COMPLEMENTARITY BETWEEN RAIL AND ROAD IN PROMOTING AFRICAN DEVELOPMENT

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ABSTRACT

Roads are versatile, offer low entry barriers, ubiquitous access, omni-purpose ability, and low break-even traffic. Their advantages vis-à-vis African development are incontestable. Railways present high entry barriers, which have constrained them in many ways. Africa's railway interoperability- and networkability constraints affect micro-interoperability, pending fundamental transformation to macro-interoperability. By contrast, railways in developed regions pursue competitive strengths and macro-interoperability with continental- and intercontinental strategic horizons. However, Africa's non-mainstream solutions command a price premium, resulting in uncompetitive assets costing more than state-of-the-art assets. Its railway legacy therefore cannot, without major transformation, support sustainable development toward globally competitive macro-interoperability. Africa currently has insufficient traffic to jump-start new railway investment, while macro-interoperability premiums render it unaffordable. Road transport is thus the pathfinder that must identify and open trade routes, after which rail can leverage capacity for growth. From a rail perspective, road and rail could, and should, be complementary and sequential in developing Africa.

1 INTRODUCTION

1.1 Essential modal distinctions

Roads offer a range of land transport options, from rough tracks to multi-lane highways. Relative to railways, roads offer lower entry barriers, ubiquitous access, omni-purpose ability, and low break-even traffic. The benefits to African development are indisputable. Railway genetic technologies, which the author will describe in §1.3, distinguish railways from roads, as well as from other competitive transport modes: Their attributes inherently pitch them at comparatively high traffic volumes, although railways also offer a range of quality- and capacity options. Relative to roads, railways present higher entry barriers: To reduce their effect, many African railways have had to skimp on permissible axle loads, forego networkability, restrain incremental investment, and constrain support for development, ultimately finding that they are unsustainable and vulnerable to predators. The author explored relations between those genetic technologies and the potential for a complementary contribution from road transport.

1.2 An enormous challenge

Rather than repeat the customary catalogue of African railway woes, the author examined challenges and opportunities for railways, and then asked how the requisite re-alignment and transformation could be realized with support from road transport. To estimate the size of the challenge, appreciate that while the Sahara desert is larger than the continental United States, only six African national economies rank among US state economies. This comparison suggests that the existing intra-African formal transport market is numerically small and geographically dispersed.

Source competition among commodity exporting countries dictates that heavy haul railways must be relatively short: Their potential network contribution is therefore capped at hinterland-to-port links of around 1000km. Any African railway network growth must therefore rest on manufacturing- or consuming large volumes of high-value-added goods. The former is more likely to lead the latter, but neither is on the near horizon. High-speed intercity is even further away. The challenge is thus to appreciate what railways do best, and then find a way of applying them to that task.

1.3 Railway leverage

1.3.1 Rail's competitive strengths …

Three genetic technologies distinguish railways from other land transport modes—*Bearing*, which supports heavy axle loads; *Guiding*, which supports high speed operation; and *Coupling*, which supports stringing vehicles together, thereby scaling train configuration to meet capacity demand. Railways that exploit these genetic technologies to their respective limits, either individually or in reinforcing combination, and progressively extend those limits as technology advances, are able to position themselves in market niches where they confidently dominate other transport modes (Van der Meulen, 2006).

Railways create and develop market opportunities by exploiting their genetic technologies. Cross-breaking Bearing and Guiding yields four niches. Bearing supports heavy haul, attaining axle loads of 40 tonnes, but at relatively low speed. Guiding supports high-speed intercity passenger trains, attaining service speeds of 350km/h, but at relatively low axle load. Bearing and Guiding in combination support heavy intermodal or double stack container trains, attaining axle loads of 32 tonnes at 120km/h. Coupling leverages the trains in each niche to align capacity with market opportunities: No other transport mode can scale its capacity the way railways do. Given sufficient traffic, railways can ultimately overtake any other mode with respect to cost and quality. These three niches define three markets in which railways are intensely competitive against both maritime- and road transport: The associated long hauls have stimulated national networks to link into continental- and intercontinental railway networks in developed regions (Van der Meulen, 2006).

1.3.2 … to counter Africa's weaknesses

The remaining niche subsumes low axle load, low speed railways: They fail to exploit the strengths of rail's genetic technologies. In Africa, axle loads and speeds are both low, and railways are generally not competitive by global standards[1]. The author will therefore introduce issues that influence rail's ability to contribute to broad-based development, to provide insight into prospects for African development from a railway perspective. This will

[1] Coupling may nevertheless instill railways with sufficient competitive advantage to be sustainable in a metropolitan setting, despite low axle load and low speed. However, railways are typically absent from African metropolitan transport solutions, hence that setting is not included in this paper.

expose weaknesses in existing railways, as well as show potential strengths of future railways, and hence identify complementary road contributions. Road's strengths, rail's strengths, and railways in Africa, are three sets that have little, if any, intersection at present: The author aims to identify areas in which to increase that intersection.

1.4 Global alignment

The world's railways have become a globalized industry over the last decade. The author therefore approached the topic from a global perspective. While there exists a vast body of learning about globalization per se, railways are asset intensive and change slowly, so their learning is not yet fulfilled. One key insight is that globalization can ruthlessly marginalize non-mainstream or non-conforming industries and settings.

What has this to do with roads? Globalization has redirected, refined and refocused the railway industry. Competitive railways look vastly different compared to a decade ago, and so for that matter do non-competitive railways: Prosperity for the former, and poverty for the latter. In situations where it is not workable to position railways effectively, either in space or time, road transport needs to complement them, and of course vice versa. The author will examine a range of key issues and arrange them such that their context will suggest a way forward.

Note that the author does not address logistics in this paper. Railways, like other transport modes, must first deliver basic competencies before technology can leverage them into supply chains. The logistics industry does not work in the other direction.

2 AN EXPLORATORY, REASONED APPROACH

The parlous state of many railways in Africa suggests two hypotheses. First, incumbent railway managements are generally not competent to perform their task. However, despite ongoing intervention by consultants, donors, and contract managers over many years, no meaningful upturn has materialized. Concurrently, other industries, consumer retailing and cellular communication to mention two, have flourished in Africa. There is thus no substantial evidence to support the first hypothesis, which leads to the next. Second, railways in Africa are generally not competitive, because no theoretical foundation for designing effective interventions exists. Again, despite ongoing intervention by consultants, donors, and contract managers over many years, no meaningful repositioning has materialized. The author considered the second hypothesis amenable to research: At the present time, the only scientifically legitimate approach was to explore the field, and reason about linkages to successful interventions elsewhere in the world. One could consider it counterpoint to some more emotional approaches in the past. The following section introduces pertinent issues that offer useful insights into African railways.

3 THE AGENDA

3.1 Railways through territory and time

3.1.1 The Silk Route, ancient and modern

The traditional Silk Route was a braided overland transport network, operated by camel caravans, between ancient centres of population via passes through the Kunlun, Tian, and Alatau mountains on China's western border. In searching for a safer alternative to east-west land transport, sea explorers discovered a route around southern Africa. One offshoot of that discovery, colonization and the railways that eventually followed, turned out to be the setting for this paper.

Since the invention of railways, land transport has once again offered unquestionable advantages over maritime transport in particular settings. They were realized on completion of the Trans-Siberian railway in 1916: Today, it is still growing traffic. One of the original Silk Route braids, through the Alatau Pass between China and Kazakhstan, developed as a road route, and was ultimately connected by rail in 1990. Nowadays, further alternatives are in operation or under development. The European Union is promoting the Transport Corridor Europe Caucasus Asia (TRACECA), a multimodal road and rail solution (www.traceca-org.org). A standard gauge (1435mm) railway line is under construction through Kazakhstan to link the Chinese and European standard-gauge networks[2]. A third railway route through Uzbekistan's Ferghana valley to China's Tarim Basin is also under consideration.

Such iterative development, over many centuries in this instance, illustrates the fundamental role of trade as a catalyst for transport links, and the pioneering role of road to grow sufficient traffic in a corridor to ultimately justify a railway.

3.1.2 Europe

Railways originated in Europe, where Roman roads had first defined formal trade routes. Centuries later, canal networks reinforced those routes. When railways were later invented, they naturally aligned with pre-existing routes and networks, and simply displaced previous incumbents. Europe thus came to have a railway network that spanned the continent in support of intra-continental commerce and mobility.

3.1.3 North America

With the exception of canals in the east, navigable water predominantly flows north-south on the North American continent. Early development was orthogonal to that, from east to west, giving the technology of the period, animal-drawn transport, natural dominance. The arrival of railroads, and construction of east-west routes, supported a hypothesis that development of the West followed the building of railways. Its causality is disputed, opponents asserting that development would have taken place anyway, with or without railroads. Nevertheless, other transport modes were absent, and for the first time railways came to be associated with development.

3.1.4 North Africa

The railways of North Africa wisely followed the technical standards of their role models across the Mediterranean Sea, at least in respect of their standard-gauge routes parallel to the coast. The region's standard-gauge basic railway infrastructure is therefore set to participate in whatever opportunities come its way. It also has potential to link with the extensive networks developing in the Middle East and beyond. The Libyan sector is still under construction, and several sections are still under studying [sic] (www.libyanrailways.com).

3.1.5 The Southern Hemisphere

A colonial legacy pervades railways in the Southern Hemisphere. They were generally built to harvest natural resources, not to support continental networkability and integration, as in the home countries. Ad hoc standards proliferated, because there was no compulsion to interoperate with other railways. The legacy included different track gauges, structure gauges, brake systems, and coupler heights—everything that underpins interoperability. Rightly or wrongly, trade had once again dominated the transport technology of the period, railways at that time.

[2] Note that existing railways in Kazakhstan were built to the 1520mm gauge of the former Soviet Union.

In addition, colonial railways were constructed to the lowest passable standard: Absent competition from road, which only came much later, they were predicated on low axle load and low speed. The author has shown that such parameters handicap competitiveness. Australia has dealt with most of its legacy, by standardizing track gauge on transcontinental links. Africa and South America have yet to deal with theirs.

3.1.6 Cape-to-Cairo and Sub-Saharan Africa

Cecil Rhodes had the vision, but implementation of the Cape-to-Cairo railway required agreement on the main arterial system among the British, Belgians, French and Portuguese. They failed to achieve that, and the mind-boggling folly of meter-gauge east-west routes, and 3'-6" gauge north-south routes, followed (Weinthal, 1922: 13). In addition, they failed to cross the Congo-Nile watershed (Weinthal, 1922: 81) while enthusiasm was high. Rhodes' vision became relegated to history, unfulfilled.

Recent research on the global railway population found that narrow track gauge opposes networkability (Van der Meulen & Möller, 2006). This implies that, other than heavy haul, Africa is unable to access the three intensely competitive railway niches mentioned in §1.3.1. Indeed, other than sporadic investment in heavy haul, Sub-Saharan Africa no longer sustains new railway investment or significant refurbishment, which adds support to the second hypothesis in §2. Rhodes' vision of a continental railway network was ahead of the game. Did he get it right? Colonial railway standards cannot support competitiveness and large-scale networkability, so one could argue that his vision was stillborn.

3.1.7 Micro- and macro-interoperability

At micro-interoperability level, Africa's physical interoperability- and networkability constraints only affect close railway neighbours: They represent only symptoms, which deserve no more than palliatives, pending fundamental transformation. By contrast, railways in developed regions pursue macro-interoperability, informed by continental- and intercontinental strategic horizons. They leverage rail's heavy-axle-load and high-speed strengths in the heavy haul, high-speed intercity, and heavy intermodal market niches, and pursue long-haul cross-border routes. Furthermore, they minimize costs by specifying industry-standard, series-produced, rolling stock. Unsurprisingly, the theme of the next World Congress on Railway Research in Seoul, Korea, is *Toward Global Railway Business* (www.wcrr2008.org). The emerging global railway network already shows axes trained on central-, north-, and west African targets. Once the Saudi Arabian Landbridge and North-South expansions are complete, the implications and potential for African networkability will be a no-brainer.

3.2 Railway development options

3.2.1 African challenges

African railways carry mainly general freight and, in some cases, a modicum of line-haul passenger traffic as well. Failure to assert rail's competitive strengths has frustrated their competitiveness. Furthermore, their graduated release brakes (vacuum or air) limit train length and preclude exploitation of the Coupling genetic technology to leverage capacity. Introducing the missing, intensely competitive, applications, namely double-stack container trains and high-speed intercity services will, as a minimum, require across-the-board removal of all constraints. The following sections introduce some stratagems:

3.2.2 Encourage and stimulate

Recent research, which compared all 114 railways in the global population to find ways of leveraging insight from developed- into developing regions (Van der Meulen & Möller, 2006), yielded the following latent variables for leveraging railways to global relevance:

The mutually exclusive Societal- and Territorial (or Freight) Orientations: Africa did not participate in the Industrial Age, and given China's and India's aggressive industrial positioning, might now find entry difficult. African railways will need to formulate a strategy to orientate themselves with respect to their perceived freight- or passenger opportunities.

Several stimulating interventions, in particular Competitive Freedom, and Continuous Improvement: African railways need competitive freedom to position themselves, and accelerated asset turnover to support competitiveness through fresh equipment.

Moderating railway-setting relations, in particular Inherent Sustainability, Government Encouragement, and Self Regulation: African railways need to renew or to replace assets timeously, governments should encourage rather than intervene in their development, and they need to ensure safety through self regulation rather than external interference.

A no-go area with respect to Global Networkability: African narrow gauge does not support networkability with global railways and, as a minimum, denies African railways access to the intensely competitive heavy intermodal (double stack) growth niche.

It also found the following relations among the competitiveness, freedom, and sustainability of railways, controlled by structural differences between countries and their railways:

A Constrained Railways cluster, representing 77% of countries, which was characterized by low freight and/or passenger traffic volume; insignificant operator and route diversity; low networkability and strategic horizon limited to national borders; low technology that does not exploit rail's competitive strengths; public ownership with long commitment horizons; low economic freedom and relatively low national income; and low sustainability. All African countries, except South Africa, were in that cluster.

The other 23% clustered as Countries with Intense Competition; Countries with Private Participation (including subsets of three participation variants); and Emerging Countries, which exploited at least one of the railway competitive niches. Of the latter clusters, railway sustainability associated with free competition, private participation, and/or exploitation of at least one strong railway competitive niche. Only one African country featured in the latter category, namely South Africa, and that by virtue of its heavy haul railways. The message for Africa's other railways should be clear.

3.2.3 Deal with narrow gauge

In exploiting their competitive strengths, many Northern Hemisphere railways are developing a standard-gauge core global network. One cannot envision pockets of non-interoperable rail territory surviving in that future global railway scenario. Australia's last 3'-6" gauge railway, QR (Queensland Rail), recently transcended its colonial legacy, by announcing its intention to acquire most of Australian Railroad Group's above-rail assets, terminals, yards, depots and customer contracts in Western Australia, New South Wales and South Australia: It is a major step in implementing its national freight strategy to survive and prosper in the new competitive environment, by looking beyond traditional state borders and taking advantage of the many opportunities that competition provides (QR, 2006). Brazil's CVRD started out with meter gauge, but built its second line to broad gauge in 1985. Diversifying out of narrow gauge appears to be a significant behaviour pattern. Spoornet, Africa's leading railway, is the last major adherent to narrow gauge—the rest are either subsidized or moribund. Martin's (2004) interesting article on 3'-6" gauge railways appears, probably unintentionally, to have

created a catalogue of failed railways. Note further that new narrow-gauge rolling stock commands a price premium, absurdly resulting in lower performing, globally uncompetitive, assets costing more than state-of-the-art assets. Spoornet's forthcoming coal line locomotives, at around R30 million each, double what competitors pay for a pukka heavy haul locomotive, are a topical case in point. The African railway legacy therefore cannot, without major transformation, support sustainable development toward globally competitive macro-interoperability. The writing is on the wall for Africa's narrow gauge railways.

3.2.4 Reconstruct from basics

Railways are currently passing through a disruptive phase of their globalization trajectory. The disruption applies asymmetrically. Railways that can readily align with the mainstream should as a minimum survive, and with some effort may actually prosper. Those that cannot readily align with the mainstream, in particular those that cannot afford to renew their assets, will gradually slide into oblivion. So it appears that even survival may have an entry barrier.

Now is thus a good time to review the basics. Many of Africa's railway assets are run down, while globally competitive railway performance standards rise relentlessly. So there is little point in restoring what exists: It is opportune rather to discard the legacy and start afresh. Of course, some rights-of-way may still have value, provided that their basic geometry and structure can support competitive axle load-, speed-, and train length standards, and that they can contribute connectivity to a viable continental railway network.

3.2.5 Overcome conceptual obstacles

Economic development is a prerequisite for rising transport demand. Whatever the funding source, donations or earnings, it is difficult to drum up enthusiasm for building railways when there is little or no traffic in prospect. Roads can usefully contribute to identifying opportunities, opening up routes with their relatively low entry barriers, and ultimately yielding to rail's dominance when traffic has grown sufficiently. The critical challenge is for existing, uncompetitive, railways to mark time, while Africa concurrently builds economies and roads. Of course, this presupposes that the railways in question have the potential to contribute in some way to a larger continental plan.

High-speed intercity passenger railways probably belong to Africa's distant future. Heavy freight is closer, but it too must overcome obstacles. While the valuable contribution of heavy haul railways has already been mentioned, they are mainly associated with mining, and its finite life expectancy. Africa has already experienced the demise of such railways. Furthermore, heavy haul prefers short haul distances, to be competitive against commodities sourced in other countries. Thus, while it shares the same technological foundation, heavy haul may not necessarily support heavy intermodal aspirations, which require substantial traffic to justify the necessary investment. Hence heavy haul can support long term railway development and sustainability only to the extent that its right-of-way naturally serves other traffic, in which case it may ultimately contribute a useful segment to a larger network.

It is also important to appreciate that *intermodal* is not synonymous with *heavy intermodal*: Simply including a single-stack rail sector in container movements, without raising axle load by double stacking, does not exploit the competitive strengths of rail. Single stacking of containers on rail wagons remains vulnerable to competition from road hauliers, and is unlikely to recapture traffic from road once it has been lost. The distinction between single stacking and double stacking is unmistakable when comparing railways that prosper in intermodal with those that simply put containers on wagons (Van der Meulen, 2006).

3.3 Railway funding options

3.3.1 No funds, no go

Before railways advance in Africa, they will need to secure funding. The first port of call has traditionally been state funding or, failing that, sovereign guarantees. However, such funding is unlikely to be forthcoming for a moribund railway. The second place to look is of course self-funding. Unfortunately, uncompetitive railways are unlikely to be self funding. China provides an interesting role model: Railway expansion into its relatively undeveloped regions rides on high economic growth in relatively developed regions. However, that role model may be out of reach to secure Africa's railway future. The following funding sources should therefore not be ignored.

3.3.2 Avoid fruitless expenditure

By globally competitive standards, much of Africa's present railway legacy is beyond redemption. A given quantum of development funding will likely deliver more immediate and medium-term benefit if channeled into road instead of rail. The channeling of the same funding to railways, unless they contribute to an integrated, continental, plan for the long term future, could well be fruitless.

3.3.3 Negotiate reparation

Colonial powers left a railway legacy that is neither appropriate to current challenges, nor supportive of entering the three intensely competitive railway niches. Furthermore, the cost of non-standard equipment is high, as pointed out in §4.5.3. Whereas Southern Africa once supported a significant railway manufacturing industry, its capacity has dwindled to almost zero. Concurrently, the global supplier industry has concentrated, and many railway technologies have developed to levels that require high volume, specialized manufacture. The probability of reestablishment of African railway equipment manufacturing capacity, in the foreseeable future, is therefore not high.

African railways will henceforth have to look predominantly to Northern Hemisphere suppliers, for batch quantities of non-standard equipment, at a premium to their basic prices, for the inferior performance that associates with narrow gauge. Clearly their colonial legacy has placed African (and likewise South American) railways at a competitive disadvantage. One avenue worth pursuing would be to inveigle former colonial powers to assist in upgrading their railway legacy to appropriate international standards. Multilateral engagement on issues such as debt relief and trade relations is the order of the day: This is an issue that national departments of trade and industry, and New Partnership for Africa's Development, could use as a bargaining counter.

3.3.4 Exploit time arbitrage

Arbitrage takes advantage of different prices in other markets. Time is one resource that Africa has in abundance: While waiting for stragglers at a meeting, the author was once told "You've got the watch, we've got the time". Time has a higher price in developed- and emerging countries than in most of Africa: Time arbitrage has the potential to realize the value of that difference for Africa. Operation and maintenance of railways in developed countries, where time has high value and competition is intense, routinely displaces good equipment by higher performing state-of-the-art equipment. The good equipment becomes available to other countries where time has lower value than in the country of origin. Substantial global trade redeploys second hand railway equipment from high time value economies to low time value economies. Channeling some of that redeployment to Africa could reduce the cost of initiating a wave of new railway development, by making affordable

rolling stock available. It would of course not change the cost of providing infrastructure. Standard gauge is the entry ticket to time arbitrage.

3.3.5 Encourage private participation

From §4.5.2, it is evident that an unreceptive setting can undermine railway sustainability. Liberal competition, private participation, and application of at least one strong railway genetic technology, associate with sustainable railways. Africa's railways generally do not accommodate any of these requirements, and their threatened existence should come as no surprise. Money and talent find their way to opportunities, so it is essential to nurture an attractive and rewarding economic climate.

3.3.6 Beware mirages

African railways need to guard against apparent solutions that turn out to be mirages. As a guiding principle, solutions that do not leverage competitive strengths founded on rail's genetic technologies should be suspect.

Concessioning may be one mirage**.** Its value is in attracting private participation, and it may resuscitate a badly managed railway. However, concessioning an uncompetitive railway, whether badly run or well run, is a pen-ultimate intervention[3]. Uncompetitive railways are unsustainable (Van der Meulen, 2006), and the only outcomes are life support or termination: Remaining life and subsidy quantum are the only variables. It may be possible to postpone the day of reckoning, but not to avoid it. Notwithstanding this caveat, concessioning may be the easiest or only way out of an intractable situation.

Low-priced narrow-gauge rolling stock may be another mirage. It too may appear attractive, but once again it does not build on rail's competitive strengths. Instead of facilitating access to global networking and standards, it will in the long run establish a dependency that could keep railways that follow that course, forever beholden to their apparent benefactors.

3.4 Contributions from road

3.4.1 In the near future

Road is the de facto transport mode for much of Africa. Rhodes reportedly envisioned a point on the Sudan-Uganda border, possibly Nimule (Weinthal, 1922, 81), which would have been the junction of the Cape-to-Cairo- and east-west railways. This would have had four limbs, to Cape Town, Mombasa, Cairo, and an unnamed eastern destination. A Trans-African highway network is taking shape, currently paralleling the eastern and southern limbs of Rhodes' scheme. A Mombasa to Lagos highway has been mooted, paralleling the eastern limb, while there is still silence on a northern limb. Although more than a century late, the present situation demonstrates that road's primary role is to open, to maintain, and to grow intra-African trade routes. The task for roads and road hauliers is simply to go forth and multiply. In so doing, they will hopefully sharpen the competitiveness of railways—one would not like to think that railways survive merely because their competitors are weak—and open up new opportunities for railways when routes and volumes have been sufficiently established.

3.4.2 In a roundabout way

The author has taken a roundabout way to get to a meaningful contribution from road. The essence of the foregoing railway-oriented discourse is that it will take courage, determination, and time to resolve Africa's railway issues. There is simply no quick fix. Many institutions

[3] The ultimate intervention is to dispose of the fallout after final collapse.

need to be established, and economic capacity needs to be built, before railways can commence making a meaningful contribution to intra-African transport, by exploiting the intensely competitive niches that their genetic technologies support.

In the meantime, road will need to undertake the lion's share of Africa's transport task. It will need to develop, and fill gaps in, the emerging trade route networks, while railways get their house in order. Thereafter, one can look forward to fair competition between rail and road. The conclusions that follow are an inevitable outcome of the foregoing reasoning.

4 CONCLUSIONS

4.1 Support for the hypothesis

There is ample prima facie support for the second hypothesis formulated in §3, namely that railways in Africa generally are not competitive. The author has reasoned through several pertinent issues, to an outcome that agreed with earlier research, namely that, with the exception of South Africa, and that not without substantial qualification, African countries are constrained in their approach to railways. Their existing narrow-gauge railways are not competitive, and hence not sustainable. This could well be a contentious conclusion, for which the only apology can be that correct diagnosis is an essential first step to problem solving.

4.2 Road's symbiotic role

Other than possible heavy haul export traffic, Africa arguably has insufficient traffic to jump-start new intra-continental railway investment at this time. If a corridor does not already have substantial road traffic, and possibly even road congestion, then it is not yet a candidate for railway investment. Road transport must thus be the pathfinder that identifies and opens trade routes, or even development corridors, after which railways can leverage their genetic technologies to provide tonnage, speed, and capacity. The Silk Route has validated that model over centuries. Road and rail could, and should, be complementary and sequential in contributing to Africa's development.

4.3 Right timing

Should standard gauge have been considered in the immediate post colonial phase? Probably not, because at that time Africa's railways made a useful contribution to its economy. Should it be considered now? Probably yes, because most of those railways are now obsolete and worn out, and given the shift to global standards, there is no point in replacing like with like. However, globalization is not a one way street: It now offers a second chance for Africa to get its railways right.

Road will need to carry the can while rail realigns to claim its rightful place. Thereafter, there can be balanced competition among modes, under which each will contribute an economically rational share. Right timing is the only outstanding question—when should one start to fix Africa's rail problem? The past is past, so it can only be medium- to long-term future. Africa now needs to contemplate how it will deliver an economically critical, socially delicate, temporal juggling act.

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