



# **Assessment of OVERRUNS and Delays in Construction Works of Fuel Filling Stations in Rural Areas, Mozambique**

## **Extended Abstract**

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# **Assessment of Overruns and Delays in Construction Works of Liquid Filling Stations in Rural Areas, Mozambique**

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## **Abstract**

This study evaluates the occurrence of overruns and delays to comply with the deadlines in public works contracts for the construction of fuel filling stations in rural areas of Mozambique. For this purpose, 78 fuel filling stations were analyzed in Mozambican rural areas. The methodology comprised a review of the literature on the legal framework of public works contracts in Mozambique as well as in the international context. Additionally, this study reviewed studies on deviations of costs and deadlines in construction contracts and on the legal framework of fuel filling station in Mozambique. A quantitative study was carried out using a questionnaire to different actors, namely, project' owner, supervisors and designers. The analysis was modeled using Statistical Package for Social Sciences software version 20. As a result, this study reveals that in Mozambique as well as in the international context the legal framework on deviations from costs and deadlines is encouraging. The actors interviewed indicated there are differentiated responsibilities regarding to the deviations from costs and deadlines with respect to the actions of the project' owner, contractors, supervisors and external factors. On the other hand, it was possible to aggregate overwork and delays to meet deadlines into the following categories: project' members; project' planning and management; project' specificity; contract management; technical capacity, climate conditions, changes into the law framework, etc. This study concludes the projects do not meet the deadlines for delivers, and in some cases, as they represent an overruns unforeseen by the local law.

## **Key-words:**

Fuel Filling station; Project management; delays; overruns; Mozambique.

# **1. Introduction**

## **1.1 Study Background**

This study aims at evaluating the occurrence of overruns and delay into public construction works of liquid PAC (Fuel Filling Station) in rural areas, Mozambique. These PAC are under the Mozambican Geographic Incentive' (GI) program. Thus, a set of PACs were established and sponsored by the Mozambican Government, through Public State Budget (OE), under the Decree-Law no. 63/2006 of 26<sup>th</sup> December, across all rural areas. Across all Mozambique rural areas, some significant impacts that results from the implementation of PACs – from the GI program include: access improvement to the fuel at district level; emergence of other services which promoted rural communities, such as, the convenience store and water supply; fuel consumption of certified quality; long life expectancy of car engines; guarantee of the disposal of agricultural products; creation of new opportunities for job for local communities (ME, 2012).

Actually, some constraints into the construction' sector include: burden assumed by the State as a customer, lack of security into the place of construction, workforce qualified, irregularities within the contracting process, and so on (Lopes, 2007; CIP 2015). However, within the legal framework of the construction sector, efforts have been made to guarantee the improvement of procedures for contracting public construction works. An analysis of the legal framework, revealed the existence of three important Decree-Laws into contracting sector, namely: the Decree no. 54/2005 of 13th December; the Decree no. 15/2010 of 24<sup>th</sup> May and; the current Decree no. 05/2016 of 8<sup>th</sup> March. From all these Decrees, there were some improvements, in particular from the last Decree.

## **1.2 Objectives**

The main objectives to be achieved in this research follows: Characterize the legal framework of the public work construction' sector in Mozambique; Understand the specificity of project construction of PAC in rural areas, Mozambique, both at the project level and the legal framework; Identify factors of overruns and delays among the selected projects; Identify responsibilities in the occurrence of cost' deviations within the project' construction of PAC; Draw up measures to overcome obstacles of the deviations that may occur occurred in the project construction of PAC in rural areas of Mozambique.

## **1.3 Methodology**

Firstly, this research reviewed and analysed the legal framework about public works construction' contracts applicable and operative in Mozambique, Portugal, South Africa, and in all African Portuguese-speaker countries (Angola, Cape Verde, Guinea Bissau and São Tomé e Príncipe). Secondly, this

research included the analysis of the main key actors involved in public construction of PAC in rural areas, Mozambique, namely, project 'owner, contractors, and supervisors. Through the project' owner, it was possible to get hold of the project history and specificity, the database under study including other relevant information. Finally, a questionnaire was developed and applied to the key actors in order to grasp the causes associated with overruns and delay public construction of PAC. Meanwhile, it is important to stress that one of the constraints encountered during this study, was the lack of local empirical studies about Mozambique.

## **1.4 Outline of the thesis**

This thesis is structured into six chapters. The first chapter presents the introduction where the background of this study is presented. Then, the objectives and the methodology are discussed, followed by the outline of this thesis. The second chapter focus on the literature review about the current legal framework for the public works 'construction contracts in Mozambique and Portugal. The aim of this literature review was to take into account the way in which modifications in the contracts of public works occurs in these countries. As well, it was briefly reviewed the legal framework of other countries, such as, South Africa, Angola, Cape Verde, Guinea Bissau and São Tomé e Príncipe. This chapter is followed by the characterization of the liquid PAC in Mozambique. To meet this aim, characteristics of the legal and institutional framework for this type of project, some aspects inherent to the works of this type and, lastly, the contract' management of the construction sector were discussed. Chapter four analyses cost' deviations in project planning of PAC, addressing aspects, such as, projects' overruns and delays. As well, this study focuses on statistical data and analysis of the projects' database. Further, this study presents the main causes and the motivations associated with the deviations into project' planning. The chapter five presents the questionnaire applied to key actors into the project's construction of PACs in rural areas, Mozambique. The last chapter presents study' conclusions and recommendations for future studies.

## **2. Literature Review**

### **2.1 Mozambique Legal Framework: A General Overview**

Mozambique is a former Portuguese colony and because of this experience as colony, it has been ruled by the Portugal legislation, which is extended to the so-called overseas territories. As a result, the concept of contract into Mozambican legal framework is subjacent of that of Portuguese Law, Mungambe (1998). In 1995, the Ministry of Public Works and Housing (MOPH) was created by

Presidential Decree No. 8/95 of 26<sup>th</sup> December – the current Ministry of Public Works, Housing and Water Resources (MOPHRH). According to the Resolution No. 19/2015 of July 17 – Organic Statute of the MOPHRH – it is incumbent of this ministry to regulate activity of contractors and consultants of civil construction and public works in Mozambique within the sphere of: public works; construction' materials; roads and bridges; urbanization and housing; water resources; water supply and; sanitation.

Civil construction 'activities and public works fit into the public (state) and non-public sectors (private). The Decree no. 2/2004 of 31<sup>th</sup> March, the first one to regulating the licensing of private works in post-independent Mozambique, defines private works as those, which are not executed by the local government, municipal or national level. On the contrary, public works are those effectively executed by the local government. The legal framework for the public works construction' contracts is huge, however, currently, among the most commonly used regulations follows: the Ministerial Diploma n<sup>o</sup> 77/2015 - Regulation of the Licensing of Civil Construction Contractor Activity; Ministerial Diploma n<sup>o</sup> 77/2015 - Regulation of the Licensing of the Consultancy Activity of Civil Construction; Decree-Law no. 05/2016 of 08<sup>th</sup> March - Regulation of Contract for Public Works, Supply of Goods and Provision of Services to the State; And the Ministerial Diploma n<sup>o</sup> 49/2013 - Formulas of Price Revision in Public Works Contracts.

## **2.2 Contract' execution of Public Works Construction's Contracts**

The main modifications in the works contracts, in light of the different regulations for the public works construction's contracts applied in Mozambique, are characterized by: overruns; project' errors and omissions and; price's revision. In this research, each of the above mentioned factors are justified with reference to the different legal frameworks for the contraction, in light of the Mozambique 'regulation.

## **2.3 Portugal Legal Frameworks**

According to Fachada (2008), in Portugal, public works contracts have been ruled through Administrative Law. From the onset of the implementation of this Law it has been marked by three (3) distinct periods, namely: the end of the Monarchy and the emergence of the new state, the successor to the previous Decree-Law, No. 48,871 of 19<sup>th</sup> February 1969, which revoked its duration with the approval of Decree-Law 235/86 of 18<sup>th</sup> August. This last Law is also revoked with the approval of Decree Law 71/304 / EEC and 71/305 / EEC of the Council of 26 July. All mentioned Decree-Laws were replaced by the Decree-Law no. 405/93 of 10<sup>th</sup> December and Decree-Law no. 59/99 of 2<sup>th</sup> March, which also was revoked by the current Public Contracts Code (CCP), which has been in force since 30<sup>th</sup> July 2008.

## **2.4 Legal Framework from other Countries**

For the purpose of analysing the legal framework, in particular the main modifications into construction' contracts, this study selected the African Portuguese-speaking' countries – the former Portugal overseas provinces in Africa, namely, Angola, Cape Verde, Guinea Bissau and São Tomé e Príncipe. Since Mozambique is located in the Southern Africa region, bordering Zimbabwe, Malawi, Tanzania, Zambia and South Africa, this study also selected South Africa' legal framework for construction 'contract to be reviewed because of the level of development of this country, as well as the relative closeness to Mozambique.

## **2.5 Diversity of studies on Cost and Deadlines' Deviation**

In order to analyse obstacles of overruns and delays (deviations) in construction' contracts, a set of academic thesis (Antunes, 2012; Simões, 2014; Costa, 2009; Cabrita, 2008), local and diverse studies (CIP, 2016; AEMC, 2012; Lopes, 2007), and articles of international journals (Majid & McCaffer, 2008; Kadry, Osman & Georgy, 2016; Shah, 2016) were reviewed and analysed. Several researchers (Couto & Teixeira, 2005; Elanga, Kimbembe & Petang, 2014; Mukuka, Aigbavboa & Thwala, 2015; OEP, 2006; Braimah & Ndekugri, 2009; Nguyen, Kneppers, Soto & Ibbs; 2010) consider diversity of causes about deviations, namely, the owner, contractors, errors and omissions in the projects, qualification of the involved technicians, non-use of current technological tools in the project design, adverse climate conditions, among others. In the same sense, the literature review also addresses the used methodological procedures in the analysis of the problem of overruns and delays in the construction contracts.

# **3. The Mozambique's Projects of Filling Station**

## **3.1 PAC Institutional and Legal Frameworks**

The construction and management of public or private enterprises of liquid PACs in Mozambique is regulated by the Ministry of Energy and Mineral Resources (MIREME), through the National Directorate of Fuels and Hydrocarbons (DNCH). From the private sector, some multinationals such as BP, ENGEN, Galp/Petrogal and TOTAL have been established in Mozambique. As well, simultaneously other PACs that are not necessary multinational are being implemented through the Mozambican capital cities. On the other hand, the public sector comprises two main institutions, namely, Energy Fund (FUNAE) and Mozambique Petroleum (PETROMOC, S.A.), both under the supervision of Energy Ministry (MIREME). In general, the construction of a PAC involves a set of regulations, given the fact that the project encompasses several specialties. Among the legal Decree, the most recent is the Ministerial Decree No.

176/2014, which approves the Regulation of Construction, Exploitation and Filling Stations Safety into the Republic of Mozambique - the first emerged sector after the independence of Mozambique. Prior to the appearance of this Decree it was applied the colonial legal framework. This measure and strategy was also the same adopted in other African countries ruled by Portugal in the colonial era.

### **3.2 Characteristics of the PAC' Projects**

The PAC' typical physical typology is evidenced in the following equipment: canopy area of mechanical equipment (pumps); islands where the bombs rest; area of buried or overhead tanks, including the zone where the trucks fill the tanks with the liquid fuel; access area and vehicles circulation which uses or accessing the PAC. There are also complementary services, such as convenience store, which usually has toilets for employees and clients; area of the air compressors for tire filling of the vehicles, car washing building and space for exchanging oils and lubricants.

In this section this study describes some technical components of the PAC' projects. According to the Ministerial Diploma no. 176/2014, the main technical components include licensing, implantation, drainage and treatment of wastewater, recovery of vapours and reservoirs. In the same sense, at the light of the Ministerial Diploma No. 176/2014, some of the main objects of a typical PAC project follow: the islands and the structure of buried deposits.

### **3.3 The Procurement' Process for PAC Public**

The Decree no. 05/2016 of 5<sup>th</sup> March, rules the process of contracting and managing public works contracts for the construction of PAC in Mozambique. The process of contracting a public works to build a PAC is similar to the process of contracting any other public work across the country. It begins with the preparation of the project 'proposal and it ends with the signature of the contract and submission to the Administrative Court (TA) for inspection and approval. In general, during the preparation phase of the public tender, the main actors include the contracting entity, the competent authority, the Procurement Management Unit (UGEA), the jury, the Functional Unit for the Supervision of Acquisitions (UFSA), the Administrative Court (TA) and the competitor.

The main steps taken during the process of contracting, execution and management of the construction project of PAC in Mozambique follow: preparation of the project; public' tender preparation (tender' construction work and tender' supervision); execution; delivery of the work (provisional and definitive). Throughout different phases of the contracting process there are several stakeholders involved with different responsibilities, such as: the owner; the designer; the authority' assessment of the environmental impact; the environmental consultants; the contracting entity; the competent authority; the UGEA (an integrated unit in each State' organ or institution that has to execute a budget); the jury; the UFSA (an public organ with competence to coordinate and supervise all activities related to public procurement); the



Administrative Court (TA); the contractor; the technical director of the project; the project' supervisor; the manager of the contract. As well, during the phase of contract 'management phase, which are ruled by the Decree no. 05/2016 of 8<sup>th</sup> March the following steps follow: consignment of construction site; onset of the construction; construction work execution; inspection and provisional reception of the construction work; closing of work account of the construction work; reimbursement of the retained value (if exist); inspection and definitive reception of the construction work; reimbursement of the definitive guarantee or performance bond; property' registration and e Inventory; document file and finally, maintenance.

## **4. Deviations in planning of the construction works of PAC in Mozambique**

Mozambique is part of a set of countries with problems associated with overruns and delays in construction contracts. This research found scarcity of studies written in Mozambique about the topic under research. Despite this limitation, there are some measures that are being taken by the Government in order to minimize the problems: changes in the regulation of contracting public works' contracts, and in the regulation of licensing and exercise of the activity of contractors; increasing requirements from the technical professionals (Order of the Mozambican Engineers) to the professional from the construction sector, etc. However, the regulation itself it is not enough, given to the fact that there are mismatch between theory and practice, which means there are disparity between what is regulated and what has in practice occurred in terms of deviations. Therefore, it should be taken into to account that key actors should be able to implement the foreseen measures and procedures.

This study analysed the PAC' projects in rural areas of Mozambique, using an Excel table with project data (see Annex 7). The database encompasses information regarding to owner of the PAC. The owner has been materializing the PAC' projects since 2008 up to the present year. Thus, for the purpose of this study it will be only considered construction works completed in the period between 2008 and 2016. In total were analysed 73 PAC. In order to synthesize the study and characteristics of the projects, it was decided to divide the 73 projects into three phases: from 0 (zero) to 3 (three). In the available database, the contract values only include costs of construction contracts. Each phase is characterized by the implementation of a set of projects. Each phase refers to a time period, according to the following: Phase 0 - It comprised the period between 2008 and 2009; Phase 1 - Understand the period between 2009 and 2011; Phase 2 - Understand the period between 2011 and 2012; And Phase 3 - Understand the period between 2013 and 2016.

The analysis of the statistical database revealed that only two projects from Phase 3 met deadlines, which did not happened in previous phases. Concerning the analysis of the overruns, this study revealed

the existence of overruns above 25% of the respective contracts' values. Six projects of phase3; nine projects of phase 2; three projects of phase1; two projects of phase 0 present overruns above 25%.

## **5. Questionnaire to the key actors**

In order to determine the main causes associated with cost deviations (overruns) and delays in construction works of PAC a questionnaire was applied to the main key actors of the project, namely, contractors, owner, designers and supervisors. The questionnaire was structured using closed questions (causes / questions) regarding the problem of overruns and delays in construction projects. This questionnaire was adapted from Couto's study (2006) entitled "Failure to comply with Construction Deadlines". For the purpose of this study, the applied questionnaire covered the main key actors of the projects, technicians that belong to the owner (contractors' manager), contractors, supervisors and designers. The questionnaires were sent to interviewees through email. In total 18 contract managers and auditors working for the owner, 12 contractors, 5 inspectors and, 2 designers were contacted and requested to answer the questionnaire. However, only 15 contract managers and auditors working for the owner, 5 contractors, 3 inspectors and, none designers answered the questionnaire. The "Statistical Package for Social Sciences" software or simply "SPSS Statistic" (version 20) for the analysis of the data.

Therefore, this study concludes that the causes of overruns and delays of the PAC 'projects are due to owner contractors, supervisors, inspectors and external factors. According to the key actors interviewed, the reason for delays associated to the owner encompasses the following categories: design team; specificity of the project; planning; contract agreement; financial management and, contract manager. With regard to contractors, this study found that the causes of delays include the following categories: disobedience; planning; financial management; technical capacity; materials; equipment; labour force; contract; and, project' specificity. Concerning to the answer given by supervisors, the following categories follow quality and technical capacity and financial management. Lastly, this study found causes associated with the external factors, such as, atypical adverse climate conditions; wars, floods and earthquakes; changes into the legislation. When the interviewees were asked about overruns, this study allows concluding that, for the owner can be found into the following categories: bidding documents; contract managers; design team and; specificity of the project. Concerning the contractors, the following categories were identified as the main causes of the overruns: materials; disobedience; technical capacity; financial management and; project' specificity. However, when it was asked the possibility to assume the contractor as obstacle, the contractors did not respond to this question. The absence of the answer may lead this study to conclude that the contractors himself does not stand as an agent of overruns. Concerning the answer given from supervisors, the main causes for the overruns include: quality and technical capacity and financial management. Lastly, this study found that external factors

associated with the overruns follow: abnormally adverse climate conditions; flood, wars and earthquakes and changes in the legislation framework.

In light of the above causes associated with overruns and delays, this study recommends the following measures: Permanent training and technical capacity of the project' managers, in particular on project' management; technical rigor in PAC's project designer revision; preliminary designers' studies before the release of the public tender; rigor in reading and interpretation of the Legal Decree of the contracting of construction works in Mozambique; requirement of the supervision that complies with that stipulated in his contract signed with the owner and peer attention on the recommendation of the Decree-Law (5/2016) regarding contracting of construction works in Mozambique; the owner should minimize the problem of delay in payment to the contractors and supervisors; rigor in preparation of the bidding documents. Additionally, the need for rigor in the selection and evaluation of the contractors and supervisors; the contractors must better plan the project; eliminate the model "project type" adapted to the various sites and focus on a single project per site; reward contractors who comply with the terms of contracts and penalize those who do not comply with the contract; greater control of the activities requiring project high cost, such as a paving, in order to control the overruns; correcting the problem related to limited communication among the main key actors. As well, the owner should invest in project software (BIM models) for the activities of the designers who belong to the owner' technical team, as well as the needs for management' software (Microsoft Project, CCS Candy, Primavera/Oracle, etc.); avoid conflicts of interests between supervisors and designers which emanate from the fact that supervisor has been playing the same role as designer and; more rigor in estimated costs of the construction works of PAC; more clarity from MOPHRH concerning the practical application of Decree 48/2013 of 24<sup>th</sup> May which approve the prices' revisions in public construction works.

## **6. Conclusions and recommendations for future studies**

This study reveals that most of the 73 public construction work of PAC in rural areas, Mozambique does not meet the stipulated project 'deadlines, implying delay in delivering of the projects to the beneficiaries. As well, these projects encompass overruns unforeseen within the legal framework. Consequently, both overruns and delays entail burdens to the project donor. In order to understand the way delays and overruns influence the projects under study, this section is structured into three parts.

Firstly, contrary to the two former Decree within the construction works (54/2005 and 15/2010) the current Decree (5/2016) bring together several improvements, namely, the contract manager, the events susceptible to be compensated; the recommendation that the bidden documents should establish requirements for certification of the materials and quality control 'presentation of the constructions made

by the Mozambican Engineering Laboratory, as well as the respective financial prediction; the obligation to communicate conclusions of the construction work and, to presenting results from the construction work to the MOPHRH; risks associated with contractors. As well, in the recent Law there was a separation of the following concepts: overruns; errors and omissions into - which in the former (Decree-54/2005 and 15/2010) were recognized as single entities or simply defined as modifications. This separation of concepts brought transparency and objectivity in the interpretation and application of the law. Since the projects analysed in this study comprised the periods between 2008 and 2016, the advances and benefits brought by the new regulations are recent: this indicated that only the most current projects have benefited from the recent Law. The legal recommendation of allocating 25% of the contract' value to the ceiling of the totality of modifications foreseen into contracts (overruns, errors and omissions) is similar to that applied in Angola and Cape Verde. In the Portugal CCP the percentage limits for the modifications in the contracts are also present, and it is attributed distinct percentages to each type of modification, which in Mozambique does not verified. At the Southern Africa region, in particular the case of South Africa, through FIDIC, this study shows that the top limit percentage of the contract' value for overruns was not found. However, it is mandatory the owner' representative to evaluate and propose to his owner to a time extension and pay associated costs with supply of errors and omissions. Further, it is also mentioned that the contractor is obliged to notify the contractor of any lack, error, omission or defect in the project or specification of the work that may be discovered in the process of contract' review or during the execution of the work.

Secondly, despite of lack participation of the designers in answering the questionnaire, this study found the level of the interviewees' participation was satisfactory. For those who filled the questionnaire, the results revealed that there are common responses concerning delays and overruns in construction work of PAC among the three key actors. It has also been found that the occurrence of the overruns and delays are at large extent interconnected; which indicates that both deviations should be analysed together. Thirdly, although this study allowed identifying the causes of overruns and delays, it is important to consider some limitations of this study. One of the study's limitations is associated with constrains faced during the data collection, namely, lack of literature review about local studies. As a result, this study did not allow comparing results from this study with other probably studies from Mozambique, and studies from international context.

Finally, results from this study may contain relevant implications for future studies in Mozambique: studies focusing on overruns and delays in public construction works at an extended dimension; surveys applied to main key actors from the construction sector in relation to some services' delivery by some public institutions that rule the construction sector, for example, the case of MOPHRH and the LEM; Surveys applied to the engineering technicians, and owners from private sector concerning delays and overruns in construction works; studies on prediction about construction works from the owner' perspective and; studies on maintenance and rehabilitation of the public infrastructures.

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