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Africa's Railway Renaissance: Continental Aspirations versus National Realities

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Abstract: As per the African Union's 2016 prescription, most new rail projects in Africa are greenfield standard gauge railways (SGR) that cost billions of dollars, which, if successfully implemented and well run, can offer better services than road transport. However, to be viable, SGR investments must have adequate freight traffic, provide reliable services, and charge much lower tariffs than the trucking industry. This means that SGRs will very likely have to be subsidized, which most African governments cannot afford to do. Based on the rail economics for SGRs, this article argues that it would be more feasible for most African countries to invest in upgrading and expanding brownfield rail infrastructure in the short-to-medium term. Using Kenya's Nairobi-Naivasha SGR as a case study, this article contextualizes and critically analyzes the greenfield vs. brownfield rail infrastructure debate that underpins Africa's railway renaissance and demonstrates that SGR investments may not necessarily be the most feasible rail projects for developing African economies.

Keywords: Africa's Railway Renaissance, Railways, Kenya

Introduction

Since the early 2000s, countries, regional economic communities (RECs), and the African Union have been planning and implementing projects to improve Africa's rail network. As a result, ambitious new rail infrastructure projects have popped up across the continent over the last decade, heralding Africa's railway renaissance. According to Vera Songwe, the former Executive Secretary of the United Nations Economic Commission of Africa (UNECA), "rail will be the future land transport mode of choice for Africa," especially with the operationalization of the African Continental Free Trade Area (AfCFTA) and the need to move large volumes of goods and bulk commodities.[1]

However, with railway projects requiring massive financing, African governments face a serious conundrum. Do they develop expensive, risky greenfield standard gauge railways (SGR)—per the African Union's [AU] 2016 White Paper on Transport Policy Framework—or

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upgrade, modernize, and expand existing brownfield rail infrastructure that would be a cheaper, more affordable, and less risky investment? The article uses Kenya's Mombasa-Naivasha SGR as a case study to contextualize and critically analyze the greenfield vs. brownfield rail infrastructure debate that underpins Africa's railway renaissance. It argues that based on the rail economics for SGR projects to be viable, greenfield SGR investments may not be the most feasible railway investment for developing African economies, especially those under debt stress. Though plans to build the Kenyan SGR predate the AU's 2016 rail prescriptions, this case remains relevant. It aptly showcases that greenfield SGR projects may not be the most suitable investments for developing African countries, especially if the rail economics for their success is not thoroughly considered.

The first part of the article outlines Africa's rail sector and the need for rail development in the region. In doing so, it assesses the economic viability of Africa's railway renaissance. Specifically, it outlines whether African countries should pursue greenfield SGR investments or brownfield projects. Using Kenya's less than a decade-old Mombasa-Naivasha SGR as a case study, the second section of the paper contextualizes the greenfield vs brownfield rail infrastructure debate. Moreover, it showcases that if rail economics is not seriously considered, and adequate due diligence is not undertaken, SGR investments could turn out to be a costly mistake and a debt burden. Lastly, the third part concludes with a recommendation that investments in greenfield SGR infrastructure should not be viewed as a panacea for African railway development. Instead, and most importantly, it is the responsibility of African governments to be selective, prudent, and thorough in their due diligence when deliberating on rail infrastructure investments.

Africa's Rail Sector

Rail transport, especially the establishment of regional rail networks and trans-African lines, is critical in realizing Africa's integration aspirations. However, the spatial density of the rail network in Africa is low.[2] Additionally, outside of South Africa, very few lines are electrified, and, generally, railways operate below capacity and function as a collection of national systems rather than an integrated regional rail network.[3] Railways will play an increasingly important role in transporting freight and passengers on the continent as rail transport is more cost-effective and environmentally friendly.[4] Yet, existing railway infrastructure is in poor condition and this undermines the potential of rail systems to play a meaningful role in economic development. Two primary reasons are attributable to the current state of Africa's railways: a lack of investment and the absence of an effective institutional framework.

Railways are central to connecting ports to large industrial zones or logistics hubs and, as such, are critical to supporting national economic growth and intra-regional trade and development.[5] Since the early 2000s, various plans and projects to improve Africa's rail network have been devised. African countries, regional economic communities (RECs), and the AU have drafted rail schemes and designs that herald the revival of Africa's rail sector. Recognizing the importance of railways in achieving the continent's structural transformation, Africa's ambition for improved rail infrastructure has attracted the attention of several foreign companies—most notably from China—which has grown to be very active in the region's rail sector.[6] As a result,

the African rail industry is attracting levels of unmatched investment since its sparse and basic network was laid by European colonial powers.

With only a few developments over the past two decades, Africa's railway network (apart from South Africa and some parts of North Africa) remains largely reminiscent of its colonial past. European colonizers developed most African railway systems in the late 19th and early 20th centuries: "Historically, railways can be considered the single most crucial infrastructure for the systematic exploitation of Africa and its population by external powers."[7] Colonizers built rail lines to transport labor and export goods (obtained from mining and agricultural operations) to colonial metropoles and transfer military personnel to expand and take over new territories. Infrastructure was solely constructed to satisfy colonial needs; not much consideration was given to cross-border linkages. Any efforts to link up inter-colony lines were driven by strategic reasoning that "served the consolidation and expansion of colonial economies" instead of providing socio-economic development for the colonized.[8]

After obtaining independence, railway networks were dismantled to reflect new borders, thus effectively reducing the market size and potential economies of scale in African states.[9] African governments were left with this "clear geographical distribution" of railway infrastructure, "which has privileged connectivity between inland sites of production and seaports—to cater for extractivist and dependent (neo-)colonial economies—at the expense of regional/continental integration of African transport systems."[10] And, by virtue of its nature as a colonial heirloom, African railway networks consist of different gauges, technical standards, and specifications—all of which have proven to be obstacles to developing interconnected and interoperable railway systems.[11]

With independence, the "economic liberalisation of African economies in general, and the transport sector in particular, had a devastating impact on Africa's railways."[12] Governments shifted away from subsidizing railways to adopting cost-based tariff systems, essentially "doing away with the railways traditional 'public service' obligations."[13] Moreover, in development discourse and practice, Zajontz et al. point out that "railways as the archetype of large-scale, centrally managed and state-funded transport infrastructure were increasingly considered a thing of the past with the emergence of neoliberal policies in the development realm."[14] Most development loans in the transport sector were channelled towards road construction. Western donors mostly favoured road projects because they were perceived to "[represent] the freedom of the market."[15] The competition from a booming road sector became an additional challenge to the rail sector. Due to the zero-sum nature of budgetary expenditure, African governments prioritized investment in road infrastructure, neglecting railways.

When Western donors began decreasing developmental loans for large infrastructure projects in the 1970s, railways' competitiveness further fell, becoming subject to "a steady process of attrition."[16] As a result, by the late 1980s and 1990s, railway efficiency had declined, profitability was substantially reduced, service standards dropped, and customers opted for road transport.[17] Railways were reduced to primarily transporting bulk minerals, agricultural freight, and semi-bulk freight such as fuel.[18] Given a decrease in revenues, the maintenance and replacement of deteriorating track and rolling stock were neglected.[19]

As a result of the neglect of the rail sector, structural buildings and tracks are often over a century old.[20] In addition, various conflicts and periods of violent civil unrest have damaged

some railways to the point of rendering the lines inoperable. The AU estimates that the railway sector may require more than US$100 billion in investments to improve existing infrastructure and construct new lines.[21]

There is considerable potential for rail development in Africa as the region is "experiencing important economic, social, and institutional developments that are creating a framework in which railways may once again play a major role within the transport system."[22] Over the last decade, several new railway developments have popped up across the continent, including Kenya's Mombasa-Nairobi SGR, which opened in 2017; Africa's first high-speed railway in Morocco made its debut in 2018; the Ethiopia-Djibouti SGR began commercial operations in the same year; and, in 2021, Nigeria's Lagos-Ibadan SGR was inaugurated. Several more railway developments worth billions of dollars are being undertaken in Egypt, Senegal, Tanzania, Ghana, Angola, and the DRC, to name a few.

The main motivations for railway development in the region are: the need for better-integrated logistics (to build regional value chains in various sectors); a renewed demand for transportation and better infrastructure in light of Africa's economic and population growth, especially in cities; new developments in the hydrocarbon and mining sectors in East and West Africa, which require infrastructure capable of transporting mined resources in bulk quantities; and the pressing need to provide landlocked countries with reliable and efficient connectivity infrastructure to seaports.[23]

However, a gargantuan financing effort is required to develop quality rail infrastructure across the continent. Furthermore, better regulation—coupled with higher expertise—is essential for developing railways and sustaining their operability. Simultaneously, it is equally important for African states to develop their own railway standards. Given that Africa has its own unique geography, economic dynamics, and development levels that differ from region to region, borrowed railway standards and technology from abroad may not suit the African context. Hence, Africa must develop its own specific railway standards at a continental or regional level that "are applicable and specific to the needs of the regional circumstances of the railway network."[24]

The Economic Viability of Africa's Rail Renaissance

It is imperative to ensure a new railway project's economic sustainability from the construction phase through to the operation phase.[25] "The economics of railway operations are mainly characterised by the need to cover large fixed costs and achieve traffic volumes."[26] The capital cost of new rail infrastructure is high. For example, the construction of a single-track non-electrified railway costs approximately US$1.5 million per kilometer on relatively flat terrain and, an estimated additional US$5 million across more rugged landscapes.[27] Hence, a railway project's financial feasibility primarily lies in the challenge of covering massive infrastructure costs and achieving the necessary traffic density to ensure profitability. Africa's private sector is reluctant to get involved in developing railways on the continent because "the initial investment is very high, and [private enterprises] would have to charge exorbitant fares for the route to recover their investment, make a profit, and cover operational and maintenance costs – it is just too risky."[28]

However, private sector participation is necessary to ease the financial burden on African governments. Innovative mechanisms, such as the Luxembourg Rail Protocol (2007, yet to be enforced) could be the solution to reeling in private sector involvement—specifically in providing and managing rolling stock.[29] Ultimately, "the Protocol will create an economic dynamic towards more standardised rail equipment, and this, together with the global Unique Rail Vehicle Identification System (URVIS), will make it easier for rolling stock to move across national borders and also facilitate the much-needed regulation of cross border operability."[30] With the protocol making provision for tracking measures to identify all rolling stock, it will reduce creditor and operator risk and "unlock a greater pool of capital finance available for investment which will lower the barriers to entry for smaller operators and ultimately result in a more competitive and dynamic African rail industry."[31]

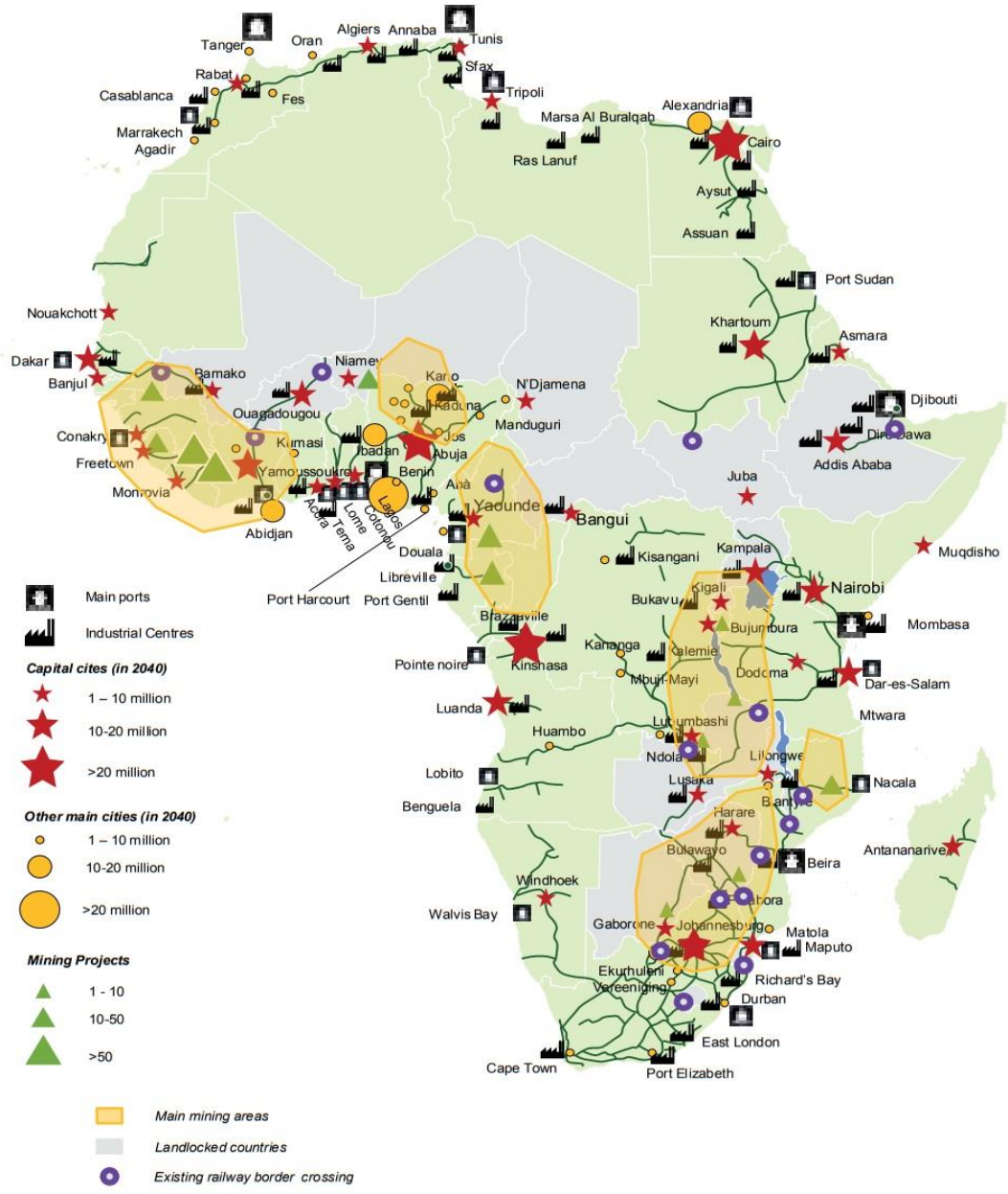
In addition to most African states having a limited capacity to fund infrastructure expenses, rail traffic densities on the continent are much lower than in other regions of the world. As of 2013, Africa only accounted for about 2% of the global volume of freight (as a measure of total ton/km) and passenger rail traffic, whilst Sub-Saharan Africa operated only 11.6% of the freight volume and 1.7% of rail passengers within Africa.[32] This is a significant constraint for developing railways on the continent, as "high volumes and frequencies are the foundations of operational sustainability of any railway system."[33] Due to the low traffic density, the cost of operations for railway transport services in Africa is comparatively higher and, in many cases, not competitive.

Given the different railway gauges across Africa, new projects designed to standard gauge specifications will result in interoperability problems with existing networks. [34] Not only does the integration of new standard gauge lines with older lines have to be considered, but the interoperability of standard gauge lines built to different specifications based on European or Chinese standards can also potentially pose challenges. For example, connecting from a standard gauge to a meter gauge will require the extra handling of cargo (moving it from one gauge to the other), adding to the cost of operations.[35] In addition to standardizing gauges for future development, there seems to be a pressing need to set up common regulations and interoperability systems at a regional or continental level. This is necessary for ensuring that rolling stock can move as smoothly as possible from one country to another.[36]

In most cases, the competition between road and rail transport is not carefully considered, leading to insufficient and incorrect traffic forecasts.[37] The traffic structure of most railways on the continent is mainly dedicated to freight movements which, in theory, could become a profitable business if effectively and efficiently operated.[38] Yet, many new developments still prioritize passenger services for social and political reasons without proper consideration given to long-term costs and the implications of operating and subsidizing new lines.[39]

Another critical factor is investing in people and skills development. Both infrastructure and rolling stock need to be maintained and operated by a skilled and knowledgeable workforce.[40] With many African states lacking a substantive railway workforce, African governments should, in addition to developing rail infrastructure, focus on investing in local staff development.[41] Locals must be competent at all levels—engineering, management, and operations. However, this is a slow process that can take years to achieve.[42]

Figure 1: Main Areas Suitable for Railway Development in Africa as of 2015 According to the African Development Bank.



Source: African Development Bank (AfDB) (2015).

Another factor to consider is the competition facing rail from road transport, especially for freight railways, which dominate Africa's rail sector. Due to increased competition with the road sector, African freight railways are experiencing slow and sometimes negative growth. Moreover, several proposed new routes would compete with existing road and rail lines. Consequently, "the rates that could be charged by lines running parallel with roads would be

limited by the competing road freight rates…"[43] As a result, for freight rail investment to be commercially justifiable, traffic volumes need—as a bare minimum—to reach between 2-4 million tons per year.[44]

For several reasons, commercial passenger railway services are not popular in Africa and limited passenger services contribute to the favourability of road transport over railways. In rare cases, rail is faster than travelling by bus, especially where dirt roads are difficult to navigate during rainy seasons. Suburban commuter lines in Africa generally offer limited services outside of peak periods. Commuter train operations are usually limited to one or two peak hours and only travel a short distance. Some cities, such as Lagos, plan to introduce modern commuter lines. However, "the problem is that the financial basis for such projects is typically weak, as a consequence of governments trying to maintain low fares without paying any direct subsidy."[45] With road networks having improved along many corridors, buses and shared taxis compete with railways in both price and service frequency. Even though bus fares are about 30-50% higher than economy rail, buses are a more favorable form of transport because they are twice as fast as trains and run more frequently.[46] The cost of maintenance is another factor—it is cheaper to maintain a road than a railway line.

Continental Aspirations vs. National Realities

Despite all the constraints and difficulties in developing railways in Africa, there remains a keen interest in developing railway infrastructure on the continent. However, a conundrum faces Africa's rail revival: is it necessary to develop brand new rail lines (greenfield infrastructure) to standard gauge specifications, or should existing (mostly meter gauge) railway networks (brownfield infrastructure) and rolling stock be renovated, upgraded or replaced? The debate on the effectiveness of SGR railway vs. meter gauge lines has been "key among civil engineers on the one side and economists on the other."[47]

Greenfield developments are costlier and face a higher level of market risk due to uncertainty concerning future demand. On the other hand, brownfield infrastructure developments are more suitable when constructing a new railway line is too risky for investors or when massive upfront investments are not available—as is generally the case in developing regions like Africa. Upgrading or refurbishing outdated or old colonial railway lines may be the most suitable option for "connecting areas with untested railway market demand[s]."[48] Economies of scale play an important role in determining a project's viability regardless of whether a railway project involves greenfield or brownfield infrastructure. The larger the volume of freight and passengers served, the greater the likelihood of railways being successful commercially.[49] Since most lines in Africa carry low freight volumes, the partial rehabilitation of lines using cascaded materials would be justifiable and more cost-effective.[50]

Several new standard gauge greenfield developments are being undertaken across the continent in line with AU regulations. In efforts to achieve continent-wide gauge standardization, the 2016 AU White Paper on Transport Policy Framework stipulated that all new railway lines "should…be constructed to standard gauge" and upgraded railway lines "should move to standard gauge."[51] If this is not possible in the short-term, "measures should be taken to ensure that the trackbed can accommodate standard gauge in the future."[52] Although the AU did not explicitly state why it opted for standard gauge—the fact that it has a

better average speed, can carry more cargo, and that solutions can be purchased from a wider market—is likely to have influenced the organization's decision.[53] This is financially risky for African countries, as multiple African nations are debt stressed.

Understandably, African states aspiring to higher development levels want access to the premium technology needed to hasten or jumpstart their development. However, this "idea about industrialisation and modern technology is misguided," and standard gauge is often "erroneously equated" with "modern and effectively operated."[54] "This is unfortunate as modern and effective railways can be operated on many different gauges," and how a railway is governed and managed at an operational and financial level also has a bearing on its performance.[55]

Essentially, African states seeking to modernize their rail infrastructure have two choices: opt for the economically sound choice of updating and extending existing brownfield infrastructure or—from a strategic view of connecting the continent per the AU's development aspirations—construct expensive greenfield standard gauge railways.[56] Regardless of the option chosen, the trade-off will have implications and ramifications for a country's development and economy. Based on the various standard-gauge greenfield developments planned or already under construction across the continent, many African states (e.g. Ghana, Nigeria, Kenya, Ethiopia, and Tanzania) seem to favour the latter option.

Kenya's Mombasa-Nairobi SGR: A Costly Lesson in Rail Economics

In theory, developing a new railway line in Kenya seemed to be a good idea. The old-colonial meter gauge line (known as "The Lunatic Express") was in poor condition because of reduced funding after independence, inadequate maintenance, and a poorly planned privatization process that barely improved the railway.[57] As a result, most importers preferred to use trucks, resulting in annual rail freight dropping significantly. However, infrastructure constraints at the Port of Mombasa increased the cost of transporting goods via truck and worsened road congestion. The Kenyan government publicly seemed to reason that if they could build a new railway, the transport industry would become more competitive and offer better haulage prices for businesses, reducing road congestion around the port.[58] "The motive, however, for the investment in the SGR may, however, had more to do with the gouging available on the contracts rather than the gauge of the rails."[59]

Looking at the bigger regional picture, Kenya's development of a SGR that stretches to its border with Uganda is the first phase in the East African Community's (EAC) efforts to develop the region's Northern Corridor SGR network (which will link landlocked Rwanda, Burundi, and Uganda to the Port of Mombasa via rail). From a strategic point of view, this would position Mombasa as the gateway to East and Central Africa markets.[60]

However, Kenya's development of the SGR line was not economically sound. Given that it is a developing lower-middle-income economy, the US$ 4.7 billion SGR may not have been the most appropriate investment for Kenya's current development level.[61] Instead, the exorbitant amount of development finance could have been channelled into welfare sectors such as education and healthcare, which would have been much more beneficial for Kenya's socio-economic development.[62] Echoing this sentiment, there is a growing consensus that the new SGR was a mistake. David Ndii aptly outlines that the Mombasa-Nairobi line is a case of

"unpleasant arithmetic."[63] The primary selling point of the Mombasa-Nairobi SGR was that it would reduce truck traffic, be cheaper and faster, and be able to haul 22 million tons of freight annually.[64] However, various sceptics had reservations that the railway would be able to achieve this ambitious target.[65]

Bizarre Freight Capacity Calculations

With the new SGR having a locomotive capacity of 3000 tons, twenty trains a day would need to operate every eighty minutes to reach the 22 million ton target.[66] But, because the train also offers passenger services, the operational time is reduced to a train per hour.[67] As of 2018, imports dominated over 90% of the freight, but if the cargo were equally split between imports and exports, only half of the departures would be required.[68] However, with virtually all freight going one way (from Mombasa port to Nairobi), "a departure every hour both ways on a single track is a stretch."[69] Based on data for 2018, the operational capacity of the railway (considering rolling stock and the line's configuration) was twelve trains a day—four passenger and eight freight trains.[70] This results in only 8.7 million tons annually, falling short of the 22 million ton target.[71] Given the grossly overestimated freight capacity, there are concerns about whether the SGR should be extended to Uganda. The volume of transit cargo entering Mombasa Port was nearly eight million tons in 2018, just about the same capacity as the SGR was transporting.[72] Therefore, the operational capacity could not serve both domestic and transit cargo.

Because of the increased competition between the trucking and railway industries, "the question of how the railway will generate an adequate profit [is] the big elephant in the room."[73] As of 2019, the cost of trucking a container from Mombasa to Nairobi was approximately US$800, whilst ferrying it via railway cost about US$1,100.[74] It is more expensive to haul cargo via the new railway primarily because of extra charges incurred at the inland container depot (ICD) in Nairobi and that trucks have to be used to collect and transport goods to-and-from the depot.[75] Essentially, "the delays, storage charges and intervention by too many agencies have eroded the gains of a cheaper mode of transport."[76]

Cargo demand between Nairobi and Mombasa is predicted to increase to 11.94 million tons by 2025, with railways expected to carry 60% of the volume.[77] Yet, based on a 2013 World Bank study, these figures are not enough: for the SGR line to be profitable, it must transport between 20-25 million tons a year.[78] This would mean that the railway would need to haul all freight currently being trucked to Mombasa.[79] If Kenya were endowed with "large quantities of extractive commodities" that needed to be transported over a relatively short distance, it would have been a more viable justification for a greenfield railway, as it would have "a stable source of revenue."[80] Relying on importing and transporting cargo from (yet to be fully established) manufacturing zones is not financially sound.[81]

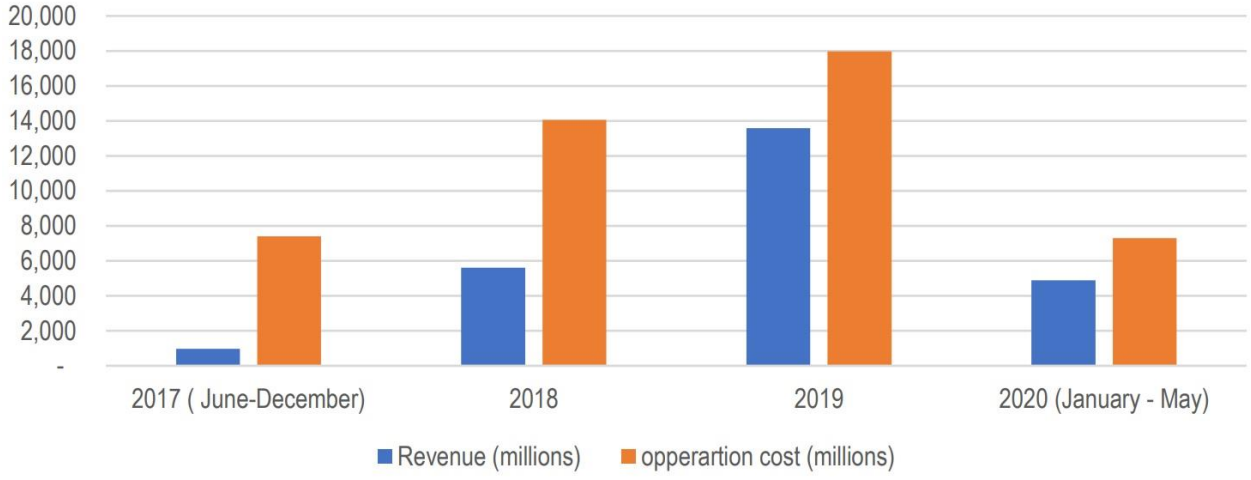
Even with the Mombasa-Nairobi SGR's extension to Naivasha (completed in 2019), there is an inadequate amount of traffic to make the line profitable.[82] The extension is unlikely to have enough passengers as it does not connect Nairobi to significant population centers—the line extends to "the middle of nowhere."[83] There are also concerns that the line will not haul much cargo. Bhandari argues that large volumes primarily derived from mined commodities haulage would have justified the extension and the short length of the Mombasa-Nairobi-Naivasha rail.[84] Even though surrounding agricultural produce and companies setting up at the Naivasha

special economic zone (SEZ) could use the rail to transport their cargo, "it still does [not] generate enough volume to justify the billions of dollars that were spent on a new railway."[85] Extending the line to Kampala in Uganda is needed to make the line more viable, but this would further increase costs, compounding Kenya's debt stress.[86] As of 2019, the country's public debt was approximated at US$ 60 billion, equivalent to 61% of its GDP.[87] The World Bank has advised Kenya against racking up more debt than it can repay and has stressed that the country needs to adopt debt management measures to ensure that its debt is not accelerating.[88]

A Commercially Viable Project?

The Mombasa-Nairobi SGR was promoted as a commercially viable project, meaning that profits (especially from the rail haulage of freight) would be used to repay the loans taken to build it.[89] However, railways are mainly considered a public good and service that governments usually subsidize. European, Japanese, and Chinese high-speed rail operators all have difficulty generating profits—it is "only with government support and soft budget constraints…[that] they cover huge operational losses and survive."[90] Since most African governments (including the Kenyan government) cannot afford to subsidize rail transport or channel significant funds into the rail industry, there are doubts about whether the Kenyan SGR will generate enough profit to cover its capital expenditure.[91] The railway is struggling to break even due to its relatively low freight volumes. The Mombasa-Nairobi line has failed to make a profit since opening to passengers in May 2017 and freight in January 2018. Kenya's Parliamentary Budget Office (PBO) report for the 2021/2022 financial year shows that the cost of maintaining and operating the SGR far outweighs the revenues generated in 2020 (see figure 2). The report states, "the [project's financial health] continues to be weak with accumulating pending bills often paid for through mid-year budgetary reviews, and project running costs relative to revenue."[92] This means that the project cannot sustain itself without assistance from the government.

Figure 2: Mombasa Nairobi SGR Revenue and Operation Cost in Kshs.millions



Source: Kenyan Parliamentary Budget Office (2021).

The contractor's—China Road and Bridge Corporation (CRBC)—feasibility study, which is somewhat confounding and questionable, states that the project has a "high profitability" and "financial accumulation ability."[93] However, there are no cash flow projections to justify these claims. Instead, the report showcases a "Net Present Value (NPV) of three different configurations of US$ 2.0, 2.4 and 2.6 billion as evidence of viability, leaving one at a loss to understand how this justifies borrowing US$3.2 billion for the project."[94] Furthermore, even the economic justification of attracting more cargo for the SGR from road haulage by charging cheap freight tariffs was not thoroughly calculated.[95]

According to the CRBC study, the SGR railway would make a profit with a freight rate of US$ 0.083 a ton per kilometre and a passenger rate of US$ 0.03.[96] Containers weigh between twenty and thirty tons; as such, the study's tariff at the time translated to between US$ 830-1,245 to freight containers from Mombasa to Nairobi.[97] Comparatively, it noted road haulage cost at US$ 0.10 to US$ 0.12.[98] Hence, the proposed SGR tariff would have been 20-45% cheaper than trucking.[99] However, these calculations are rather bizarre because, in 2012, railway freight revenue in Kenya was US$0.052 a ton per kilometer.[100] In effect, the CRBC study claimed that the SGR would make freight cheaper, but, in fact, its break-even tariff was higher than the railway tariff prevailing at the time.[101] Moreover, even the postulated tariff advantage over trucks is flawed. It covers freighting to the ICD and does not include the additional cost of transporting the containers from the ICD to various business locations.[102]

The CRBC study did also not take into consideration exchange rate movements. US$ 0.12 (KSh 10.15) was used in the 2012 study.[103] In 2022, Ksh 10.15 was equivalent to US$ 0.87, making the SGR railway an economic liability because as the Kenyan shilling depreciates, the SGR loses cost advantage. Most of the SGR's costs are in a foreign currency and even its approved tariffs are US dollar-denominated. On the other hand, trucking in Kenya has less foreign currency exposure, and this is indirect.[104] As of mid-2020, trucks were charging KSh 70,000-90,000 to transport a 40-foot container from Mombasa to Nairobi, which is about US$0.05-0.07 a ton per kilometer and significantly cheaper than CBRC's calculated break-even rate of US$ 0.083.[105]

Over time, currencies adjust to the inflation difference between a country and its trading partners, which, for the Kenya shilling translates to depreciating by five percent per year on average.[106] As of 2018, the Kenyan government relied on forceful measures to load cargo on the trains, even though it was charging a questionable discounted tariff.[107] It will be difficult for the Kenyan government to raise train tariffs when needed as the prices and operational efficiency of trucks in Kenya continue to improve.

With an operational capacity of 8.76 million tons, interest on the SGR's debt (approximately US$200 million), means that US$ 4.60 a ton per kilometer needs to be charged.[108] Add operational costs, and it becomes evident that no competitive tariff would enable the railway to service its debt. The new SGR railway will require the government to implement measures that force businesses to use the railway and issue a massive subsidy for the Mombasa-Nairobi rail line to stay in business.

With the Kenyan Railways Corporation (KRC) taking over 90% of operations from Afristar (a subsidiary of CRBC) as of March 2023, the Mombasa-Nairobi SGR's profitability will likely improve.[109] Since most of the SGR line's revenue was directed towards paying Afristar's expensive operational charges, with locals becoming increasingly in charge of operations and

railage increases, "the line could break even and become more profitable, generating revenues to cover its operational and maintenance costs, but its future revenue will not be enough to pay back the loans used to build it."[110] As such, it seems like public coffers will have to be used to repay loans.

The Debate: Brownfield Gauge vs. Greenfield Standard Gauge

Considering the rail economics of building SGR, it would have been more feasible to upgrade Kenya's old meter gauge than to build a new standard gauge line. It would have cost "approximately US$500,000 per km" compared to a range of "US$2.5-5.0 million per km needed to construct standard gauge on a new alignment."[111] The volumes that can be carried on a meter gauge are "exactly the same" as that of a standard gauge: "the only difference is speed, and speed is somewhat irrelevant for freight transportation."[112] If the existing meter gauge line were rehabilitated, it "could have transported 10 to 15 million tons per annum."[113] The A109 highway also runs parallel to the Mombasa-Nairobi SGR line. Thus, "on the premise that the Kenyan economy remains flat, the SGR will inevitably compete fiercely with the A109 highway and the MGR (meter gauge railway)."[114] Overall, it seems that the planning for the project was "done in a manner that was entirely inconsistent with [a market dominated by trucking]."[115]

With rail traffic in the East African Community (EAC) estimated to range between 13-21 million tons by 2030, the EAC Railway Master Plan Study notes that with the necessary investment, the existing meter gauge railway lines can be upgraded and expanded to handle projected rail traffic increases for the next ten to twenty years.[116] Conversion to a standard gauge would provide some direct benefits—such as increased carrying capacity—but the investment costs remain high, and conversion to electric traction would be "uneconomic" for the "foreseeable future."[117] Considering the most optimistic scenario, the EAC's current networks will generate revenues of less than US$ 1billion annually by 2030.[118] Converting all trunk lines to the same gauge would cost, at most, around US$ 20 billion.[119] Thus, operating savings (if any) would be marginal, if not insignificant.[120] Based on the ratio of capital costs to revenues, the study notes that the conversion is cost-prohibitive.[121]

Instead, the EAC study recommends that rail links be developed consistent with the gauge network that they would connect to—either a meter gauge or a cape gauge for connecting with the Southern Africa network. Only if the rail line will not connect to an existing network should consideration be given to a standard gauge. Although the study advocates for developing either meter gauge or cape gauge lines (depending on the route), it recommends that track lines be constructed with a substructure that can accommodate future conversion to standard gauge.[122] The World Bank study—*Economics of Rail Gauge in the East African Community*—draws similar deductions.[123]

Concerns over Kenya's debt sustainability and the poor performance of its new railway have resulted in Chinese lenders holding off on funding the extension of the line to the Ugandan border. Even though the extension is critical for connecting East Africa's biggest port with the landlocked countries of Uganda, Rwanda, and South Sudan, China announced in April 2019 that it would not finance the US$3.7 billion extension due to concerns over commercial viability.[124] It remains unclear as to whether the extension of the SGR will be undertaken. Some

reports have indicated that Kenya will finance the extension without China, while others have reported that China may consider financing the extension.[125]

While Kenyan officials figure out financing for the SGR's extension, the government has ramped up efforts to modernize and extend its existing meter gauge railway to connect with its neighbours. Funds for the various tranches are being secured mainly through state-owned enterprises and will be built using local labor.[126] The rehabilitation of Kenya's meter gauge network is anticipated to spur the revival of several towns whose economies were affected by the collapse of railway transport after independence.[127]

Conclusion

Per the AU's Agenda 2063, regional economic communities and individual states have produced elaborate railway network plans to improve rail transport and the subsequent facilitation of integration. Africa's construction and upgrading of railways will come to function as vital transport arteries connecting economic centers, special economic zones, and production and distribution hubs across the continent. However, African governments face a conundrum: to either choose the economically sound option of updating and extending existing brownfield infrastructure or—from a strategic view of connecting the continent (as per the AU's development aspirations)—to construct expensive greenfield standard gauge railways. With many regions of the continent lacking the required operational and business environment for greenfield SGR investments, the sound economic option for most African countries (with existing brownfield rail infrastructure) would be to invest in upgrading and expanding their existing rail lines.

Yet, despite the rail economics for greenfield SGR investments to be viable, many African states, such as Kenya, have pressed ahead with SGR developments promoting them as a tool for improving economic development and facilitating regional integration. Currently, there is little indication that Kenyan and other African SGR lines can have a significant economic impact to justify the billions of dollars spent constructing them. Only a handful of SGR investments exist, which have been developed too recently to draw definitive conclusions about their longer-term contribution to industrialization in Africa.

Post-construction, Kenya's Nairobi-Mombasa SGR is performing well below expectations. Concerns over its commercial viability have raised questions about whether the project was a mistake and due diligence undertaken for the project is under scrutiny, especially the feasibility study conducted by CRBC. While CRBC's study was sketchy, the Chinese should not shoulder all the blame for the reckless business decision to build an expensive SGR line in Kenya.[128]

If the Kenyan government had thoroughly conducted their own due diligence, they would have been aware of the significant costs associated with greenfield SGR investments and the high risk of failure (in the short-to-medium term) with inadequate freight traffic and lacking auxiliary infrastructure. Various feasibility studies, notably the East African Masterplan Study and that of the World Bank, stressed the colossal investment costs associated with SGR developments and electric traction, deeming them impractical investments. By ignoring simple rail economics, Kenya is now faced with the challenge of ensuring that its new SGR railway line can, at the very least, break even over the short-to-medium term.

The Kenyan situation aptly encapsulates the debate over whether African countries should invest in expensive greenfield SGR infrastructure (that can further compound debt burdens) or brownfield projects that are cheaper and better suited to most African economies' purchasing power. Moreover, this case provides a valuable lesson for other African countries considering rail infrastructure projects—namely, that rail investments should not be undertaken without prudence and thorough due diligence that informs deliberations. As such, it is the responsibility of African governments to deliberate on rail projects carefully. Otherwise, Africa's rail renaissance runs the risk of becoming a chimera.

The Kenyan case showcases that SGR investments may not be the most economically rational choice for many developing African countries. Instead of serving as a symbol of economic prosperity, development, and progressive integration, the Kenyan SGR serves as a lesson to investors and African states to be more calculated and cautious in rail infrastructure undertakings. The Mombasa-Naivasha SGR demonstrates that investments in greenfield SGR infrastructure should not be viewed as a panacea for African railway development. Instead, at a national, regional, and continental level, the focus needs to be on choosing priority projects that have been thoroughly assessed, are cost-effective, and can deliver significant socio-economic impact. Only when this approach is taken can African rail projects contribute to building the "Africa We Want" as envisaged by the AU.

Works Cited

African Development Bank (AfDB). 2015. "Rail Infrastructure in Africa: Financing Policy Options." https://www.afdb.org/fileadmin/uploads/afdb/Documents/Events/ATFforum/Rail_Infrastructure_in_Africa_-_Financing_Policy_Options_-_AfDB.pdf.

African Union (AU). 2016. "Transport Policy Framework (White Paper) – Draft Version." https://au.int/web/sites/default/files/newsevents/workingdocuments/31372-wd-lot_1_transport_policy_paper_updated_1409.pdf.

_____. n.d.a. "Towards the African Integrated High Speed Railway Network (AIHSRN) Development." https://au.int/sites/default/files/documents/32186-doc-towards_the_african_integrated_high_speed_railway_network_aihsrn_development-e.pdf.

BBC News. 2017. "Kenya Opens Nairobi-Mombasa Madaraka Express Railway." 31 May. http://www.bbc.com/news/world-africa-40092600.

Canadian Pacific Consulting Services (CPCS). 2009. *East African Railways Master Plan Study, Final Report*. CPCS.https://africog.org/wp-content/uploads/2017/06/The-East-African-Railways-Master-Plan.pdf.

Chege, Kimani. 2021. "Railway Growth and Mobility in Africa." *The American Society of Mechanical Engineers*, 27 September. https://www.asme.org/topics-resources/content/railway-growth-and-mobility-in-africa

Flyvbjerg, Bent, et al. 2006. "Inaccuracy in Traffic Forecasts." *Transport Reviews*. 26.1: 1-24.

Guthrie, Doug, et al. 2020. "China's Belt & Road Initiative: The Case of the Madaraka Express." *On Global Leadership*, 20 October. https://ongloballeadership.com/f/china%E2%80%99s-belt-road-initiative-the-case-of-the-madaraka-express?blogcategory=International+Trade.

Gwilliam, Ken. 2011. *Africa's Transport Infrastructure: Mainstreaming Maintenance and Management*. Washington, DC: The World Bank.

Hairsine, Kate. 2019. "Kenya struggles to manage debt for railway to 'nowhere." *Deutsche Welle*, 20 October. https://www.dw.com/en/kenya-struggles-to-manage-debt-for-railway-to-nowhere/a-50887431.

Kacungira, Nancy. 2017. "Will Kenya get value for money from its new railway?" *BBC News*, 8 June. https://www.bbc.com/news/world-africa-40171095.

Kenya News Agency. 2020. "Government Set To Rehabilitate Meter Gauge. Kenya News Agency." 18 August. https://www.kenyanews.go.ke/government-set-to-rehabilitate-meter-gauge-railway/.

Kenya Railway Corporation (KRC) and China Road and Bridges Corporation (CRBC). 2011. *Feasibility Study Report of Kenya Mombasa- Nairobi Railway Project*. Beijing: CRBC

Marete, Gitonga. 2020. "Why exports cargo through SGR remain low, two years later." *Business Daily*, 4 June. https://www.businessdailyafrica.com/corporate/shipping/Why-exports-cargo-through-SGR-remain-low--two-years-later/4003122-5494750-92eidnz/index.html.

Mills, Greg. & Emily van Der Merwe. 2019. "Kenya makes a big, risky bet on a railway project." *Daily Maverick*, 7 October. https://www.dailymaverick.co.za/article/2019-10-07-kenya-makes-a-big-risky-bet-on-a-railway-project/.

Monson, Jamie. 2009. *Africa's Freedom Railway*: *How a Chinese Development Project Changed Lives and Livelihoods in Tanzania*. Bloomington: Indiana University Press.

Mwangi, Irene. 2023. "Kenya Railways Takeover of SGR At 90pc – MD Mainga." *Captial Business*, 15 March. https://www.capitalfm.co.ke/business/2023/03/kenya-railways-takeover-of-sgr-at-90pc-md-mainga/

Mwase, Ngila. 2003. "The Liberalisation, De-regulation and Privatisation of the Transport Sector in Sub-Saharan Africa: Experiences, Challenges and Opportunities." *The Journal of African Economies*. 12: 153-92.

Ndii, David. 2018. "SGR by the Numbers: Some Unpleasant Arithmetic." *The Elephant*, 21 July . https://www.theelephant.info/op-eds/2018/07/21/sgr-by-the-numbers-some-unpleasant-arithmetic/.

Njoh, Ambe. 2008. "Implications of Africa's Transportation Systems for Development in the Era of Globalization." *Review of Black Political Economy* 35:147-62.

Nugent, Paul. 2018. "Africa's Re-enchantment with Big Infrastructure." In Schubert et al. (eds.), *Extractive Industries and Changing State Dynamics in Africa* (London: Routledge): 22-40.

O'Dowd, Emily. 2016. "Special report: How five major African rail projects are supported by China." *Smart Rail World.* https://www.smartrailworld.com/live/en/node/newsitem-special-report:-how-five-major-african-rail-projects-are-supported-by-china.

Odendaal, Natasha. 2018. "Luxembourg Protocol Can Reshape African Rail Industry." *Engineering News*, 19 October. https://www.engineeringnews.co.za/article/luxembourg-protocol-can-reshape-african-rail-industry-2018-10-19

Okoth, Edwin. 2020. "SGR earns Sh13.5 billion revenue in second year of operations." *Business Daily*, 28 April. https://www.businessdailyafrica.com/economy/SGR-earns-Sh13-5-billion-revenue-in-second-year-of-operations/3946234-5537168-eufg56z/index.html.

Olander, Eric. 2021 (a). "Chinese Rail Operator to Kenya Railways: Settle Your Debts First and Then We'll Hand Over Control of the SGR." *China Global South Project*, 10 August. https://chinaglobalsouth.com/2021/08/10/chinese-rail-operator-to-kenya-railways-settle-your-debts-first-and-then-well-hand-over-control-of-the-sgr/.

_____. 2021 (b). "Kenya to Finally Extend the SGR to the Ugandan Border…Without Any Chinese Financing." *China Global South Project*, 17 February. https://chinaafricaproject.com/2021/02/17/kenya-to-finally-extend-the-sgr-to-the-ugandan-border-without-any-chinese-financing/.

Olievschi, Vasile Nicolae. 2013. *Rail Transport Framework for Improving Railway Sector Performance in Sub-Saharan Africa*. The World Bank Africa Transport Policy Program, Working Paper no. 94. https://openknowledge.worldbank.org/bitstream/handle/10986/16557/786720SSATP0NW00Railway0Performance.pdf?sequence=1&isAllowed=y.

Olingo, Allan. 2019. "Kenya fails to secure $3.6b from China for third phase of SGR line to Kisumu." *The East African*, 27 April. https://www.theeastafrican.co.ke/tea/business/kenya-fails-to-secure-3-6b-from-china-for-third-phase-of-sgr-line-to-kisumu-1416820.

Oluochi, Jane Nthenya. 2018. "Analysis of the Economic Value of The Standard Gauge Railway (SGR) and its Contributions for Kenya." *International Journal of Social Science and Humanities Research.* 6.2: 740-48

Otieno, Bonface. 2021. "China firm seeks billions before giving Kenya SGR." *Business Daily*, 9 August. https://www.businessdailyafrica.com/bd/economy/china-firm-seeks-billions-before-giving-kenya-sgr-3504438.

Parliamentary Budget Office. 2021. "Evading Recessionary Pressure under a Mounting Debt Burden." Nairobi: Parliament of the Republic of Kenya

Puffert, Douglas. 2009. *Tracks across Continents, Paths Through History: The Economic Dynamics of Standardization in Railway Gauge*. Chicago: University of Chicago Press.

Rogers, David. 2022. "China hints at renewed funding for Kenya's rail megaproject." *Global Construction Review*, 17 January. https://www.globalconstructionreview.com/china-hints-at-renewed-funding-for-kenyas-rail-megaproject/.

Shiundu, Alphonce. 2019. "Railway to nowhere." *Development and Cooperation*, 22 December. https://www.dandc.eu/en/article/why-kenyas-ambitious-cross-country-railway-controversial.

Simuyemba, Shemmy. 2000. "Linking Africa through Regional Infrastructure." African Development Bank, Economic Research Papers (64). https://www.afdb.org/fileadmin/uploads/afdb/Documents/Publications/00157662-EN-ERP-64.PDF.

Taylor, Ian. 2020. "Kenya's New Lunatic Express: The Standard Gauge Railway." *African Studies Quarterly*. 19.3/4: 29-52

The New Times. 2018. "Kenya's Mombasa-Nairobi rail service to break even by 2020." 3 August. https://www.newtimes.co.rw/business/kenyas-mombasa-nairobi-rail-service-break-even-2020.

United Nations Economic Commission for Africa (UNECA). 2018. "Africa's railway renaissance needs public private partnerships." https://archive.uneca.org/stories/africa%E2%80%99s-railway-renaissance-needs-public-private-partnerships.

World Bank. 2013. "The Economics of Rail Gauge in the East Africa Community." Africa Transport Unit, 8 August. https://africog.org/wp-content/uploads/2017/06/World-bank-Report-on-the-Standard-Gauge-Railway.pdf.

_____. 2020. *Modern Railway Services in Africa: Building Traffic - Building Value.* Washington D.C.: The World Bank

_____. 2022. *Railways in Developing Countries: A Global Review.* Washington D.C.: The World Bank

Zajontz, Tim, et al. 2024. *Africa's Railway Renaissance: The Role and Impact of China*. Abingdon: Routledge.

Notes

[1] UNECA 2018.
[2] Gwilliam 2011, p.86.
[3] Gwilliam 2011, p.86. As of 2011, 42% of South Africa's network – approximately 9000km – was electrified; the only other electrified sections are 858km in the DRC, the new 756km-long Ethiopia-Djibouti line, and 313km in Zimbabwe (which was not operable as of the time of writing).
[4] AfDB 2015.
[5] AfDB 2015.
[6] Zajontz et al. 2024; O'Dowd 2016.
[7] Zajontz et al. 2024, p. 4.
8 Zajontz et al. 2024, p. 4; Njoh 2008, p. 149
9 AfDB 2015, p. 20.

[10] Zajontz et al. 2024, p. 5.
[11] African Union n.d.a, p. 1; Zajontz et al. 2024, p. 6.
[12] Zajontz et al. 2024, p. 7.
13 Mwase 2003, p.180.
[14] Zajontz et al. 2024, p. 7.
15 Monson 2009, p. 2.
16 Nugent 2018, p. 22; see also World Bank 2022, p.5.
17 Simuyemba 2000, p. 16.
18 Gwilliam 2011, p. 84.
19 Gwilliam 2011, p. 84.
[20] Olievschi 2013, p. 8.
[21] AfDB 2015, p. 53.
[22] Marcelo Blumenfeld. 2020. Online Interview. Industrial Fellow, Centre for Railway Research and Education, University of Birmingham. 2 July.
[23] AfDB 2015, p. 21.
[24] Marcelo Blumenfeld. 2020. Online Interview.
[25] AfDB 2015, p. 8.
[26] AfDB 2015, p. 41.
[27] Gwilliam 2011, p. 90.
[28] Anil Bhandari. 2020. Online Interview. Former Senior Infrastructure Advisor, World Bank. 6 June.
[29] Stephen Karingi. 2020. Online Interview. Director of Regional Integration and Trade, UNECA. 11 June.
[30] Howard Rosen. 2020. Online Interview. Chairman, Rail Working Group. 16 July.
[31] Odendaal, 2018.
[32] Olievschi 2013, p. 9.
[33] AfDB 2015, p. 50.
[34] There are nine different gauges in Africa, of which three are commonly used: the Cape gauge, the narrow or meter gauge, and the standard gauge.
[35] Puffert 2009, p. 33.
[36] Howard Rosen. 2020. Online Interview.
[37] Flyvbjerg 2006.
[38] Olievschi 2013, p. 4.
[39] AfDB 2015, p. 64.
[40] Marcelo Blumenfeld. 2020. Online Interview.
[41] Marcelo Blumenfeld. 2020. Online Interview.
[42] Marcelo Blumenfeld. 2020. Online Interview.
[43] Gwilliam 2011, p. 91.
[44] Gwilliam 2011, p. 91.
[45] Gwilliam 2011, p. 97.
[46] Gwilliam 2011, p. 97.

47 Chege 2021.
[48] AfDB 2015, p. 39.
[49] AfDB 2015, p. 49.
[50] Gwilliam 2011, p. 90.
[51] AU 2016, p. 15.
[52] AU 2016, p. 15.
[53] Marcelo Blumenfeld. 2020. Online Interview.
[54] Anonymous (a). 2020. Online Interview. World Bank Transport Official. 16 July; World Bank 2020, p. 8.
[55] World Bank 2020, p. 17.
[56] Marcelo Blumenfeld. 2020. Online Interview.
[57] Mills & van Der Merwe 2019.
[58] Greg Mills. Online Interview. 2020. Managing Director, Brenthurst Foundation. 22 July.
[59] Greg Mills. Online Interview. 2020.
[60] Mills & van Der Merwe 2019.
[61] Bob Wekesa. 2020. Online Interview. Research, Partnership, and Communications Coordinator, African Centre for the Study of the US. 15 June.
[62] Bob Wekesa. 2020. Online Interview.
[63] Ndii 2018.
[64] Oluochi 2018.
[65] Such as: Ndii 2018; Anil Bhandari. 2020. Online Interview; Anonymous (a). 2020. Online Interview. World Bank Transport Official.
[66] Oluochi 2018.
[67] Ndii 2018.
[68] Ndii 2018.
[69] Ndii 2018.
[70] Ndii 2018.
[71] Ndii 2018.
[72] Ndii 2018.
[73] Oscar Meywa Otele. 2020. Online Interview. Lecturer, University of Nairobi. 6 June.
[74] Hairsine 2019.
[75] Hairsine 2019.
[76] Marete 2020.
[77] *The New Times* 2018.
[78] World Bank 2013.
[79] Kacungira 2017; BBC News 2017.
[80] World Bank 2013; Yunnan Chen. 2020. Online Interview. Senior Research Officer, Overseas Development Institute. 5 June.
[81] Yunnan Chen. 2020. Online Interview.
[82] Anil Bhandari. 2020. Online Interview.
[83] Hairsine 2019.

[84] The total length of the Mombasa-Nairobi-Naivasha railway is 592km. Anil Bhandari. 2020. Online Interview.
[85] Anil Bhandari. 2020. Online Interview.
[86] Anil Bhandari. 2020. Online Interview.
[87] Hairsine 2019.
[88] Hairsine 2019.
[89] Ndii 2018; Shiundu 2019.
[90] Guthrie et al. 2020.
[91] Okoth 2020.
[92] Parliamentary Budget Office of Kenya 2021.
[93] KRC and CRBC 2011, p. 129.
[94] Ndii 2018.
[95] Ndii 2018.
[96] KRC and CRBC 2011, p. 129.
[97] Ndii 2018.
[98] KRC and CRBC 2011, p. 125.
[99] Ndii 2018.
[100] Ndii 2018.
[101] Ndii 2018.
[102] Ndii 2018.
[103] Ndii 2018.
[104] Ndii 2018.
[105] Ndii 2018.
[106] Ndii 2018.
[107] Ndii 2018.
[108] Ndii 2018.
[109] Mwangi 2023. However, CRBC has listed clearing its debts as a pre-condition that needs to be met before SGR operations can be handed over to the Kenyans. See: Olander 2021(a). The Kenyan Parliament acknowledged in 2020 that Kenya owed Ksh 38 billion (approximately US$ 317 billion) to Afristar. See: Otieno 2021.
[110] Anonymous (b). 2020. Online Interview. Kenya Railway Corporation Official. 30 July.
[111] Anonymous (a). 2020. Online Interview.
[112] Anonymous (a). 2020. Online Interview.
[113] Anil Bhandari. 2020. Online Interview.
[114] Guthrie *et al.* 2020.
[115] Anonymous (a). 2020. Online Interview.
[116] CPCS 2009, p. 20.
[117] CPCS 2009, p. 20.
[118] CPCS 2009, p. 20.
[119] CPCS 2009, p. 20.
[120] CPCS 2009, p. 20.

[121] CPCS 2009, p. 20.
[122] CPCS 2009, p. 20.
[123] World Bank 2013; Taylor 2020.
[124] Olingo 2019.
[125] See: Olander 2021(b); Rogers 2022.
[126] Kenya News Agency 2020.
[127] Kenya News Agency 2020.
[128] Taylor 2020.