



Cost-effectiveness of enforcing axle-load regulations: The Douala-N'Djamena corridor in Sub-Saharan Africa^{☆, ☆ ☆}

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ABSTRACT

Road conditions in Sub-Saharan Africa are typically poor, and only a subset of the newly constructed or rehabilitated roads reach their design life. Truck overloading generally causes this rapid deterioration. In Africa, there are few success stories on the imposition of axle-load limits. This study examines the existing regulations on the Douala-N'Djamena international road, which is the main transport corridor in Central Africa and the backbone for internal transport in Cameroon. It benefits from the detailed existing weighing data recorded since 1998 in the corridor's 10 weighing stations. This vast amount of traffic data, together with available information on road structure and deterioration over time, has been used to conduct an accurate calculation of load equivalency factors. The HDM 4 model has been applied to three scenarios between 2000 and 2015: (1) no axle-load control, (2) the real situation and (3) no overloading tolerance. Results show that axle-load regulations have been reasonably well applied in Cameroon and have contributed to maintaining the corridor in fair condition. In spite of the fact that significant traffic increases are presently counterbalancing the damage avoided by axle-load limits, benefits provided by axle-load control have been substantial: in the period of 2000–2015, every € invested or spent on axle-load control has generated more than €20 of savings in road user costs and in road maintenance and rehabilitation expenditure, which represents, in absolute terms, more than €500 million.

1. Introduction: the persistent problem of truck overloading in Sub-Saharan Africa

In the 1980s, international financial institutions started to raise the alarm regarding the rapid road deterioration in many developing countries, especially in Sub-Saharan Africa. In 1988, the World Bank published a detailed policy study on the causes and scope of this problem and on the possible options to overcome it (Harral and Faiz, 1988). The significant expansion of the road

[☆] The results of this paper are presented in euros (€) for accuracy reasons. For the total period covered by the study, the Central African currency, the CFA franc, has had a fixed exchange rate to the € (1 € = 655.957 CFA francs), and most of the road investments analysed were funded in €. In addition, many of the costs considered were in € because the European Union has remained the main supplier of Cameroon. The average annual €/US\$ exchange rates used in this paper can be found in Appendix C.

^{☆☆} The findings, interpretations and conclusions expressed in this paper are entirely those of the authors. They do not engage or represent the views of the European Commission.

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network during the previous two decades had not been accompanied with consistent budgets for road maintenance, and traffic had been much heavier than projected. However, sufficient evidence had already been provided to assume that overloading was the main cause of road deterioration and that neglecting road maintenance had contributed to the poor condition of the network (Lea and Ass., 1969). Moreover, it was already known that overloaded heavy vehicles threatened road safety (especially if trucks are in poor condition) and led to increased vehicle operating costs (higher fuel consumption and premature breakdown) (Keita, 1989). Above all, the 1988 World Bank study concluded, the main reason for road deterioration was institutional failure.

The implementation of axle-load control was an integral part of the reforms promoted by donors in the 1990s. By then, they already warned that axle-weight regulations were “the most important, but the most difficult to enforce” (Heggie, 1995). As a matter of fact, road maintenance policies in Sub-Saharan Africa had been quite timid with regard to pavement protection, and international development agencies did not succeed in making African countries respect the axle-load limitations already approved by most of them (Torres, 2001). Almost 20 years later, African regional economic communities still admitted that vehicle overloading was “one of the greatest threats to the sustainability of road infrastructure improvements in Sub-Saharan Africa” (SSATP, 2007). In an independent evaluation of its assistance to the transport sector, the World Bank highlighted that the lack of capacity to enforce vehicle overloading axle-load regulations was widespread in Africa (World Bank, 2007).

Since 2000, various programmes supported by the Official Development Aid (ODA) have focussed on reducing overloading and promoting axle-weight control activities with the primary objective of protecting existing road infrastructure. The evaluation of these programmes financed in Africa by the European Commission highlighted that control of overloaded vehicles has improved but continues to be inadequate due to a lack of political commitment (European Commission, 2016a). Regulations are not enforced, and weighing stations do not operate properly. Overloading continues to be a dominant and seriously damaging setback for the sustainability of the road network in many countries. According to a special report from the European Court of Auditors, most of the African countries audited failed to demonstrate sufficient commitment in implementing effective measures to reduce the incidence of vehicle overloading (European Court of Auditors, 2012). The Court noted that regional and national legislation on axle loads is not enforced effectively and that too little attention is given to the fundamental causes of vehicle overloading. The “offloading” policy of taking excess load out of a vehicle is not applied, and fines imposed are too low to have a deterrent effect. In addition, the licences of hauliers that have repeatedly infringed overloading regulations are rarely withdrawn.

The reasons behind the inadequate implementation of effective axle-load control can be characterized into two categories. The first group relates to the lack of will of many African states to tackle the overloading problem, which is closely linked to the inefficiency and corruption of the public administration responsible for road freight traffic control. Security forces and weighing agents are often bribed to overlook non-compliant loads, which occurs in the context of very low salaries in the public sector (Pinard, 2010). The second group regards the transport freight operators. Where high transport prices prevail due to overregulated transport services markets, overloading is a strategy to maximize loads and revenues from limited trips and low vehicle utilization while keeping capital costs low (purchasing second-hand trucks) and minimizing vehicle maintenance costs. Because the marginal cost of overloading is low, this practice makes sense. In addition, most stakeholders have a vested interest in operating with overloads, such as drivers, who are paid cash for extra tons loaded but not declared; intermediaries, who receive a commission based on the real truck load; and shippers, who pay lower tariff duties. Transport freight companies are poorly organized and managed and are not in a position to break the vicious cycle of transport prices and costs in which overloading is a valuable mitigation strategy (Teravaninthorn and Raballand, 2009).

Globally, few academic studies on the economic benefits of enforcing axle-load regulations exist (Moreno-Quintero et al., 2013). In Sub-Saharan Africa, research in this domain is hindered by the lack of reliable data on overloading practices (Pinard, 2010; UEMOA, 2015). The Douala-N'Djamena corridor constitutes an exception as a result of the close monitoring of overloading practices that has been carried out in parallel to new investments in load control systems. Unlike the corridors in West Africa, most of the Douala-N'Djamena corridor runs in a single country, and there are virtually no alternative routes. Thus, Cameroonian authorities have had easier conditions to enforce and keep track of load regulations (Arvis, 2011).

The lack of progress by African countries in the fight against overloading is one of the reasons why ODA's donors are reducing road investments in the form of grants. In this manner, the 11th European Development Fund, the main aid instrument providing grants to the transport sector in African, Caribbean and Pacific countries, has seen the allocation to roads drastically reduced (Herrero et al., 2015). In a global context of economic uncertainties and financial constraints, it is of paramount importance to increase the effectiveness of ODA for the transport sector (Runji, 2015). In the next few years, aid will favour African partner countries that implement appropriate sector policies to achieve sustainable road transport with relevant and credible measures for addressing vehicle overloading (European Court of Auditors, 2012; African Development Bank, 2014). At the same time, there will be a strengthening of conditions attached to projects and programmes in relation to road maintenance and protection.

The purpose of this paper is to provide a methodology to assess the economic benefits of enforcing axle-load regulations by applying it to the specific case of the Douala-N'Djamena corridor in Cameroon. After this scene-setting introduction, the paper is structured as follows: Section 2 briefly describes the weighing control system in Cameroon. Section 3 starts reviewing the origins and fundamentals of the Highway Development and Management (HDM) model and the load equivalency concept on which this study is based. It is followed by a summary of the hypothesis and data used, the research methodology proposed and a calibration of the model. Section 4 shows the results of the application of this methodology to the Douala-N'Djamena Corridor. Section 5 presents the conclusions of this paper.

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