merely aim to secure access to technology, but build the capacity to participate in the ownership, design and governance of the systems through which digital value is produced.

3.6 The infrastructural turn

The fourth body of thought is the infrastructural turn itself. In the study of technology and society, infrastructure has moved from the background of analysis to the foreground. Star's ethnography of infrastructure showed that infrastructures are relational, largely invisible until they fail, and carry embedded standards and categories that shape whose needs count.[49] Larkin treats infrastructures both as technical systems and as objects of political and aspirational investment,[50] and scholars of platforms have argued that platforms are becoming infrastructural and infrastructures increasingly platform-like,[51] and that the computational layers of the digital economy, from cloud services to protocols, are themselves sites of governance and power.[52]

This literature has rarely been brought into conversation with the right to development, and it has been applied to Africa mainly through studies of particular infrastructures rather than as a framework for assessing continental strategy. Therefore, this chapter brings it to bear on a specific question: whether infrastructural investment translates into the capabilities to shape, adapt and govern the systems on which development depends as an extension of the existing scholarship. Infrastructural sovereignty has recent antecedents in work on digital sovereignty and infrastructural power, including a growing body of writing on African digital sovereignty, and the chapter applies it to the RtD and to regional institutions. By contrast, co-constitutive ownership is, as far as can be ascertained, introduced here for the first time. A related line of work argues that the rapid use of AI in economic, political and social decision-making calls for a broader approach than data sovereignty, which it terms

49 SL Star 'The ethnography of infrastructure' (1999) 43 *American Behavioral Scientist* 377.

50 B Larkin 'The politics and poetics of infrastructure' (2013) 42 *Annual Review of Anthropology* 327.

51 J-C Plantin and others 'Infrastructure studies meet platform studies in the age of Google and Facebook' (2018) 20 *New Media & Society* 293.

52 B Bratton *The stack: On software and sovereignty* (2015) 1-12.

algorithmic sovereignty.[53] The chapter's concept is wider than either, and the algorithmic layer is one that it does not examine. The phrase 'infrastructural turn' is used here in three related senses: for the scholarly shift just described, for the direction that the AU's strategies have taken, and for the chapter's proposal that RtD studies follow that shift by asking what infrastructure does to the capacity to realise the right.

4 From technology transfer to the infrastructural turn

The chapter does not treat technology transfer as innately ineffective. Transfer has been an important channel of industrial development, including in the East Asian economies discussed in part 5.3. The question is what happens to technology after it is transferred. Was it absorbed, and by whom? Which institutions mediated between foreign sources and domestic users? Was knowledge retained and adapted, or did it leave with the supplier? Did domestic firms and research institutions take part, and did the terms of dependence change over time? Also, what happens if it does not come at all? Do states sit and wait forever, or they empower themselves?

The literature on technological capabilities treats these as questions of technological learning. Lall described technological capabilities as the skills, knowledge and institutional arrangements that allow firms and countries to operate, adapt and improve technology.[54] Bell and Pavitt argued that technological accumulation in developing countries depends on deliberate investment in learning and not on the presence of imported equipment alone.[55] Cohen and Levinthal's notion of absorptive capacity makes a related point at the level of the firm: The ability to exploit external knowledge depends on prior related knowledge.[56] Kim's study of Korea shows the process at the level of a national economy. The chapter uses 'capability formation' for the process through which firms,

53 S Jubaer 'From data sovereignty to algorithmic sovereignty: Reimagining global governance under intelligent infrastructure' (2026) *Trends in Artificial Intelligence* 4.

54 S Lall 'Technological capabilities and industrialization' (1992) 20 *World Development* 165.

55 M Bell & K Pavitt 'Technological accumulation and industrial growth: Contrasts between developed and developing countries' (1993) 2 *Industrial and Corporate Change* 157.

56 WM Cohen & DA Levinthal 'Absorptive capacity: A new perspective on learning and innovation' (1990) 35 *Administrative Science Quarterly* 128.

public institutions and research organisations acquire the ability to operate, adapt, improve and eventually replace technology, and it treats infrastructural sovereignty as, in large part, the outcome of that process.[57]

5 Africa's infrastructural turn: Case studies and regional frameworks

The AU's digitisation and infrastructure strategies provide a basis for assessing how the continent is responding to the emerging 'infrastructural turn'. The analysis asks whether these initiatives advance infrastructural sovereignty and move towards co-constitutive ownership, and what they show about the implementation of the right to development.

5.1 Digital public infrastructure and the AU's digital strategies

The infrastructural turn is increasingly visible in the emergence of digital public infrastructure (DPI), which shifts attention from discrete digital projects towards shared and interoperable socio-technical systems.[58] These systems provide foundational digital capabilities through which public and private services can operate at scale.[59]

The significance of DPI for the infrastructural turn lies in the capabilities that these systems create. Digital infrastructure can facilitate economic activity, public administration and access to services, but its developmental effects are not automatic. Its effects depend on the institutional capabilities through which it is governed, maintained and integrated into wider systems of development. Data raise the same issue: The developmental value of digital infrastructure depends partly on who can access, govern and derive value from the data generated through it.[60]

The question is not simply whether African states and institutions have access to digital infrastructure. It is whether they participate meaningfully in designing, governing and adapting the systems on which their digital economies and public services depend. However, the existence of DPI

57 L Kim *Imitation to innovation: The dynamics of Korea's technological learning* (1997)1-10.

58 J Fetter, K Rao & D Eaves *State of Digital Public Infrastructure Report: A look at measurement and prevalence as DPI transitions from experiment to scale* (2025) 11.

59 Fetter and others, Rao & Eaves (n 58).

60 UNCTAD 'Digital economy report 2021: Cross-border data flows and development: For whom the data flow' (2021) iii.

alone does not establish infrastructural sovereignty. The underlying technologies, standards, financing arrangements, data infrastructure and technical expertise may still be controlled elsewhere. DPI can therefore expand access while leaving deeper forms of technological dependence intact.

African digital public infrastructure is not a blank slate, and the chapter does not treat it as one. Ethiopia's National ID Programme has customised the Modular Open Source Identity Platform (MOSIP) for its national identity system, known as Fayda.[61] Nigeria's NIBSS has operated an instant payment system since 2011.[62] Southern and Eastern Africa already have regional payment arrangements, among them the SADC-RTGS, the SADC TCIB scheme and the COMESA clearing house.[63] They show that African institutions already design, operate and adapt systems of this kind, which is the capability the chapter is concerned with, and that DPI varies in how much control it leaves with the adopting state. Adapting an open-source platform is a different kind of capability from consuming a proprietary system, and a capability-based test can capture that difference where an access-based test cannot.[64]

Digital markets and infrastructure are highly concentrated, particularly in cloud computing, online platforms, search and artificial intelligence, and a small number of large technology firms headquartered predominantly in the United States and China occupy central positions.[65]

61 MOSIP 'Ethiopia's National ID Program (NIDP) extends their partnership with MOSIP for the implementation of a national digital ID solution' (23 February 2022), https://www.mosip.io/news_events/ethiopia-s-national-id-program-nidp-extends-their-partnership-with-mosip (accessed 20 November 2026).

62 World Bank Fast Payments Toolkit 'Case study: Nigeria NIBSS instant payment' https://fastpayments.worldbank.org/sites/default/files/2021-09/World_Bank_FPS_Nigeria_NIBSS_Case_Study.pdf (accessed 20 November 2026).

63 SADC Banking Association 'SADC-RTGS', https://sadcbanking.org/sadc-rtgs/; World Bank Project Information Document: SADC Transfers Cleared on an Immediate Basis (TCIB) Payment Scheme Project (P176529), https://documents1.worldbank.org/curated/en/208871624554612081/txt/Project-Information-Document-PID-SADC-Transfers-Cleared-on-an-Immediate-Basis-TCIB-Payment-Scheme-Project-P176529.txt; COMESA 'COMESA Clearing House', https://www.comesa.int/comesa-clearing-house/ (accessed 19 September 2026).

64 MS Miller and others 'Capability myths demolished' (2003) Systems Research Laboratory Technical Report SRL2003-02 15; see also D Sang and others 'Digital public infrastructure: A practical approach for Africa (2025) 7, https://assets.carnegieendowment.org/static/files/Munga%20et%20al_A%20Practical%20Approach%20for%20DPI%20in%20Africa-1.pdf (accessed 14 November 2026).

65 UNCTAD (n 60).

The more significant question, from a dependency and structural-power perspective, is whether African economies acquire the capabilities to determine the terms on which external technologies and platforms are used and whether sufficient value, knowledge and productive capacity remain within African economies. The concern is not only theoretical for Africa. Coleman traces how the collection and control of user data on the continent by foreign technology firms escapes effective control by existing data protection laws,[66] and Birhane argues that data-driven and algorithmic systems developed elsewhere and deployed in Africa reproduce colonial patterns of extraction and control.[67]

The Digital Transformation Strategy for Africa 2020-2030 provides the broader policy framework for Africa's digital transformation and links digital development to Agenda 2063,[68] continental integration, inclusive growth and sustainable development.[69] The strategy is a policy instrument. It sets objectives for the AU and its member states but does not itself create binding obligations. The data protection element is different in kind. The AU Convention on Cyber Security and Personal Data Protection, known as the Malabo Convention, is a treaty. It was adopted on 27 June 2014 and entered into force on 8 June 2023 after its fifteenth ratification;[70] it binds only the states that have ratified it. At the time of writing this chapter, it had 20 ratifications.

The AU Data Policy Framework, adopted in 2022, complements this strategy by addressing the governance of one of the principal resources generated, exchanged and processed through digital infrastructure: data.[71] The Framework is a policy instrument, not a treaty. It calls on member states to ratify and implement the Malabo Convention, and it cautions against broad data localisation requirements in favour of

66 D Coleman 'Digital colonialism: The 21st century scramble for Africa through the extraction and control of user data and the limitations of data protection laws' (2019) 24 *Michigan Journal of Race & Law* 417.

67 A Birhane 'Algorithmic colonization of Africa' (2020) 17 *SCRIPTed* 389.

68 African Union The Digital Transformation Strategy for Africa (2020-2030) (2020) 6.

69 As above.

70 African Union African Union Convention on Cyber Security and Personal Data Protection (adopted 27 June 2014), https://au.int/en/treaties/african-union-convention-cyber-security-and-personal-data-protection (accessed 20 September 2026).

71 African Union *AU Data Policy Framework* (2022) 7.

categorising data by sensitivity.[72] In December 2025 the AU Commission convened a validation workshop in Addis Ababa on three implementing frameworks, on data categorisation and sharing, cross-border data flows, and open data, presented as operationalising the Framework and the Digital Single Market agenda.[73]

Physical infrastructure without the capacity to govern the data, standards and systems operating through it can reproduce dependence at a different level. Conversely, data governance without sufficient physical and technological infrastructure may leave African states dependent on external systems for the implementation of their own regulatory objectives. The AU's approach consequently represents an important step towards continental infrastructural sovereignty at the level of policy, but it does not by itself establish co-constitutive ownership. Policy frameworks can establish objectives, principles and common rules but they cannot automatically create the financial, technological, institutional and productive capabilities required to implement them.

The continental frameworks help address the questions in part 3 by setting common goals, creating shared terminology, and allowing African institutions to shape the agenda. Control remains external where the technologies, financing and technical expertise on which implementation depends are supplied elsewhere, and neither instrument, on its face, builds those capabilities itself. For the implementation of the RtD, the frameworks matter as enabling conditions, not as mechanisms of implementation. However, evidence on national uptake is thin.[74]

72 M King Ori and others 'Future of Privacy Forum: The African Union's Data Policy Framework: Context, key takeaways, and implications for data protection on the continent' Future of Privacy forum (web blog) 29 March 2023, https://fpf.org/blog/the-african-unions-data-policy-framework-context-key-takeaways-and-implications-for-data-protection-on-the-continent/ (accessed 20 September 2026).

73 African Union Commission 'Validation of data governance frameworks to accelerate the Digital Single Market' (web blog) 2 December 2025, https://au.int/en/pressreleases/20251202/validation-data-governance-frameworks-accelerate-digital-single-market (accessed 20 November 2026).

74 CIPESA 'Five takeaways from the 2022 African Union Data Policy Framework Brief' 6, https://cipesa.org/wp-content/files/briefs/Five_Takeaways_From_the_2022_African_Union_Data_Policy_Framework_Brief.pdf (accessed 21 September 2026).

5.2 PAPSS, PIDA and AXIS and the infrastructural turn

PAPSS, PIDA's ICT terrestrial fibre-optic networks and AXIS operate at different infrastructural levels, including their financial infrastructure, physical connectivity and internet exchange.

5.2.1 Pan-African Payment and Settlement System

PAPSS, developed through cooperation between Afreximbank, the AU and the African Continental Free Trade Area (AfCFTA) Secretariat, provides an important example of an African-led attempt to reshape the infrastructure through which intra-African trade is conducted.[75] Its governance is set out in by-laws, and its council brings together central bank governors and representatives of Afreximbank, the AU, the AfCFTA Secretariat and the African Development Bank.[76]

By September 2026, press reports put PAPSS's reach at around 30 countries, 24 central banks and some 200 financial institutions, with settlement times reported in seconds.[77] Concerns about currency volatility, exchange rate management and monetary stability can limit participation, while businesses may continue to prefer internationally traded currencies where mechanisms for managing local-currency risk remain limited.[78]

PAPSS is an African-led infrastructure, but its existence does not automatically produce autonomous control over the monetary and financial conditions within which it operates. The initiative demonstrates movement towards infrastructural sovereignty at the level of regional institutional design, while simultaneously revealing the continuing importance of national monetary systems, financial markets and global currency structures. Infrastructural sovereignty requires meaningful capacity to shape the standards, interoperability arrangements, risk-

75 Pan-African Payment and Settlement System, https://papss.com/ (accessed 14 July 2026.)
76 As above.
77 TechCabal 'PAPSS payment network' (web blog) 10 September 2026, https://techcabal.com/2026/09/10/papss-payment-network-africans-use/ (accessed 12 November 2026).
78 K Genna 'Ensuring the success of PAPSS: Overcoming challenges for a unified African payment system', https://www.globalafricanetwork.com/company-news/ensuring-the-success-of-papss-overcoming-challenges-for-a-unified-african-payment-system/ (accessed15 July 2026).

management mechanisms and institutional rules that determine how the infrastructure functions. The evidence is mixed. PAPSS shows real African institutional agency and a plausible route to co-constitutive ownership, since central banks, Afreximbank and the AU jointly govern a shared instrument. It does not, however, yet show that the capabilities to build, adapt or replace the underlying technology sit with African institutions, and it says little about how benefits reach small traders and communities, which is where its significance for the RtD would ultimately be tested.

5.2.2 PIDA and the physical foundations of digital integration

The ICT terrestrial fibre-optic networks developed through PIDA seek to address the geographical fragmentation of African communications infrastructure by creating cross-border terrestrial links between countries and connecting landlocked states to international submarine cable systems.[79] The Central African Backbone, for example, has extended fibre connectivity to landlocked countries such as the Central African Republic and Chad, which have historically depended on neighbouring coastal states for access to international communications infrastructure.[80]

Digital transformation can consequently produce access without autonomy if the underlying infrastructure remains dependent on fragmented national systems, external financing or externally controlled technologies. Improved connectivity can lower the cost of wholesale bandwidth and create conditions for the expansion of e-government, financial technology and other digital services.[81] Differences in telecommunications regulation and licensing arrangements increase the costs of cross-border deployment,[82] while financing remains difficult,

79 African Union 'Program infrastructure development for Africa (PIDA)' (2026), https://au.int/en/ie/pida (accessed 14 July 2026); https://www.au-pida.org/elementor-13061/ (accessed 15 June 2026).

80 AD Bank 'Central African Republic – Central Africa Fibre-Optic Backbone Project (CAB) – CAR Component', https://mapafrica.afdb.org/en/projects/46002-P-CF-GB0-002 (accessed 16 June 2026).

81 SA Secretariat 'Smart Africa initiatives towards making broadband affordable' (2022), https://www.broadbandcommission.org/smart-africa-initiatives/ (accessed 2 May 2026).

82 Telecom Review Africa 'How africa is optimizing limited spectrum, appeasing both operators and regulators' (web blog) 18 June 2026, https://www.telecomreviewafrica.com/articles/features/28842-how-africa-is-optimizing-

particularly where commercial returns are uncertain. The problem is especially acute in rural and underserved areas, where infrastructure investment may not generate returns comparable to those available in densely populated markets.[83]

African states and regional institutions are increasingly participating in the construction of the continent's physical digital backbone, but the ability to construct infrastructure does not necessarily confer control over the capital, technology, standards and regulatory arrangements on which its construction and operation depend. Ownership in this context cannot be reduced to formal title to a fibre network. It concerns the capacity to participate meaningfully in decisions about financing, design, technical standards, maintenance, expansion and future technological adaptation. The evidence for PIDA is equally mixed: It shows coordinated regional investment in physical infrastructure, and little about the capabilities to design, finance and maintain it.

5.2.3 AXIS and the question of where African data travels

AXIS addresses the routing of internet traffic.[84] The initiative supports the establishment and upgrading of internet exchange points (IXPs) so that internet traffic originating and terminating within Africa can, where possible, be exchanged locally rather than being routed through infrastructure outside the continent.[85] Local internet exchange infrastructure can therefore contribute to infrastructural sovereignty by changing where African digital traffic is exchanged.

The limits of this form of sovereignty, however, become apparent when routing is considered alongside hosting and storage. Local traffic exchange does not necessarily mean that the underlying data, applications or computing capacity are locally controlled. The availability of data

limited-spectrum-appeasing-both-operators-and-regulators/ (accessed 23 July 2026).

83 World Bank 'Western Africa Regional Digital Integration Program' World Bank Project Document 30 October 2024, https://documents1.worldbank.org/curated/en/099103024204012368/pdf/P500628-101f3486-58e3-4ebf-896b-14de8994c9c0.pdf (accessed 23 July 2026).

84 African Union 'The African Internet Exchange System (AXIS) Project' (2017), https://au.int/sites/default/files/documents/32509-doc-axis-brochure_pida_-january_2017.pdf (accessed 14 July 2026).

85 https://au.int/en/african-internet-exchange-system-axis-project-overview(accessed (accessed 25 September 2026).

centres and cloud infrastructure remains an important constraint on the development of a more complete African digital ecosystem.[86] Where data, applications or public-sector systems continue to depend on infrastructure located and operated elsewhere, local routing can improve network efficiency without resolving deeper forms of technological dependence.[87] AXIS thus exposes a distinction central to this chapter, that localisation is not the same as ownership or control. African data may travel through African infrastructure without African actors controlling the platforms, cloud systems, storage facilities, software or standards through which that data is ultimately processed and used.

5.2.4 The 2025 AUDA-NEPAD partnership

In July 2018, the AU Assembly endorsed the reform of the New Partnership for Africa's Development Planning and Coordinating Agency (NPCA) into the African Union Development Agency-NEPAD (AUDA-NEPAD).[88] The primary objective of AUDA-NEPAD is to improve the implementation of Africa's Agenda 2063 development priorities.[89] The agency has a stronger focus on improving the capacity of Africans to plan, build, implement, raise money and coordinate with other institutions and reduce reliance on external funding.[90] AUDA-NEPAD is also responsible for helping member states and regional economic communities (RECs) complete priority projects including assisting in building the capacity of various sectors, including infrastructure, energy, water and ICT. It also supports the development of policies and regulations and raising funds for Agenda 2063.[91] The reflections on AUDA-NEPAD's work through 2025 indicated that

86 Africa Data Centres Association 'The economic report: Data centres in Africa' (2026), https://africadca.org/wp-content/uploads/2026/02/DataCentresInAfrica2026-EN.pdf (accessed 14 July 2026).

87 M Illidge 'South Africa's data centre boom gets push from government' *MyBroadband* 19 September 2026, https://mybroadband.co.za/news/cloud-hosting/666504-south-africas-data-centre-boom-gets-push-from-government.html (accessed 24 September 2026).

88 African Union Resolution Dec.691(XXXI), decision on the transformation of the NEPAD planning and coordinating agency (NPCA) into the African Union Development Agency (AUDA) Doc.assembly/au/2 (xxxi).

89 https://www.nepad.org/content/about-auda-nepad (accessed 15 September 2026).

90 As above.

91 As above.

financial sovereignty is fundamental to achieving long-term sustainability and that improving the execution capacity of African institutions would help enhance Africa's presence in international forums.[92]

The implementation of these initiatives shows a positive shift in the way in which Africa now recognises development. They reflect a growing willingness to take greater ownership of Africa's development and to shape its direction according to African priorities and aspirations. The growing ability of African countries to make decisions for themselves and to reduce their dependence on foreign aid and external support provides another reason for hope. At the same time, this is why the chapter finds that introducing the infrastructural turn to RtD scholarship has become timely and relevant. The pace and scope with which the above infrastructure development initiatives are being rolled out call for evaluations of the strength of the foundations upon which Africa's development is being constructed, to establish sustainability for the future. The infrastructural turn will especially be useful in evaluating these initiatives, since it provides us with an opportunity to consider what lies behind the short-term successes of these initiatives, and whether there are adequate institutional, financial and infrastructural bases to support the achievement of the long-term goals of these initiatives.

5.2.5 From infrastructure provision to co-constitutive ownership

The infrastructure development initiatives above illustrate an emerging infrastructural turn, but not its completion. The normative theory discussed in part 3.2 of the chapter considers development as a human right and not simply a policy objective.[93] This is because, as attested to by Sen, development cannot be separated from legal development.[94] Further, the governance and implementation perspective also asks how that right is given effect through institutions, resources and accountability.[95] The dependency and structural power perspectives, on the other hand, ask

92 AUDA-NEPAD 'Abridged annual report 2025' (2025) 15, https://www.nepad.org/publication/auda-nepad-2025-annual-report (accessed 20 November 2026).
93 Sengupta (n 11); M'baye (n 6).
94 A Sen 'What is the role of legal and judicial reform in the development process?' in *The World Bank Legal Review, Volume 2: Law, Equity and Development* (2006) 35; BZ Tamanaha 'The primacy of society and the failure of law and development' (2011) 44 *Cornell International Law Journal* 209-247.
95 Ngang (n 30).

who has the capacity to shape the systems through which development takes place?[96]

This is where the infrastructural turn becomes important. The issue is no longer only whether infrastructure can be constructed, but who designs, finance,s governs, adapts and maintains it. PAPSS, PIDA, AXIS and the AUDA-NEPAD show different forms of African institutional coordination and agency, but they also leave questions about technological control, financing and the capacity to shape the underlying systems. These questions matter for the RtD because infrastructure cannot be separated from development.[97] Therefore, systems through which development is organised affect who participates, whose interests are represented, who makes decisions and who benefits. This is why infrastructure development cannot be treated as normatively neutral.

The infrastructural turn builds upon the normative foundation of the RtD by integrating the RtD into physical and institutional systems through which development is facilitated and realised. Therefore, as the PAPSS, PIDA, AXIS and AUDA-NEPAD initiatives above do not reference or recognise RtD as their normative foundation, they can be seen as contributing to operationalising some components of the RtD but will not in the end result in full realisation of the RtD. This is particularly important because it shows that these initiatives are founded primarily on development goals and objectives rather than on a rights-based approach.[98] This shift also risks overlooking a central dimension of the RtD, if the RtD is not kept visible throughout the regional development process. Development is not merely a goal or objective to be achieved; it is also a legal right enshrined and given a binding legal nature by article 22 of the African Charter.[99] This means that all development initiatives meant for African peoples should be founded on this right. This understanding should therefore be reflected in the planning, design and implementation of development initiatives, including infrastructure projects. Otherwise, there is a risk that development

96 Prebisch (n 34); Cardoso & Faletto (n 33).

97 J Loots 'Infrastructure for development: The use of human rights impact assessments in public-private partnerships' LLD thesis, University of Pretoria, 2020 45.

98 https://unsdg.un.org/2030-agenda/universal-values/human-rights-based-approach (accessed 20 September 2026).

99 African Charter art 22.

becomes reduced to questions of investments, economic growth, capital, trade, infrastructure, productivity and regional competitiveness, while the rights to participation and accountability that give development its normative meaning are pushed into the background. This also speaks to the co-constitutive component of the infrastructural turn that promotes ownership of the right to effectively realise it. Equally, the spirit of sovereignty and independence behind the roll-out of the initiatives is rooted in trade and investment rather than in rights, which also raises the question of whether they are sufficient to drive the kind of Africa envisioned by African peoples.

5.3 Lessons from comparative development experiences: East Asia and China

The previous part of this chapter examined the role of infrastructure in relation to the institutional and productive capacity required to realise the RtD. In order to illustrate the above proposition, it may be beneficial to analyse the development trajectories of the East Asian states (China, South Korea and Taiwan) against those of Africa. This does not mean that the East Asian model should be applied to Africa; rather, it will provide an opportunity to explore how various governments have been able to convert their development goals into productive, technological and infrastructural capabilities. The chapter recognises the distinct historical, political, institutional, economic and cultural contexts within which these development trajectories emerged. Their relevance lies in the mechanisms through which they sought to overcome technological dependence and build domestic productive capacity. The East Asian experience is particularly relevant because these countries followed different development paths while nevertheless achieving substantial increases in productive and technological capacity. The literature on the East Asian experience emphasises the importance of institutions, state capacity, investment in infrastructure and human capital, technological learning and the development of domestic productive capabilities.[100]

100 J Page 'The East Asian miracle: Building a basis for growth' (1994) 31 *Finance & Development* 2.

5.3.1 China's infrastructure development

China is particularly relevant to this comparison given the depth and breadth of contemporary China-Africa relations. Beyond its extensive trade, investment and infrastructure engagement with African countries, China's engagement increasingly extends into knowledge production, education, training and skills transfer.[101] Benabdallah demonstrates that knowledge production and network building have become important dimensions of China-Africa relations, including through technical training, exchanges and other forms of educational engagement.[102] More recent research similarly points to university partnerships as contributing to the development of Sino-African epistemic communities and networks of knowledge producers.[103] China is therefore relevant to this analysis, not only as an important economic and infrastructure partner, but also as a source of development experience and knowledge gradually encountered within African institutional and educational spaces.

China's development experience illustrates how infrastructure, technological learning, productive capacity and state capability can become interconnected over the course of development. Examining this experience alongside African initiatives can therefore help to identify the institutional and productive foundations that may enable infrastructure to contribute to longer-term development transformation. The purpose is not to determine whether the Chinese experience should be followed, but to examine what insights it may offer for understanding the conditions under which infrastructure and technology can strengthen domestic capabilities and greater ownership of development.

China's transformation from a technology importer into a major technology producer was accompanied by sustained investment in physical infrastructure, digital infrastructure, research and development,

101 L Benabdallah *Shaping the future of power: Knowledge production and network-building in China-Africa relations* (2020) 1-10.

102 As above.

103 B Mulvey 'Tertiary education in China's engagement with Africa: Building epistemic communities?' (2025) *Globalisation, Societies and Education* 1; J Eisenman 'China's relational power in Africa: Beijing's "new type of party-to-party relations"' (2023) 44 *Third World Quarterly* 2441-2461; J Eisenman 'Locating Africa in China's community of shared future for mankind: A relational approach' (2023) 35 *Journal of International Development* 65-78; I Taylor 'Sino-African relations and the problem of human rights' (2008) 107 *African Affairs* 63-87.

education and industrial capabilities.[104] The principle of *zìlì gēngshēng*, or self-reliance, became an important component of its technology strategy. Technology was consequently treated not merely as a product to be purchased, but as a capability to be acquired, learned from, adapted and progressively developed domestically.[105] The state's ability to condition foreign firms' access to a very large domestic market on joint ventures and technology sharing is often identified as a further element, and it is a lever that few African states could exercise individually, which makes the scale of the AfCFTA market relevant.[106]

For the purposes of this chapter, the significance of the Chinese experience lies in this movement from technology acquisition towards technological capability. The relevant question is not simply whether African states acquire foreign technologies, but whether African firms, institutions and governments develop the capacity to understand, adapt, govern and eventually shape the technologies on which their development depends. The comparison therefore helps to clarify what the infrastructural turn means in practice. Infrastructure and technology become not only resources for development, but potential sites for building longer-term African capability. At the same time, the Chinese experience raises an important normative question for the RtD. Building technological and infrastructural capability should not require treating rights as secondary to development.[107]

The objective of an African infrastructural turn is therefore not to reproduce the Chinese model, but to consider how capability formation can take place within a rights-based conception of development. The African RtD in accordance with the African Charter[108] recognises participation, accountability and other normative elements of

104 Ministry of Foreign Affairs of the People's Republic of China 'China's progress report on implementation of the 2030 Agenda for Sustainable Development' (2017); E Pankaj 'Institutionalisation of self-reliance in China's tech strategy: Zìlì Gēngshēng reimagined', https://orcasia.org/article/1654/institutionalisation-of-self-reliance-in-chinas-tech-strategy (accessed 18 July 2026).

105 B Naughton *The Chinese economy: Adaptation and growth* (2018) 7; K Lee *Schumpeterian analysis of economic catch-up: Knowledge, path-creation, and the middle-income trap* (2013) 2-8.

106 T Hout & P Ghemawat 'China vs the world: Whose technology is it?' (2010) 88 *Harvard Business Review* 94.

107 L Benabdallah *Shaping the future of power: Knowledge production and network-building in China-Africa relations* (2020) 45.

108 African Charter art 22.

development, and for this reason development is not seen solely as an economic goal, but as a legal right. This position is supported by the jurisprudence of African human rights institutions, as it clearly illustrates that no country can pursue its own development in disregard of the rights and interests of the people being affected.[109] It is on this foundation that the infrastructural turn identifies a disconnect between ongoing development initiatives and their commitment to the effective implementation of the RtD and sustainable development.

5.3.2 South Korea

The South Korean experience differs from the contemporary African context not simply because Korea received foreign capital and technology, but because these external resources were progressively embedded within a domestic process of capability building. During its industrialisation from the 1960s to the 1990s, South Korea also faced significant resource constraints and remained dependent on foreign technology and capital.[110] Its development strategy nevertheless sought to ensure that these external resources contributed to domestic industrial learning rather than becoming substitutes for it. South Korea did not simply reject foreign direct investment or foreign technology. Rather, the state exercised considerable control over the terms on which foreign capital and technology entered the economy.[111] Amsden's account of Korean industrialisation illustrates the importance of state intervention in directing investment and disciplining firms.[112] Licensing arrangements, reverse engineering, investment in education and research and state-directed finance enabled Korean firms to absorb technologies and progressively develop their own technological capabilities.[113] State-supported credit also encouraged investment in productive sectors and enabled domestic firms to move from imitation towards technological

109 *Centre for Minority Rights Development & Others v Kenya* (2009) AHRLR 75 (ACHPR 2009) (*Endorois*).
110 JH Wang 'From technological catch-up to innovation-based economic growth: South Korea and Taiwan compared' (2007) 43 *Journal of Development Studies* 1084.
111 R Wade *Governing the market: Economic theory and the role of government in East Asian industrialization* (2003) 1-20.
112 AH *Amsden Asia's next giant: South Korea and late industrialisation* (1989) 1-10.
113 Wang (n 110) 1084.

innovation.[114] Government-funded research institutes, notably the Korea Institute of Science and Technology established in 1966, complemented firm-level learning by absorbing and adapting foreign technology for domestic industry.[115] The South Korean strategy did not require the state to own every productive enterprise. Instead, the state sought to influence the conditions under which firms acquired technology, finance and market access, while domestic firms developed the capabilities to use and improve those resources.

5.3.3 Taiwanese public research institutions as intermediaries of technological learning

Taiwan followed another route, placing greater emphasis on public research institutions and networks linking government, research organisations, universities and private firms. The establishment of the Industrial Technology Research Institute (ITRI) in 1973 was particularly significant.[116] ITRI provided an institutional mechanism through which foreign technologies could be acquired, adapted and transferred to domestic firms. Its programme in the 1970s to acquire and adapt integrated-circuit technology from a United States firm, and the later spin-off of firms from its laboratories, are frequently cited examples of the mechanism.[117] Research institutions helped translate imported technologies into domestic knowledge and productive capability. The relevant achievement was not simply ownership of a physical facility. It was the creation of institutional capacity to understand, adapt and further develop technologies acquired from elsewhere.

5.4 What the comparison shows and why trajectories differed

The East Asian experiences should not be treated as templates for African development. South Korea and Taiwan industrialised during the Cold War with security guarantees, aid and market access from the United States, after land reform and, in both cases, under the administrative

114 Kim (n 57) 45.
115 Wang (n 110).
116 D Breznitz *Innovation and the state political choice and strategies for growth in Israel, Taiwan, and Ireland* (2007).
117 JA Mathews & DS Cho *Tiger technology: The creation of a semiconductor industry in East Asia* (2000) 5.

legacy of Japanese colonial rule; China's scale, centralised authority and later access to global markets were different again.[118] There was also no East Asian equivalent of the AU. No continental body coordinated their strategies or set common digital and infrastructure objectives for them, so the comparison is between national developmental states and a regional organisation that works through, and depends on, its members.

This bears on the question of whether these states have built capability within a regional framework or without one. In the main, they did so without one. Their learning institutions, industrial policies and technology strategies were national, though they operated within regional production networks in which Japan and later other economies played a central part.[119] The African position differs. Small and fragmented national markets, and dependence on neighbouring states for transit and connectivity, are problems that regional frameworks can address and that the East Asian economies faced differently. What a regional framework cannot supply is the national institutions of learning through which capability forms. The two levels are complementary, not substitutes.

The three East Asian cases raise a question that the theories introduced in part 3 should be able to answer: Why did some late-industrialising economies build technological capability while many African economies, subject to comparable external constraints, did not? No single body of thought answers it.

South Korea and Taiwan built bureaucracies able to discipline firms, coordinate investment and connect public research with production, what Evans calls embedded autonomy: state institutions tied to industrial actors without being captured by them.[120] Where such institutions are weak, or where policy is set largely by external creditors and donors, the adoption of a policy need not become its implementation. This is not a claim that African states lack capacity by nature. Mkandawire's discussion

118 A Kohli *State-directed development: Political power and industrialization in the global periphery* (2004); M Woo-Cumings (ed) *The developmental state* (1999) 3-10.

119 S Lall 'Promoting technology development: The role of technology transfer and indigenous effort' (1993) 14 *Third World Quarterly* 95.

120 P Evans *Embedded autonomy: States and industrial transformation* (1995) 1-5.

of developmental states in Africa is a necessary counterweight to accounts that attribute African outcomes simply to weak institutions.[121]

The late industrialisers of the 1960s and 1970s could use tariffs, subsidies, technology-licensing conditions and local-content requirements to steer foreign technology towards domestic learning, and trade and investment rules have since narrowed some of that room.[122] Dependency theory explains the constraint better than it explains the exceptions, which is one reason that restatements of the tradition resist reading it as deterministic. The relevant question for Africa, therefore, is not whether foreign capital or technology is present, but whether African institutions have sufficient capacity to shape the conditions under which those resources enter, are used and generate further domestic capabilities.

Lall's and Kim's accounts suggest that what distinguished the East Asian economies was less the fact of importing technology than what followed it: deliberate investment in skills, engineering effort, research institutions and firm-level learning.[123] Decolonial theory does not explain differences in outcomes and does not claim to. The East Asian experience is often read through models developed to explain it, such as the developmental state, and lessons drawn from it risk becoming another imported template. That is why the chapter extracts mechanisms, and states the different conditions under which they operated, rather than recommending models. African conditions differ in ways that matter for the comparison. Many economies are small, borders inherited from colonial rule fragment markets, and colonial-era infrastructure was oriented towards extraction rather than integration. The chapter does not claim that African states have built no technological capability, but that the record is uneven.[124]

Co-constitutive ownership exists where African states, firms, research institutions and other relevant actors are not merely users of infrastructure and technology, but participants in the processes through which technologies are selected, adapted, improved, governed and eventually replaced. The East Asian experience suggests that the long-

121 T Mkandawire 'Thinking about developmental states in Africa' (2001) 25 *Cambridge Journal of Economics* 289.
122 HJ Chang *Kicking away the ladder: Development strategy in historical perspective* (2002) 2-6.
123 Kim (n 57).
124 Lall (n 54).

term developmental significance of such infrastructure will depend on whether it is connected to institutions capable of producing technological learning and domestic productive capacity. The question consequently is no longer simply whether Africa is building infrastructure. It is whether the infrastructures being built are generating the institutional, technological and productive capabilities required for Africans to shape their own development.

6 Legal implications for the right to development

As explained under part 5.1, the instruments discussed in this chapter differ in legal force, and the difference matters for what can be expected of them. The AfCFTA Agreement entered into force in 2019. Its Phase II protocols on intellectual property, digital trade and investment have been negotiated and adopted by the AU but are not yet in force, and each requires ratification by the number of states its own terms specify.[125]

6.1 The AfCFTA and its Phase II Protocols

The African Continental Free Trade Area (AfCFTA)[126] is the largest regional economic framework in Africa and the most significant legal vehicle through which development objectives associated with the RtD can be pursued in the digital economy.[127] However, the AfCFTA can only fulfil its potential if its legal architecture addresses the structural barriers that have historically hindered Africa's development.[128] Three of its protocols are especially important for addressing these barriers.

125 G Erasmus 'How will Phase II of the AfCFTA be negotiated, ratified and implemented?' Tralac (web blog) 27 March 2020, https://www.tralac.org/blog/article/14463-how-will-phase-ii-of-the-afcfta-be-negotiated-ratified-and-implemented.html (accessed 23 September 2026).

126 European Centre for Development Policy Management 'A call for a developmental regionalism approach to the African Continental Free Trade Area (AfCFTA)', https://ecdpm.org/great-insights/african-continental-free-trade-area-agreement-impact/developmental-regionalism-afcfta, (accessed 18 July 2026).

127 https://au.int/en/african-continental-free-trade-area (accessed 25 September 2026).

128 JN Wanki & CC Ngang 'Unsettling colonial paradigms: Right to development governance as framework model for African constitutionalism' (2019) 18 *African Studies Quarterly* 71.

First, the AfCFTA Protocol on Intellectual Property Rights takes a different starting point from the TRIPS Agreement.[129] It is described as giving weight to development needs, public health and local innovation, and as making use of the flexibilities available under international law for parallel importation, compulsory licensing and the adaptation of technology.

Second, the AfCFTA Protocol on Digital Trade[130] is a framework for regional digital trade, adopted in February 2024. According to commentary on the Protocol, it emphasises the free flow of data, subject to public policy and national security exceptions, and does not impose data localisation, it also contains provisions on source code. Several annexes remain under negotiation, and commentators have questioned whether some of its provisions may constrain the technology transfer and localisation policies that could build domestic capability.[131] Its significance for infrastructural sovereignty is therefore ambivalent. Free flow of data supports the regional scale on which domestic firms and platforms could grow, while limits on localisation and source-code requirements may narrow the options open to states that want to build domestic capability.

Third, the AfCFTA Protocol on Investment[132] addresses the imbalances of international investment law, where bilateral investment treaties (BITs) historically stripped developing states of their regulatory power and elevated investor rights over human rights. According to commentary on the Protocol, non-discriminatory regulatory measures aimed at legitimate public policy objectives are excluded from claims of expropriation, national-treatment exceptions cover public interest, national development and support for disadvantaged groups, and chapter 5 sets out obligations for investors, including on human rights,

129 Protocol to the Agreement Establishing the African Continental Free Trade Area on Intellectual Property Rights art 2.

130 Protocol to the Agreement Establishing the African Continental Free Trade Area on Digital Trade, 2024, art 20.

131 S Kugler 'The AfCFTA Digital Protocol: A bird's eye view' International Institute of Sustainable Development (web blog) 30 October 2024, https://www.iisd.org/articles/policy-analysis/afcfta-digital-protocol (accessed 25 September 2026).

132 Protocol to the Agreement Establishing the African Continental Free Trade Ar ea on Investment (2023) arts 13, 20(2) & 47.

environmental protection and anti-corruption, with provision for civil liability in investors' home states.[133]

A further difficulty is that, while the protocols bear on key goals associated with the RtD, such as industrialisation, regional integration and sustainable development, they do so mainly through economic integration. The AfCFTA's legal framework also does not appear to make the RtD a general principle of interpretation. This creates a disconnect between Africa's regional human rights framework and its regional economic governance regime.

Read together, the three protocols indicate that the AfCFTA has the potential to advance infrastructural sovereignty and, in some areas, co-constitutive ownership. Because they are not yet in force, this is a claim about design and not yet about effect.

6.2 The digital and infrastructural transformation of development governance

The infrastructural turn replaces isolated, project-based interventions with integrated socio-technical systems called digital public infrastructure (DPI).[134] These core digital systems enable public and private services to function at scale.[135] The United Nations Development Programme (UNDP) describes DPI similarly as foundational digital systems that form the backbone of modern societies, enabling secure, seamless interactions among citizens, businesses and governments.[136] Some elements of DPI existed earlier, but the concept gained international consensus only after the G20 adopted a shared definition in 2023.[137] However, these

133 MSA Pirzada 'The AfCFTA Investment Protocol: A new age for regional investment and dispute resolution' (2025) *Harvard International Law Journal Online*, https://journals.law.harvard.edu/ilj/2025/04/the-afcfta-investment-protocol-a-new-age-for-regional-investment-and-dispute-resolution (accessed 25 September 2026).

134 J Fetter, K Rao & D Eaves *State of digital public infrastructure report: A look at measurement and prevalence as DPI transitions from experiment to scale* (2025) 11.

135 As above.

136 United Nations Development Programme 'Digital public infrastructure', https://www.undp.org/digital/digital-public-infrastructure (accessed 14 July 2026).

137 G20 Digital Economy Ministers Meeting Outcome Document and Chair Summary, https://g7g20-documents.org/database/document/2023-g20-india-sherpa-track-digital-economy-ministers-ministers-language-g20-digital-economy-ministers-meeting-outcome-document-and-chair-summary (accessed 14 July 2026).

gains remain inequitably distributed. The World Bank notes that digital technologies have spread rapidly, yet their digital dividends in growth, employment and public services remain uneven.[138] The report stresses that these benefits require solid analogue complements, including sound regulation, competitive markets and capable public institutions.[139]

The World Bank's World Development Report 2021 evaluated the developmental potential of data.[140] It classified data as a public good that users can reuse without depleting its supply. Proper data governance improves public services, strengthens accountability and empowers citizens. However, the report warned that the data economy creates power imbalances, exploitation and privacy breaches. Managing these risks requires an integrated national data system (INDS) that balances data utility with guarantees for trust, security, and human rights.[141]

These analyses find practical application in digital public infrastructure. DPI provides shared, interoperable digital systems deployed across society to support innovation and service delivery for public and private sectors.[142] DPI relies on three main pillars: digital identity systems; interoperable payment networks; and data exchange protocols.[143]

Therefore, under the infrastructural turn, deploying DPI will become a primary driver of development justice.[144] Building these foundational digital rails allows developing countries to bypass the costly, fragmented, proprietary systems of global technology firms. It also enables local agencies and enterprises to build their own digital solutions. This is where co-constitutive ownership becomes decisive. States that build and govern their own DPI are participating as co-architects in shaping the digital rails on which their societies will depend, not merely adopting technology.

138 World Bank 'World development report 2016: Digital dividends' (2016).
139 World Bank (n 138) 4-10.
140 World Bank 'World development report 2021: Data for better lives' (2021).
141 World Bank (n 138) 22-30.
142 G20 Digital Economy Ministers Meeting Outcome Document and Chair Summary (n 137) 6.
143 Fetter and others (n 134).
144 A Gurumurthy & N Chami 'Development justice in the digital paradigm: Agenda 2030 and beyond' (2019) 62 *Development, Palgrave Macmillan; Society for International Deveopment* 19-28.

The digital economy also introduces serious risks of subordination and inequality. The United Nations Conference on Trade and Development (UNCTAD)'s recent Digital Economy Reports warn of growing consolidation in global digital value chains, a sector now highly concentrated. A few super platforms, based mainly in the United States and China, control global digital infrastructure, search, cloud computing and artificial intelligence (AI). These include Alphabet, Meta, Amazon, Microsoft, Alibaba and Tencent.[145]

These platforms extract raw data from the Global South without providing fair local compensation. A prominent example is the rise of data sweat shops in targeted countries such as Kenya, Ghana and Nigeria.[146] Northern actors process this data to train proprietary algorithms and AI systems, then rent those technologies back to southern states through software subscriptions. UNCTAD warns that this dynamic creates structural dependency. This form of digital colonialism prevents developing nations from building local digital capacity and capturing high-value segments of the digital supply chain.[147]

The AU created regional frameworks to counter these dependencies and assert Africa's digital sovereignty. The Malabo Convention, adopted in 2014, provides a binding regional legal framework for cybersecurity, electronic transactions and personal data protection, complementing the AU's broader digital transformation and data governance strategies.[148]

The AU's Digital Transformation Strategy for Africa (2020-2030) offers a blueprint for a unified African digital market.[149] The Strategy connects digital transformation to Agenda 2063 by using digital technology to drive economic integration, reduce poverty and advance sustainable development. It prioritises regional digital public infrastructure, unified telecommunications rules, affordable broadband, domestic digital skills, and local research and development (R&D).

145 UNCTAD (n 60).

146 M Du & CT Okolo 'Reimagining the future of data and AI labor in the Global South' Brookings (web blog) 7 October 2025, https://www.brookings.edu/articles/reimagining-the-future-of-data-and-ai-labor-in-the-global-south/ (accessed 25 September 2026).

147 UNCTAD (n 60) 35-42.

148 African Union Convention on Cyber Security and Personal Data Protection (2014).

149 African Union 'The Digital Transformation Strategy for Africa (2020-2030)' (2020).

The strategy is complemented by the AU's Data Policy Framework (2022) which provides a regional plan for data governance.[150] It rejects both the commercial, lightly regulated US model and the state-controlled, surveillance-heavy Chinese model. Instead, it prioritises 'data sovereignty, equity, and human-centred development' above corporate or state monopolies.[151]

6.2.1 Reassessing the AU's digitisation and infrastructure strategies and policies

Evaluating the AU's digitisation and infrastructure strategies shows how the continent is responding to the new 'infrastructural turn'. This evaluation also reveals if its projects advance infrastructural sovereignty and co-constitutive ownership to help realise the right to development. The question is whether this infrastructure is governed and owned in a way that makes African states co-architects of their digital future, rather than mere recipients of systems designed elsewhere.

The AU has created connected frameworks that support an infrastructural approach. Agenda 2063 links continental integration with human development and economic transformation.[152] The Malabo Convention provides a regional legal basis for cybersecurity, electronic transactions, and protecting personal data.[153] The Digital Transformation Strategy for Africa 2020-2030 aims for a secure digital single market, supported by infrastructure, skills, innovation and harmonised rules.[154] The AU Data Policy Framework adds principles to create value, protect rights, set common standards and coordinate Africa's role in global data governance.[155] These strategies are more than blueprints. They are being

150 African Union 'AU Data Policy Framework' (2022).
151 African Union (n 96) sec 2.1.
152 African Union (n 14) paras 67-72.
153 African Union Convention on Cyber Security and Personal Data Protection (2014) arts 8-13 & 24-31.
154 African Union (n 95).
155 African Union (n 96).

put into practice through three key projects. These are the PAPSS,[156] the ICT terrestrial fibre-optic networks under PIDA[157] and AXIS.[158]

6.3 From recognition to operational content

The first gap exists within the framework of the AfCFTA. While the AfCFTA aims to foster inclusive and sustainable economic integration, it does not explicitly acknowledge the RtD as a substantive or enforceable right. As such, there is a disconnect between trade liberalisation and human-centred development. The second is evident at the national level. The RtD has been inconsistently adopted into African domestic legal systems. This is especially problematic considering Africa's long-standing role in the development of the RtD. This inconsistency of domestic adoption also represents a gap between Africa's historical role in defining this right and its current legal ownership and application. Furthermore, the existing realities on the ground are constantly proving that even for states such as Malawi, Ethiopia and Uganda, which have expressly recognised the RtD in their constitutions, legal recognition does not necessarily translate into effective operationalisation[159]

Constitutional provisions may establish the right and a corresponding state duty without specifying how it should shape development planning, participation, distribution, accountability or access to remedies. Thus, the gap lies in both legal recognition and the availability of domestic mechanisms able to meaningfully influence development decisions and hold the state accountable.[160] In the *Endorois* case, the African Commission on Human and Peoples' Rights (African Commission) found that Kenya's failure to ensure the effective participation of the Endorois community in the process affecting its land, and to secure a share of the resulting benefits, violated the right to development in

156 Pan-African Payment and Settlement System, https://papss.com/ (accessed 14 July 2026).
157 African Union 'Program infrastructure development for Africa (PIDA)' (2026), https://au.int/en/ie/pida (accessed 14 July 2026).
158 African Union 'The African Internet Exchange System (AXIS) Project' (2017), https://au.int/sites/default/files/documents/32509-doc-axis-brochure_pida_-january_2017.pdf (accessed 14 July 2026).
159 Constitution of the Republic of Malawi, 1997 sec 30; Constitution of the Federal Democratic Republic of Ethiopia, 1995 art 43; Constitution of the Republic of Uganda, 1995 Preamble para IX.
160 Mekonnen (n 32) 10.

article 22 of the African Charter.[161] The Declaration itself points in the same direction, referring to active, free and meaningful participation in development and the fair distribution of its benefits, and to popular participation.[162] The RtD acquires that content in infrastructure governance only when it is translated into planning and procurement rules, participation requirements, benefit distribution and monitoring mechanisms, and avenues of remedy.[163]

7 Conclusion

The chapter has shown that the infrastructural turn supports the RtD by connecting infrastructure to capability, agency and participation. Infrastructural sovereignty concerns the capacity to shape and govern critical systems, while co-constitutive ownership ensures that African actors have meaningful influence within them. The challenge for the next 40 years is therefore not only to build infrastructure, but to ensure that it strengthens African capacity to shape and benefit from development. The chapter's argument leads to the recommendations, addressed to the AU, the regional economic communities and African governments below.

1. States should focus on building technological and innovation capability. Technology arrangements should promote skills development, adaptation, maintenance and knowledge retention, while public procurement, domestic funding and interoperability standards should support African innovation and enable local technologies to scale.
2. Digital sovereignty should be linked to capacity. Requirements for local processing of critical public sector data should reflect the category of data and available domestic technical capacity. Data localisation alone should not be treated as infrastructural sovereignty.
3. Where national law recognises the RtD, including in Malawi, Ethiopia and Uganda, that recognition should inform infrastructure planning, procurement, participation, benefit sharing, accountability

161 *Endorois* (n 109).
162 UN General Assembly Declaration on the Right to Development, Resolution 41/128 (4 December 1986) arts 2(3), 4(2) & 8(2).
163 AUDA- NEPAD (n 92).

and remedies. Where it is not recognised, legal recognition may provide a foundation for implementation.

4. Sovereignty should be measured through capability and participation. Infrastructural sovereignty should be assessed by African participation in design and decision making, local technical and maintenance capacity, technological adaptation, research and development, data governance and the ability to sustain critical infrastructure. These measures should also strengthen co-constitutive ownership through meaningful participation and decision making.

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