CHAPTER EIGHT

COLONIAL CENTRES AND PERIPHERIES: LOW-COST ROADS AND PORTUGUESE ENGINEERS IN THE 1950S

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Scholars within the Science and Technology in the European Periphery network have proposed that with technological and scientific peripheries there needs to be a greater emphasis placed on the history of appropriation, which means considering the receptor environment active, acknowledging the point of view of the receivers and studying this history through its conflicts, i.e. those caused by the different agendas of the actors (political, technical and others). How can this concept be applied in a European periphery, such as Portugal, in its relation as a centre to the colonies of Angola and Mozambique? We answer this question by following road engineers from the metropole in their technical missions to these African peripheries, and how they adapted their discourse on traffic engineering and economic development to a discourse on the low-cost roads to be built there in the 1950s. By taking this approach, we aim to challenge the concept of appropriation and apply it to the mobility realm, also bringing an interpretation of the dynamic relation between centres and peripheries.

Keywords: European peripheries, colonial occupation, low-cost roads, road engineers, reverse appropriation

8.1 Introduction

Scholars within the Science and Technology in the European Periphery network have proposed that when studying technological and scientific peripheries, we should place a greater emphasis on the history of appropriation, which means considering the receptor environment active, acknowledging the receivers' point of view, and studying this history

through its conflicts, namely those caused by different actors' agendas (political, technical and others).[1] The emphasis on appropriation instead of transfer aims at overcoming the diffusionist model in the history of science and technology (Patiniotis 2013).

The authors of the article "Science and technology in the European Periphery: some historiographical reflections" have criticised the historical approaches that emphasise the process of transmission of technical and scientific knowledge from centres to peripheries focusing on "how the locals adapt to the exigencies of what is 'imported' and which is invariably considered 'new' and 'progressive'" (Gavroglu et al. 2008: 154). If this is pertinent within European centres and peripheries, it is at least equally so if we move to the relation between metropoles and colonies. Indeed, the same paper refers to the common aspects between the study of European peripheries and colonial studies (although it also refers their different stances):

> colonies and peripheries should be analysed as epistemologically active; knowledge not only dynamically circulates among metropoles and colonies, but also among centres and peripheries in Europe; […] as the scholarship in neo-colonial and subaltern studies has clearly shown in the last decades, metropoles and centres have imposed a hegemonic historiographical view on colonies and peripheries (Gavroglu et al. 2008: 158).

In line with subaltern studies, a founding member of one of its groups, the historian of colonial technology, science and medicine, David Arnold, also questions the relations centres/peripheries, with regard to Europe and the non-European world:

> … how far the history of technology in Africa, Asia and the Caribbean can be understood as essentially an aspect of the history of technology in Europe, the mere extension of steamships and railroads into the non-European sphere, the simple imposition or transfer of modern technologies of warfare, transport and communications, in ways which yet again make Europe the dynamic center of all things and the rest of the world its periphery. It is remarkable how many histories of technology blatantly ignore the non-European world or confine its role to remote antiquity. […]

[1] Scholars from two European History research networks that are concerned with the history of technology, both founded in 1999, Science and Technology in the European Periphery (STEP) and Tensions of Europe (ToE) emphasise the concept of appropriation in the studies of technology and science (Gavroglu et al. 2008; Misa and Schott 2005).

> it is imperative to see the history of technology in the non-European world as representing more than a single (Western) logic and a single (living) tradition (Arnold 2005: 93).

Although European peripheries and colonies have similarities, they also have different stances concerning their relative positions in the centre/periphery equation. In this paper we aim to examine the dynamic relations between centres and peripheries through the concept of appropriation (in opposition to a linear diffusionist path presented in Basalla 1967). In the 1950s, Portugal had the dual role of being a technological and scientific European periphery while being at the same time a coloniser. We ask if it is possible to study the history of appropriation from the point of view of the coloniser but include features of two of its most important African colonies.

We answer the question by addressing the relationship between technology and colonialism, and, in particular, the role of experts (Beinart, Brown, and Gilfoyle 2009). To do so, we follow the Portuguese metropolitan engineers to Angola and Mozambique in the 1950s and investigate a different kind of appropriation: the material and discursive one they practised while working there. Although the engineers answered to the colonial administration, there is still the need to assess how autonomous they were and many questions are still without answers. Nonetheless, this paper points to how the colonial engineers integrated aspects of the reality of the colonies into their professional and technical agendas. This operation can be interpreted as a kind of "reverse appropriation," i.e. the metropole (centre) absorbs data from the colonies (peripheries) and subsequently organises and transforms it into technical knowledge, just as happened in the shaping of disciplines like geology, botany or medicine (Patiniotis 2013: 374). Moreover, these engineers aimed to create a specific kind of colonial road engineering, which affirmed itself within not only the metropolitan civil engineering community but also internationally. By doing so, they were also addressing a lack of specific training in civil engineering that included the problems of the colonies, which, in the Portuguese metropole, was not the case with other disciplines like agronomy, medicine and the social sciences.

Particularly, it seems that at the Permanent International Association of Road Congresses (PIARC) in the 1950s, Portuguese road engineers working in Angola and Mozambique were successful in bringing up the subject of low-cost roads (*estradas económicas*), which were treated explicity for the first time as a separate "question" at the IX Congress held

in Lisbon, in 1951, and which almost became a synonym for colonial, or "overseas" roads[2].

8.2 Portuguese colonial occupation in the 1950s and the role of technology

Two opposing (but inter-related) political trends in Portuguese colonialism were ongoing in the 1950s, one international and the other national. On the one hand, independence movements were emerging and gradually being internationally accepted, and on the other there was also the reaction of the right-wing dictatorship of the *Estado Novo* (New State) (1933-74), which faced the need to renew the occupation of the colonies by legitimating it through an administrative change (in the revised Constitution of 1951). This meant the term "colonies" was replaced by "overseas provinces," and new development policies were promoted. Portuguese colonial development had been envisioned since the late nineteenth century as material development, which meant public works (communication and transports), the exploitation of natural resources and white settlement. Although in the 1930s state investment would be cut (rhetorically emphasising the spiritual character of the "civilising mission"), material development investment would be re-introduced in the 1950s, now framed in a technocratic and modernising discourse (Castelo 2014: 64-67, 69). In the 1950s, there was a discursive shift, moving away from a strict definition of development policies as investment in public works to the support of development ("fomento") plans for a broader approach to the colonies' economies, which implied, moreover, technical expertise (Castelo 2014: 67). Technology played a role in the greater development of African colonies (Arnold 2005: 93-94), acting as a kind of vector of a "second colonial occupation" (Low and Lonsdale 1993; for the Portuguese case see Silva 2010). However, this second colonial occupation was more a "repressive version of development" during the late Portuguese colonialism than a development *tout court*, which would have had to include some degree of native emancipation (a tendency found

[2] This is not to say that roads in the colonies were not discussed previously. The VI World Road Congress held in Washington in 1930 already dealt with roads inndeveloped regions in a separate Question. It was the "Third Question – The Construction of Roads in New Countries such as Colonies and Undeveloped regions". Some of the topics discussed preceded what would later (in Lisbon, and following congresses) be discussed as the features of low cost roads. Even the term "low cost highways" appeared once in the discussion (Proceedings of the Congress, 1930: 104).

in the British, Belgian, and French colonies in Africa) (Cooper 2006: 62-63; Castelo 2014: 86). Nevertheless, the word development came up frequently in Portuguese economic policies and multi-annual plans.

As for the natives in Portuguese colonies, although there was a change in the discourse by the 1950s, the colonial project was still based on their compulsory labour (Abrantes 2014: 45). In fact, the "true 'civilising mission' of the Portuguese in Africa was to educate the natives' bodies and souls for work" (Castelo 2014: 66). Only in the early 1960s (which was also marked the beginning of the colonial wars in Angola, Mozambique and Guinea Bissau), did the social development of the native populations begin to appear in the discourses and practices of the Portuguese colonial administration (Castelo 2014: 70-71).We know that forced labour played an important part in the history of road construction and maintenance in Guinea, Mozambique, and Angola (Havik 2006; Id. 2009; Chilundo 2001; Heintz and Oppen 2008), as well as in African Mobility History (Mavhunga 2001: 75-78). However, in this paper, we will follow the colonial road engineers and not the native populations, so forced labour will only be signalled through the silence of the engineers about the need for unpaid manual labour to maintain low-cost roads. This paper is a preliminary contribution to the little studied road mobility history in Africa (Pirie 2009, on recent English-written historiography), and the study of the role of Portuguese metropolitan road engineers in the colonies, which has already been assessed for railway engineers in the late nineteenth century (Diogo 2009; Id. 2012).

As the trajectories of these engineers show, although the role of technology in colonialism is acknowledged (technology was "woven into the fabric of colonialism"), its features were not only defined by colonialism, but also by local (Patiniotis 2013: 376) and reverse appropriations.

8.3 Low-cost colonial roads: following Portuguese road engineers at the 1950s PIARC World Congresses

Road planning and building in the Portuguese colonies came under discussion before the 1950s because of the rising importance of motorised road transport, the recognition of the need to construct all-weather roads and bridges (many only accessible in the dry season), and also because of the continuing poor road planning and financing. According to the historian Arlindo Chilundo, only in the late 1930s was road planning and construction started in a scientific way in Mozambique (Chilundo 2001: 197). Until the 1930s, roads were constructed both by military engineers (for obvious military purposes) and private companies, and there were

very few engineers experienced in working on colonial roads, as had happened earlier, for instance, in the Dutch East Indies, where the Dutch East Indian Road Association (of road engineers) was established in 1924 (Horn-van Nispen and Ravesteijn 2009: 51). Mário José Ferreira Mendes, who was later to have an important role in low-cost roads, was one of the road engineers in Mozambique from the late 1930s (as the chief engineer of the road construction company of Mozambique), who "refuted fallacious claims of government bureaucrats on the existence of good roads" (Chilundo 2001: 204).[3] Another specialised road engineer who left Portugal for Angola in the 1940s was João Rangel de Lima (Processo individual de João Rangel de Lima, 1921-61). He took up the post of chief engineer of the newly formed road construction company of Angola (*Brigada Autónoma de Estradas de Angola*) in 1943 (Decreto no. 32707, 1943), after having worked for 21 years in the Portuguese metropolitan road bureau, where he had been regional director of roads in several districts.

In the 1930s and 1940s, there was an emulation process in act, with Angola and Mozambique adapting Portuguese road administrations and regulations, with these engineers taking part. Their journeys from the metropole to the colonies were backed by a legal frame, like, for instance, a 1945 law, which allowed engineers from the metropole's ministry of public works to work in the colonies (Decreto-lei no. 34411, 1945). The desire was to circumvent the lack of technicians in the colonies, and in the same year the minister of colonies Marcello Caetano claimed that "Africa needs technicians!", regretting that "the vacancies for colonial technical staff remained unfilled" (Caetano 1945: 8, quoted in Castelo 2014: 67). Although Portugal, like Great Britain, recognised technical expertise as an important requirement for state intervention in the colonies, still in the 1960s it had the problem of a dearth of technicians. Nevertheless, *Estado Novo* used science and technology to establish and legitimise development in Angola and Mozambique (Castelo 2014: 76-77).

Back in the metropole, it was during the 1940s that the main road technical instruments were created: a national roads plan (only to be applied in the metropole) (1945) with modern technical features, calibrated vehicle speed and an updated road classification including the new main itineraries, and the road status (*Estatuto das Estradas Nacionais*), which was a tool defining road space and perimeters. Since its creation in 1927,

[3] Mário Mendes, a military engineer, was initially recruited by the Ministry of the Colonies in 1922 for the public works in Mozambique, and held until the mid 1930s positions as head of railways and port services in Mozambique (Processo individual de Mário José Ferreira Mendes, 1910-66).

the Autonomous Bureau of Highways (*Junta Autónoma de Estradas*, JAE), had established itself as the state organ for road policy in the metropole during the *Estado Novo* regime, specialising its civil engineers in road engineering, and so constructing an image of competence and order back home, which worked both at a national and international level (Sousa 2013). The IX PIARC Congress, held in Lisbon (the "capital of the Empire") in 1951, was a reflection of that (Sousa forthcoming). The colonial/overseas roads would assume a particular importance for the Portuguese engineers working in Angola and Mozambique in the 1950s, particularly in the definition of low-cost roads. An overview of the 1950s PIARC congresses (Lisbon, 1951; Istanbul, 1955; Rio de Janeiro, 1959) shows how the debates on low-cost roads evolved and how engineers like Mendes, Manuel Pimentel dos Santos and Joaquim Ferreira da Silva took part. Their interventions are also visible in other congresses that combined the rhetoric of Portuguese colonialism with the role of technology, in what could be called a "technopolitics of colonialism" (Mehos and Moon 2011).

The IX World Road Congress (Lisbon, 1951), the first after WWII, was the second to introduce autonomously in one "Question" the construction of roads in underdeveloped regions, after the VI World Road Congress (Washinkgot DC, 1930) did so (Proceeding of the Congress, 1930: 101-113). The 1951 congress dealt, in Question IV, with the construction and maintenance of roads in "thinly populated or under-developed countries, with special reference to available resources to the traffic to be carried." As usual, each question had a general reporter, a technician from the host country. It was Mendes who was the general reporter for Question VI in 1951, and also the author of the report on Portugal on the same question (supplying a descriptive overview of the roads in all Portuguese overseas provinces) (Mendes 1951a). Although Question VI included low-traffic roads, like local and rural ones in the metropole's territories, Mendes decided to write the Portuguese national report only about the overseas roads, and omitting therefore low-traffic roads in mainland Portugal (Mendes 1951b). This choice, declared explicitly in Mendes's report to the Overseas Ministry (Mendes 1951b: 4), was presented in another way in the official PIARC version: "In the entire Portuguese national territory, the thinly populated areas which are still economically under-developed are to be found only in the overseas possessions in Africa, Asia and Oceania" (Mendes 1951a: 2). In this way, Mendes both denied the existence of this type of area in metropolitan Portugal, and began to treat low-cost roads as overseas/ colonial.

This strategy was not adopted by France and Great Britain, which spoke about low-traffic roads back at home. Reports for the Question VI

were also submitted by Algeria, French West Africa, Iceland, Indonesia, Morocco, Nigeria and Norway. Mendes's general report was based on all the others, addressing the so-called "problem of the low-cost road," i.e. combining what was considered the need to improve and extend roads in under-developed countries or regions, and the need to reduce costs of construction, improvement, and maintenance (Proceedings of the Congress 1951: 157). The idea of the roadway as a "progressive creation" was also present, which would later become explicit in the proposed definition of a low-cost road. It should be constructed in stages, so as to not prevent future developments. For instance, earth roads should be constructed from the outset right to their final alignment road gradients, and be fit to receive a permanent surfacing when deemed necessary (the criterion was when traffic exceeded 50 vehicles per day, although other factors were raised, like construction typology) (Proceedings of the Congress 1951: 159). During the discussion of the reports on Question VI and the conclusions drawn by Mendes, it was clear that the definition of low-cost roads was not shared (i.e. if it should be applied to both construction and maintenance), and there were proposals for the establishment of common standards and statistics (Proceedings of the Congress 1951: 164-167, 173-174). The final conclusions acknowledged the differences between the discussants, namely over the variations in defining the technical features of the roads from country to country; or the lack of agreement over road-width, paving and foundation, plus the criteria for defining them (Proceedings of the Congress 1951: 287-291). Mendes and Santos recognised that the state of the roads in Portuguese overseas territories was poor when compared to African colonies governed by France and Great Britain. They attributed it to a lack of funding, organisation and planning, but also mentioned the increasing importance of a scientific approach, which was then being established by the Laboratory for Soil Mechanics and Testing of Materials in Mozambique, whose director was Santos (Mendes 1951b: 6-8; Santos 1952). The discussion on the low-cost roads during the 1950s and in which both engineers were involved also served this purpose.

Many of the problems raised in the discussion were proposed for the next congress, which would take place in four years' time, but for some questions, like waterway bridging, the suggestion was made for a committee to be created to treat it more rapidly. Two years later, the Permanent International Commission decided to establish a new technical

committee[4] on low-cost roads. Portugal had joined PIARC only in 1951, but was already a member of the Permanent International Commission. It was present in none of the six technical committees except this one, in the person of Mendes (Mendes 1957b; 1959:5). The low-cost roads technical committee held its first meeting in April 1955 with five of its six members, which were Belgium, France, Great Britain, Portugal, and Turkey (only the Indonesian delegate was absent) (Mendes 1955b). Mendes and Bonnenfant (France) had already made important interventions in the discussions in the Lisbon Congress. However the low-cost roads technical committee was the only one that did not present a report to the 1955 Istanbul Congress, because although the committee was created in 1953, the nomination of its delegates was only concluded in early 1955, and so the first meeting was held just five months before the Congress (Santos 1956: 94). In its inaugural meeting, the members aimed at preparing for Istanbul, formulating the issues to be addressed in the general and national reports on low-cost roads.

At Istanbul, "Question III," would be called "low-cost roads," and the metropolitan and colonial situations were separated by creating two points: A) lightly trafficked roads in rural areas; B) roads in under-developed areas. 13 national reports were presented, from Algeria, Australia, Federal Republic of Germany, Denmark, France, Great Britain, Italy, Japan, Morocco, Portugal, Sweden, Tunisia and Turkey, all addressing these two points in very different ways. Santos (Mozambique), Ferreira da Silva (Angola), and Mendes (Overseas Superior Inspector) were the delegates from the Overseas Ministry, on the request made by JAE's president, who was leading the Portuguese delegation (Macedo 1955).

According to both Mendes and Santos, the technical committee on low-cost roads had suggested that these two points be treated in separate questions in future congresses, the idea also of the French delegate at Istanbul (Mendes 1955a: 5,-6; Santos 1956: 94; Proceedings of the congress 1955: 147). Moreover, both engineers criticised the fact that national and general reporters mixed the points (Mendes 1955a: 5-6; Santos 1956: 4). Indeed, for instance, the general report on low-cost roads by the Turk engineer Muzaffet Ulusahin treated in part A), roads in rural areas, some cases presented in the national reports as belonging to B) roads in under-developed areas, as in as the case of Algeria (Ulusahin 1955: 1-2). The initial conclusions proposed by Ulusahin were separated in the two points A) and B), but they had to be re-written, and as the

[4] PIARC technical committees started in the Hague Congress, in 1938. (Glasson 2007: 21-22).

majority agreed that most of them were issues common to both types of roads, they were presented together in the final accepted conclusions (Proceedings of the Congress 1955: 144-146, 153-155, 365-370; Santos 1956: 58-65).

France, Great Britain, and Portugal presented issues addressing A) rural and municipal roads in their metropolitan territories, and B) roads in their overseas territories. The general and the national reports showed that low-cost roads continued not to have an agreed definition and that it was difficult to establish standards across regions and countries. Great Britain's report even proposed not using the term low cost in future congresses for roads in under-developed areas because it was interpreted in many different ways. However, the definition of low-cost roads in under-developed areas accepted at the Istanbul Congress, already adopted by the Permanent Committee, was a very similar to the British proposal, but omitting "has been constructed down to a price rather than up to a standard," and adding other terms (Proceedings of the Congress 1955: 148, 370):

> A low-cost road is one which, having regard to considerations of climate and traffic, has been located and built to geometrical standards commensurate with future requirements, but it has been constructed with bases and surfacings to meet the present traffic requirements. It is however one which should be so designed, constructed and maintained that it allows for stage construction when traffic requires it and improvement in economic conditions permits.

Mendes discussed some of the general reporter's remarks and summed up the progress made since Lisbon, highlighting the issues that to his mind were more important (Proceedings of the Congress 1955: 164-167). The definition of low-cost roads would continue to be discussed, however. One of the issues highlighted the stage construction, from earth to fully paved roads, for instance. In both the French and British reports, low-cost roads only referred to earth roads, with the simplest surfacing methods, such as adding to the earth base a surface of local materials (like laterite) or of stabilised soil mixtures. The use of laterite was addressed in several national reports, and Mendes mentioned the need for a study in the general discussion. Some Portuguese engineers then started a study on the use of laterite in roads, through a cooperation between the Portuguese Civil Engineering Laboratory (in the metropole) and the Angola Engineering and Mozambique Soil Mechanics Laboratories (Proceedings of the Congress 1955: 1665; Mendes 1955a: 13-14). Another issue was mechanising the construction and maintenance of earth roads, which had

already come up in the 1951 Congress, and gained greater prominence at Istanbul. It was considered one of the most important developments in these proceedings, although manual labour was still deemed necessary by some, mostly where it was cheap (Proceedings of the Congress 1955: 144-146, 150, 151, 164, 366, 367).

Low-cost roads were still on the agenda of the technical committee, which met three times, between the 1955 and the 1959 Congresses (Report by the Committee on the Low Cost Roads 1959b: 4). Information was not completely divulged in the committee meetings as there were some sensitive issues regarding financial matters. For instance, in the meeting held in Paris, in April 1957, the British proposed a study on road finances and establishing points where earth should be replaced by bituminous paving (according to the road capacity and rationalising road funds), which the Portuguese delegate felt was a delicate subject. He felt the committee members would be forced to admit the insufficiencies of their roads and funds, for him a political matter (Mendes 1957b: 3-4). The members of the commission agreed, in fact, to keep to the purely technical aspects of the roads, and decided that at the 1959 Congress the following issues were to be debated: the geometrical characteristics of the roads, classification and traffic studies; drainage; earth, laterite and black cotton roads; the passage from earth to bituminous pavement; road maintenance (Mendes 1957b: 4).

In 1957 and 1958, Mendes, who did not consider himself a specialist on the subject, published three volumes on low-cost roads to help his overseas Portuguese engineers overcome the fact they were "far away from the centres," and break their isolation by providing a kind of an updated manual of road engineering in overseas territories, a summary of the PIARC proceedings and his own experience (Mendes 1957a: 5,-6). As a member of the low-cost roads technical committee, he had access not only to what was said and what proposals were made during the meetings, but also to field visits (his main interest was earthworks), and missions to other roads overseas departments to collect information, which he did, for instance, in France, in 1957 (Mendes 1957b: 5-6). Santos also wrote several works on road engineering (with a special emphasis on low-cost roads), and recognised that participation in international meetings was not only for sharing experiences with other engineers and learning in the process, but also for legitimating Portuguese technical capacity and sovereignty. In a report on the 1955 Congress he stated that "in particular, the presence of the Portuguese Overseas delegates [has contributed to the prestige of Portugal] and their active participation in the meeting was a

serious propaganda to our works [in Angola and Mozambique]" (Santos 1956: 107-108).

In this period Portuguese overseas road engineers also participated in different congresses, like those held by International Road Federation (IRF). Here they discussed inter-territorial roads crossing several African nations or regions, with higher technical standards and interregional cooperation. Founded in 1948, the IRF was based in the US, and soon became a competitor of PIARC, and contrary to the latter, organised regional congresses. Both Silva (Angola) and Santos (Mozambique) attended the IRF's African Regional Road Congress held in May 1957 in what was then Salisbury, South Rhodesia (Silva 1957).[5] These inter-territorial roads had been discussed in the 1950 Central and Southern Africa Transport Conference held at Johannesburg, where an inter-territorial highway classification and numbering system was adopted.[6] Apart from great itineraries observing international standards, some shared concerns were aired, like weight regulations (Silva 1957). Another congress on African colonies in this period was the first Road Meeting of Angola, in 1957. Arguments included technical aspects of the roads in Portuguese African colonies, and some references were made to low-cost roads (*estradas económicas*) (Lemos 1957; "Discussão: Estradas económicas", 1957).

Mendes was in favour of sending the Portuguese delegation to the 1959 Rio de Janeiro Congress, both for important technical and political reasons - the affirmation of Portugal sovereignty over its colonies played a role. He stated that the proposal of Rio de Janeiro as venue of the XI

[5] One of the aims of the congress was to discuss a road of around 5600 km between Cape and Nairobi, which would cross central Africa from the South to the East, near the Equator. As the road would not pass through Angola and Mozambique, the two engineers only acted as observers.

[6] These classifications included the expected "Cape to Cairo" road, which was designated as A-104, and the roads A-21 and A-100 that crossed Angola, mentioned by Silva in the IRF 1957 Congress. Although the agenda gave priority to the problems of railways and maritime ports, measures that intended to develop the road transport were also taken. Besides the classification system, maximum permissible loads and traffic limits were defined, which were part of the provisions of the 1949 Road Traffic Convention; and a basic system of highway signs and signals, based on the Geneva Protocol of 1949, was agreed upon. The Agenda for the Johannesburg meeting was fixed at the Conference on Central African Transportation, which had been convened in Lisbon in May, 1949. In general, the aim of the Johannesburg Conference was to improve and expand transport facilities south of the Sahara by establishing a permanent inter-territorial organisation (Kelly, Smith and Birch 1951: 111-112).

Congress had been strongly supported by Portugal, against proposals by other countries like India, which, since independence had been calling for Portugal to cede sovereignty over its Indian enclaves of Goa, Daman and Diu (Mendes 1958). Following his usual line, defending Portuguese sovereignty over her overseas possessions, Mendes stressed that information on the Portuguese overseas provinces roads, mainly about Angola and Mozambique, should not be limited to the question on low-cost roads, but also to other questions in PIARC Congresses, so that the Portuguese reports would "be, really, national reports" (Mendes 1958: 4). He also recommended that Santos be the national reporter of the question about low-cost roads on the grounds of his work on Mozambique roads and former participation in both the Lisbon and Istanbul Road Congresses (Mendes 1958:2).

The Rio de Janeiro Congress discussed low-cost roads in a separate question as before, but with no separate points as had happened at Istanbul. 14 national reports were presented: Australia, Federal Republic of Germany, France, French Equatorial Western Africa, Great Britain, Israel, Italy, Japan, Morocco, Nigeria, the Netherlands, Portugal, Turkey, and the USSR. The general report for Question VI, written by the Brazilian engineer João Maggioli Dantas, showed that the polemics around the term and definition of low-cost roads persisted, arguing that it would be better to classify roads in terms of technical (geometrical) characteristics and relative variables like cost, emphasising the main aspects that had already been discussed, since 1951: geometric design; stage construction; mechanisation and road maintenance; limitation of vehicle weight; use of laterite and clay soils; erosion and drainage (Dantas 1959).

The low-cost road technical committee had decided previously that contrary to what some members (namely the Portuguese) had maintained, low-cost roads would continue to include both roads in under-developed regions and rural roads, because they considered that "experience of countries whose extensive network includes secondary roads may benefit countries with less developed road networks" (Report by the Committee on the Low Cost Roads 1959b: 4). Indeed, the question whether low-cost roads was a concept to be applied to all low-traffic regions (including rural regions in developed countries), was being raised also by other Portuguese engineers. Although the Minister of Public Works wanted the Portuguese reporter on low-cost roads to be an overseas engineer, now the question was also thought to cover secondary (municipal) roads in mainland Portugal (Mendes 1958: 3). Dividing roads with low traffic in rural areas in countries "with a certain development" from those in "under-developed countries or regions" was discussed in the third meeting of the committee,

held in 1957, and met the objections of two of its seven members, the Turkish and the French delegates (Mendes 1957b: 2). In that meeting, Mendes argued that roads in underdeveloped countries/regions, especially in Africa, had lengthy itineraries which implied high speeds, heavy cargos and low circulation, while rural roads in developed countries shared only the latter. He therefore proposed that the low-cost roads issue be divided into three parts: two regarding specific problems of each road type, and the other problems common to both road types (Mendes 1957b: 3).

The Portuguese delegate to the Rio de Janeiro Congress, Manuel dos Santos, continued to defend the position of the Portuguese delegation on separating low-cost roads in the metropole from those on overseas territories, because of their very different characteristics. He proposed:

> … to separate the study of the secondary roads in highly developed countries, which usually cover only short distances, and converge on the main highway network, from the study of the road system in countries still in the development stage; these countries include those situated in the tropical and sub-tropical zones where the problems to be solved exhibit features which are peculiar to them in regard to the nature and conditions of the traffic, the distribution of the population and of the economic resources, the length of the routes, the climatic, geological and pedological characteristics, the drainage conditions, the materials available and the financial limitations, having regard to the magnitude of the expenditure to be incurred (Proceedings of the Congress 1959a: 203)

After a debate, the general reporter decided to withdraw his proposal to replace the term low-cost roads with "main and secondary" roads according to technical characteristics (Proceedings of the Congress 1959a: 227).

Low-cost roads continued to be a separate question in PIARC Congresses and technical committees in the two following decades. In the 1960s, Santos would replace Mendes as the Portuguese delegate in the low-cost roads technical committee, and would be one of the authors (together with three other members of the committee) of a book promoted by UNESCO, as part of their programme to "provide standards, codes and guides for engineering works in developing countries" (Processo individual de Manuel Pimentel Pereira dos Santos 1944: 74). The book entitled *Low cost roads: design, construction and maintenance* was written for the "guidance of road planners and road builders in tropical and sub-tropical countries" (Odier et al. 1971 [1968]). The PIARC technical committee on low-cost roads would continue to treat both type of roads together until the beginning of the 1980s, when they decided to substitute the term "low cost" roads by "roads in developing regions," wanting to give greater emphasis to the study of roads in those regions (Proceedings

of the Congress 1983: 545). The work and conceptualisation of roads in developing countries continued to be instrumentalised, but now by a different agenda.

8.4 Final remarks

The term low cost appears in some literature in imperial history on Africa, as the low price European colonisers paid for the lands they acquired, or to describe the adaption of services and infrastructures to prices that under-developed areas could afford, as well as the use of local materials, as in "low-cost sanitation" (Weiss 2006). Besides this latter definition, in the case presented in this article, low cost also means that some of the production costs for road building and maintenance were omitted, like the unpaid labour carried out by Africans (which normally glossed over by the Portuguese engineers). It seems that there was a great silence among the engineers about forced labour in Angola and Mozambique but this does not mean that it did not enter as a variable in the planning and administrating of the roads. In this respect, the use of materials such as laterite (natural local material used for gravel road surfaces), which was difficult to maintain, could well have been justified by the low-cost "abundance" of manual labour available.[7]

While considering local characteristics of colonial roads, and giving them technical treatment, Portuguese road engineers contributed to their own legitimation as professionals, both at national and international levels, and to the legitimation and reinforcement of Portuguese colonial rule in Angola and Mozambique.

These overseas engineers, who were at a given time simultaneously in central and peripheral positions, placed a great emphasis at the national and international forums on the need to separate low-cost roads in the overseas territories, from low-traffic roads in the metropole by presenting their specific features.

This paper has followed the colonisers/engineers from a European periphery into the colonies, providing leads for the history of a reverse appropriation of local features by the engineers, and not by the natives, and so it contributes to being one small piece to be inserted into a larger puzzle formed by other more rooted non-European perspectives.

[7] This information came from an interview by Cláudia Castelo to the agronomist Rui Pinto Ricardo, and I thank Cláudia Castelo for providing this information (Entrevista de Cláudia Castelo a Rui Pinto Ricardo, 2013).

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