



Patchwork in an interconnected world: the challenges of transport networks in Sub-Saharan Africa

Sergio Oliete Josa & Francesc Magrinyà

To cite this article: Sergio Oliete Josa & Francesc Magrinyà (2018) Patchwork in an interconnected world: the challenges of transport networks in Sub-Saharan Africa, *Transport Reviews*, 38:6, 710-736, DOI: [10.1080/01441647.2017.1414899](https://doi.org/10.1080/01441647.2017.1414899)

To link to this article: <https://doi.org/10.1080/01441647.2017.1414899>



© 2018 The Author(s). Published by Informa UK Limited, trading as Taylor & Francis Group



Published online: 04 Jan 2018.



Submit your article to this journal [↗](#)



Article views: 694



View Crossmark data [↗](#)



Citing articles: 1 View citing articles [↗](#)

Patchwork in an interconnected world: the challenges of transport networks in Sub-Saharan Africa*

Sergio Oliete Josa ^a and Francesc Magrinyà ^b

^aDirectorate General for International Cooperation and Development, European Commission, Brussels, Belgium; ^bDepartament d'Enginyeria Civil i Ambiental, Universitat Politècnica de Catalunya, Barcelona, Spain

ABSTRACT

Sub-Saharan Africa has recently undergone, or still do in many countries, a period of transport infrastructure expansion. Current policies are centred on the development of international links, which require large capital-intensive projects and are sometimes economically dubious. This paper reviews the past policies and transport functions since colonial times by placing them in their economic and political context. We find that present strategies have similarities to the ones prevailing in previous periods, where expansion phases dominated by transport-led economic growth theories were followed by a stagnation of Africa's infrastructure development. In view of the challenges in translating findings from empirical research into right policies, we identify the potential of more balanced and sustainable strategic investments, notably by reinforcing the existing secondary transport networks converging into urban centres.

ARTICLE HISTORY



Received 15 January 2017
Accepted 5 December 2017

KEYWORDS

Transport; road; rail; infrastructure; Africa; development

1. Introduction: the myth of the transport-led economic development in the African context

In 2009, the 12th Assembly of the African Union adopted a Declaration inviting the African Union Commission to formulate the Programme for Infrastructure Development in Africa [PIDA] (African Union, 2009). In this Declaration, the Heads of State and Government, concerned about “the enormity of gaps in transport and energy infrastructure in Africa and the huge financing needs of these infrastructure”, decided to “take all appropriate measures to complete the missing sections in the major transport corridors and remove all physical and non-physical barriers to the development of inter-State transport in Africa”. The expected impacts of PIDA in the transport sector are to “link the major production and consumption centres, provide connectivity among the major cities, define the best hub ports and railway routes and open the land-locked countries to improved regional and continental trade” (PIDA, 2012). If the completion of transport corridors is so critical, why does Africa not yet have a complete continental transport network? The map of the transport network

CONTACT Sergio Oliete Josa  sergio.oliete-josa@ec.europa.eu  Directorate General for International Cooperation and Development, European Commission, Rue de la Loi 41, B-1049, Brussels, Belgium

*This paper is published under the sole responsibility of its authors and does not engage the European Commission.

© 2018 The Author(s). Published by Informa UK Limited, trading as Taylor & Francis Group

This is an Open Access article distributed under the terms of the Creative Commons Attribution-NonCommercial-NoDerivatives License (<http://creativecommons.org/licenses/by-nc-nd/4.0/>), which permits non-commercial re-use, distribution, and reproduction in any medium, provided the original work is properly cited, and is not altered, transformed, or built upon in any way.

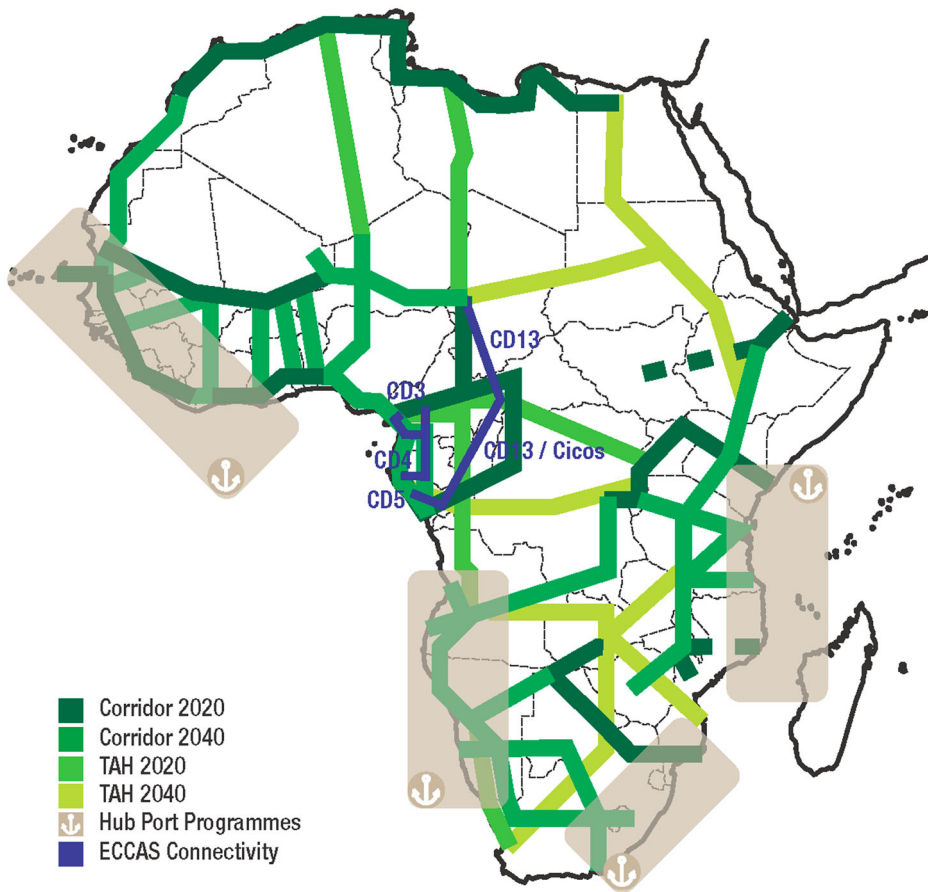


Figure 1. PIDA's transport network plan (PIDA, 2012). [TAH: Trans-African Highway].

proposed by the PIDA (Figure 1) shows that some of these corridors connect Africa from north to south and from east to west, going through the Saharan region and the Central African forests; other corridors open landlocked countries; a third category, mostly parallel to the coast, links capitals and main port cities to each other.¹

These political statements inevitably raise the question of the growth-enhancing effects of transport infrastructure in the African continent, or the "effets structurants" as this supposed causality relationship is known in the francophone literature. In 1993, Offner had evidenced the methodological deficiencies of the ex-ante studies used by decision-makers to justify major transport projects. He argued that a transport facility does not necessarily generate new economic value, but rather accelerates or consolidates the pre-existing dynamics and trends (Offner, 1993). The construction of a new transport infrastructure will only generate growth if there is a concomitance of mutually supported politico-institutional, economic and investment conditions (Banister & Berechman, 2003). The economic effects of new transport infrastructure are not obvious in industrialised countries, where networks are dense with high traffic flows intense, and decision-making based on econometric models remains controversial (Deng, 2013). On the contrary, in underdeveloped contexts, transport infrastructure can be a direct and crucial

factor of territorialisation (Steck, 2009). However, in developing countries, policy formulation based on empirical evidence may even be more difficult due to lack of quality data (Berg, Deichmann, Liu, & Selod, 2017; Calderón & Servén, 2014) and, in the case of Sub-Saharan Africa, to the existence of strong political-economy constraints (Beuran, Gachassin, & Raballand, 2015).

The purpose of this paper is to contribute to transport policies in Sub-Saharan Africa by analysing, from a geo-historical perspective, the development of the transport networks since colonial times and the place of the current policies in this evolution. We are interested in seeing to what extent infrastructure-led development theories have been influential at different points and to what extent previous experiences are currently being taken into account. This paper reviews the different approaches and ideologies that have underpinned the development of the transport infrastructure since the construction of the first railways and roads in Sub-Saharan Africa. Our hypothesis is that, once historical reasons leading to network failures are properly identified, patterns followed by African transport systems replicate models comparable to others contexts, particularly with regard to the critical role of urban hierarchies and the regional influence of cities.

In Section 2, a timeline with the principal events and different identified periods is proposed and commented upon. While we study the evolution of transport networks in Sub-Saharan Africa at continental level, many of the specific cases used to support the review focus on West and Central Africa. Section 3 presents the recent relevant literature to show that typical methodological limitations of research on transport and development amplify in the case of Sub-Saharan Africa and that empirical evidence does not necessarily translate into appropriate policies. Section 4 identifies the potential of tackling more resolutely the development of secondary networks converging into cities. Section 5 concludes and provides some policy recommendations.

2. The cyclical pattern of transport infrastructure policies in Sub-Saharan Africa

In the past, the gradual development of transport networks in Sub-Saharan Africa has been closely related to the construction of the national territories (Lombard & Ninot, 2010). This evolution was determined by the initial decisions taken during the colonial period and, afterwards, by the political will of the newly created states. Almost 60 years of international aid since the first independences has also had a significant impact in shaping African transport networks. A review of the development of the land transport networks in Sub-Saharan Africa is summarised in Figure 2. On the basis of the works of Debrie (2010), three main geo-historical periods are distinguished: the colonial, the national and the regional. This timeline includes a bar chart where we have indicated the periods of expansion and stagnation of transport infrastructure. This framing is superposed to the ideal-typical sequence of transport development proposed in 1963 by Taaffe, Morrill and Gould. The length of these periods is indicative; the relative infrastructure growth of each period is not based on quantitative calculations, but on this paper's review of literature and documents. In most countries, these cycles have not generally implied a contraction because the lifespan of transport infrastructure is long enough. That is the reason why we prefer to use the word "stagnation". The exception to this irreversibility is countries that have undergone a major crisis, like a war, hastening the degradation of roads and rails and/or causing

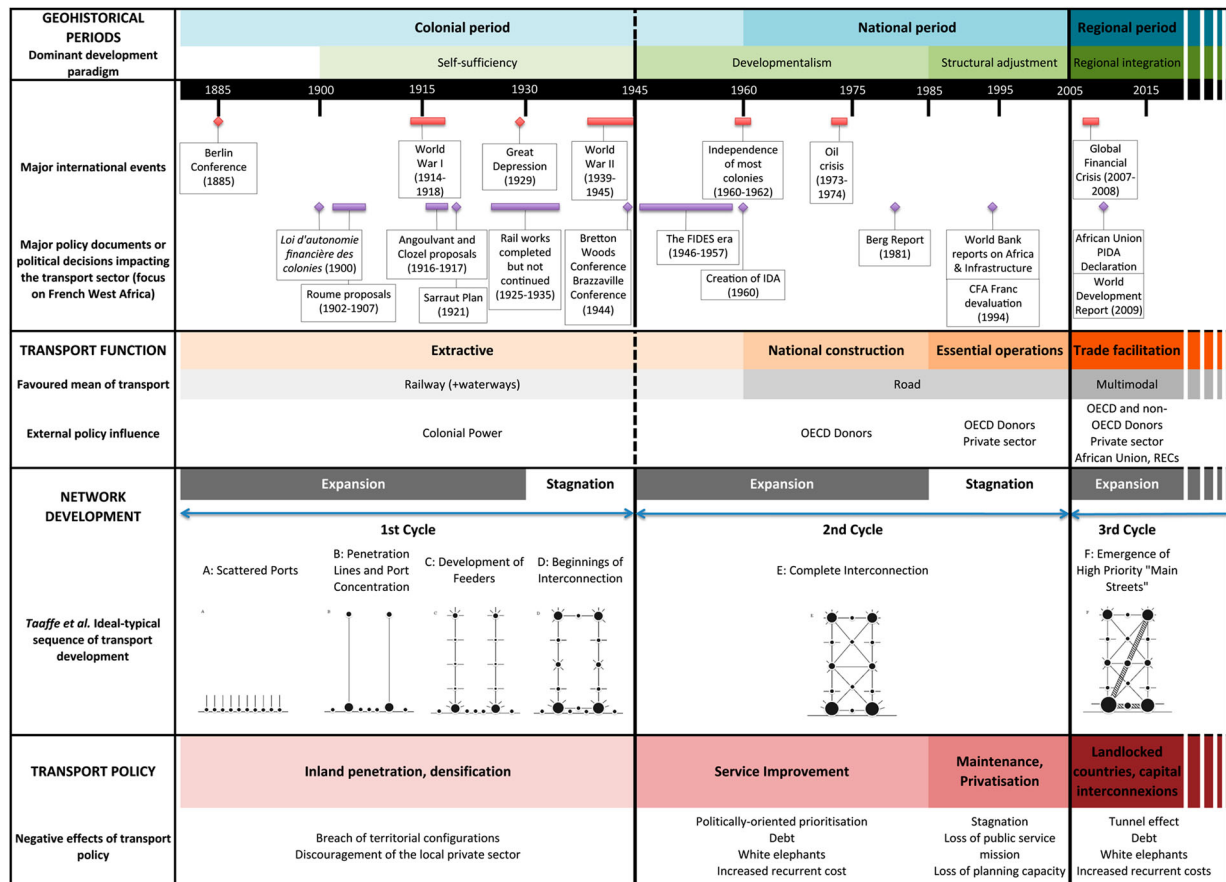


Figure 2. Evolution of the transport networks in Sub-Saharan Africa: an explanatory timeline.

the abandon of maintenance programmes. A description of these growth-decline cycles is provided in the following four sub-sections.

2.1. Colonial and geographical determinants

In the early stages of colonial rule, the penetration transport lines were essentially built for geopolitical reasons and military control and to connect the seacoast with the hinterland, thus enabling the export of minerals and agricultural products to the metropolitan countries (Taaffe, Morrill, & Gould, 1963). The initial plans of colonial powers were rather ambitious, especially in French West Africa where successive colonial governors projected transcontinental rail networks aiming to connect the main ports to all inland major cities (Debie, 2001). They even proposed to exchange territories with the British Empire in order to obtain a more logical territory and coherent transport network (Marguerat, 1997). However, this initial expansion was significantly limited by economic constraints. In 1900, France passed a law adopting the principle of the financial autonomy of the colonies. For colonial powers, capital investments were justified, at first, to access areas with high economic value. The prevailing principle was that colonies had to be self-sufficient, with minimal administration (Young, 1994). Europeans wanted to maximise profits from colonies at the least possible cost (Njoh, 1997). For Taaffe et al., mineral exploitation was the main reason for the rail penetration, as it allowed for repayment of the loans required to finance the infrastructure. Njoh highlights the preference of colonial governments to develop interregional rather than intraregional links and observes that these lines were also conceived to facilitate the transport of labour from inland to the coastal plantations. In the words of Debie (2010), this period was characterised by “the primacy of economic considerations and the absence of a political plan”. As a consequence, colonial territories had an uneven infrastructure provision, and the transport network covered only a limited space within the colonial boundaries. As a matter of fact, the existing transport discontinuities in distant regions were seen as administrative divisions of the colonial space (Herbst, 2000), and when the independences were declared, some of these undeserved areas delineated the national borders of the new states (Debie, 2010). In the 1960s, Taaffe et al. already raised the alert that vast areas of the new created African countries, mostly in the periphery, remained inaccessible by road or rail.

Major disparities in infrastructure provisions were just one of the consequences of a more complex effect of the colonial heritage on the future development of transport networks. Graham and Marvin (2001) note that colonial authorities paid little attention to the mobility needs of local populations. As these authors suggest, “traditional modes of transport were often undermined by new rail and road networks, substantially disadvantaging many important indigenous towns that were economically and administratively bypassed”. Colonial powers enforced bureaucratic obstacles to the development of local industries, and controlled the economy by diverting trade through coastal cities, which was more favourable to the colonialist (Graham and Marvin 2001). This originated the decline of many pre-colonial prominent towns and accelerated the growth of others, particularly the ones that became colonial administrative centres (Njoh, 2006). Some contemporary major African cities did not even exist before colonial times. This reshaping triggered the first significant flows of modern rural–urban migration in Sub-Saharan Africa (Stren & Halfani, 2001). The development of transport networks in Africa entailed

the destruction of previous territorial configurations and the establishment of new spatial compositions (Steck, 2009). Slater (1975) described it as “a simultaneous process of internal disintegration and external reintegration”. For Debie (2001), these mechanisms have led to territorial inversions. Centralities have changed due to physical and administrative discontinuities in the networks. As a consequence, continental areas, such as the Sahel, which once were central to trade, are now considered landlocked. Conversely, coastal areas became central to trade because maritime transport was key to the expansion of the colonial empires.

When looking at the influence of colonial intervention in the evolution of transport networks in Africa, the role of physical geography cannot be underestimated. Colonisers were confronted with an adverse environment that today still has an effect on economic development (Gallup, Sachs & Mellinger, 1999). A critical factor was tropical climate, which is favourable to the vectors of transmission of infectious diseases. Acemoglu, Robinson and Johnson (2003) recall that mortal diseases such as malaria and yellow fever made many colonised areas forbidding to Europeans, circumstance that affected the institutional development and has subsequently constrained the economic development. Gallup et al. also stress the correlation between a hot, extreme climate – humid or dry – and the low productivity of agriculture.

Yet, unfavourable geography negatively affects African economic development in several other ways. As Adam Smith already noted in 1776, Africa lacks navigable rivers providing access from the interior to the sea, and the largest ones are too distant from each other. The rough relief of Africa is linked to higher investment costs in agriculture, construction and transport (Naudé, 2009), although historically ruggedness has also been advantageous in protecting local populations from slave trade (Nunn & Puga, 2012). Furthermore, on what Naudé calls second-nature and third-nature geography,² Sub-Saharan Africa suffers from three drawbacks: low densities, long distances and deep divisions (World Bank, 2009b). Many traditional pre-colonial settlements were dispersed and located away from the sea. In the Middle Age, the nexus between the expansion of Islam and trade favoured the urbanisation along fertile areas of the Southern limit of the Sahara, like the Lake Chad shores or the Niger course (Bairoch, 1985).³ Meanwhile, there has been a significant increase of urbanisation around the world, multiplying by five the urban population between 1930 and 1970. However, following independence, Sub-Saharan Africa still had rates of urbanisation below 15%, and cities were of small size in general (Bairoch, 1985). A major consequence of this population distribution pattern was that colonial governments were unable to collect significant taxes from individuals and opted to rely essentially on custom duties (Herbst, 2000). At the end of this period, the partition of the African colonies into “artificial states” fragmented the territory and exacerbated pre-existing geographical hindrances (Alesina, Easterly, & Matuszeski, 2011).

2.2. The national construction: governments' failure to meet expectations

As represented in the second row of Figure 2, between the Second World War and the final years of colonialism, self-sufficiency policies had been progressively replaced by a developmentalist vision (Young, 1994). This new doctrine implied vast amounts of public investment, especially in infrastructure projects, and the spending of savings accumulated over

previous decades (Herbst, 2000). This boost should be understood in reaction to the strategic role that African colonies had played in the war and in the context of the threat of the Cold War. In the case of West Africa, Huillery (2014) provides quantitative evidence showing that post-war policies represented an important increase of funding to develop infrastructure. These investments essentially consisted of loans channelled through the French “Fonds d’Investissement pour le Développement Economique et Social (FIDES)”, created in 1946.

The aftermath of the Second World War also favoured the resurgence of Eurafrican ideals. The creation of a homogeneous and coherent transport system between Europe and Africa, including the realisation of the trans-Saharan railway from the Mediterranean to the Niger River, was seen as a precondition to establishing the Eurafrica region (Guerrier, 1957). In spite of failing to receive an official endorsement (Dramé & Saul, 2004), these ideals had a decisive influence on the Yaoundé Convention signed in 1963, which defined the principles of the multilateral association between Africa and Europe (Hansen & Jonsson, 2014) that, since then, has contributed to finance a significant part of African transport infrastructure.

African independences coincided with the emergence of the “big push” thesis, which proposed accelerating the growth of underdeveloped countries. As a result of the extractive colonial policies, economies of the independent countries had been born deficiently industrialised and highly dependent on export-oriented resources (Herbst, 2000). The new political leaders, in a conjunction of pragmatism, lack of capacity and desire to preserve their privileges, readily adopted the pre-existing economic model, allowing for the emergence of “rentier states”, where the vast majority of the revenues derived from the rent of natural resources to foreign interests (Clapham, 1996). As a consequence of the deficiencies of the inherited fiscal system, the revenue structure of African countries centred almost exclusively on custom duties and foreign aid (United Nations Economic Commission for Africa [UN-ECA], 1967).

At the end of the 1950s, influential economists like W. Rostow and Rosenstein-Rodan pleaded for massive foreign aid rather than relying on the scarce local savings. They urged support for central governments with substantial international aid programmes in order to simultaneously stimulate investments in several economic sectors (Rosenstein-Rodan, 1961). The big push was supposed to overcome the poor absorption capacity and to increase the national revenue and the size of internal markets. This model was deemed as appropriate for Africa. Colonial policies had had the final consequence of virtually dismantling the local private sector, and Western countries continued to look down on its entrepreneurial capacity (Herbst, 2000). Despite frequent criticisms, particularly on the lack of qualified human resources and institutional capacity of low-income countries to absorb large amounts of foreign aid (Adler, 1965; Myint, 1969), the World Bank predominantly adopted this model in Africa because the new states were seen as an opportunity to expand its lending activities (Fisette, 1997). In 1960, faced with the prospect of the insolvency of a number of African states, donor countries set up the International Development Association (IDA) and entrusted the World Bank with its execution (Laïdi, 1989)⁴. Between 1961 and 1965, 76.8% of all World Bank loans and 50% of IDA loans were granted in the transport and energy sector (Ayres, 1983).

In spite of capital inflows in the form of foreign aid, and the enormous revenue potential from cash-crop agriculture and mineral extraction, most independent Africa states

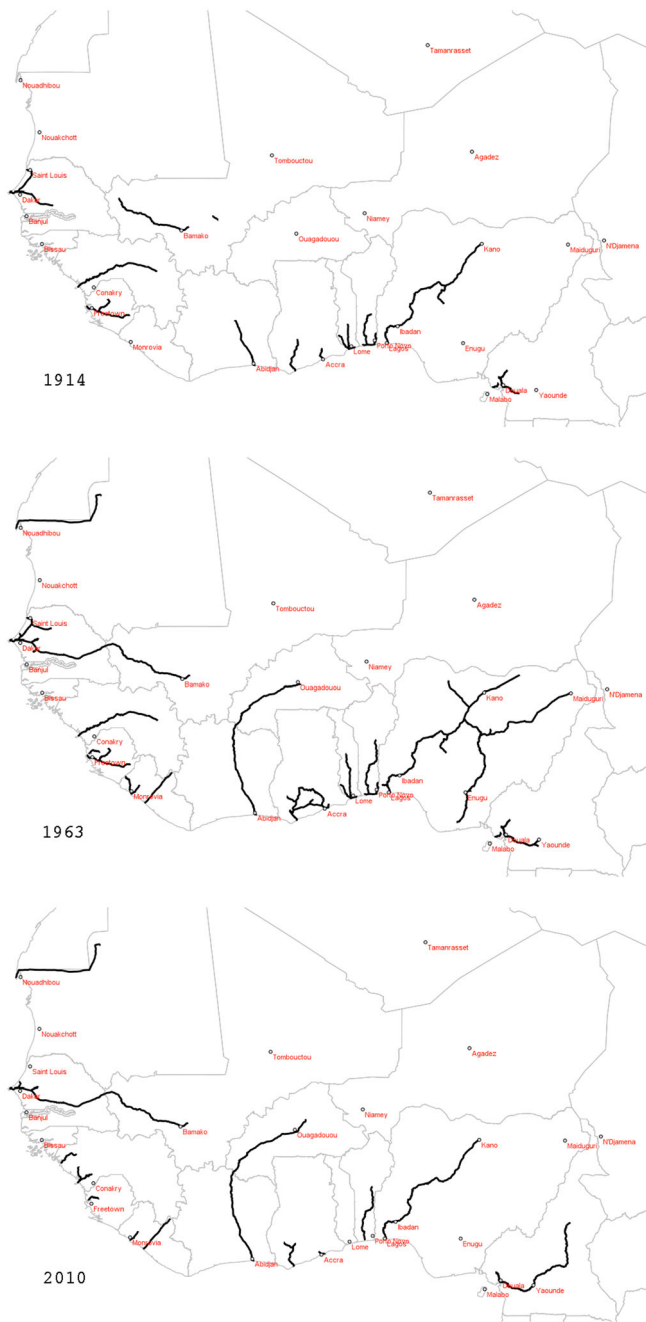


Figure 3. Rail lines in service in West Africa in 1914, 1963 and 2010.

quickly entered into a spiral of indebtedness and slow growth. In an attempt to compensate for structural and geographical weaknesses, African rulers adopted development policies that exacerbated the economic problems (Clapham, 1996). In particular, road transport, a symbol of sovereignty and unity and of territorial control, attesting the very

existence of the new nation on the African scene (Debie, 2010), had become an attractive sector that favoured the proliferation of “white elephants” (Robinson & Torvik, 2005). Public resources of African countries did not follow the substantial increase of public expenditure and were not appropriately oriented (UN-ECA, 1967). For instance, more public expenditure of low-income African countries was on infrastructure than on productive activities, education and social protection (UN-ECA, 1967). The conviction of a rapid launch on the basis of monetary injection, “the big push”, entailed the implementation of inadequate urban-centred industrialisation policies. In 1977, Lipton and other development theorists warned of an “urban bias” in developing countries’ governmental actions. In their opinion, an economy based on heavy taxation of agricultural exports, that diverts resources to industry and urban development, is not viable and condemns rural populations to permanent poverty. Pedersen (2003) emphasises that these import-substitution policies allowed for a further progress of capital cities and main ports, but did not contribute to the national economic integration or to the development of the national transport systems. Actually, transport policies were not a break with the previous period but rather a continuation of the policies decided by the colonial powers (Lombard & Ninot, 2010).

From the 1970s, the increase in the number of asphalted roads represented a harsh competition for the railway mode, which ended by putting the relatively good-performing rail public operators into financial troubles (Chaléard & Chanson-Jabeur, 2006). This precipitated the decline of small hubs and towns situated along the rail lines, where the large colonial trading companies were established, while other towns expanded due to their positioning on the new roads (Lombard & Ninot, 2010). As it is shown in Figure 3, with the exception of Cameroon and some private mining lines, the railway network in West Africa has contracted since the 1960s and it is still far from reaching the connectivity aspired by colonial powers and current governments.

2.3. The deregulation of the economy and the power of the World Bank’s policies (1985–2005)

At the end of the 1970s, a widespread debt crisis accompanied by very low, or even negative, growth rates had emerged in Africa (UN-ECA, 1980). In addition to the structural and inappropriate policies, the international economic situation, notably since the oil and stock market crisis of 1973–1975, contributed to aggravate the African development problems. The reasons for the poor economic performance of Sub-Saharan countries were detailed in a 1981 World Bank report known as the Berg Report. This report proposed a new strategy to rectify the existing situation by identifying “major policy actions central to any growth-oriented programme: more suitable trade and exchange rate policies; increased efficiency of resource use in the public sector; and improvement in agricultural policies”. The Berg Report positioned the World Bank as the “dominant source of economic and policy analysis for Sub-Saharan Africa” (Sander, 2002) and became the “immediate intellectual precursor to the introduction of the structural adjustment programmes (SAPs)” (Mkandawire & Soludo, 1998) largely assumed in the 1980s by international financial institutions, bilateral donors and governments in Africa.

SAPs were instituted to encourage higher growth rates in countries experiencing economic crises. For this purpose, African governments were asked to undertake pro-

market reforms, notably through macroeconomic measures, domestic deregulation, trade liberalisation, civil service reform and privatisation of public enterprises (World Bank, 1994a). These policies affected the transport sector in different ways. First, adjustment measures resulted in a substantial reduction in infrastructure capital spending (World Bank, 1994b). This contracted the already scarce resources allocated to road maintenance, and consequently, roads in Africa entered into an irremediable deterioration process (Torres Martinez, 2001). In 1988, Sub-Saharan countries had lost 15% of the capital invested in main roads, or approximately 3.3% of GNP, due to lack of maintenance (Harral & Faiz, 1988). The same year, less than 50% of Sub-Saharan Africa's paved roads were in good condition, with countries like Ghana, Cameroon and Mozambique having only 28%, 38% and 10%, respectively, of paved roads in good condition (World Bank, 1994b). The Harral and Faiz study concluded that, in a number of African states, it would have not been possible to rehabilitate the network within a period of ten years, even if funding had been increased by 50% and new construction held to 20% of the new total to ensure adequate maintenance. In 1994, the proportion of roads needing restoration had increased to one-third, having a cost estimated at \$13 billion; in parallel, the portion of IDA commitments allocated to infrastructure had been reduced to one-third of the total, that is, \$2 billion per year (World Bank, 1994b). During the period 1985–1994, IDA commitments for transport in Africa amounted to approximately \$3.6 billion of a total of the \$14.5 billion allocated to the sector by Official Development Assistance (ODA) donors (Torres Martinez, 2001). In addition to these financial constraints, factors that accelerated road degradation include traffic growth, absence of protection against overloaded trucks and weak technical and managerial capacity in the road maintenance departments (European Commission, 1991). In this context, African rail operators had also been particularly impacted, as they had entered into a vicious circle of decay: low traffic due to the economic crisis and road competition, drop in revenues, high debts that governments were not able to subsidise, stricter donors' conditions, lack of maintenance, operational failures, customers' dissatisfaction and lower revenues (Dupre La Tour, 2006).

From the mid-1980s and during the 1990s, in view of the importance of transport to economic development, Transport Sector Projects (TSPs) were progressively introduced in Africa. TSPs were closely linked to the economic reforms promoted by the SAPs and led to profound institutional changes in the transport sector (Adolehoume, 1999). Considering the high transport costs, the low efficiency of the public companies and the deplorable situation of the road network in Africa, TSPs mainly focused on two aspects: to liberalise transport services and to improve road maintenance (Adolehoume, 1999). For these purposes, the prevailing formula prescribed by the World Bank was to increase the involvement of the private sector (World Bank, 1994b) and to redefine the role of the government (World Bank, 1996). These policies resulted in the privatisation of many national and international public transport enterprises and facilities such as rail lines, truck companies and container terminals. The segmentation of the sector management increased financial efficiency but entailed a loss in coherence and long-term vision (Lombard & Ninot, 2010). With regard to road maintenance, public works departments were restructured and limited their roles to tendering, managing and supervising work contracts instead of carrying out direct operations (Adolehoume, 1999). A major reform was the introduction of second-generation Road Maintenance

Funds (RMF), based on the idea that “commercialising” road management would secure and increase the efficiency in the use of the funds (Heggie, 1995).⁵ However, benefits expected from TSPs take a long time to become a reality. RMFs still perform with difficulties in many countries (Foster & Briceño-Garmendia, 2010). In West and Central Africa, the CFA Franc devaluation in 1994 accelerated the fragmentation of the transport offer by a multiplication of informal road operators who overload and use old trucks in poor condition to make their investments profitable (Debie, 2001). In West Africa, the absence of a real regional integration still favours unfair competition between corridors and prevents the implementation of a coherent truck-load control policy (Zerelli & Cook, 2010).

The period of hegemony of SAPs coincided with significant developments of the transport sector at the international level, in particular the containerisation and the concentration of the shipping industry (Pedersen, 2001). These private strategies had little immediate impact in the African transport configuration because of limited port capacity, predominance of unskilled low-wage professionals and deficient inland transport conditions (Pedersen, 2001). However, the development of the most vital logistical chains for the national economy started to be strongly influenced by these private international interests (Debie, 2001). Indeed, as a result of the privatisation and deregulation process, only the most promising and profitable terminals, lines and services had actually been conceded and awarded to a few big logistic groups (Chaléard & Chanson-Jabeur, 2006). In addition, these international companies base their business models on monopolistic practices aimed at offering the full range of activities of integrated door-to-door services in specific international corridors (Debie, 2001).

In terms of network development, the end of the national period was strongly impacted by SAPs, a phase of stagnation as labelled in Figure 2. The density and the technical nature of the transport network had virtually not changed (Debie, 2010). Priority had been given to rehabilitating the existing infrastructure. IBRD/IDA commitments for transport in Africa remained below \$600 million per year between 1995 and 2006, representing 14% of the total IBRD/IDA commitments in the region (World Bank, 2007). The financial volumes of European aid in the form of grants to the sector were of the same order of magnitude during this period, between €400 and €500 million per year (European Commission, 2008). As a point of comparison, in 2008, the annual spending needs for the transport sector in Sub-Saharan Africa were estimated at \$18.2 billion, of which \$8.8 billion was required for capital expenditure and \$ 9.4 billion for operation and maintenance (Foster & Briceño-Garmendia, 2010). Despite the enormous financial gap, this phase ended with “signs of a more positive development” (Pedersen, 2003) and a growth both of EDF and IBRD/IDA transport commitments, the latter “because the [World] Bank realized that excessive transport costs continue to be a hindrance to the Region’s development” (World Bank, 2007).

2.4. The trade/regional integration paradigm and the inrush of Chinese interests

In the last 20 years, economists have developed areas of interest particularly relevant to understanding growth and poverty reduction in developing countries. A number of them are concerned with the specific difficult situation of Africa and study the relationship between growth, trade, transport costs, infrastructure and natural geography (Bosker &

Garretsen, 2012; Limão & Venables, 2001; Naudé, 2009; Redding & Venables, 2004; Venables, 2010). Authors have been pleading the importance of helping African countries in market liberalisation and in improving their capacity to trade, claiming the fact that trade works as leverage for economic growth and poverty reduction (Collier, 2008; Collier & Venables, 2007; Stiglitz & Charlton, 2006). The unquestionable proximity of most of these scholars with the World Bank and other development agencies has influenced policy-making in developing countries.⁶ Such is the case that, since the launch of the Aid for Trade initiative at the Hong Kong Ministerial Conference in 2005, trade facilitation and regional agreements are considered as central instruments for development assistance (World Bank, 2009a; African Development Bank Group, 2013; European Commission, 2011). Another prominent development policy document influenced by economic geography theorists is the World Development Report of 2009, entitled “Reshaping Economic Geography” (World Bank, 2009b). The main assumption is that, in a given territory or country, economic production cannot be encouraged simultaneously all over. It provides evidence that the geographic concentration of economic activity will increase the national average worker productivity and incomes. The emigration of workers and firms from low-density areas will ultimately also lead to higher per capita incomes in the regions that lose population. Transport infrastructure has a notable impact on location decisions and consequences on local and aggregate incomes. The report concludes that, although growth is necessarily unbalanced across space, development can still be inclusive, thanks to the convergence of living standards.

The advance of trade and regional integration policies that has characterised this period has coexisted with a significant increase of aid to infrastructure development (Gutman, Sy, & Chattopadhyay, 2015). In 1994, bilateral and multilateral foreign aid accounted for approximately 12% of the total infrastructure financing in developing countries (World Bank, 1994b). In 2008, 25% of the capital spending on infrastructure in Sub-Saharan Africa came from ODA and non-OECD donors (Foster & Briceño-Garmendia, 2010). In 2014, 28% of the total funding for infrastructure in Africa (including North African countries) came from bilateral donors and multilateral banks (Infrastructure Consortium for Africa, 2014). It is in this context that, in 2012, the PIDA was drawn up and approved by the African Union. In addition, during this time, there has been a proliferation of publications and initiatives interested in the infrastructure financing needs at a continental level.⁷ Concomitantly, OECD donors’ investments in the transport sector have had a growing focus on regional economic integration, tending to finance regional multimodal corridors that interconnect African capitals and give sea access to landlocked countries (see, for instance, Ernst & Young, 2012). As Figure 2 displays, this period, where trade and regional integration becomes the archetype for African countries, has strong similarities to the sixth and last phase preconised in the Taaffe et al. model.

Another common message of recent policy documents is the importance of increasing the participation of the private sector, notably through Public–Private Partnerships (PPP), in order to fill the gap of Africa’s infrastructure financing needs. However, private investments as a contribution to the total funding in infrastructure in Africa (including North African countries) have remained low, 9% in 2012 and 4% in 2014 (Infrastructure Consortium for Africa, 2014). Osei-Kyei and Chan (2016) examine the adverse institutional context to develop PPP projects in Sub-Saharan Africa, which is one of

the developing regions with fewest transport PPP projects and highest number of failed ones.

Finally, a major feature in the Africa infrastructure sector in the current period is the surge of Chinese investment. Although other significant non-OECD financiers have also become relevant, China quadrupled development aid between 2001 and 2005, with a specific focus on resource-rich Sub-Saharan countries (Foster & Briceño-Garmendia, 2010). Between 2011 and 2013, the average commitments of Chinese lending to African infrastructure projects were \$13.9 billion. In 2014, China contributed with almost 15% of the total financing committed for Africa's infrastructure development, including the African national budgets (Infrastructure Consortium for Africa, 2014). On average, approximately 67% of Chinese investments have been allocated to the transport sector (Infrastructure Consortium for Africa, 2014). Although Chinese investments are mostly centred on international links, as it is the case with ODA projects, Bonfatti and Poelhekke (2017) provide some evidence on a bias towards reinforcing Africa's interior-to-coast transport network, probably obeying to mining interests. Another aspect is the significant arrival of Chinese construction firms, not only to execute projects funded by the Chinese government but also under contracts financed by traditional partners like the World Bank or the African Development Bank. Corkin, Burke, and Davies (2008) describe the intervention of Chinese firms and the role of China in the developments of large infrastructures in Africa and highlight that the entry of Chinese companies in the Africa's construction sector has intensified competition in the bidding process.

According to these trends, the outlook of Africa's infrastructure seems favourable. Paradoxically, this growth in financing infrastructure projects has not necessarily implied better projects and reduced transport costs. Policies requiring comprehensive project appraisals, going beyond classic cost-benefit analysis, have not been consistently implemented (World Bank, 2010). High transport prices in Africa cannot merely be explained by lack of infrastructure in good conditions (Teravaninthorn & Raballand, 2009). Non-physical determinants, as customs formalities, corruption and the prevalence of transport cartels, are still highly representative in the breakdown of transport prices. In addition, recent developments suggest caution. Economic uncertainties that followed the global financial crisis of 2008 remain. After a fall in external aid, infrastructure commitments have increased again from 2011, but China's flagging economy seems to also have entailed a shift in the country's investment strategy in Africa: in 2014, Chinese commitments for infrastructure were reduced by 77%, down to \$3.1 billion (Infrastructure Consortium for Africa, 2014). The overall growth in Sub-Saharan African countries is decreasing, mainly as a result of the decline in oil and other commodity prices. Security conditions have deteriorated in many places, which also has a negative impact on the economy. These adverse conditions develop in contexts that still have high levels of inequality and are unattractive for domestic and foreign investors. In response to this weakening, policy recommendations from IMF in 2015 include, among other macroeconomic and institutional measures, fostering competitiveness by "productivity-enhancing infrastructure investments while maintaining debt sustainability" (International Monetary Fund, 2015).

3. Challenges for incorporating recent empirical research recommendations into transport policies

A noticeable characteristic we can draw from the previous section with regard to the outline presented in [Figure 2](#) is that the development of Sub-Saharan Africa's transport infrastructure may currently be at the changing point of a third cycle turning into stagnation after more than a decade of expansion. In particular, in West and Central Africa, the current situation has similarities to the big push policies of the era of the FIDES loans and the first years of independence. Since the infrastructure coverage today is much larger and of better quality, and African economies are more solid, a slowdown would probably have less critical consequences than the ones of the period of the 1970s–1990s. However, as it is explained, current policies represent significant investments, the rise of public debt and an increase in operational and maintenance costs, circumstances that may lead to another period of inactivity, infrastructure degradation and the abandonment of important projects.

As can also be observed in [Figure 2](#), each of these three cycles shows a correspondence between the rise of Africa's infrastructure financing and the proliferation of studies and policy documents advocating for it. It should be clarified though that the succession of growth theories or the set of paradigms in development strategy thinking that has evolved over time is not as disjoint as [Figure 2](#) may suggest. For instance, the “big push” thinking contained the element of emphasising increasing returns to scale or indivisibilities of inputs that is fundamental for the current development thinking. Large-scale (indivisible) investment is supposed to have a coordinating effect for private investors, leading to cumulative causation of development as average costs of infrastructure services or manufacturing production decrease with increasing demand. This is expected to secularly increase macroeconomic productivity. Similarly, the importance of access to local and international markets had not been suspended in the early days of development policies.

The effects of transport infrastructure and their theoretical justifications in the Sub-Saharan context remain controversial and easily misconceived. Retrospectively, some authors consider that forced and violent opening of inland areas during colonial times cannot be considered as a development policy (Steck, 2009) and even resulted in underdevelopment and poverty in the case of Southern Africa (Pirie, 1982). This adverse effect of transport networks is also identified in the post-colonial periods. Debie (2001) rightly notes that aid projects opening landlocked areas often adhere to a strictly technical vision. Certain corridors are privileged, but the interaction between the network and the territory it crosses is ignored. There is a polarisation effect, where a small number of urban centres and main corridors have a growing hegemony to the detriment of the rest of the country (Péguy, 1998). The concentration of the flow in a few corridors may lead to the emptying of the bypassed regions but also to the saturation of the ones that are prioritised (Steck, 2009). Dagnogo, Ninot, and Chaléard (2012) explain that prolonged spaces crossed by the rail line between Côte d'Ivoire and Burkina Faso experience a “tunnel effect”; that is, they do not have access to transport services because some stations are not profitable for the concessionaire and therefore are closed. Contrariwise, in the case of Ghana, the century-old railways have had a long-lasting positive impact on the urban economic system, thanks to its complementarity with the posterior road

network (Jedwab & Moradi, 2016). Béranger (2012), by comparing two study cases from Kenya and Mozambique, stresses the importance of balancing the import–export rail function with short-distance rail services in order to enhance development at the local level. Contrastingly, Laurance, Goosem & Laurance (2009) provide a singular favourable vision of the tunnel effect and advocates for rail lines, rather than roads, with stations in selected locations as a means to reduce the deforestation of tropical areas. If trans-African roads through large rainforest regions are inevitable, a network of conservation corridors should accompany them (Kleinschroth, 2016). In the case of the Nouakchott-Nouadhibou trans-Saharan road in Mauritania, Steck (2012) highlights that the opening of this international corridor has also had adverse effects on biodiversity in desert zones. Since classical cost–benefit analysis based on traffic forecasting cannot estimate these direct or indirect impacts, Ali et al. (2015) propose new analytical tools in order to maximise benefits (in agriculture) and to reduce negative externalities (deforestation and conflict-related impacts) of road improvements.

A number of papers published by World Bank economists reinforce the idea that the African main road network should be massively asphalted in order to catalyse trade and contribute to growth (Buys, Deichmann, & Wheeler, 2010; Calderón & Servén, 2010; Coulibaly & Fontagné, 2006). Figure 4 shows two maps developed by Buys et al. (2010), based on the Trans-African Highway Network proposed by the UN-ECA and the African Development Bank in 2003. Read out of context and uncritically by politicians and policy-makers, these maps can underpin the myth of the “structuring effects” of transport and justify decisions that are unfavourable for the sustainability of the transport system. Indeed, while the conclusions of that paper may certainly be robust, the second map seems to indicate that the upgrade of certain roads, like the ones connecting East and West Africa between the tropics, should be prioritised. However, it is reasonable to expect that the traffic on the roads with higher trade growth after upgrading may not even be close to the traffic on the roads with current higher absolute traffic, especially if the traffic of the former was nearly inexistent before construction.

The economic impact of trans-African highways and their prioritisation among other transport investments has also to be discussed in juxtaposition to the need for improving rural accessibility and opening remote areas inside a country (Mwase, 1989). Indeed, there is an undeniable pressing demand for improving rural roads in developing countries, especially in Africa where poverty prevails in rural areas (Porter, 2014) and the majority of jobs remain in the agricultural sector (Gollin & Rogerson, 2014). Also in this case, transport-led growth misperceptions and political interferences are frequent (Raballand, Macchi, & Petracco, 2010). Moreover, rhetoric in favour of transport infrastructure can be particularly harmful in certain contexts of Sub-Saharan Africa where undemocratic regimes and/or bad governance abound. Blimpo, Harding, and Wantchekon (2013), in the case of Senegal, Benin, Ghana and Mali, and Burgess, Jedwab, Miguel, Morjaria, and Padró i Miquel (2015) for Kenya, provide some startling illustrations where the political utilisation of road investments has had a negative impact by marginalising parts of the population.

The numerous works reviewed above are not exhaustive but are enough to illustrate that, in the case of Sub-Saharan Africa, efforts to translate academic research into right policies can be even more challenging than in other contexts. Growth-enhancing effects of transport infrastructure can be higher than in industrialised economies but, depending on the institutional settings, can more easily result in spatial inequality,

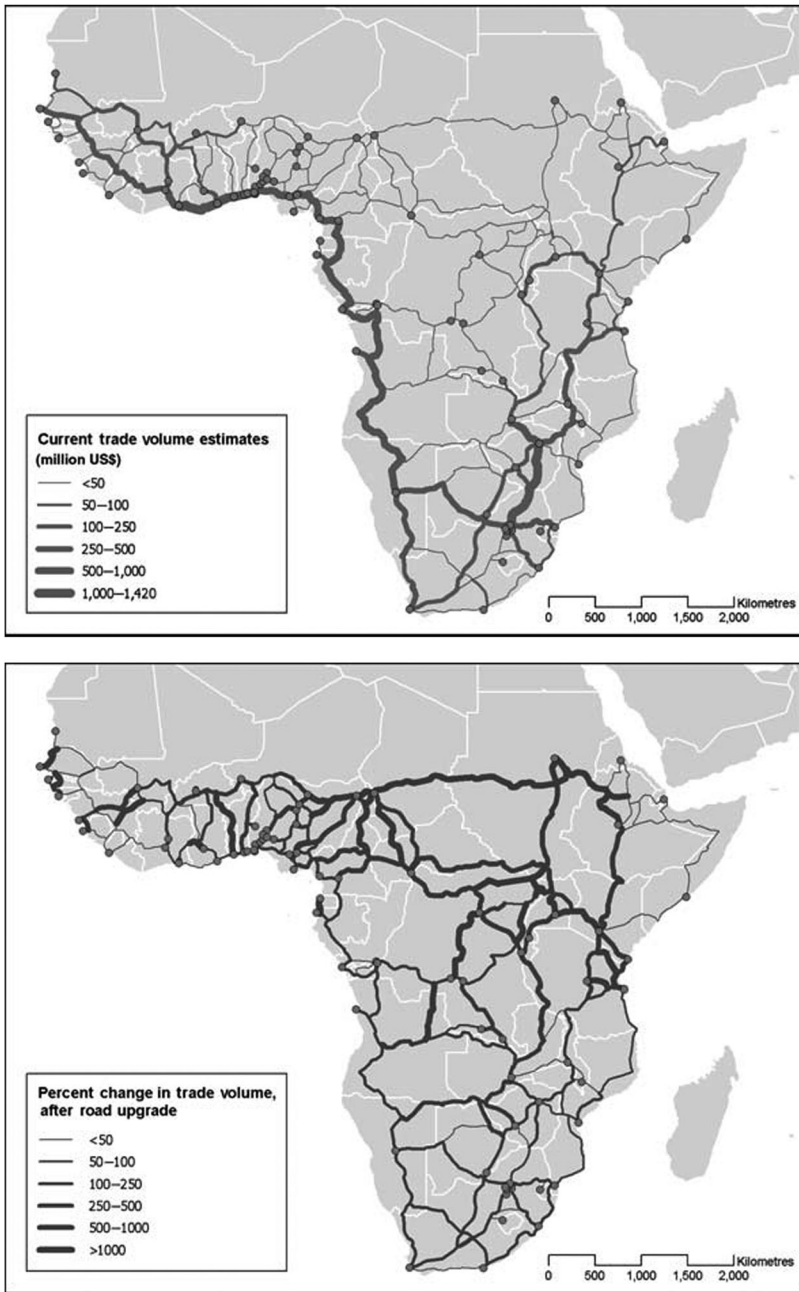


Figure 4. Trade estimates for the African road network (USD, million) and % changes in trade after road upgrading (Buys et al., 2010).

unsustainable road management costs and increased negative environmental impacts. To address these drawbacks, policies have to consider the articulation between international and local transport, in particular, the impact of the efficiency of the urban systems on the country’s international competitiveness, the rural–urban dynamics

(especially how agricultural production is transferred to cities) and an appropriate investment mix between corridors, the secondary network and rural roads (Godard, 1996; Raballand, Macchi & Petracco, 2010). As Lall, Schroeder, and Schmidt (2014) recommend, “policy-makers should consider spatial efficiency–equity trade-offs in deciding the spatial allocation of infrastructure investment”.

4. Start filling the middle gap: secondary networks converging into cities

As shown in previous sections, a number of factors characterising network failures in the Sub-Saharan African transport system lie in the historical heritage since the colonial period. Debie (2001) raises the question of whether African countries are skipping the fifth phase of the Taaffe et al. model, the one of the interconnection of the main inland centres, and whether these countries have directly entered in a phase of development of the “high priority main streets”. However, as described in Section 2.2, the average road network expansion in Africa during the post-colonial period has been relatively low. Herbst (2000) explains that road alignments do not differ much from the ones existing in colonial times if we consider “anything that could reasonably be said to be able to carry motor traffic at least part of the year (i.e. the dry season)”. Actually, even in the most remote areas, exchanges are old and have never ceased to exist (Debie, 2001), and many of the paths taken end up becoming part of the road network. The important change lies in the service level to be considered. Many pre-existing roads have been upgraded to all-season gravel or asphalted roads since the independence. So, even if the results after the independence may have been modest in terms of network extension, service improvements have been considerable.

To better illustrate this evolution, it is useful to examine how the road networks have grown in Africa after independence. Figure 5, where spots represent cities with more than 100,000 inhabitants and red lines indicate main paved or partially improved roads, reveals that these improvements have started around main urban centres, regardless of their coastal or inland position, and that they have successively expanded until they have almost completed connectedness and improved the connectivity at the regional level. The problem, explained in Section 2.2, is that, with poor maintenance systems, service level easily deteriorates and the backlog of rehabilitation needs increases sharply.

For Hoyle and Smith (1998), historical models of transport development, including the Taaffe, Morrill and Gould model for West Africa, have a global relevance and confirm that the spatial patterns of global links and urban hierarchies can be replicated in different contexts. It is in coherence with classical models advocating for the self-organising character of spatial economy and, in particular, with authors like Lösch (1954) in the sense that, in the evolution towards equilibrium between cities, there should be some predictable regularity in spatial structure. Dorosh, Wang, You, and Schmidt (2011) confirm that agricultural production and travel time to urban markets are highly correlated in Sub-Saharan Africa, which means that both population and agricultural production follow a spatial concentric distribution encircling large cities. In a similar way, Storeygard (2016) establishes that the decentralisation of economic activity is related to road service level (paved or unpaved) around cities. These findings are consistent with Jedwab and Moradi (2016) who reveal that, despite significant road

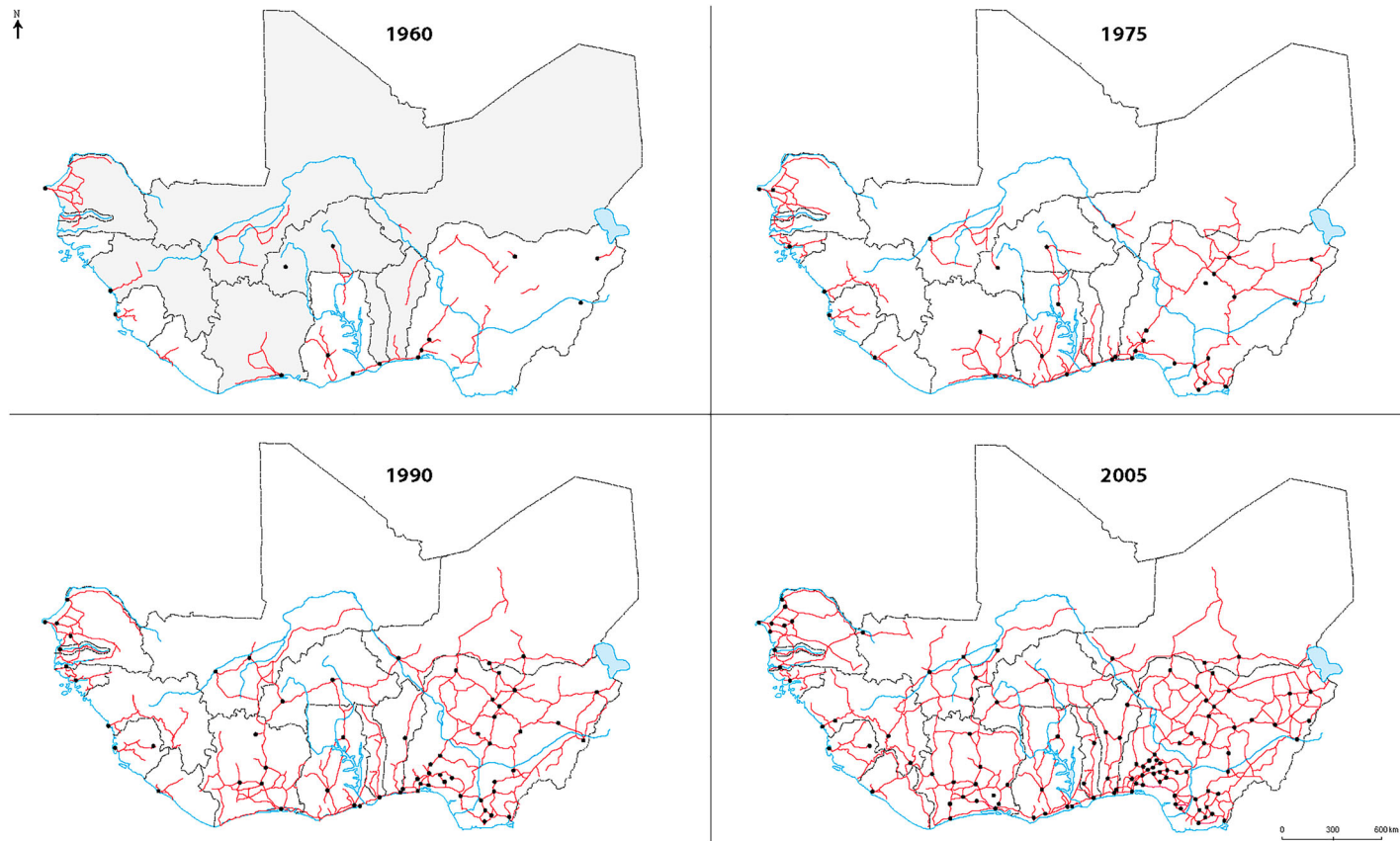


Figure 5. Main paved or partially improved roads within ECOWAS (Economic Community of West African States, 2005).

investments, urban systems have been stable in post-colonial Africa while, in line with 1933 Christaller's central place theory, complex hierarchised relations between localities have emerged. Interestingly, according to Raffestin's perspective on Christaller's theory, in the developed economies, nodes were relatively more important than networks between the industrial revolution and 1950s (Raffestin, 1987). In the same way, Taaffe et al. warn of the limits of their ideal sequence of transport development in developing countries by acknowledging that "high-priority linkages would seem to be less likely to develop along an export trunk line than along a route connecting two centres concerned in internal exchange".

Accordingly, one can say that the overall development of land transport networks in Africa has not followed significantly different patterns from the ones that occurred in other continents, as it is determined by the regional influence of the main urban centres and has been influenced by political decisions and economic activity. However, the role of nodal development is still predominant and poorly understood in the African context. For instance, recent research concludes that the urbanisation patterns in Africa are mostly driven by the extraction of natural resources rather than by an industrialisation process (Gollin, Jedwab, & Vollrath, 2016). This singularity of the growth of cities in African resource-exporting countries probably entails a relationship between them and their area of economic influence that shapes a regional development different from the one favoured by cities in industrialised contexts.

An adaptation of the Taaffe et al. model, by adding enlarged representations at the level of an interior urban centre, could be useful to better understand the critical role of African cities in the context of the local, national and international systems which they serve (Figure 6). In their model, Taaffe et al. bring forward the idea that the last phase is actually a repetition of the previous processes but at a higher level, which is in line with the hierarchical organisation of the territory anticipated by Christaller and the infrastructure-led reorganisation of urban areas. Analogously, at a lower scale, following the thesis that places cities as central drivers of urban revolutions (Soja, 2001), a process of concentration and prioritisation of linkages can be established. Thus, the initial stages of scattered ports and the introduction of inland transport modes correspond to the traditional city systems, where the role of nodes predominates and transport modes are limited. With the progressive introduction and extension of arterial and feeder railways and roads, localities expand, first around the city centre and gradually along the transport lines. The complete interconnection at the national level arrives with the generalisation of modern motorised transport modes, which in turn drastically changes the appearance of cities. However, access cannot be spatially uniform and numerous geographical areas and social groups are left segregated.

Therefore, the last and current phase of transport development should be conceived beyond the emergence of international trade corridors. Inclusiveness and integration of regional cities in the territorial networks are critical at this stage. Addressing the weaknesses of secondary transport networks encircling cities is an investment need comparable to interconnect major African capitals. In this respect, further research specifically focused on the relationship between the existing urbanisation trends and transport networks in Sub-Saharan African countries is needed and is set to become crucial in policy-making.

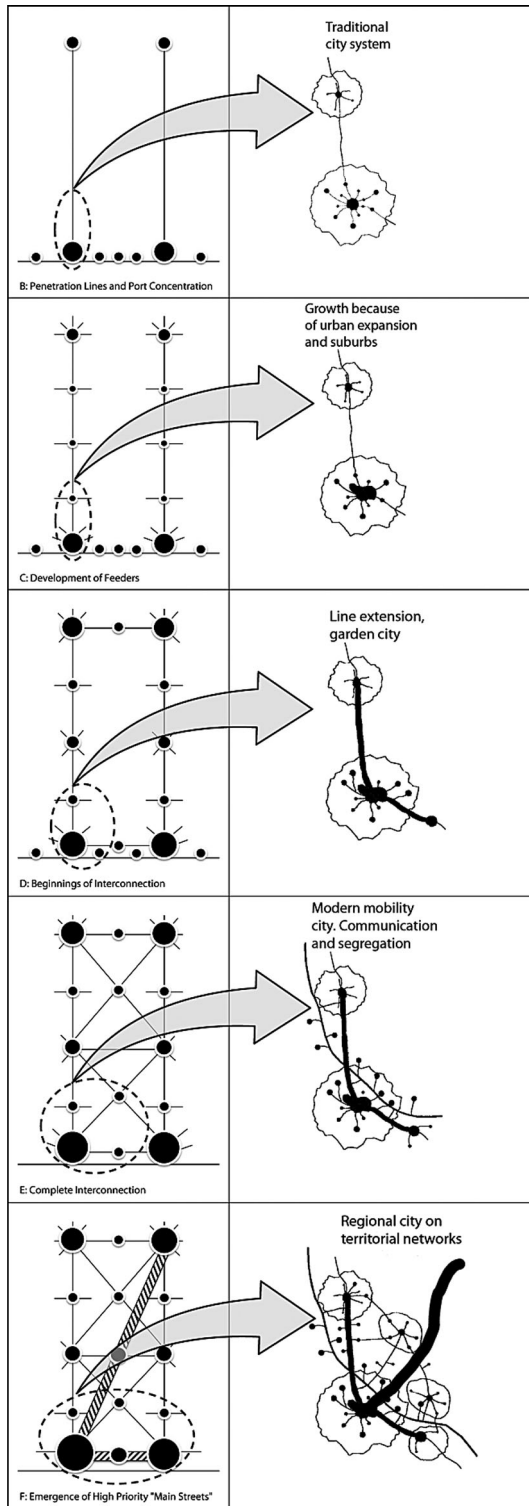


Figure 6. The correspondence between the ideal-typical sequence of Taaffe et al. (1963) and the metropolisation process model shaped by transport infrastructure (Herce & Magrinyà, 2002).

5. Conclusions

In this paper, we have reviewed the history of transport infrastructure development in Sub-Saharan Africa, in the perspective of changing development strategies that have accompanied the expansion of transport infrastructure development since the colonial rule. The mechanisms shaping this evolution show that the development of transport corridors between the main urban centres depends on the coexistence of a regional influence of these cities with specific political and economic paradigms. Past events at the continental and regional levels reveal that the continent has recently experienced different periods of infrastructure expansion that could lead again to a stagnation phase. Current transport infrastructure policies are markedly focused on the development of international rather than local connectivity. While completing most international corridors certainly needs to be considered, a balance with strategic investments at subnational and local levels in the form of secondary metropolitan roads should be encouraged. Overall, the selection and design of transport projects should be accompanied by rigorous analysis of the operating and maintenance costs and future recovery mechanisms, especially in terms of debt sustainability. These principles are widely accepted by traditional aid actors. However, their capacity to shape national or regional transport policies is becoming more and more limited. While infrastructure policies have been strongly influenced by the path dependence that originates in colonial times, nowadays, only about three quarters of the infrastructure funding comes from other than international financial institutions and bilateral aid. Moreover, multilateral banks and bilateral donors are committed to act upon the demand of developing countries, while exposed to competition among each other and the new development banks set up by emerging economies, notably China. Therefore, the future of land transport infrastructure in Sub-Saharan Africa will be determined by the influence of a greater number of international actors with different interests and political and economic leverage. The result will depend on the capacity of African governments to allocate resources efficiently, by developing appropriate public investment decision-making tools and by negotiating fair and timely agreements with foreign partners. Rather than giving preference to international corridors, transport policies aiming at further improvements of the road network should be supportive to the actual expansion patterns: developing around metropolitan areas and contributing to consolidate and amplify the already existing exchanges.

Notes

1. Plans to develop trans-African corridors are not a PIDA novelty. See, for instance, Comité de l'Alliance Internationale de Tourisme (1947) and UN-ECA and African Development Bank (2003).
2. "Second-nature geography concerns features that depend on the spatial interaction between people in an area but are not necessarily inherited", and "third-nature geography concerns features of an area that are based on prior human intervention".
3. This advance of Islam was limited to the south by the presence of the Tsetse fly (Bairoch, 1985).
4. This new development financial institution was created to complement the mission of the International Bank for Reconstruction and Development (IBRD), the first of the World Bank institutions established in 1944, which mainly offers non-concessional loans to middle-income developing countries. Instead, IDA provides grants or loans at highly concessional terms mainly to low-income countries.

5. The principle tenet is that road users should pay a fee separate from the government's taxation, a fee that is usually paid through a levy included in the fuel price and transferred by petrol companies directly to the RMFs.
6. For instance, Sitglitz was senior Vice-President and Chief Economist at the World Bank from 1997 to 2000, Venables was the Chief Economist at the UK Department for International Development (DFID) from 2005 to 2008 and Collier was the Director of the Development Research Group of the World Bank from 1998 to 2003.
7. It is worthy of mention: Foster and Briceño-Garmendia (2010), Infrastructure Consortium for Africa (2014) and World Economic Forum (2013).

Acknowledgements

Authors are grateful to the anonymous reviewers for their valuable and constructive comments in revising the paper.

Disclosure statement

No potential conflict of interest was reported by the authors.

ORCID

Sergio Oliete Josa  <http://orcid.org/0000-0003-2337-4382>

Francesc Magrinyà  <http://orcid.org/0000-0002-4638-0868>

References

- Acemoglu, D., Robinson, J., & Johnson, S. (2003). Disease and development in historical perspective. *Journal of the European Economic Association*, 1(2–3), 397–405. doi:10.1162/154247603322391035
- Adler, J. H. (1965). *Absorptive capacity: The concept and its determinants*. Washington, DC: Brookings Institution.
- Adolehoume, A. (1999, November). *Les projets sectoriels des transports en Afrique Sub-Saharienne: bilan et reflexions (Actes du Séminaire SITRASS 5, 2–4 novembre 1999, Cotonou)*. Lyon: SITRASS.
- UN-ECA, & African Development Bank. (2003). *Review of the implementation status of the Trans African Highways and the Missing Links (Volume 1: Main Report, Final Report)*. Stockholm: SWECO International AB and Nordic Consulting Group AB. Retrieved from <https://www.afdb.org/fileadmin/uploads/afdb/Documents/Project-and-Operations/00473235-EN-TAH-FINAL-VOL1.PDF>
- African Development Bank Group. (2013). *At the center of Africa's transformation, strategy for 2013–2022*. Retrieved from https://www.afdb.org/fileadmin/uploads/afdb/Documents/Policy-Documents/AfDB_Strategy_for_2013–2022_-_At_the_Center_of_Africa's_Transformation.pdf
- African Union. (2009, February 2–3). *Declaration on development of transport and energy infrastructure in Africa*. Declaration Assembly/AU/Decl.1 (XII), Assembly of the African Union 12th Ordinary Session. Retrieved from https://au.int/sites/default/files/decisions/9559-assembly_en_1_3_february_2009_auc_twelfth_ordinary_session_decisions_declarations_message_congratulations_motion.pdf
- Alesina, A., Easterly, W., & Matuszeski, J. (2011). Artificial states. *Journal of the European Economic Association*, 9(2), 246–277. doi:10.1111/j.1542-4774.2010.01009.x
- Ali, R., Barra, A. F., Berg, C., Damania, R., Nash, J., & Russ, J. (2015). *Highways to success or byways to waste: Estimating the economic benefits of roads in Africa*. Washington, DC: World Bank Publications. Retrieved from <http://hdl.handle.net/10986/22551>
- Ayres, R. L. (1983). *Banking on the poor: The World Bank and world poverty*. Cambridge: MIT Press.
- Bairoch, P. (1985). *De Jéricho à Mexico: villes et économie dans l'histoire*. Paris: Éditions Gallimard.

- Banister, D., & Berechman, J. (2003). *Transport investment and economic development*. London: UCL Press.
- Berg, C. N., Deichmann, U., Liu, Y., & Selod, H. (2017). Transport policies and development. *The Journal of Development Studies*, 53(4), 465–480. doi:10.1080/00220388.2016.1199857
- Beuran, M., Gachassin, M., & Raballand, G. (2015). Are there myths on road impact and transport in Sub-Saharan Africa? *Development Policy Review*, 33(5), 673–700. doi:10.1111/dpr.12125
- Béranger, C. (2012). *Le rôle du chemin de fer en Afrique. Les cas du mozambique et du Kenya* (Doctoral dissertation). Université du Havre, Le Havre. Retrieved from <http://www.theses.fr/2012LEHA0010>
- Blimpo, M. P., Harding, R., & Wantchekon, L. (2013). Public investment in rural infrastructure: Some political economy considerations. *Journal of African Economies*, 22(Suppl. 2), ii57–ii83. doi:10.1093/jae/ejt015
- Bonfatti, R., & Poelhekke, S. (2017). From mine to coast: Transport infrastructure and the direction of trade in developing countries. *Journal of Development Economics*, 127, 91–108. doi:10.1016/j.jdeveco.2017.03.004
- Bosker, M., & Garretsen, H. (2012). Economic geography and economic development in Sub-Saharan Africa. *The World Bank Economic Review*, 26(3), 443–485. doi:10.1093/wber/lhs001
- Burgess, R., Jedwab, R., Miguel, E., Morjaria, A., & Padró i Miquel, G. (2015). The value of democracy: Evidence from road building in Kenya. *The American Economic Review*, 105(6), 1817–1851. doi:10.1257/aer.2013.1031
- Buys, P., Deichmann, U., & Wheeler, D. (2010). Road network upgrading and overland trade expansion in Sub-Saharan Africa. *Journal of African Economies*, 19(3), 399–432. doi:10.1093/jae/ejq006
- Calderón, C., & Servén, L. (2010). Infrastructure and economic development in Sub-Saharan Africa. *Journal of African Economies*, 19(AERC Suppl. 1), i13–i87. doi:10.1093/jae/ejp022
- Calderón, C., & Servén, L. (2014). *Infrastructure, growth, and inequality, an overview* (World Bank Policy Research Working Paper No. 7024). Retrieved from <http://hdl.handle.net/10986/20365>
- Chaléard, J. L., & Chanson-Jabeur, C. (2006). Le chemin de fer en Afrique. De l'état des lieux aux perspectives. In J. L. Chaléard, C. Chanson-Jabeur, & C. Béranger (Eds.), *Le chemin de fer en Afrique* (pp. 9–16). Paris: Karthala Editions.
- Christaller, W. (1933). *Die zentralen Orte in Süddeutschland: eine ökonomisch-geographische Untersuchung über die Gesetzmässigkeit der Verbreitung und Entwicklung der Siedlungen mit städtischen Funktionen*. Jena: University Microfilms.
- Clapham, C. (1996). *Africa and the international system: The politics of state survival*. Cambridge: Cambridge University Press.
- Collier, P. (2008). *The bottom billion: Why the poorest countries are failing and what can be done about it*. New York: Oxford University Press.
- Collier, P., & Venables, A. J. (2007). Rethinking trade preferences: How Africa can diversify its exports. *The World Economy*, 30(8), 1326–1345. doi:10.1111/j.1467-9701.2007.001042.x
- Comité de l'Alliance Internationale de Tourisme. (1947). *Rapport sur les Grandes Voies de Communication Transafricaines*. Presented at the 2ème Congrès International du Tourisme Africain, Alger.
- Corkin, L., Burke, C., & Davies, M. (2008). *China's role in the development of Africa's infrastructure* (Working Papers in African Studies 04-08). Washington, DC: School of Advanced International Studies.
- Coulibaly, S., & Fontagné, L. (2006). South–south trade: Geography matters. *Journal of African Economies*, 15(2), 313–341. doi:10.1093/jae/eji030
- Dagnogo, F., Ninot, O., & Chaléard, J. L. (2012). Le chemin de fer Abidjan-Niger: la vocation d'une infrastructure en question. *EchoGéo*, 20. Retrieved from <http://echogeo.revues.org/13131>
- Debie, J. (2001). *De la continentalité à l'Etat enclavé: circulation et ouvertures littorales des territoires intérieurs de l'ouest africain* (Doctoral dissertation). Université du Havre, Le Havre. Retrieved from <https://tel.archives-ouvertes.fr/tel-00011321/>
- Debie, J. (2010). From colonization to national territories in continental West Africa: The historical geography of a transport infrastructure network. *Journal of Transport Geography*, 18, 292–300. doi:10.1016/j.jtrangeo.2009.05.014

- Deng, T. (2013). Impacts of transport infrastructure on productivity and economic growth: Recent advances and research challenges. *Transport Reviews*, 33(6), 686–699. doi:10.1080/01441647.2013.851745
- Dorosh, P., Wang, H. G., You, L., & Schmidt, E. (2011). Road connectivity, population, and crop production in Sub-Saharan Africa. *Agricultural Economics*, 43, 89–103. doi:10.1111/j.1574-0862.2011.00567.x
- Dramé, P., & Saul, S. (2004). Le projet d'Eurafrrique en France (1946–1960): quête de puissance ou atavisme colonial? *Guerras mundiales et conflits contemporains*, 216(4), 95–114. Retrieved from <https://www.cairn.info/revue-guerres-mondiales-et-conflits-contemporains-2004-4-page-95.htm>
- Dupre La Tour, F. (2006). Histoire des chemins de fer d'Afrique Noire francophone. De la construction aux privatisations. In J. L. Chaléard, C. Chanson-Jabeur, & C. Béranger (Eds.), *Le chemin de fer en Afrique* (pp. 19–34). Paris: Karthala Editions.
- Economic Community of West African States. (2005). *Regional atlas of transport and telecommunications in the ECOWAS zone*. Executive Secretariat of the ECOWAS and the Sahel and West Africa Club.
- Ernst & Young. (2012). *Mid-term evaluation of the EU-Africa infrastructure trust fund* (Final Report). European Commission.
- European Commission. (1991). *Politique CEE-ACP dans le domaine des transports routiers*. Brussels: Direction Générale de Développement.
- European Commission. (2008). *European development cooperation in infrastructure. A review of the past twelve years*. Brussels: EuropeAid.
- European Commission. (2011). *Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, Increasing the impact of EU Development Policy: An Agenda for Change*, 13.10.2011, COM(2011) 637 final. Brussels. Retrieved from <http://eur-lex.europa.eu/procedure/EN/200917>
- Fisette, J. (1997). Les infrastructures reinventées: les technologies du gouvernement de la Banque Mondiale. In M. Marié, & M. Gariépy (Eds.), *Ces réseaux qui nous gouvernent?* (pp. 193–216). Paris: L'Harmattan.
- Foster, V., & Briceño-Garmendia, C. (Eds.). (2010). *Africa's infrastructure: A time for transformation*. Washington, DC: Agence Française de Développement & the World Bank. Retrieved from <http://hdl.handle.net/10986/2692>
- Gallup, J. D., Sachs, J. D., & Mellinger, A. D. (1999). Geography and economic development. *International Regional Science Review*, 22(2), 179–232. doi:10.1177/016001799761012334
- Godard, X. (1996). Transport local, transport international: Quelle articulation? In A. Adolehoume (Ed.), *Efficacité, concurrence, compétitivité: la chaîne de transport en Afrique sub-saharienne* (Actes du séminaire SITRASS 4, du 28 au 30 octobre 1996, Brazzaville, pp. 339–343). Lyon: Sitrass.
- Gollin, D., Jedwab, R., & Vollrath, D. (2016). Urbanization with and without industrialization. *Journal of Economic Growth*, 21(1), 35–70. doi:10.1007/s10887-015-9121-4
- Gollin, D., & Rogerson, R. (2014). Productivity, transport costs and subsistence agriculture. *Journal of Development Economics*, 107, 38–48. doi:10.1016/j.jdeveco.2013.10.007
- Graham, S., & Marvin, S. (2001). *Splintering urbanism: Networked infrastructures, technological mobilities and the urban condition*. London: Routledge.
- Guernier, E. (1957). L'Eurafrrique, troisième force mondiale. *Eurafrrique*, 21, 22. Cited in Dramé & Saul, 2004.
- Gutman, J., Sy, A., & Chattopadhyay, S. (2015). *Financing African infrastructure: Can the world deliver?* Washington, DC: The Brookings Institution.
- Hansen, P., & Jonsson, S. (2014). *Eurafrica: The untold history of European integration and colonialism*. London: Bloomsbury Publishing.
- Harral, C., & Faiz, A. (1988). *Road deterioration in developing countries: Causes and remedies (A World Bank policy study)*. Washington, DC: The World Bank. Retrieved from <http://documents.worldbank.org/curated/en/722851468162562433/pdf/multi-page.pdf>
- Heggie, I. G. (1995). *Management and financing of roads: An Agenda for reform* (World Bank Technical Paper Number 275, Africa Technical Series). Washington, DC: The World Bank. Retrieved from <https://www.ssatp.org/sites/ssatp/files/publications/WorldBank-TechnicalPapers/TP275/TP275.pdf>

- Herbst, J. (2000). *States and power in Africa: Comparative lessons in authority and control*. Princeton, NJ: Princeton University Press.
- Herce, M., & Magrinya, F. (2002). *La ingeniería en la evolución de la urbanística*. Barcelona: Edicions UPC.
- Hoyle, B., & Smith J. (1998). Transport and development: Conceptual frameworks. In B. Hoyle & R. Knowles (Eds.), *Modern transport geography* (2nd ed., pp. 13–40). Chichester: Wiley.
- Huillery, E. (2014). The Black Man's Burden: The cost of colonization of French West Africa. *The Journal of Economic History*, 74(1), 1–38. doi:10.1017/S0022050714000011
- Infrastructure Consortium for Africa. (2014). *Infrastructure financing trends in Africa, annual report 2014*. Abidjan: Author. Retrieved from https://www.icafrica.org/fileadmin/documents/Annual_Reports/INFRASTRUCTURE_FINANCING_TRENDS_IN_AFRICA_-_2014.pdf
- International Monetary Fund. (2015). *Sub-Saharan Africa, dealing with the gathering clouds, regional economic outlook, October 2015* (World Economic and Financial Surveys). Washington, DC: Author. Retrieved from <https://www.imf.org/external/pubs/ft/reo/2015/afr/eng/pdf/sreo1015.pdf>
- Jedwab, R., & Moradi, A. (2016). The permanent effects of transportation revolutions in poor countries: Evidence from Africa. *Review of Economics and Statistics*, 98(2), 268–284. doi:10.1162/REST_a_00540
- Kleinschroth, F. (2016). *Roads in the rainforests: Legacy of selective logging in Central Africa* (Doctoral dissertation), AgroParisTech, CIRAD, Bangor University. Retrieved from <https://hal.archives-ouvertes.fr/tel-01366607/document>
- Laidi, Z. (1989). *Enquête sur la Banque mondiale*. Paris: Fayard.
- Lall, S. V., Schroeder, E., & Schmidt, E. (2014). Identifying spatial efficiency–equity trade-offs in territorial development policies: Evidence from Uganda. *The Journal of Development Studies*, 50(12), 1717–1733. doi:10.1080/00220388.2014.957277
- Laurance, William F., Goosem, Miriam, & Laurance, Susan G.W. (2009). Impacts of roads and linear clearings on tropical forests. *Trends in Ecology & Evolution*, 24(12), 659–669. doi:10.1016/j.tree.2009.06.009
- Limão, N., & Venables, A. J. (2001). Infrastructure, geographical disadvantage, transport costs, and trade. *World Bank Economic Review*, 15(3), 451–479. doi:10.1093/wber/15.3.451
- Lipton, M. (1977). *Why poor people stay poor: Urban bias in world development*. Cambridge: Harvard University Press.
- Lombard, J., & Ninot, O. (2010). Connecter et intégrer, les territoires et les mutations des transports en Afrique. *Bulletin de L'Association de Géographes Français*, 87(1), 69–86. Retrieved from http://www.persee.fr/doc/bagf_0004-5322_2010_num_87_1_8182
- Lösch, A. (1954). *The economics of location (English edition)*. New Haven, CT: Yale University Press. First published as *Die räumliche Ordnung der Wirtschaft*, 1940.
- Marguerat, Y. (1997). A quoi rêvaient les Gouverneurs généraux? Les projets de “remembrement” de l’Afrique de l’Ouest pendant la Première Guerre mondiale. In C. Becker, S. Mbaye, & I. Thioub (Eds.), *AOF: réalités et héritages: sociétés ouest-africaines et ordre colonial, 1895–1960* (pp. 89–100). Dakar: Direction des Archives du Sénégal.
- Mkandawire, P. T., & Soludo, C. C. (1998). *Our continent, our future: African perspectives on structural adjustment*. Ottawa: IDRC. Retrieved from <https://idl-bnc-idrc.dspacedirect.org/bitstream/handle/10625/25742/IDL-25742.pdf>
- Mwase, N. R. (1989). Role of transport in rural development in Africa. *Transport Reviews*, 9(3), 235–253. doi:10.1080/01441648908716726
- Myint, H. (1969). *The economics of the developing countries*. Hutchinson: Hutchinson University Library.
- Naudé, W. (2009). Geography, transport and Africa's proximity gap. *Journal of Transport Geography*, 17, 1–9. doi:10.1016/j.jtrangeo.2008.04.011
- Njoh, A. J. (1997). Colonial spatial development policies, economic instability, and urban public transportation in Cameroon. *Cities*, 14(3), 133–143. doi:10.1016/S0264-2751(97)00053-X
- Njoh, A. J. (2006). African cities and regional trade in historical perspective: Implications for contemporary globalization trends. *Cities*, 23(1), 18–29. doi:10.1016/j.cities.2005.07.009

- Nunn, N., & Puga, D. (2012). Ruggedness: The blessing of bad geography in Africa. *Review of Economics and Statistics*, 94(1), 20–36. doi:10.1162/REST_a_00161
- Offner, J. M. (1993). Les « effets structurants » du transport: Mythe politique, mystification scientifique. *L'Espace Géographique, Tome*, 22(3), 233–242. Retrieved from http://www.persee.fr/doc/spgeo_0046-2497_1993_num_22_3_3209
- Osei-Kyei, R., & Chan, A. P. (2016). Developing transport infrastructure in Sub-Saharan Africa through public–private partnerships: Policy practice and implications. *Transport Reviews*, 36(2), 170–186. doi:10.1080/01441647.2015.1077288
- Pedersen, P. (2001). Freight transport under globalisation and its impact on Africa. *Journal of Transport Geography*, 9(2), 85–99. doi:10.1016/S0966-6923(01)00006-0
- Pedersen, P. (2003). Development of freight transport and logistics in Sub-Saharan Africa: Taaffe, Morrill and Gould revisited. *Transport Reviews*, 23(3), 275–297. doi:10.1080/0144164032000091681
- Péguy, P.-Y. (1998). Transport, Epine dorsale des politiques de développement. *le Courrier*, 169, 46–49.
- Pirie, G. H. (1982). The decivilizing rails: Railways and underdevelopment in Southern Africa. *Tijdschrift Voor Economische en sociale Geografie*, 73(4), 221–228. doi:10.1111/j.1467-9663.1982.tb00959.x
- Porter, G. (2014). Transport services and their impact on poverty and growth in rural Sub-Saharan Africa: A review of recent research and future research needs. *Transport Reviews*, 34(1), 25–45. doi:10.1080/01441647.2013.865148
- Programme for Infrastructure Development in Africa. (2012). *Interconnecting, integrating and transforming a continent*. Addis Ababa: Author. Retrieved from <https://www.afdb.org/fileadmin/uploads/afdb/Documents/Project-and-Operations/PIDA20note20English20for20web%200208.pdf>
- Raballand, G., Macchi, P., & Petracco, C. (2010). *Rural road investment efficiency: Lessons from Burkina Faso, Cameroon, and Uganda*. Washington, DC: The World Bank. Retrieved from <http://hdl.handle.net/10986/2425>
- Raffestin, C. (1987). Repères pour une théorie de la territorialité humaine. *Cahier/Groupe Réseaux*, 3(7), 2–22. doi:10.3406/flux.1987.1053
- Redding, S., & Venables, A. J. (2004). Economic geography and international inequality. *Journal of International Economics*, 62, 53–82. doi:10.1016/j.jinteco.2003.07.001
- Robinson, J. A., & Torvik, R. (2005). White elephants. *Journal of Public Economics*, 89(2), 197–210. doi:10.1016/j.jpubeco.2004.05.004
- Rosenstein-Rodan, P. N. (1961). *International aid for underdeveloped countries*. Cambridge: Massachusetts Institute of Technology Center for International Studies.
- Sander, J. (2002). Reassessing the role of the World Bank in Sub-Saharan Africa. In J. Pincus & J. A. Winters (Eds.), *Reinventing the World Bank* (pp. 185–202). Ithaca, NY: Cornell University Press.
- Slater, D. (1975). Underdevelopment and spatial inequality: Approaches to the problems of regional planning in the third world. *Progress in Planning*, 4, 97–167. doi:10.1016/0305-9006(75)90005-7
- Smith, A. (1776). *An inquiry into the nature and causes of the wealth of nations*. Renaissance Editions.
- Soja, E. W. (2001). *Postmetropolis. Critical studies of cities and regions*. Oxford: Blackwell.
- Steck, B. (2009). Transport et développement. In M. Brocard (Ed.), *Transports et territoires. Enjeux et débats* (pp. 125–155). Paris: Éditions Ellipses.
- Steck, B. (2012). West Africa facing the lack of traffic lanes. A study case: The Nouakchott-Nouadhibou road (Mauritania). *EchoGéo*, 20. Retrieved from <http://echogeo.revues.org/13101>
- Stiglitz, J. E., & Charlton, A. (2006). Aid for trade. *International Journal of Development Issues*, 5(2), 1–41. doi:doi:10.1108/eb045861
- Storeygard, A. (2016). Farther on down the road: Transport costs, trade and urban growth in Sub-Saharan Africa. *The Review of Economic Studies*, 83(3), 1263–1295. doi:10.1093/restud/rdw020
- Stren, R., & Halfani, M. (2001). The cities of Sub-Saharan Africa: From dependency to marginality. In R. Paddison (Ed.), *Handbook of urban studies* (pp. 466–485). London: Sage.
- Taaffe, E. J., Morrill, R. L., & Gould, P. R. (1963). Transport expansion in underdeveloped countries: A comparative analysis. *Geographical Review*, 53(4), 503–529. doi:10.2307/212383
- Teravanthorn, S., & Raballand, G. (2009). *Transport prices and costs in Africa: a review of the main international corridors*. Washington DC: World Bank Publications <http://hdl.handle.net/10986/6610>

- Torres Martinez, A. J. (2001). Road maintenance policies in Sub-Saharan Africa: Unsolved problems and acting strategies. *Transport Policy*, 8, 257–265. doi:10.1016/S0967-070X(01)00009-9
- UN-ECA. (1967). *Etude des conditions économiques en Afrique 1960–1964 (volume II)*. Addis Ababa: United Nations Economic Commission for Africa. Retrieved from <http://hdl.handle.net/10855/11402>
- UN-ECA. (1980). *Etude des conditions économiques et sociales en Afrique 1978–1979 (Partie I)*. Addis Ababa: United Nations Economic Commission for Africa. Retrieved from <http://hdl.handle.net/10855/9922>
- Venables, A. J. (2010). Economic geography and African development. *Papers in Regional Science*, 89 (3), 469–483. doi:10.1111/j.1435-5957.2010.00312.x
- World Bank. (1981). *Accelerated development in Sub-Saharan Africa* (“The Berg Report”). Washington, DC: Author. Retrieved from <http://documents.worldbank.org/curated/en/702471468768312009/pdf/multi-page.pdf>
- World Bank. (1994a). *Adjustment in Africa: Reforms, results, and the road ahead*. Washington, DC: Oxford University Press. Retrieved from <http://documents.worldbank.org/curated/en/219981468192845881/pdf/multi-page.pdf>
- World Bank. (1994b). *World development report 1994: Infrastructure for development*. Washington, DC: Oxford University Press. Retrieved from <http://hdl.handle.net/10986/5977>
- World Bank. (1996). *Sustainable transport: Priorities for policy reform*. Washington, DC: The World Bank. Retrieved from <http://documents.worldbank.org/curated/en/113831468764674772/pdf/multi-page.pdf>
- World Bank. (2007). *A decade of action in transport. An evaluation of World Bank assistance to the transport sector, 1995–2005*. Washington, DC: World Bank Independent Evaluation Group. Retrieved from <http://hdl.handle.net/10986/6695>
- World Bank. (2009a). *Unlocking global opportunities the aid for trade program of the World Bank group*. Washington, DC: Author. Retrieved from <http://hdl.handle.net/10986/18717>
- World Bank. (2009b). *World development report 2009: Reshaping economic geography*. Washington, DC: Author. Retrieved from <http://hdl.handle.net/10986/5991>
- World Bank. (2010). *Cost-Benefit analysis in World Bank projects*. Washington, DC: World Bank Independent Evaluation Group. Retrieved from <http://hdl.handle.net/10986/2561>
- World Economic Forum. (2013). *The Africa competitiveness report*. Collaborative publication with the African Development Bank, the Organisation for Economic Co-operation and Development (OECD) and the World Bank Group. Retrieved from http://www3.weforum.org/docs/WEF_Africa_Competitiveness_Report_2013.pdf
- Young, C. (1994). *The African colonial state in comparative perspective*. New Haven, CT: Yale University Press.
- Zerelli, S., & Cook, A. (2010). *Trucking to West Africa’s landlocked countries – market structure and conduct* (West Africa Trade Hub Technical Report, 32), USAID. Retrieved from <http://borderlesswa.com/sites/default/files/resources/nov10/Trucking%20to%20WA's%20landlocked%20countries.pdf>