Domesticating the wilderness
Portuguese engineering and the occupation of Africa[1]

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From historical rights to the effective occupation of colonial territories

Although Portugal played a crucial role during the 15th and 16th centuries European overseas expansion, Portuguese colonies in Africa remained mostly as "obscured" territories until the 19th century. Unlike Brazil, whose gold was quite visible in Portugal - allowing King João V to build a sumptuous Monastery in Mafra (near Lisbon) and to send an expensive embassy to the Pope in Rome, with exotic animals, objects in gold and rich embroideries,- the African territories were covered by a veil of oblivion and ignorance. Africa was seen as a dangerous and wild territory, where force was the law: the owners of the land behave like feudal barons, with their own private armies, being famous for their "generosity in giving and violence and cruelty in punishing"[2]; the most profitable activity was the slave trade; those who ventured into the inland territories, simple adventurers, explorers, travellers and a few men of science, described Africa as a land of luxuriant landscapes and exotic people, animals and plants.[3]

However, one can find some evidences of a different kind of interest concerning both Angola and Mozambique, throughout the 17th and the 18th centuries: there are persistent projects of linking the two coasts of Africa, revealing commercial, political and military purposes; during the reign of King José I, his Prime-Minister the Marquis of Pombal,[4] issued a set of laws in order to improve the administrative organisation of the African colonies; the reformist and pro-industrialist atmosphere of Pombal's government also encouraged some timid (and in the long run unsuccessful) efforts in order to implement a truly economic structure in Angola and Mozambique, beyond the slave trade.

[2] Manuel Barreto (jesuit priest) quoted by Boxer (1977), p.165.
[3] Marie-Noëlle Bourguet, "O Explorador", *in* Michel Vovelle (ed.), *O Homem do Iluminismo*, Lisboa, Presença, 1997, pp. 207-249.
[4] The Marquis of Pombal was prime-minister during the reign of King José I. Although he was a very controversial figure, he launched a set of economic, political and cultural reforms aiming to attain the European standards of the Enlightenment.

The 19th century was a decisive turning point both in the European and the Portuguese scenes. On one hand it became clear for the European great powers that Africa was absolutely essential to their economic growth; on the other hand, as far as Portugal was concerned, the political instability that characterised the first three decades of the century (first with the French invasions and then with the war opposing liberals and absolutists) slowly gave place to a true policy of industrialisation. After 1835, effective changes in the Portuguese industrial *milieu* took place: the factory system was implemented and the steam-driven machinery became more common. By 1850, with the *Regeneração*,[5] Portugal found its way to a true policy of industrialization, based on a new economic strategy, aiming at developing the industrial sector. The core of this strategy was the efficiency of the network of communications that would enhance the circulation of goods and the birth of new factories; the railways were considered, therefore, the most powerful tool to achieve modernity. In so far as progress was materialised in a locomotive, engineers, the professional group that dominated technological knowledge and practise, became one of the main pillars of the "new" Portuguese society.

It is within both the European and the national contexts that the role played by Portuguese engineering in the African Empire must be understood. Early in the 1870s it was already possible to foreseen the deep changes that were to take place in the traditional colonial order. One should recall in this respect the political agendas of Disraeli and Cecil Rhodes for the British Empire, of Leopold II of Belgium for Congo, of the conflicts between the Boers and Great Britain (Orange and Transvaal), of France for its African possessions and of Bismark for the colonial expansion of Germany. The Berlin Conference (1885) was the natural consequence of the voracious appetite of European industrial powers for new sources of raw materials and markets, imposing the principle of the effective occupation of overseas territories, instead of the traditional rule of historical prerogatives.

Confronted with the intention of dividing Africa among the great powers of Europe, Portugal was forced to rethink its political agenda of exploration and effective occupation. The strategy for Portuguese domination was soon associated with technological domination: as in the mainland, railways, roads, harbours and

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[5] Portuguese historiography dates the *Regeneração* to the period 1850-1877. Its spirit, however, was carried on into the rest of the 19th century and the early 20th century. Fontes Pereira de Melo, a

telegraphs were envisaged as preferential marks of the Portuguese presence in Angola and Mozambique

Colonial technology played a double folded role: on the one hand it allowed, through the construction of networks of infrastructures (railways, harbours, telegraphs, sanitation) in the colonies to "domesticate" human and non-human subjects, in a double process of "Europeanizing" the world and "globalizing" Europe. This was no automatic process, but a conflicting one often showing the difficulties of transferring and/or adapting European technologies in tropical latitudes and the distance between the grandiloquent colonial rhetoric and its translation in the landscape.

. From the Portuguese point of view these "technosigns" embodied different messages and expectations: as far as the international scene was concerned, Portugal consolidated its presence in Africa and kept its colonies; concerning the national context the profits of this strategy were quite clear: national pride was secured, Portugal undertook once again the flag of the "civilising mission" and Portuguese engineers could expand their expertise to the colonies, becoming the main protagonists of the Portuguese intervention in African territories.

Railways in Angola and Mozambique: the tools of the Empire

In 1877 Portugal launched an important and quite publicized expedition to Africa, headed by Capelo and Ivens, in order to explore the inland territories of Angola and to pave the way to the establishment of the Pink Map (1886), in which Angola and Mozambique were linked in a coast to coast Portuguese dominance[6]. At the same time, two other expeditions – Public Works Expeditions –, much more low-profile, were sent to Africa. They were headed by two engineers, Rafael Gorjão (Angola) and Joaquim Machado (Mozambique) and their purpose was to analyse the viability of constructing two railway lines: one in Angola, linking Luanda to Ambaca and other in Mozambique linking Lourenço Marques to Transvaal.

prominent engineer and politician (he served several times as Minister and Prime Minister) was the main mentor of this new agenda, often labelled as *fontismo*.

[6] The "Pink Map" (1886) relates to the Portuguese plan of connecting Angola to Mozambique by means of a zone of Portuguese influence stretching from coast to coast. This project was strongly

These two expeditions were the first of a much larger set of surveys concerning the construction of the railway network both in Angola and Mozambique. The railway network, which together with the harbours formed the core of the circulation infrastructure, was the main tool for building a homogeneous economic region, by overcoming the gap between the coast and the inland territories of both Angola and Mozambique, thus linking agricultural and mining areas to commercial centres. It was a true interventionist technological structure in a double sense: not only it mirrored a governmental active policy of intervening in the economic and social design of the colonies, but also it reshaped the face of the territory, domesticating the "wilderness" and imposing the European concept of civilisation. Railways were expected to develop the colonies, bringing progress to the Empire and wealth and international prestige to Portugal.
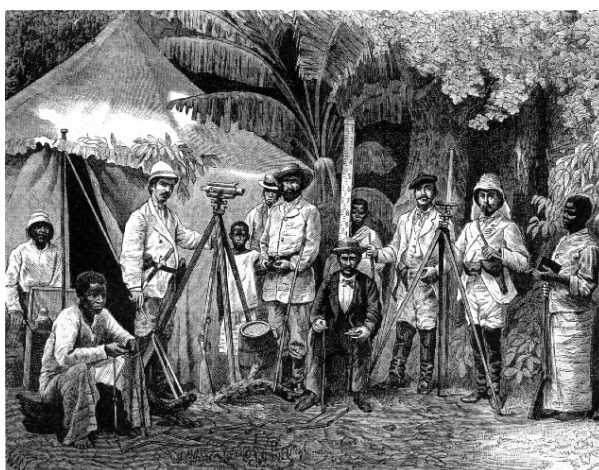
Public Works Expedition in Angola, *Ocidente*, 1879

The reports made by the Portuguese engineers always focused on three main subjects: the railway as a tool for "civilising the savages"; the railway as the centre of the economic activity; technical issues concerning the railway itself. The idea of profitable applications of knowledge in both economic and political terms was the *leitmotif* of these 19th century's explorers.[7] Technology was clearly viewed as the right instrument to enforce an efficient colonisation. In this context the "civilising

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opposed by the English as it clashed with Cecil Rhodes' plan of connecting Cairo to Cape. It led to the Bristish Ultimatum to Portugal in 1890.

[7] A. Simões, A. Carneiro, M. P. Diogo, "Introductory Remarks", in A. Simões, A. Carneiro, M. P. Diogo (eds.), *Travels of Learning*, Dordrecht/Boston, London, Kluwer Academic Publishers, 2003, pp. 1-18.

mission" was meant to reshape the races and cultures living in Africa in terms of the model of the coloniser: [8]

> A few years ago men knowledgeable of the African wilderness became aware of the fundamental help provided by railways in transforming and civilising this immense continent, for the most part still in a barbaric stage, and almost exclusively populated by a primitive and savage race devoted to hunting and war and living in complete darkness

Contrary to what had been accepted in former centuries, this process of adaptation ascribed a fundamental role to co-operation instead of violence. Of course the Europeans, especially through their technology would head this co-operative process and the natives would evolve in a perfect symbiosis with the construction of the railway. To "bring civilisation to the natives"[9] was an ideological imperative and the best way to enhance their desire for progress was to dazzle them with technological devices[10]

> In the century of steam engines and electricity Europe does not have to use old methods to civilise Africa. There is nothing better than material facts, complex, unknown and incomprehensible to ignorant people to make a deep impression in the savages' imagination and produce simultaneously admiration towards the Caucasian race and the acknowledgement of its superiority. A gun, a sophisticated fire engine, a steam machine, a large road, a railway, the whistle and movement of an engine, etc., produce in the inhabitants of Africa a deeper stimulus to their intellectual development than masses and sermons preached by the most eloquent missionary.

The wealth of African soil – coal, copper, iron, cobalt, gold, diamonds, woods and rubber – and its agricultural potentialities – coffee –, demanded strict rules for space management, and therefore the quantity and quality of means of communication was considered vital. Railways played a strategic role in the promotion of commerce, industry and agriculture, bringing Africa to the heart of the 19th century world

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[8] J.J.Machado, "Memória ácerca do caminho de ferro de Lourenço Marques à fronteira do Transvaal", *Revista de Obras Públicas e Minas*, 1882, 12 (445): 1-57, 23.
[9] Letter of the Chief Engineer of the Companhia Real dos Caminhos de Ferro atravez d'Africa (Royal Railway Company across Africa), 1888. AHU (Arquivo Histórico Ultramarino, Overseas Historical Archive), 2678, Sala 3, Est.16, Prat.17, nº13420
[10] Machado, op.cit. (5), 5.

economy, by "taking advantages of the natural wealth of the continent, and creating great overseas markets for European and American textiles".[11]

Decisions on which route to choose were, therefore, extremely important as they had to balance, on one hand, the economic *status quo* and, on the other hand, the future leading economic areas. These decisions were often quarrelsome, opposing different economic interests and different technical views, as, for instance, in the quite fierce discussion about part of the line linking Luanda to Ambaca or about the lines Mossamedes-Bié and Lobito-Benguela-Bié. In spite of the controversies, in the earlies 1880s, two main lines were being built: in Angola, from Luanda to Ambaca; in Mozambique from Lourenço Marques to the Transvaal.
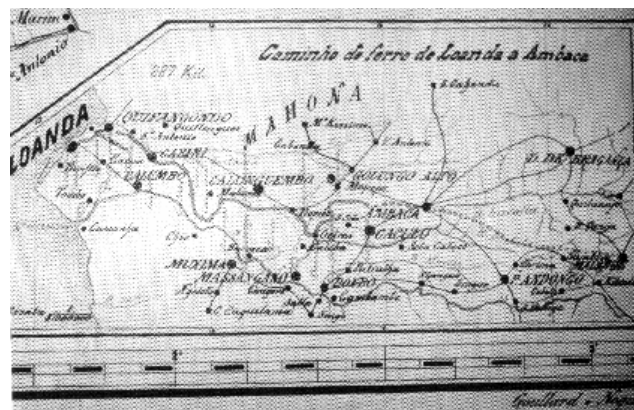

Railway line in Angola, from Luanda to Ambaca

Railway line in Mozambique, from Lourenço Marques to the Transvaal

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[11] Machado, op.cit. (5), 2-3.

It is clear that the Portuguese government was quite committed to build a railway network in Angola and Mozambique. In 1877, from a total of 400 000$000, 165 000$000 (41%) were allocated to preliminary studies concerning the railway line Luanda-Ambaca[12]; in 1878, the engineer Joaquim José Machado, is shipped off to Lourenço Marques, on a Public Works Mission, in order to study the railway line linking Lourenço Marques to the Transvaal border, in spite of the fact that he would have to work during "the worse period of the year (...).The season of heavy rain, of strong heat and dangerous fevers."[13]

At the beginning of the 20th century (1906) 783 km of railways were already built and working in Angola and Mozambique, and around 400km more were in process of construction. In 1914, on the brink of World War I, the Portuguese African railways were already 1600km long.[14] All these lines were part of a more general railway system, designed by the Portuguese engineer Manuel Costa Serrão,[15] linking Angola to Mozambique, starting at Lobito, past Benguela, going eastwards up to Belgian Congo (Zaire), and from there to Mozambique and South Africa.
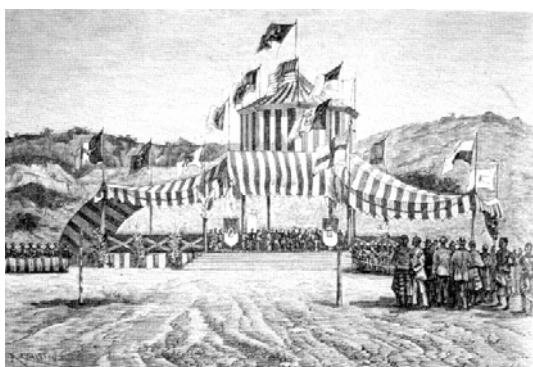
Inauguration of the works on the line Luanda-Ambaca (Angola), *Ocidente*, 1888
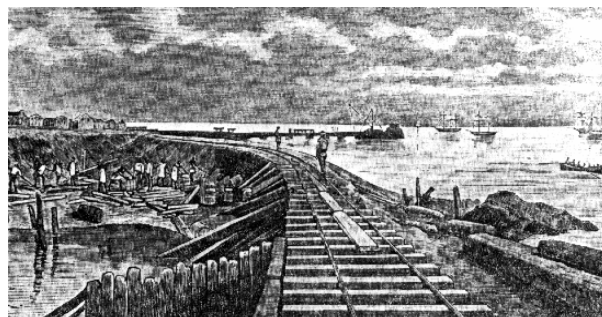
Works on the line Lourenço Marques-Transvaal (Mozambique), *Ocidente*, 1888

All the reports, and sometimes even the simple letters, wrote by the Portuguese engineers who took part in the construction of the African railways had a technical and a financial assessment, containing information on the characteristics of

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[12] AHU, 866, DGU, 3ªRep.1874-78.
[13] Letter of J.J.Machado, AHU, 2678, Sala 3, Est.16, Prat.17, nº119.
[14] A. Castilho, "As Grandes Linhas do Caminho de Ferro", *Revista de Obras Públicas e Minas*, 1914, 45: 638-640.
[15] M.Costa Serrão, "Systema Ferro-Viário de Penetração em Africa – Linha do Sul de Angola", *Revista de Obras Públicas e Minas*, 1900, 31: 211-351.

the soils, number and length of sections, "works of art" needed (viaducts and bridges) and number of stations. In terms of railway traffic, an estimation of costs and equipment was made, taking into account the number of locomotives, passenger carriages and wagons. The main suppliers of locomotives, carriages, wagons and even bridges were the Belgians, the French and, in a smaller number, the Germans.

The human workforce required by the projects was also evaluated, given that the local population was to be used only in non-specialised tasks (as for instance, earthworks) which entailed the importation of qualified European workers. Concerning the African workers, and unlike other colonial experiences (for instance the building of the Transindochinois railway by the French), it wasn't always easy to captivate them to this kind of work, as they often "disappeared in the jungle, being very expensive and difficult to bring them back"[16] As far as the Europeans were concerned the main problem were the tropical fevers and diseases, leading to frequent returns to the mainland.[17]

Concluding remarks: engineers, technology and national prestige

Portuguese engineers were undoubtedly one of the main pieces in the Portuguese strategy concerning the African colonies. Their commitment was very clear and was perceived not only as a patriotic duty, but also as a professional imperative: the effective occupation of the African territories, by using technical expertise, asserted the Portuguese engineers as the main tool of the colonial policy, allowing them to show, within the national context, their proficiency and creating a large market for young engineers to develop their careers. In fact, many engineers were only able to find a job through their enrolment in colonial endeavours.

This commitment is very clear if one analyses the number of articles about public works in the African colonies of the *Revista de Obras Publicas e Minas* (*Journal of Public Works and Mining*), the influential journal published by the *Associação dos Engenheiros Civis Portugueses* (Portuguese Association of Civil Engineers).[18]

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[16] Letter of the President of the Companhia Real dos Caminhos de Ferro atravez d'Africa (Royal Railway Company across Africa), 1888, AHU, 2678, Sala 3, Est.16, Prat.17, nº355.
[17] One can find in the AHU a very large number of letters written by Portuguese qualified workers and administrative workers asking permission for coming back to Europe to receive medical treatment.
[18] The Associação dos Engenheiros Civis Portugueses (Portuguese Association of Civil Engineers) was founded in 1869. It was the first professional association of engineers and had among its members the
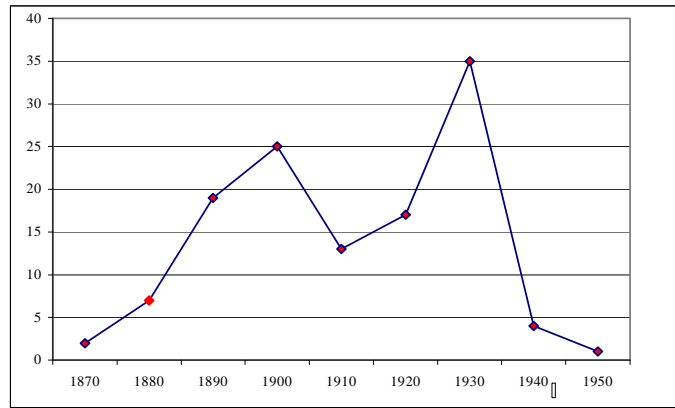
Articles about African public works published in the *Revista de Obras Publicas e Minas*
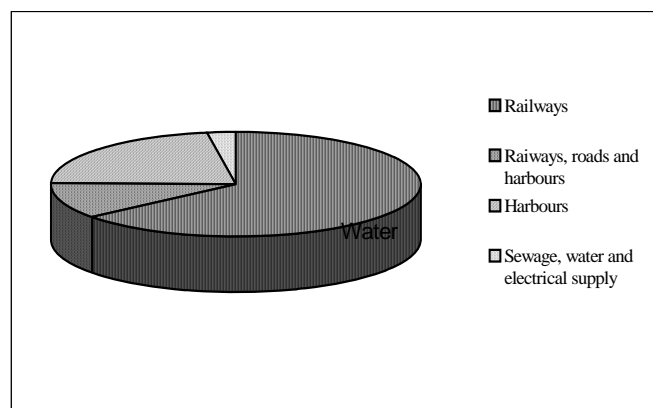
Articles about African public works published in the *Revista de Obras Publicas e Minas*
(by main themes)

In the age of colonialism and imperialism, European countries profited from their colonies in several ways. Beside national profits, these countries could use their colonies as assets in the European struggle for power and influence. Consequently, European countries consolidated and developed their overseas power bases and engineered ways to translate colonial power into power in the European arena.

By the 19th century technology had become the main driving force of the European industrialised society. The relationship established with non-industrialised African societies meant the integration of African populations in the European economy and culture, and technology played in this process a dominant role. The tensions existing in Europe stemming from different rhythms of industrialisation among centres, and centres and peripheries or from hegemonic disputes between

most prestigious and influential Portuguese engineers. See Maria Paula Diogo, "In Search of a Professional Identity", ICON, 1996, 2: 123-137.

European great powers, were transferred to and replicated in African possessions. The Portuguese industrialist agenda on the mainland, whose practical results materialised mostly in public works and especially in the construction of railways, was transposed to Africa. Despite the weakness of the Portuguese economy, which the African territories under Portuguese administration mirrored, technology became nevertheless the main building block of the ideology and the politics of Portuguese colonisation throughout the 19th century and the beginning of the 20th century. The relationship established with non-industrialised African societies meant the integration of African populations in the European economy and culture, and technology played in this process a dominant role.

The technological landscape of the Portuguese empire in Africa was therefore decisive to keep Portugal as an active actor in the European and international scene. Both in the mainland and in the colonies, Portugal had a strong technocratic approach of the concept of "being modern". Colonial engineering mirrored the mainland modernizing agenda, being a tool both to assert the Portuguese identity in Africa and in the European arena. The overseas territories were used (i) as a strategic commodity when Portugal had to negotiate its place in the new worldwide economy; (ii) as a field for developing technical expertise and acquire prestige, both in national and professional contexts: (iii) as a new labour market for Portuguese engineers.

As wrote in 1899, in the *Revista de Obras Publicas e Minas* "When colonial nations want to take real possession of their territories they send their engineers overseas".

Sources:

AHU, 866, DGU, 3ªRep.1874-78.

A. Castilho, "As Grandes Linhas do Caminho de Ferro", *Revista de Obras Públicas e Minas*, 1914, 45: 638-640.

J.J.Machado, "Memória ácerca do caminho de ferro de Lourenço Marques à fronteira do Transvaal", *Revista de Obras Públicas e Minas*, 1882, 12 (445): 1-57, 23.

Letter of the Chief Engineer of the Companhia Real dos Caminhos de Ferro atravez d'Africa (Royal Railway Company across Africa), 1888. AHU (Arquivo Histórico Ultramarino, Overseas Historical Archive), 2678, Sala 3, Est.16, Prat.17, nº13420

Letter of J.J.Machado, AHU, 2678, Sala 3, Est.16, Prat.17, nº119.

Letter of the President of the Companhia Real dos Caminhos de Ferro atravez d'Africa (Royal Railway Company across Africa), 1888, AHU, 2678, Sala 3, Est.16, Prat.17, nº355.

M.Costa Serrão, "Systema Ferro-Viário de Penetração em Africa – Linha do Sul de Angola", *Revista de Obras Públicas e Minas*, 1900, 31: 211-351.

Bibliography

Adas, M., *Machines as the Measure of Men: Science, Technology, and Ideologies of Western Dominance*, Ithaca: Cornell University Press, 1989.

Adas, M., (ed) *Technology and European Overseas Enterprise: Diffusion, Adaptation and Adoption*. Expanding World, vol.7; Hampshire:Variorum, 1996.

Arnold, David, "Europe, Technology, and Colonialism in the 20th century", *History and Technology*, 21:1 (2005), 85-106.

Blanchard, P. and S. Lemaire, (eds.), *Culture Coloniale: La France conquise par son Empire*, Paris : Éditions Autrement, 2003.

Boxer, C.R., *O Império Colonial Português*, Lisbon: Edições 70, 1977 (portuguese translation of Boxer's book *The Portuguese Seaborne Empire 1415-1825*).

Headrick, D. R., *The Tools of Empire: Technology and European Imperialism in the Nineteenth Century,* New York: Oxford University Press, 1981.

Headrick, D. R., *The Tentacles of Progress : Technology Transfer in the Age of Imperialism, 1850-1940,* New York: Oxford University Press, 1988.

Kerr, I. J., *Building the Railways of the Raj 1850-1900*, Delhi: Oxford University Press, 1995.

Kerr, I. J., "Representation and Representations of the Railways of Colonial and Post-Colonial South Asia." *Modern Asian Studies* 37:2 (2003), 287-326

Landau, P. S. and D. Kaspin, (eds.), *Images and Empires: Visuality in Colonial and Postcolonial Africa.* Berkeley:University of California Press, 2002.

MacLeod, R. and D. Kumar (eds.), (1995). *Technology and the Raj. Western Technology and Technical Transfers to India 1700-1947,* New Delhi: Sage, 1995.

MacLeod Roy (ed.), "Nature and Empire: Science and the Colonial Enterprise", *Osiris, 15* (2000)