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THE HISTORY OF EAST AFRICA'S CRITICAL INFRASTRUCTURE

Colonial Railways of Mozambique: Critical and Vulnerable Infrastructure, 1880s-1930s

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Abstract: In the early 1880s, Portugal began the construction of railways in its colonies. The main goals were to reinforce Portuguese presence and increase colonial revenue. This paper aims to analyse the transnational railways built in Mozambique, between the 1880s and the 1930s, as critical infrastructure (or critical systems). I argue that the lack of railways in Mozambique was the cause for deep concern and fostered a "sense of urgency" among the Portuguese authorities, as this could potentially jeopardise the Portuguese imperial project. Railways were considered critical to bolstering Portugal's sovereignty, as well as to exploit local resources and attract traffic from neighbouring territories. Once built, the railways revealed two major vulnerabilities: competition from South African ports and dependence on British capital. A few episodes involving Portuguese and British agents highlighted these vulnerabilities and motivated Portuguese policymakers to find solutions. This paper explores these topics based on a comprehensive literature review and the use of primary sources, intended to provide a novel approach to Portuguese colonial railways.

Keywords: critical infrastructures; colonialism; imperialism; scramble for Africa; history of technology

Introduction

Beginning in the early 1880s, Portugal invested in several infrastructures in its empire, especially railways. The primary goals of this investment were of two orders. First, to bolster Portuguese sovereignty over those territories, especially after it was challenged by other European nations in the aftermath of the Berlin Conference. Second, to increase output and revenue from the colonial economies, by furbishing them with modern transportation systems. These goals were rooted in two myths of the Portuguese imperial project, as described by Portuguese historian, Valentim Alexandre: the "myth of the *Eldorado*," expounding that the colonies were endless repositories of commodities and wealth; and the "myth of the sacred legacy," in which the colonies were tokens from the glorious era of the Discoveries and could not be abandoned or relinquished to other nations.[1] What is more, the colonial public works programme was an extension of the same programme that had been implemented in the mainland since 1850, which followed closely the Saint-Simonian ideology.[2]

Construction of the Portuguese imperial railway system began in the early 1880s in the colony of Goa, in India.[3] Railway construction began shortly afterwards in the African overseas territories of Angola and Mozambique. In Mozambique, the main lines were designed to cross the borders to the neighbouring landlocked colonies of Southern Rhodesia (present-day Zimbabwe) and Nyasaland (Malawi), and the hybrid, inland territory of the Transvaal (that alternated between independent Boer republic and British colony and today includes the South-African provinces of Limpopo, Gauteng, Mpumalanga, and part of North-West).[4] These tracks included the Lourenço Marques, Beira, Swaziland, and Trans-Zambezi railways, inaugurated in 1887, 1899, 1908, and 1922, respectively.[5] Other tracks were much shorter and served small stretches of land on the coast of Mozambique (Figure 1).[6]

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[1] Valentim Alexandre, "A África no Imaginário Político Português," *Penélope* 15 (1995): 39-52, on 40-1.

[2] Marta Coelho de Macedo, "Projectar e Construir a Nação. Engenheiros e Território em Portugal (1837-1893)" (PhD diss., Universidade de Coimbra, 2009), 5.

[3] Hugo Silveira Pereira and Ian J. Kerr, "Railways and Economic Development in India and Portugal: The Mormugão and Tua Lines Compared, ca. 1880 to ca. 1930, and Briefly Onwards," *Revista Brasileira de História* 39, no. 81 (2019): 209-34, on 212.

[4] For the transportation challenges faced by landlocked countries, see Michael L. Faye et al., "The Challenges Facing Landlocked Developing Countries," *Journal of Human Development* 5, no. 1 (2004): 31-69.

[5] There was a fifth transnational line, following the Limpopo River valley to the border with Rhodesia, but its construction ended in the 1950s and, therefore, does not fit in the timeframe of this article. Although the Swaziland railway was designed to cross the border, it only did so in the 1950s, five decades after the beginning of its construction. Regardless, I decided to include it as an object of study in this paper. Hugo Silveira Pereira, "Identidade e Tecnologia: o Caminho de Ferro da Suazilândia (1900-1914)," *Anais de História de Além-Mar* 18 (2017): 143-76.

[6] Bruno J. Navarro, *Um Império Projectado pelo "Silvo da Locomotiva": o Papel da Engenharia Portuguesa na Apropriação do Espaço Colonial Africano. Angola e Moçambique (1869-1930)* (Lisbon: Colibri, 2018),

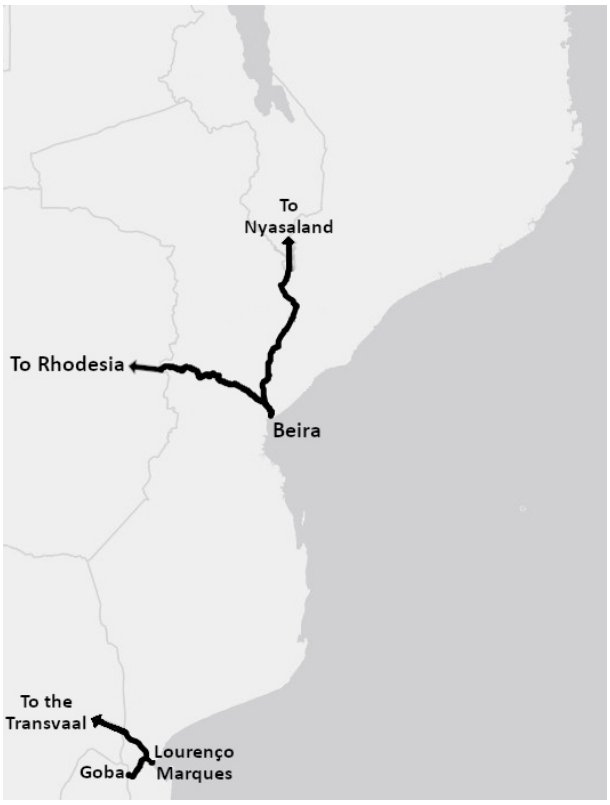

Figure 1. Cross-border railways in Mozambique (c. 1930).
Source: ShareMap and own making.

Portuguese historiography on the evolution of Mozambican railways during the imperial period has taken significant steps since the detailed, albeit very descriptive, nationalistically-biased work in three volumes by Alfredo Pereira de Lima, published in 1971, which provides exhaustive biographies of every railway built in Mozambique.[7] In the early 1990s, Maria Luísa Teixeira showed how the investment in railways in this Portuguese colony was intended to promote transnational flows rather than the development of regional economies.[8] More recently, Bruno J. Navarro published the most complete work on Portuguese colonial railways in Angola and Mozambique. Through the lens of the History of Technology, Navarro illustrates the role of Portuguese engineers in the appropriation of overseas territories and in the overall imperial project, through the planning and construction of the Portuguese colonial railway

chapters 3.2, 3.3, and 3.5.

[7] Alfredo Pereira de Lima, *História dos Caminhos de Ferro de Moçambique*, 3 vols. (Lourenço Marques: Administração dos Portos, Caminhos de Ferro e Transportes de Moçambique, 1971).

[8] Maria Luísa Norton Pinto Teixeira, "The Railways of Mozambique: a Regional or Colonial Project? 1895-1950" (PhD diss., Concordia University, 1991).

system.[9] In my research, I have also taken interest in Mozambican railways, as instruments to build national identities, as tools for technodiplomacy, and as portals of globalisation.[10]

In this paper, I add to the debate on this historical process with an analysis of the transnational Mozambican colonial railways as critical infrastructure (or critical systems) for the Portuguese colonisers.[11] I have illustrated how building those lines was considered critically urgent for the Portuguese imperial project since their very inception. Like other critical infrastructure, the Mozambican railways had vulnerabilities that often led to events that influenced their evolution. I have applied the critical infrastructure model to the literature on Mozambican railways to illustrate its instrumental value, as well as to selected primary sources. Such sources include technical reports written by colonial engineers and colonial authorities in Lisbon, official correspondence, statistics, and parliamentary debates.

In the following section, I briefly revisit the literature on critical systems to provide a definition and the main features of the central concepts, especially those that I have used in this study to interpret the planning, construction, and operation of colonial railways in Mozambique. I have also provided specific details about the history of each railway in this section. In the final section, I have illustrated the critical relevance of the existence of technical systems in contested territories, the vulnerabilities associated with cross-border connections and foreign-funded enterprises, the relevance of risk perception to decision-making processes, and how economic pragmatism can bring stability to critical infrastructure.

Critical infrastructure/systems: definition and characteristics

In the introduction to this thematic dossier, Mikael Hård has already explained the key features of the concept of critical infrastructure/systems. In this section, I will focus on those features that I have applied to the colonial railways of Mozambique in the late nineteenth and early twentieth centuries.

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[9] Navarro, *Um Império Projectado*.

[10] Pereira, "Identidade e Tecnologia"; Hugo Silveira Pereira, "O Caminho de Ferro da Beira em Moçambique (1890-1914): Entre Antagonismo Tecnodiplomático e Simbiose Económica," *Análise Social* 44, no. 233 (2019): 694-724; Hugo Silveira Pereira, "Portais de Globalização: Portos e Caminhos de Ferro no Contexto Colonial Português (c. 1870 – c. 1910)," *Revista Portuguesa de História* 49 (2018): 255-73.

[11] Imperial railways were also critical for the native populations for different reasons and from different perspectives. For instance, in terms of labour, railways were built mostly by African workforce, and, in the case of the Lourenço Marques line, it exported native workers to the mines of Transvaal. See, for instance, Charles van Onselen, *The Night Trains. Moving Mozambican Miners to and from the Witwatersrand Mines, 1902-1955* (London: Hurst Publishers, 2021). This is a line of research that requires further study, but that I will not pursue in this paper, which focuses on criticality from the coloniser's point of view.

A critical infrastructure is considered vital to the economy, administration and/or society, it provides routine services or goods, does not have any immediate substitute, causes substantial harm if it fails, and is incorporated in larger systems.[12]

The criticality of a system depends on how crucial it is in keeping other systems and relevant social institutions functioning. Considering this phrasing, one may easily think of technical systems or complex infrastructures like electrical grids, which are critical to powering railway networks, which are critical to supplying commodities or services to a given society in a specific timeframe, and so on. The functions of supplying power, goods, and services are eminently technical, but the importance they are given, and the expectations they create are very much human. Therefore, the literature on critical infrastructure, intersected with contributions from the History of Technology,[13] provides a wider understanding of the term *systems*, and includes social, political, and/or cultural institutions or processes. Consequently, "criticality" is a concept that underscores the relationships between different technical and non-technical entities and actors. If used within a historical perspective, it gives historians the tools to identify the collective representations that have deemed an infrastructure or system as critical. Moreover, the literature often claims that the failure of critical systems prompts a "sense of urgency" that influences the evolution of the system.[14] In this article, I further claim that the absence of a given infrastructure (railways, in this case) may also trigger a similar "sense of urgency," especially when the existing infrastructures were viewed as unreliable (more details below). This is a novel approach in the literature about critical infrastructure that shifts the focus to the discursive dimension of infrastructure and therefore adds to that theoretical framework that usually analyses infrastructure which is already materialised (or at least partially materialised).[15] The criticality of infrastructure is usually associated to three related concepts: "vulnerability," "resilience," and "preparedness." My focus in this paper will be on the first concept, although I also briefly refer to the resilience of Mozambican railways in the colonial era.

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[12] Kristof Lukitsch, Marcel Müller, and Chris Stahlhut, "Criticality," in *Key Concepts for Critical Infrastructure Research*, ed. Jens Ivo Engels, 11-20 (Wiesbaden: Springer, 2018), 12; Erik van der Vleuten et al., "Europe's Critical Infrastructure and its Vulnerabilities: Promises, Problems, Paradoxes," in *The Making of Europe's Critical Infrastructure: Common Connections and Shared Vulnerabilities*, ed. Per Högselius et al., 3-19 (Basingstoke: Palgrave Macmillan, 2013), 3.

[13] We remember here Bijker and Law's "seamless web" between the social and the technical or Latour's sociotechnical construction of technology. See Wiebe E. Bijker and John Law, "What Next? Technology, Theory, and Method," in *Shaping Technology/Building Society: Studies in Sociotechnical Change*, ed. Wiebe E. Bijker and John Law, 201-4 (Cambridge, MA: The MIT Press, 1992), 201; Bruno Latour, *Pandora's Hope: Essays on the Reality of Science Studies* (Cambridge, MA: Harvard University Press, 1999).

[14] Jens Ivo Engels, "Introduction," in *Key Concepts for Critical Infrastructure Research*, ed. Jens Ivo Engels, 1-10 (Wiesbaden: Springer, 2018), 6-7, 9; Lukitsch et al., "Criticality," 11-16.

[15] I would like to thank the reviewers for bringing this up to my attention.

"Vulnerability" is closely associated to risk, and it underpins the shortcomings and failings of systems at a technical and/or social/human level, that is, it covers technical failures and their negative consequences on users. Like "criticality," "vulnerability" is not an objective phenomenon as much as it is a social construct, in the sense that it depends on the representations and expectations of the stakeholders involved in a certain system, as well as the way they interpret risk. This paper focuses on the sociotechnical dimension of "criticality" and "vulnerability," particularly with regard to their discursive construction.[16] Vulnerabilities in the entire system or affecting one or some of its components may be provoked by an event or be structurally intrinsic to the system. Their analysis may explain the reasons why a given infrastructure has failed.[17]

As for "resilience," it is the capability of a system to withstand and handle perturbations, either by being able to bounce back and recover its previous state before the crisis, or to evolve and bounce forward after a given shock. It is a concept that highlights the ability of certain systems to resist, recover or adapt to vulnerabilities or threats, and therefore emphasises the reasons that explain why some systems do not fail.[18]

Railways in Mozambique: a critical and urgent need

Portuguese presence in Mozambique dates back to the early sixteenth century, but it was limited to small settlements on the coast or along the Zambezi valley in the three centuries that followed, engaging in slavery and trade, mostly of ivory and gold.[19] The independence of Brazil in 1822, recognised by Portugal in 1825, led the Portuguese authorities to turn their attention to the African territories, looking for new *Brazils* that served as surrogate sources of revenue. Nonetheless, the political instability that marked Portuguese politics during the first half of the nineteenth century prevented the implementation of any robust colonial agenda. After 1850, the parliamentary monarchy had stabilised, which attracted foreign investment. However, the

[16] Lukitsch et al., "Criticality," 18.

[17] Stephanie Eifert, Alice Knauf, and Nadja Schmitt, "Vulnerability," in *Key Concepts for Critical Infrastructure Research*, ed. Jens Ivo Engels, 22-30 (Wiesbaden: Springer, 2018), 22, 25-7; Anique Hommels et al., "Europe's Infrastructure Vulnerabilities: Comparisons and Connections," in *The Making of Europe's Critical Infrastructure: Common Connections and Shared Vulnerabilities*, ed. Per Högselius et al., 264-77 (Basingstoke: Palgrave Macmillan, 2013), 263; Engels, "Introduction," 2; Vleuten et al., "Europe's Critical Infrastructure," 10.

[18] Ivonne Elsner, Andreas Huck, and Manas Marathe, "Resilience," in *Key Concepts for Critical Infrastructure Research*, ed. Jens Ivo Engels, 31-38 (Wiesbaden: Springer, 2018), 31; Engels, "Introduction," 2. Some authors argue that the ability to prevent and avoid perturbations is also a sign of resilience, but I prefer to include this capability in the following categories of *preparedness* and *prevention*.

[19] Valentim Alexandre and Jill Dias, *O Império Africano 1825-1890*, vol. X of *Nova História da Expansão Portuguesa*, ed. Joel Serrão and António H. de Oliveira Marques (Lisbon: Estampa, 1998), 27-8, 570, 584, 589.

priority was to modernise the transportation system in Portugal and the colonies were relegated to a state of semi-abandonment.[20]

The situation changed in the mid-1870s, triggered by the discovery of gold and diamond deposits in the neighbouring Boer republic of the Transvaal. What is more, the opening of the Suez Canal in 1869 decreased the distance between Mozambique and Europe.[21] These developments also motivated Britain to reinforce its presence in Southeast Africa. A diplomatic and legal conflict for the possession of the southern Mozambican district of Lourenço Marques (present-day Maputo) between the British and Portuguese ended in 1875 when the French President, Patrice de MacMahon, ruled in favour of Portugal.[22] Nonetheless, the British did not lose their interest in the territory, which some considered the geopolitical key to the South African region.[23]

The Portuguese colonial authorities understood that without railways, the nation's imperial position in Africa was vulnerable. They thus experienced a "sense of urgency" that drove them to build modern infrastructure in the south of Mozambique. These were considered critical to take advantage of the newly discovered commodities and to develop—or to *civilise*, to use the term commonly used in those days—the territory. There was a need to overcome the obstacles to mobility faced by those travelling inland from the coast: hilly areas, crossed by many small streams, teeming with swamp areas, and infested by tsetse flies and other insects that caused diseases like sleeping sickness (trypanosomiasis).[24] Additionally, building modern technical infrastructure in the Portuguese colonies was considered the best solution to shun any claims the British might have over the land under Portuguese rule. There were many valid options to strengthen a nation's authority over a territory, but in the nineteenth century, one of the most critical was the railway, especially in colonial projects, such as the Portuguese, where it acted as a powerful tool of Empire.[25] Moreover, the railway was considered a key factor to bolster traffic through the harbour of Lourenço Marques and, therefore, create revenue to modernise the colony (Figure 1).

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[20] Fernando de Sousa, *Portugal e a Regeneração*, vol. X of *Nova História de Portugal*, ed. Joel Serrão and António H. de Oliveira Marques (Lisbon: Estampa, 2004).

[21] Alexandre and Dias, "O Império Africano," 93-6.

[22] António José Telo, *Lourenço Marques na Política Externa Portuguesa* (Lisbon: Cosmos, 1991), 30-1.

[23] Montague George Jessett, *The Key to South Africa: Delagoa Bay* (London: T. Fisher Unwin, 1900).

[24] Carlos J. Alford, "De Durban à Beira," *Boletim da Sociedade de Geographia de Lisboa* 2 (1893): 105-20; Ilídio Amaral, "Beira, Cidade e Porto do Índico," *Finisterra. Revista Portuguesa de Geografia* 4, no. 7 (1969): 76-93, on 76; Lima, *História dos Caminhos de Ferro*, vol. 1, 48; Ernesto Júlio de Carvalho Vasconcelos, *As Colónias Portuguesas. Geografia Física, Económica e Política* (Lisbon: Clássica Editora, 1921), 424.

[25] Daniel R. Headrick, *The Tools of Empire: Technology and European Imperialism in the Nineteenth Century* (Oxford: Oxford University Press, 1981), 192-204. Clarence B. Davis, Kenneth E. Wilburn Jr., and Ronald E. Robinson, ed., *Railway Imperialism* (Westport, CT: Greenwood Press, 1991).

On different occasions, this sense of urgency was used as the main argument to make political and diplomatic decisions or to amass or canvass technical advice, a common trait in critical infrastructure policymaking.[26] Furthermore, Portugal suffered from a three-decade delay in comparison to other imperial nations when it came to building railways in the colonies, which meant it was lagging behind in the race of *progress*. For instance, the engineer Joaquim José Machado, one of the leading experts on colonial railways, while surveying the route of the Lourenço Marques railway, argued that the British colonies of Cape and Natal had over 1,300 km of tracks, whereas Mozambique had none.[27] As in so many other historical episodes, including past experiences in the Portuguese mainland, the decision to develop sizeable technical infrastructure was often motivated by political and cultural factors rather than by economic reasons alone.[28] Those included the creation of zones of political/administrative influence, displays of technoscientific modernity, or the appropriation of peripheral territories.[29] This is particularly accurate in the case of the Portuguese colonial agenda, which many consider to be an example of a capitalist/imperialistic enterprise driven by prestige rather than economic motivations.[30]

Part of the concern affecting the Portuguese was shared by the Transvaal government, who wanted a connection to a port that was not under British influence. Lourenço Marques not only met this condition, but it was also the closest harbour to the gold fields of the Boer republic. In 1875, both nations signed a treaty that included the construction of a railway.[31] In parliament, the Minister of the Overseas, Andrade Corvo, emphasised that to keep Portuguese sovereignty in Lourenço Marques, it was crucial to modernise the district, and to build a railway to the border with the Transvaal.[32] An opposition member of parliament (MP), Barros e Cunha, forewarned the government not to expect any support from Whitehall, as the British

[26] Lukitsch et al., "Criticality," 18.

[27] Joaquim José Machado, "Caminho de Ferro de Lourenço Marques à Fronteira do Transvaal," *Revista de Obras Públicas e Minas* 13, no. 145 (1882): 1-57, on 4-5. For more examples, see Navarro, *Um Império Projectado*, chapters 3.2, 3.3, 3.5.

[28] Karl-Erik Michelsen, "An Uneasy Alliance: Negotiating Infrastructures at the Finnish-Soviet Border," in *The Making of Europe's Critical Infrastructure: Common Connections and Shared Vulnerabilities*, ed. Per Högselius et al., 108-30 (Basingstoke: Palgrave Macmillan, 2013), 111.

[29] Clarence B. Davis, Kenneth E. Wilburn Jr., and Ronald E. Robinson, eds., *Railway Imperialism* (Westport, CT; Greenwood Press, 1991). Tiago Saraiva, "Inventing the Technological Nation: The Example of Portugal (1851–1898)," *History and Technology* 23, no. 3 (2007): 263-73. Hugo Silveira Pereira, "Appropriation, Integration, and Nation Building: Portuguese Railways in the Second Half of the Nineteenth and Early Years of the Twentieth Century," *Social Science History* 45, no. 2 (2021): 391-416, on 405-8.

[30] Gervase Clarence-Smith, *The Third Portuguese Empire, 1825-1975: A Study in Economic Imperialism* (Manchester: Manchester University Press, 1985).

[31] Telo, *Lourenço Marques*, 33.

[32] *Diario da Camara dos Deputados* (hereafter *DCD*), 29 January 1876, 200.

only cooperated with other nations when this served their own purposes.[33] Both these events confirm the discursive dimension of criticality and that it is created by the representations and perceptions of stakeholders.[34] A few months later, in April 1877, the British annexed the Boer republic and suspended the negotiations regarding the railway. In a letter to the acting governor of the Transvaal, N.J.R. Stewart, one of his advisors, suggested that "it would not be conducive to the interests of the Transvaal, nor of South Africa in general, to have that railway now," a decision that could be changed in the future, but "Her Majesty's Government must first get possession of Delagoa Bay [Lourenço Marques]."[35] Negotiations were resumed after the Transvaal regained its independence in the aftermath of the First Boer War. The sense of urgency to build a railway in Lourenço Marques shared by Portuguese colonialists was evident in the fact that they hired the first entrepreneur who knocked on their door, the American concession hunter, Edward McMurdo, whose shenanigans delayed its construction and inauguration, ultimately forcing the government to step in and nationalise the railway, as we will see further ahead.[36]

A similar sense of urgency and criticality regarding colonial railways can also be seen in other areas of Mozambique, namely in the provinces of Manica and Sofala, in the hinterland of the port-city of Beira (Figure 1). In the 1890s, building a track to the border with Rhodesia was considered urgent to fulfil the terms of a treaty signed on 11 June 1891 with Britain. The treaty resolved the differences arisen between the two countries after the 1890 British Ultimatum[37] and set the borders between the Portuguese and British colonies in southeast Africa. Article 14 of the treaty stated that the Portuguese government was to build a railway from the mouth of the Punguè River, in the vicinity of Beira, to the British border.[38] Failure to build the line could lead to the termination of the treaty, including the arrangement regarding the borders between Portuguese and British colonies. At an economic level, it would be a missed opportunity to infuse new life into the Beira harbour and to increase the revenue of its customhouse. The Portuguese Minister of Foreign Affairs, Luís Soveral, illustrated this urgency when he reminded the parliament of the grave and disastrous consequences if the railway was not built. Debating with an opposition MP, Mariano de Carvalho, the minister argued: "Your Excellency is perfectly aware of the effect that not building that railway will cause in Europe . . . and that it will be a

[33] *DCD*, 19 February 1877, 352.

[34] Lukitsch et al., "Criticality," 18.

[35] Letter from N. J. R. Stewart to the acting governor of the Transvaal, 14 May 1877, Proposed railway from Delagoa Bay to the Transvaal: correspondence, CO 879/12/4, The National Archives (Kew, UK).

[36] Lima, *História dos Caminhos de Ferro*, vol. 1, 94-155.

[37] A memorandum that demanded the withdrawal of Portuguese forces from the territories of Bechuanaland and Barotseland (present-day Botswana and Zambia). See Nuno Severiano Teixeira, "Política Externa e Política Interna no Portugal de 1890: o Ultimatum Inglês," *Análise Social* 23, no. 98 (1987): 687-719.

[38] *Colecção Official de Legislação Portuguesa*, 1891, 249.

disaster if we do not conclude that very important improvement."[39] To avoid such dire effects, the Portuguese chartered firm, *Companhia de Moçambique* (Mozambique Company), hastily hired a British agent, Theodore van Laun, to build and operate the railway. Van Laun was an associate of Cecil Rhodes, a connection that would cause much concern among the Portuguese imperial decision-makers.[40]

A few years later, a new feeder line was added to the system connecting the Beira line to the border with Nyasaland, and from there to the railway that continued to Blantyre in the heart of the British protectorate. In this case, the urgency was felt by the trade communities of Nyasaland, who were struggling with the decreasing flow of the Shire River. A railway to Beira (or Quelimane) was therefore considered critical and this criticality motivated its construction.[41]

Critical, yet vulnerable: the British influence on the Portuguese imperial railway sector

The criticality Portuguese colonial stakeholders attributed to Mozambican railways and the urgency to build them led to some choices and situations that rendered the railways and the harbours, to which they were connected, vulnerable, as well as the imperial agenda itself. I contend that this vulnerability was eminently structural rather than event driven, because it was imbedded in the infrastructure since the beginning and was to a great extent dependent on external stakeholders.

One of the shortcomings of the Mozambican transnational railways was related to the configuration of the network and the geopolitics on the other side of the border, which created different spatial configurations of vulnerability.[42] Historically, the intricacy of mutual dependency or competition among technological systems poses potential risks that create vulnerabilities.[43] The goal of the Portuguese strategy was to attract traffic from neighbouring colonies to the ports on the coast of Mozambique, most notably Lourenço Marques and Beira, but also Quelimane. For this strategy to be successful, the establishment of through-traffic arrangements was needed, as well as good diplomatic relations and pure old-fashioned

[39] "[V]. exa. sabe perfeitamente o effeito que produziria na Europa o não se construir aquelle caminho de ferro . . . e que seria um desastre não deixarmos absolutamente concluido aquelle importantissimo melhoramento." *DCD*, 5 May 1896, 1547.

[40] Navarro, *Um Império Projectado Pelo "Silvo da Locomotiva,"* 330-342.

[41] Ibid., 342-365.

[42] Hommels et al., "Europe's Infrastructure Vulnerabilities," 273.

[43] Eifert et al., "Vulnerability," 21. Vincent Lagendijk and Erik van der Vleuten, "Inventing Electrical Europe: Interdependencies, Orders, Vulnerabilities," in *The Making of Europe's Critical Infrastructure: Common Connections and Shared Vulnerabilities*, ed. Per Högselius et al., 62-101 (Basingstoke: Palgrave Macmillan, 2013), 90.

trust with the governments of the territories bordering Mozambique.[44] Otherwise, the risk of building "starving railways" was considerable;[45] additionally, the failure of the railway sector would most certainly spill over to the adjacent harbour sector.[46]

As long as the Transvaal remained an independent Boer republic, expectedly there would not be any unsurmountable obstacle to achieve that goal. The Transvaal desperately needed an infrastructure that broke its dependence on British harbours on the South African coast (Durban, East London, Port Elizabeth, and the Cape). Lourenço Marques aspired to confirm its role as the natural harbour for the landlocked republic. Therefore, the relationship between Mozambique and the Transvaal could only be symbiotic. However, the Boer republic benefitted from the railway for only a short period of time. Although the line was inaugurated in 1887, it reached Pretoria only in 1895. Four years later, the Second Boer War began, leading to the return of British rule.

The relationship with the British regarding transnational flows was much more problematic, as their colonies did not want to share traffic with Lourenço Marques. Indeed, they made every effort to divert traffic to the ports on the South African coastline. This was also the case with the Beira line. Even though the Beira harbour was much closer to Rhodesia than those in South Africa, a combination of fares could render transportation to the south much more economical than to the east (Figure 1). The balance of power between stakeholders is a key factor to assess vulnerability.[47] In this case, the British colonies were much more powerful and took advantage of Portuguese dependence on cross-border flows. However, the Trans-Zambezia line was an exception, considering that Nyasaland did not have a viable alternative to the port in Beira. The vulnerability here was of a different order, related to the need for the transhipment of goods and passengers across the Zambezi River (near Sena) as the construction of the railway did not include a bridge.[48]

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[44] Cf. Hommels et al., "Europe's Infrastructure Vulnerabilities," 268; Michelsen, "An Uneasy Alliance," 111.

[45] Some of these *starving railways* could be found in the colony of Goa (India) and back in Portugal itself, deprived of traffic due to aggressive railway fare politics on the other side of the border (British India and Spain). See Pereira and Kerr, "Railways and Economic Development," 220-1; Hugo Silveira Pereira, "The Technodiplomacy of Iberian Transnational Railways in the Second Half of the Nineteenth Century," *History and Technology* 33, no. 2 (2017): 175-195, on 183-7; Magda Pinheiro, "Les Chemins de Fer Portugais: Entre l'Explotation Privée et le Rachat," *Revue d'Histoire des Chemins de Fer* 16-17 (1997): 159-64.

[46] Cf. Ivan Tchalakov, Tihomir Mitev, and Ivaylo Hristov, "Bulgarian Power Relations: The Making of a Balkan Power Hub," in *The Making of Europe's Critical Infrastructure: Common Connections and Shared Vulnerabilities*, ed. Per Högselius et al, 131-56 (Basingstoke: Palgrave Macmillan, 2013).

[47] Eifert et al., "Vulnerability," 26.

[48] Navarro, *Um Império Projectado*, 364.

Except for the latter case, the other vulnerabilities were serious threats to railway operations and to which there was no backup plan, a situation that could ultimately jeopardise Portuguese authority in those areas of Mozambique.[49] Draining Mozambican ports of traffic, Britain could argue that Portugal was not exploring its colonies conveniently and threaten to make a move for annexation. Although this was an unlikely worst-case scenario, it encouraged Portuguese colonial authorities to take measures. I will detail these reactions in the following section, whilst analysing the resilience of these lines.

A second vulnerability was associated with the financing of the railway sector. Portugal lacked the financial capital to build railways and had to rely on foreign lenders. In the rail sector back in Portugal, French capitalists were favoured,[50] whereas in the colonies, British financiers prevailed. Indeed, they were the main investors of the financial schemes that supported the Lourenço Marques, Beira, and Trans-Zambezi railways.[51] Considering that those who finance infrastructure often have the power to control them, this dominance of British capital over critical infrastructure in a disputed territory, such as the overseas colonies, was a clear and worrying vulnerability shared by different colonialists. An additional vulnerability of British capital was related with the quality of construction or lack thereof. A badly laid-down railway was arguably an important vulnerability for future operations. In both the Lourenço Marques and Beira railways, the quality of construction was cause for concern (Figures 2 and 3). In the former, the main defects were in the final section nearing the border with the Transvaal, which suffered substantial damage after a few days of heavy rains in January 1889. This would be the argument that justified the nationalisation of the railway a few months later. In the latter, the main issue was the gauge (distance between rails): set at a measure of 60 cm, when the African standard was 106.7 cm, the line was frail, unsafe, and could not bear heavy traffic or high speeds. It was no more than a "toy railway" as many classified it. This shortcoming was corrected at the turn of the century, when the line's British operator regauged it to the African standard to serve as an auxiliary to railway construction in Rhodesia and as an outlet for the British colony's production.[52]

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[49] On the *other side of the border*, the vulnerability was related to competition from the Mozambican harbour of Lourenço Marques, although the British colonies benefitted from an uneven spatial distribution of vulnerability; therefore, refusing or thwarting cross-border flows was a way to reduce that vulnerability. Cf. Hommels et al., "Europe's Infrastructure Vulnerabilities," 268, 273.

[50] António Lopes Vieira, "The Role of Britain and France in the Finance of Portuguese Railways 1850-1890. A Comparative Study in Speculation, Corruption, and Inefficiency" (PhD diss., University of Leicester, 1983).

[51] Hugo Silveira Pereira, "Colonial Railways and Conflict Resolution Between Portugal and the United Kingdom in Africa (c. 1880–early 1900s)," *HoST – Journal of History of Science and Technology* 12, no. 1 (2018): 75-105. Navarro, *Um Império Projectado*, 362.

[52] Navarro, *Um Império Projectado*, 300-1, 337-40.

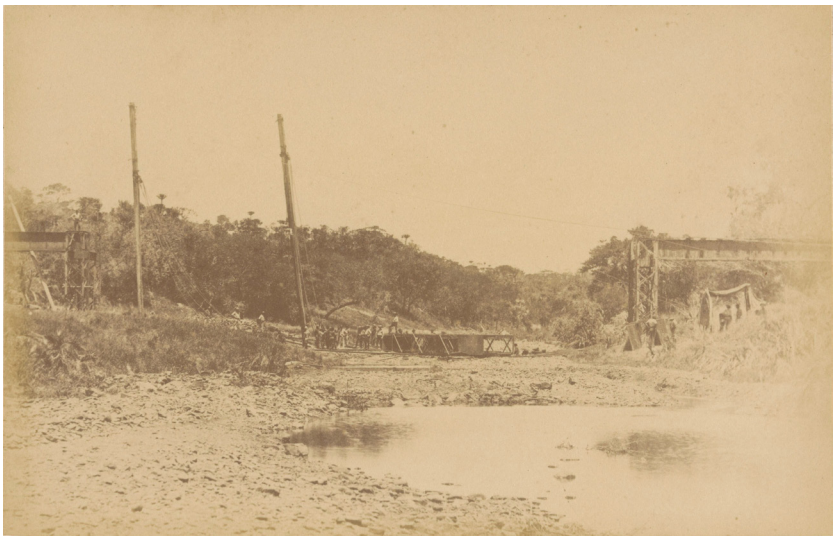

Figure 2. A technical vulnerability in the Lourenço Marques railway is evidenced in the ruins of the Chicongene bridge after the 1889 floods. The Portuguese photographer who took this photo (Romão Pereira) later took another one showing the same bridge rebuilt by Portuguese engineers, stressing how different things were when colonial railways were built by Portuguese experts. Source: Romão Pereira photography of the ruins of the Chicongene bridge after the floods of January 1889, Collecção de Photographias Relativas ao Caminho de Ferro de Lourenço Marques, PT/CPF/CAF/0005/000007, Centro Português de Fotografia (Porto), available at digitarq.cpf.arquivos.pt/details?id=1208376.

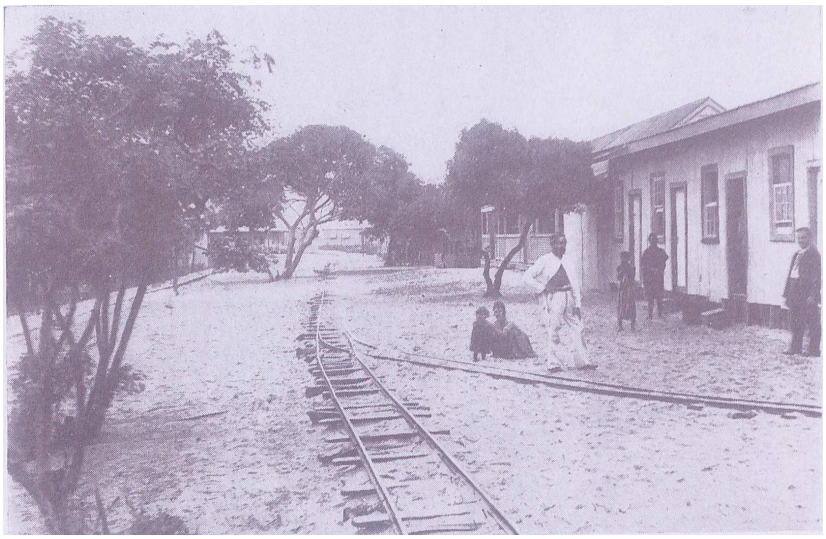

Figure 3. In this image of the Beira railway in 1894 in Beira (Valsassina Street), the vulnerability of the track is palpable. Source: Companhia de Moçambique, *Quarenta Anos de Administração no Territorio de Manica e Sofala. Documentario fotografico apresentado na Primeira Exposição Colonial Portuguesa* (Lisbon: Sociedade Nacional de Tipografia, 1934).

Different colonialists voiced their concerns about these issues. One of them was the president of the chartered company, *Companhia de Moçambique*, Fontes Pereira de Melo Ganhado, who felt the company that operated the Beira railway was more a department of Cecil Rhodes' British South Africa Company, rather than an autonomous company operating in Portuguese territory.[53] For the Republican MP, Manuel de Arriaga, the presence of foreign capital in the enterprise of the Lourenço Marques railway led the country to one of the most distressing episodes in Portuguese history, that is, the shareholders' law suit against the Portuguese government after it decided to nationalise the railway, which I will detail below.[54]

These vulnerabilities were not a novelty for Portuguese policymakers, as they were experienced in the mainland system since the 1850s. Trade flows were diverted from cross-border connections between Portugal and Spain and the influence of French capital on the rail system was a cause for concern. Many advocated for the nationalisation of the railways since the 1870s. However, it was only at the end of the nineteenth century that stakeholders recognised that the investment in transnational railways had been a failure.[55] These past experiences should have prepared the imperial railway managers to prevent them,[56] but they seemed to have been caught completely off-guard when similar events occurred in the colonies. Coping with this vulnerability required the Portuguese authorities to be resourceful and led to some important decisions for the sector. It also illustrates to what extent these critical infrastructures were resilient enough to deal with external shocks. This will be the subject of the following section.

Countering vulnerability or stepping up to the occasion

There was too much at stake in the Mozambican colonial railway system and Portuguese policymakers could not stand idle. It was not so much a financial matter, as the exchequer only financed the nationalisation of the Lourenço Marques line (see below) and the construction of the Swaziland railway. It was rather the issue of not taking advantage of those infrastructures and jeopardising Portugal's legitimacy as a colonial nation.

In general, to counter the competition from neighbouring infrastructures, reliable partnerships and agreements that regulated shared operations had to be established.[57] As mentioned before,

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[53] *Copia de documentos officiaes trocados entre a Companhia de Moçambique e o Governo de Sua Magestade* (Lisbon: Imprensa Nacional, 1894), 42.

[54] Navarro, *Um Império Projectado*, 308.

[55] Pereira, "The technodiplomacy of Iberian transnational railways," 150-64.

[56] Hommels, "Europe's Infrastructure Vulnerabilities," 276.

[57] Per Högselius, Anna Åberg, and Arne Kaijser, "Natural Gas in Cold War Europe: The Making of a Critical Infrastructure," in *The Making of Europe's Critical Infrastructure: Common Connections and Shared Vulnerabilities*, ed. Per Högselius et al., 27-61 (Basingstoke: Palgrave Macmillan, 2013), 42; Anique Hommels and Eefje Cleophas, "In Case of Breakdown: Dreams and Dilemmas of a Common

achieving this kind of understanding was not easy in the context of Southeast Africa, considering the different nationalities and competing agendas each had for their own railway-port systems.

In Lourenço Marques, Portugal benefitted from a specific set of circumstances that offset the balance of power and the bargaining power of Portuguese stakeholders. The government's first step was to decrease the influence of British capital. In June 1889, Portugal terminated the concession, which in practical terms meant the nationalisation of the railway. They argued that the contractor company had not complied with the terms of the concession contract, namely the deadline of construction, the quality of the work, and the extension of the track. The contract stipulated that the line should go to the border of the Transvaal, which was being negotiated with Portugal. However, when the contractor thought their work was complete, the border had been moved 8 km. This was an inventive and risky strategy, considering that the contractor could also argue, as indeed they did, that the government had broken several clauses of the agreement. The matter was taken to an arbitration court in Berne (Switzerland), which, after more than ten years of litigation, ruled in favour of the company's stockholders, but limited the compensation to 1 million pounds sterling (the plaintiffs demanded 6 million).[58]

There are several alternatives to correct vulnerabilities in critical infrastructures, all entailing some degree of risk (vulnerability trade-offs).[59] Portugal could leave the railway in the hands of British capital, which in the long run would probably strengthen British interests in the region; or it could claim the infrastructure and take over its operation, risking a diplomatic incident and the payment of a large compensation. In the end, the risk paid off. Although the compensation was three times the construction cost of the railway, its operational profits in the following years covered the value set by the arbitration court, even after the re-annexation of the Transvaal.[60]

The question here is to know how Portugal was able to attract traffic from the former Boer republic. The answer lies in the mines of the Transvaal and the labour needed to operate it. Most miners were hired in Mozambique and the Portuguese authorities threatened to restrict the cross-border mobility of these workers. To prevent this situation from happening, British and Portuguese negotiators signed a modus vivendi arrangement that guaranteed a certain

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European Standard for Emergency Communication," in *The Making of Europe's Critical Infrastructure: Common Connections and Shared Vulnerabilities*, ed. Per Högselius et al., 239-60 (Basingstoke: Palgrave Macmillan, 2013), 242; Faye, "The Challenges," 40-3.

[58] Telo, *Lourenço Marques*, 86-166. In present-day numbers, those figures would amount to 122 and 732 million dollars, respectively. For the conversion, see Lawrence H. Officer and Samuel H. Williamson, "Computing 'Real Value' Over Time With a Conversion Between U.K. Pounds and U.S. Dollars, 1791 to Present," *MeasuringWorth* (2021), available at www.measuringworth.com/exchange/.

[59] Hommels et al., "Europe's Infrastructure Vulnerabilities," 264.

[60] Ministerio das Colonias, *Estatistica dos Caminhos de Ferro das Colonias Portuguesas de 1888 a 1915: Documentos Principais e Gráficos* (Lisbon: Imprensa Nacional, 1917).

amount of traffic was directed to Lourenço Marques in exchange for a steady flow of workers to the Transvaal mines. The result was rapid growth in traffic on the Portuguese-Mozambican line.[61]

The resolution of this vulnerability created another one—a frequent occurrence in contexts involving critical infrastructure.[62] In Lourenço Marques, the traffic soon became overwhelming, and the line was not resilient enough to handle it. The solution was to build a new line between the port and the frontier. The engineers who surveyed the territory in 1905-1906 had suggested a route to Swaziland to explore the local resources, and thence through the Transvaal province towards the existing line that connected the Mozambican border to Pretoria. To prevent any British interference in the operation of the line, the Portuguese authorities decided the financing and the expertise should come entirely from Portugal, rebuffing several proposals from British entrepreneurs. In the end, the project was financed by a Lisbon-based bank and executed by a group of state engineers who were involved in the operation of the Lourenço Marques railway. Hence, the power and influence of the state grew, in a strategy to prevent future disruptions in its operation.[63] The Portuguese authorities expected the new structure to bring even more traffic to the Lourenço Marques harbour, therefore diverting more goods from the South African railways. However, during construction, British authorities found a loophole in the modus vivendi arrangement—the agreement was limited to traffic on the original railway built in the 1880s and did not include any other track the Portuguese added to their system. Despite protests from Lisbon, British authorities in the South African colonies refused to include the new Swaziland line in the modus vivendi, and consequently construction was halted in Goba a few miles from the Mozambican-Swaziland border (Figure 1). Without any transnational traffic, the railway accumulated operational deficits.[64]

Another improvement in Lourenço Marques, motivated by the increase in transit on the line, was the construction of a new central station in the city. The original station dated from the 1880s, when the track was laid out, and it was a plain, simple building (Figure 4). A new station was needed, not only to provide better conditions to accommodate the stream of traffic and to justify an urban reconstruction of that area of the city, but also as a matter of national dignity. The engineer in charge of the project, Lisboa de Lima, considered the old station a blight in the

[61] Felizardo Bouene and Maciel Santos, "O modus vivendi entre Moçambique e o Transvaal (1901-1909): Um Caso de 'Imperialismo Ferroviário'," *Africana Studia* 9 (2006): 239-69, on 243-47.

[62] Högselius et al., "Natural Gas in Cold War Europe," 42; Hommels and Cleophas, "In Case of Breakdown," 256; Hommels et al., "Europe's Infrastructure Vulnerabilities," 275.

[63] Arturo Crespo, Marcus Dombois, and Jan Henning, "Preparedness & Prevention," in *Key Concepts for Critical Infrastructure Research*, ed. Jens Ivo Engels, 39-44 (Wiesbaden: Springer, 2018), 44.

[64] Pereira, "Identidade e Tecnologia."

city that contrasted dearly with the South African stations of Durban, Johannesburg, Pretoria, and Cape Town, and discredited the international image of Portugal.[65]

Figure 4. A glimpse of the original station at Lourenço Marques. Source: Edward McMurdo and C. S. Fowler, *Views Of Lourenço Marques (Delagoa Bay) And Transvaal Railway* (S. l: s. n., c. 1887).

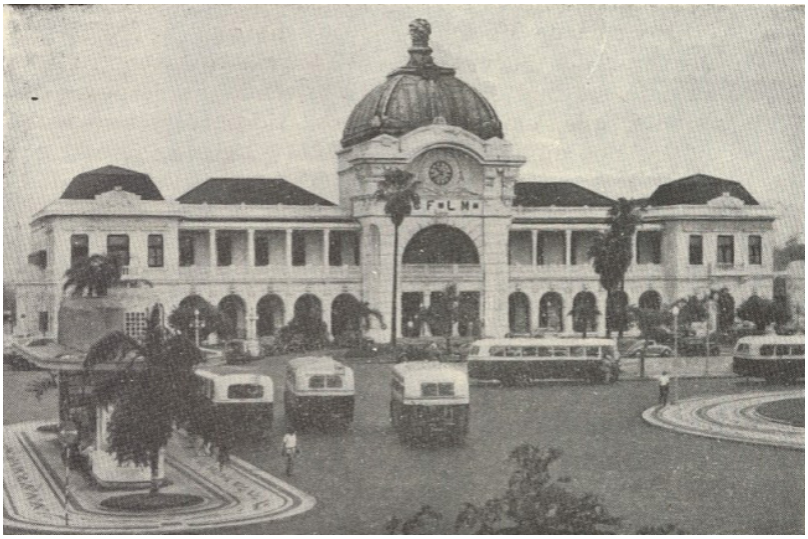

Figure 5. Lourenço Marques central station in the 1950s. Source: *Gazeta dos Caminhos de Ferro* 70, no. 1670 (1957), 260.

[65] Bruno J. Navarro, "A Estação Central de Maputo no Contexto das Políticas de Preservação do Patrimônio Edificado de Moçambique: Estudo de Caso," *Historiæ* 3, no. 1 (2012): 171-200, on 174.

Lisboa de Lima and the policymakers who instructed him to design and build the station highlighted the existence of the railway's dual vulnerability: on the one hand, it negatively affected the users of the trains (passengers, but mostly the merchandise carried along the line); on the other hand, it was a visual shortcoming or "performative" vulnerability that embarrassed national pride. Still in the early twentieth century, stations were much more than mere transportation hubs. Train stations were built to signify, to have a cultural meaning, to convey a message of power, progress, and modernity, and in the colonial context, a message of *civilisation* and self-perceived European superiority. Central stations were usually designed with very large dimensions and with imposing and impressive details, like huge arches, colossal domes, vast interior spaces, stained glass, etc. In sum, they were built to impress.[66] Thus, the Portuguese imperial state took the role of harbinger of progress upon itself. The first dimension of Lisboa de Lima's perception of vulnerability may very well be considered purely material, as it was mostly a matter of operational efficiency: to provide more comfort to travellers and better handling of merchandise. However, the second dimension is a social construct that highlights the values, representations, and expectations of colonial administrators. The construction of the station began in 1908, financed by revenue from the railway, and it was concluded in 1916 (Figure 5).[67]

Further north, in the Manica and Sofala regions, there was no negotiating lever that could be used to counter the influence of British capital nor the deviation of traffic from the Beira line and harbour to the southern routes, particularly to the ports of the Natal and Cape colonies. To some extent, the strategy of policymakers was to downplay the vulnerabilities of the undertaking. Usually, this is done for economic reasons,[68] but in the case of the Beira line and harbour, political and diplomatic reasons appear to have taken precedence. The aforementioned engineer, Joaquim José Machado, stressed that the line was working smoothly despite the presence of British agents, serving as an outlet for some production from Rhodesia, promoting the colonisation of the territory. Furthermore, the enterprise had required no investment from the exchequer, as the leasing company raised the capital with no need for public subsidies.[69] Others were not as buoyant as Machado. Army officer, Aires de Ornelas, another expert on colonial issues who would become governor of Mozambique, was far more

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[66] Richard Deiss, *The Cathedral of the Winged Wheel and the Sugar Beet Station. Trivia and Anecdotes on 222 Railway Stations in Europe* (Bonn: Herstellung und Verlag, 2013), 36; Ian J. Kerr, "Representation and Representations of the Railways of Colonial and Post-Colonial South Asia," *Modern Asian Studies* 37, no. 2 (2003): 287-326, on 291, 296; Orvar Löfgren, "Motion and Emotion: Learning to be a Railway Traveller," *Mobilities* 3, no. 3 (2008): 331-51, on 336; John Durham Peters, "Calendar, Clock, Tower," in *Deus in Machina: Religion, Technology, and the Things in Between*, ed. Jeremy Stolow, 25-42 (New York: Fordham University Press, 2013), 36-8.

[67] Navarro, "A Estação Central de Maputo," 178-9.

[68] Hommels et al., "Europe's Infrastructure Vulnerabilities," 267.

[69] *Copia de Documentos Officiaes Trocados Entre a Companhia de Moçambique e o Governo de Sua Magestade* (Lisbon: Imprensa Nacional, 1895), 176.

pessimistic. He considered the line a true "*via dolorosa*" (sorrowful way) due to the crushing presence of the British (language, currency, measurements), concluding, gloomily, that the territory was Portuguese in name only.[70] The manager of the *Companhia de Moçambique* could not but agree, as the contractor company built and operated the railway as it pleased without informing or seeking approval from the Portuguese chartered company. It was as if the railway was in a distant, estranged country, he concluded sullenly.[71]

Despite the concerns of important local stakeholders, the government in Lisbon preferred to do nothing. The parliament, usually very interceptive and eager to discuss railway controversies, barely addressed the issue of the Beira railway. The line was embedded in serious diplomatic concerns, arising from the very context in which it was leased and built—the aftermath of the British Ultimatum—and the fact that it was part of the treaty that set the borders between British and Portuguese territories in Southeast Africa. Consequently, it was better to leave the matter alone.[72] Again, there was a calculated risk in the manner in which the Portuguese authorities handled this issue. The way the railway was managed posed a clear vulnerability, but the alternatives risked creating even graver vulnerabilities.

The other shortcoming related to competition from the southern route that connected Rhodesia to the British harbours in the south of the continent ultimately sorted itself out. The Rhodesian economy grew considerably in the early years of the twentieth century, immediately after the Second Boer War, so that the railway that carried the Rhodesian goods to the south could not handle the demand. Therefore, traffic had to be shared with the Beira route. In Beira, an increase in trade and customs revenue, and the development of the city and port were noticeable.[73] After the central authorities had managed to reduce the vulnerability of the transportation system, the railway/harbour connection was transformed into an economic asset for the region. Moreover, the concerns of denationalisation or loss of the territory to British influence did not materialise and the provinces of Manica and Sofala, served by the railway, remained a part of colonial Mozambique until its independence in 1975.

To conclude this section, I would like to offer a final note about the Trans-Zambezi railway and how its vulnerability was addressed. As mentioned before, the shortcoming of the line was the absence of a bridge over the Zambezi on its route to Nyasaland, a problem that became more detrimental over the years as the river lost water flow. In 1935, a new bridge was inaugurated spanning 3.6 km over the Zambezi (Figure 6). It hastened communications between the two

[70] Aires de Ornelas, "O Caminho de Ferro da Beira e a Passagem das Tropas Imperiaes Inglesas em Julho de 1896," *Revista do Exercito e da Armada* 7 (1896): 257-64, on 264.

[71] *Copia de Documentos Officiaes Trocados Entre a Companhia de Moçambique e o Governo de Sua Magestade* (Lisbon: Imprensa Nacional, 1896), 4-6.

[72] Pereira, "O Caminho de Ferro da Beira," 720-1.

[73] Ibid., 709-19.

colonies, although the railway kept running a deficit for many years.[74] On a positive note, the new bridge was a great feat of engineering, being for some time the widest in the continent. It can be argued that it served the same purpose and had similar effects as those of the central station of Lourenço Marques.

Figure 6. An aerial view of the Dona Ana Bridge, across the Zambezi River. Source: Private archive.

Conclusion

The Mozambican cross-border railways provide an illustrative case study to debate critical infrastructures and the vulnerabilities that influence their evolution. They exemplify different kinds of vulnerabilities in different colonial contexts and with different imperial stakeholders. Additionally, their historical processes contribute to the academic debate on the role of technology in the imperial expansion of the late nineteenth and early twentieth centuries, and to the difficulty of building cross-border infrastructures to landlocked countries and between nations with an uneven balance of power.

[74] Navarro, *Um Império Projectado*, 364-5.

Perhaps the most evident representations they illustrate is the critical importance given to technology, especially railway technology in the imperial settings. The absence of trains across the Mozambican landscape was unthinkable, particularly in the expansionist context from the 1880s onwards. So much so that Portuguese stakeholders welcomed the first entrepreneurs that offered their services to build railways in Mozambique. Portugal lagged thirty years behind other colonies and imperial countries when it came to the matter of colonial railways. Furthermore, trains and the rail tracks were symbols of modernity, progress, and power. In sum, their absence was a vulnerability that had to be corrected as soon as possible.

When speaking of critical infrastructure, the correction of some vulnerabilities often creates new vulnerabilities, and the Mozambican railways were no exception. If initially their absence was considered a situation that exposed Mozambique to external threats, later, their existence created shortcomings that could potentially favour those same external threats. In the 1880s, the inexistence of railways in the Portuguese African territories was possibly viewed as proof of Portugal's inability to hold and sustain colonies, and was therefore an argument to challenge Portugal's position as an imperial nation. This motivated Portuguese colonial policymakers to invest in railway construction, initially in the highly disputed area of Lourenço Marques, and then in other provinces of Mozambique, seeking to illustrate Portugal's commitment to develop the colonial economy. By the end of the decade, though, especially after the 1890 British Ultimatum, the Portuguese authorities realised railways brought additional vulnerabilities to the imperial project. The overwhelming presence of British capital raised doubts regarding the way the railways were operated: were British investors seeking their own profit or furthering the imperial agenda devised at Whitehall? A timid attempt to counter the dominance of British capital was made in the construction of the Swaziland railway in the early twentieth century, but without any practical consequences, as the Mozambican railway sector remained dependent on British capital and influence. The choice was either building railways with pounds or not building any railways at all. Both solutions had their own vulnerabilities, but those offered by the latter were far graver than those of the former. Additionally, the ability to use railway fares to forcibly divert routes towards British harbours would potentially devoid the Portuguese harbours of transit, cutting off the main source of revenue for railway operations and the colonial economy. This could therefore justify the claim that Portugal lacked the resources and the skills to effectively exploit and *civilise* Africa.

The solutions proposed for each vulnerability provide telling examples of how risk is perceived differently according with the circumstances. In Lourenço Marques, the Portuguese authorities could take a more muscular, beefy, and aggressive stance, nationalising the railway against the pressure of the British investors who had put their money into that enterprise. The Portuguese were aware that they could postpone the sentence of the arbitration court (as they did, with many dilatory practices) and, in the meantime, secure the railway's operation. In Beira, the risk

of taking a similarly aggressive stance was just too high, so the only admissible attitude was to wait and see, and to hope for the best.

In the end, the pragmatism and economic drive of capitalism also played an important role in the management of the vulnerabilities of these colonial railways, as stakeholders on both sides of the fence realised, they could profit if they cooperated rather than exploit any vulnerabilities. This explains the agreement to keep the flow of traffic to Lourenço Marques in exchange for forced labour in the mines of the Transvaal or the sharing of transit from Rhodesia with the Beira line, which would otherwise have remained idle for lack of transportation capability to the British ports.

Competing interests

The author has declared that no competing interests exist.