

**PROPOSED STRUCTURE FOR THE SUPERVISION AND ADMINISTRATION OF
MAJOR WORKS CONTRACTS
A CASE STUDY IN MOZAMBIQUE**

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ABSTRACT

The responsibility for the construction, maintenance and management of Mozambique's national road network was devolved to the "Administração Nacional de Estradas" (ANE)-National Roads Administration- in 2000. This body is currently implementing an ambitious programme for the construction and maintenance of the country's trunk and secondary roads, with a budget of USD 1.7 billion to be expended over the next 10 years and funded by the Government of Mozambique and the international donor community.

At any one time there are a large number of major works contracts, each valued in excess of USD 20 million, in progress throughout the country. From experience on previous similar projects in the preceding decade it has become apparent that the traditional model of supervision has not provided an acceptable level of control and contract administration, due in part to the remoteness of such works from the centre of authority and decision making (government, and funding agencies). The relatively poor level of infrastructure, both physical and communications, has exacerbated the problem to such an extent that when major problems arise the response of the appropriate authorities can be delayed and incomplete.

With specific experience on projects funded by the European Union through the European Development Fund (EDF), and operating under the EDF regulations and conditions of contract, a new structure for contract supervision and administration has been developed, incorporating ANE's head office, ANE's provincial delegations and the consulting engineers. This structure has been based on the following principles:

- Delegation of appropriate authorities to the Supervisor and Supervisor's Representative;
- Separation of the Technical and Administrative functions assigned under EDF conditions;
- Retaining sufficient Technical competencies at site level (Resident Engineer and site staff);
- Allocating the Administrative functions to a Project Manager, based in Maputo but spending at least 1 week/month on site.

The structure, functions, duties and authorities of the various members of the supervision team are defined and explained in this paper using the case histories of recent works.

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1. INTRODUCTION

The Mozambican economy did not permit, at the time of the Peace agreement in 1992 and still today some ten years on, the implementation, without external financing, of the development and proper maintenance of roads. Mozambique has a network of about 29,000 km of classified roads, of which only 25% are paved. At that time more than 70 % of the road network was in bad condition due to almost 20 years of lack of maintenance.

Acknowledging these circumstances the International Financial Institutions (IFIs) and Donor Community offered his support for the resolution of this entanglement in the economy. In that same year in 1992, by initiative of the World Bank a Project called ROCS (Roads and Coastal Shipping Project) was set-up.

With international support, Mozambique had the chance to carry out a programme of road rehabilitation, in the true sense of the word, on all the main itineraries of the road network. It represented 15% of the total length of roads needing rehabilitation, as they had volumes of traffic that justified technically and economically the rehabilitation.

The ROCS Project was developed in two phases, commonly designated ROCS 1 and ROCS 2. The ROCS1 phase had its beginning in September 1992 and finished July 1999. ROCS2 had it's beginning in September 1994 and was mostly finished in September 2002. The value of the financing of/donations to the ROCS 1 and ROCS 2 Projects was around 1 billion USD.

The main contributors for the ROCS Project were the World Bank (WB) and the Government of Mozambique (GoM). The ROCS had also contributions of others financial sources, namely the European Union (EU), the African Development Bank (ADB), among others. In summary, the ROCS worked as an umbrella of the diverse financing available.

In 2003 at the time that the program ROCS is completed, a new project is already in place, designated ROADS (ESTRADAS) 3, which aims to carry on with the ROCS purposes This new programme, involving only roads an specifically directed to the maintenance and rehabilitation, has already been approved by the various IFIs and the GoM, and does exclude the Coastal Shipment included as part of the previous programme ROCS. The targets of this new programme are:

- Strengthen the institutional capacity of the road sector;
- Increase and improve the maintenance of the roads;
- Contribute to the construction /conclusion of the road rehabilitation programme.

The ROADS 3 Project has three phases to be developed in 10 years. For the first phase (2002-2005) an estimated USD 703 Million shall be needed, having most of the sources being already secured. A third (31%) of that value will be financed by the GoM, 23% by the IDA - WB and 16% by the EU. The remaining 30% will be financed by a combination of 15 other IFIs and Bilateral Donors. The Government contribution (31%) derives mainly from taxes collected through fuel sales, channelled through the Road Fund.

For the ten years duration of this new programme ROADS 3, a financial requirement amounting to about 1,7 billion USD is foreseen.

2. INSTITUTIONAL CHANGES IN THE ROAD INFRASTRUCTURE SECTOR IN MOZAMBIQUE

It is the policy of the Government of Mozambique (GOM) to ensure that maintenance of all trunk roads is carried out to protect investments made in the rehabilitation of the highway infrastructure and to train Mozambican personnel in the skills required to design, build and maintain this infrastructure. The Government's global objectives are to promote an integral development of the communities in Mozambique. The plans require intervention support to economic, institutional, social and cultural levels in order to contribute to social and economic development in the medium and long term. These interventions will contribute to:

- An increase in rural production and creation of employment, which will increase the available cash to the communities so that they can better supply their basic needs of food, health and education.
- Improve the living conditions of the communities by promoting the development of essential services which will be paid for by the communities from their increased income
- Promote the participation of the men and women in the communities in the economic and social activities at local and national levels

The GOM, through ANE has been actively involved in the Road Maintenance Initiative (RMI), a program administrated by the World Bank (WB) to raise awareness of the need for sound maintenance policies and to promote reforms to achieve them. The GOM's Transport Sector Strategy is an integral part of its efforts to accomplish the needed macroeconomic reforms and embark on sustainable economic recovery.

Rehabilitation of the Classified Road Network under ANE and the remaining roads under the Rural and Urban Municipalities together with the re-establishment of a road maintenance organisation capable of maintaining these roads, remain the aims of the Government policy in the roads sector. The directives of the Transport Protocol signed by the Member States of Southern African Development Community (SADC) coupled with the RMI initiative resulted in major institutional changes in the road Infrastructure Sector in Mozambique in 1999.

A new Road Administration System- "Sistema de Administração de Estradas" (SAE) was created in 1999. The SAE includes the creation of an autonomous Road Administration named "Administração Nacional de Estradas" (ANE). This set up of the SAE conforms to the recommendations of the RMI initiative and particularly the Protocol. The private sector participates in the Road Board (RB) of ANE and thus is in control of the management of the road sector. The SAE organisation was discussed and agreed with the IFIs and Donor community. Cabinet approved two decrees on April 27, 1999, Decree 14/99, which officially creates SAE, and Decree 15/99, which officially creates and fixes the ANE organisation and basic management principles:

--Administração Nacional de Estradas (ANE) – National Road Administration – Which has a Road Board with members from both the public and private sector - responsible under the Minister for implementing Government policy concerning roads. The Board is both advisory to the Minister and Directors for the National and Regional Road Agencies and the Road Fund.

--Direcção de Estradas Nacionais (DEN) – Directorate of National Roads - Responsible for executing road maintenance and development on the national road network (primary and secondary) through procuring and monitoring consultant and contractor services. The legal format allows for a certain degree of autonomy.

--Direcção de Estradas Regionais (DER) – Directorate of Regional Roads – Responsible for executing road maintenance and development of the remainder of the road network (tertiary feeder/rural and urban roads) through procuring and monitoring consultant and contractor services. The legal format allows for a certain degree of autonomy.

--Fundo de Estradas (FE) – Road Fund – Responsible for the financing of road maintenance of the entire road network. The Fund will also finance the administration of the Board and the Fund itself.

3. THE IMPACT OF THE EUROPEAN DEVELOPMENT FUND (EDF) PROJECTS IN THE ROAD NETWORK OF MOZAMBIQUE

The road network of Mozambique has benefited both from the National Indicative Plans (NIPs) and Regional Indicative Plans (RIPs) of the EDF and the total amount received/committed from both the 7th and 8th EDFs amounts to about € 155 Million. This represents about 30% of all EDF grant aid to Mozambique. The impact of the EDF funds in the road network can be measured both in financial terms and in the length of roads opened/rehabilitated in Mozambique. The EU was the third largest contributor to the Roads and Coastal Shipping Project (ROCS) with some 10% of the financing, which in turn has resulted in about 1,200 km of roads upgraded and rehabilitated, out of a total of around 11,000 km upgraded in Mozambique under the ROCS1 and ROCS2 programmes.

The EU is therefore a major partner along the World Bank (WB) and the Government of Mozambique (GOM) in the upgrading of the road network in Mozambique. These three partners contributed more than 50% of all financing for the road network under the ROCS1 and ROCS2.

At present, and for the next four years, it is forecast that the support of the EU through the EDF for the road network will increase significantly. Already under ROADS 3, the percentage of the contribution of the EU for the ongoing works is in the order of 28%, both in terms of financing and also in terms of length of National road network under rehabilitation. For the Regional roads the contribution of the EU is more modest, around 8%.

Considering only the first phase of the programme ROADS 3 until 2005 and with new Donors, the contribution of the EU is expected to be an average of 16% of the global financing of USD 703 Million needed. The EU together with the World Bank (WB) and the Government of Mozambique (GoM) will continue to be the most important partners in the financing and rehabilitation of the road network in Mozambique. Altogether these three partners will contribute with around 70% of all financing under the ROADS 3 programmes.

4. ISSUES RELATING TO SOME OF THE PROJECTS

4.1 Problems and difficulties with the Rehabilitation of a national trunk road

The Rehabilitation on a paved national trunk road (133.5 km) was to take place between April 1996 and April 1998 and to cost about € 13.9 Million.

It terminated almost two years after the end of the contract period at a cost of € 21 Million (€ 18 Million paid from EDF funding and € 3 Million paid from ANE funds). The works started on 8 April 1996 and should have been completed on 8 April 1998.

However due to several delays in connection with quarries, floods, technical specifications and additional work instructed to the Contractor, most of the works were completed only in December 1999 (i.e. more than 21 months after the scheduled date), and were fully completed in July 2000.

The Initial Contract Price increased by 60%, mainly as a result of two Variations of Works and the Contract Price Adjustment (CPA). Most of the cost-overruns (about 40% of the Initial Contract Price) were related to payments of CPA, which resulted from the late start of the contract. The two Variation of Works amounted to about 20% of the Initial Contract Price, which is well within the norm for this type of works.

Most of the delays which occurred, were legitimate and related to time granted by the Contracting Authority due to valid claims put forward by the contractor and additional work requested as part of the Variation of Works instructed and issued to the Contractor.

All these, cost increases and extension of time, are normal aspects of any road engineering project and they happen in projects being implemented with EDF funds or with funding from other Development Agencies elsewhere in Africa and other continents.

Nevertheless, this rehabilitation presented several problems which are unfortunately common to many road rehabilitation projects in Africa and which partly explain the implementation difficulties that arose. These problems are described below:

- Design problems. The project was designed as a light and low cost rehabilitation in 1990-91, five years before the beginning of construction. In 1992 the Civil War ended and traffic volumes dramatically increased on the road, which considerably accelerated the deterioration of the existing road, to a degree that was not anticipated by the original design. At the beginning of the construction the design of the project was totally unsuitable for the rehabilitation required. The design that was implemented was like a "patch work", by changing constantly the type of improvements, with no evident savings. This no doubt also greatly affected the works and its quality. There is no apparent reason for this and it would have been better if at the inception of the works the whole design had been revised.
- Tendering and Contract negotiations. In application of the EDF contracting procedures, the contract was awarded, after an open tendering procedure, to the lowest responsive bidder. It is likely that the successful contractor realized that the required rehabilitation work would greatly differ from the design and the bill of quantities given in the tender documents.
- Supervision. The supervision consultant was also selected on the basis of the lowest bid received. He was not involved in the evaluation of the works tenders or in the pre-contract discussions. From the beginning, the supervision consultant had difficulties in establishing clear and professional working relationships with the contractor. During implementation, both the Contractor and the Supervisor's Representative changed Project Manager and Resident Engineer four times, i.e. a different person every year. It is obvious, that this constant change of personnel affected the progress and normal flow of the work. The situation stabilised in January 1999 and normal relations prevailed between the Resident Engineer and the Contractor's Project Manager.

- Management by ANE and by the European Commission. At the beginning of this project in 1996, ANE was seriously understaffed and was implementing a very large road rehabilitation programme at the same time as the project. It would appear that until the arrival of the EDF funded TA in late 1997, ANE could not devote much time to this project. ANE also seems to have been very understanding of some of the Contractor's problems, for instance by delaying the Notice to Commence until the quarries to be used for this project were freed by another contractor using them for the next section of the road. The responsibility for the management of this project by the European Commission is divided between a Project Manager based in Brussels, originally within the DG VIII and now under EuropeAid, an Infrastructure Adviser based at the Delegation in Maputo and the TA assigned to ANE for the management of EDF funded projects. It is clear that such a dispersed management structure resulted in communication problems and in a cumbersome and incoherent decision-making process, which delayed considerably the definition and implementation of any corrective action.

4.2 Problems and difficulties with the Emergency Opening of Roads (EOR) in a Province of Mozambique

The project included the Emergency Opening of Roads (EOR) of 741 km of earth and paved roads at a cost of € 8.5 Million. The project completed the Rehabilitation of 292 km of roads for a cost of € 14 Million (€ 12.8 Million paid with EDF funding and € 1.2 Million paid with ANE funds) and one year after the scheduled end of the contract. The change of concept from EOR to Rehabilitation was approved by ANE and the EC in early 1997, and is the major reason for the reduction in the length of roads that were concluded.

The Initial Contract price increased by 60%, as result of Variation of Works issued to the Contractor and Contract Price Adjustment (CPA). Most of the increases (i.e. about 20%) were related to payments of CPA, due to the late start of the contract. The other 30% were related to additional works and 10% were related to costs of alternative method of de-mining requested by the Contracting Authority. Most of the delays were legitimate and related to time granted by the Contracting Authority due to valid claims (de-mining) put forward by the contractor and additional work requested as part of Variation of Works.

Again these are normal aspects of any road engineering project and they happen in many projects being implemented with EDF funds or with funding from other IFIs in Africa and other continents. Nevertheless, this EOR presented several problems which are unfortunately common to many road rehabilitation projects in Africa and which partly explain the implementation difficulties that took place. Some of the reasons for the delay in this project and increase in costs are the same as for the national trunk road project with the following additional ones:

- Design Problems. The project was designed at the end of the civil war with a minimum of field surveys as most of the roads were mined. The reconnaissance of the roads was actually carried out using a helicopter. This resulted in major oversights, such as the non-identification of a large swampy area that had to be crossed by one of the project roads. The contract documents included the de-mining of the roads and this was to be sub-contracted to a specialised firm. The method of payment used to pay these services was based only on the surface areas de-mined without any clear specification of the location and size of these. It seems that it provided a strong incentive to the contractor to bid a very high rate for the de-mining and he subsequently used this as a major source of profit on the job.

- At the inception of the works, a revision of these designs should have been performed. If this had been done, a lot of difficulties and problems could have been avoided.
- Contracting. The works contract for this project was awarded, after open tender, to the same contractor as for the national trunk road project. This contractor appears to have priced its bid for this project using marginal costs and to have decided to manage it as an add-on to the former. To make matters worse, at almost the same time, this same contractor was awarded the contract for the rehabilitation of another national trunk road financed by the World Bank and for the rehabilitation of a similar project in a neighbouring state, under EDF financing. Neither ANE nor the European Commission commented on these multiple awards or raised the question of the capacity of this contractor in terms of staff and equipment to carry all these projects at the same time. ANE also accepted in 1996 that the contractor used a single camp as a base for these two projects. It seems that this resulted in the systematic assignment of a lower priority for equipment, personnel and supplies to the EOR project in comparison with the national road project.
- Supervision. The organization and the performance of the supervision mission seem to have been very inadequate for this project. The main problems were: a) The supervision firm did not staff its team at the beginning with a sufficiently qualified engineer, which had to be replaced at ANE request after the verification of his credentials showed he did not have the qualifications required. His successor left after a year and was only replaced by a principal of this company who was “acting resident engineer”. From inception of the works, both the Contractor and the Supervisor Representative changed the Project Manager and the Resident Engineer three times i.e. a different person every year. It is obvious, that this constant change of personnel affected greatly the progress and normal flow of the work; b) No clear collaboration procedures were established with the contractor. The turnover in personnel would have required them to be revised and adapted each time a change took place; c) The supervision team and the contractor were base about 180 km apart. Most communications between them were by telephone or fax; d) Communications between ANE in Chimoio and the Delegation in Maputo were also difficult; e) All logistical support for the supervision team was provided by the contractor, which was difficult to manage from two different locations; f) The contractor was only required to provide four cars to a team of six supervisors.
- Management by ANE and by the European Commission. The same issues raised for the national road project are valid for this project. This has been evident for example with the non-approval by the EU of decisions taken by ANE and subsequent wrangles on payment to the Contractor.

5. EXPERIENCE ELSEWHERE

There are many reasons for the initial project contract costs increases. The most common ones have already been briefly described when presenting the two case studies above and even if they can be considered “normal” they often reflect a need for the contractor to recover their loses due to low tender prices presented and poor project cost estimation. It has been shown that 9 out of 10 transportation infrastructure projects are underestimated. For road projects usually actual costs are on average 20% higher than estimated costs.

If this aspect is considered together with the deliberate presentation of low tenders by contractors (sometimes 25% below the project cost estimation) it is evident that most of these projects will have a difficult implementation, with most likely many costs overruns and delays. Sometimes these costs overruns are legitimate to account for poor cost estimation in the first place but others are basically intended to recover the lower bid price by the contractor.

Therefore the role of the supervising engineer or the consultant engineer is becoming more and more important in order to safeguard the proper use of the scarce resources made available for the implementation of such projects. It is not possible anymore that a consulting supervisor engineer continues to have the same structure and organisation it had 40 years ago when so much has evolved in the contracting industry during the same period. The Engineer should be equipped with enough expertise to manage properly road works contracts in order to minimise if possible the “illegitimate” escalation of the contract costs. The Financiers and Donors should then put forward more financial resources to the services contracts of this kind and monitor closely the performance of the contracts.

6. NEW MODEL FOR PROJECT SUPERVISION.

The lessons learned and the deficiencies detected in the previous projects, served as the basis for the enhancement of the management of ongoing EDF projects in Mozambique (i.e. projects that started after 1998). In this context, extra care was taken when tendering, awarding and during the implementation of those projects, in particular in the following areas:

- Updating of the design.
- De-mining.
- Tendering process and award of the contracts.
- Management of the contracts by ANE and the EC.
- Organisation of the supervising teams.
- Issuance of Instructions.

The key issue remains however the organization of the supervising teams and this is valid throughout to all projects financed by Multilateral or Bilateral Financiers and for all forms of contract conditions.

Based on the positive and negative aspects of various methods for the supervision of the projects financed by the EDF and other Donors/Financiers using FIDIC regulations, the authors identified and proposed to ANE a new model for project supervision with more emphasis and efforts to be placed on the management and administrative aspects of the supervision of the projects.

Under the EDF General Conditions the Supervisor is “designated by the Contracting Authority (and) responsible for the directing and monitoring of the execution of the Works Contract. to whom the Contracting Authority may delegate rights and/or powers under the Contract.” The Supervisor’s Representative is “designated by the Supervisor and empowered to represent the Supervisor,in exercising such rights and/or powers as have been designated to him.” The crucial issue in the exercise has been identified as the authorities that are delegated to the Supervisor’s Representative. These typically do not include any authorities with implications in respect to cost and time, e.g. variations, extensions of the period of performance, etc.; such authorities are retained by the

Supervisor (located in the country capital). Thus, when it comes to dealing with significant contractual matters the site based staff are remote from the decision making process (this can also apply to the contractor's management team). The constraints of distance, in Mozambique major road projects can be 2,500 km from Maputo, and a developing communications infra-structure means that the decision making process can be slowed to ineffectiveness unless there is constant contact between the Supervisor and Supervisor's Representative at senior management level.

It has also become evident that a limited number of contractors tend to win the majority of the projects with prices well below the supervisor's estimate, therefore putting a lot of "pressure" on the supervising team during construction, in particular in dealing with claims, i.e. additional payments and time. Many of the contractor's inputs in claims arise from and are handled by the contractor's head office experts on these matters, furthering distancing the site organizations from major contractual issues.

Consequently, in an attempt to improve the communication between the supervisor's representative's team and the supervisor, contracting authority and financing agency it became necessary to devolve many authorities to an entity in constant close contact with those bodies. The concept of a separate project manager, based in the capital, was adopted and as a result the designation of authorities to the supervisor's representative was reviewed to assess which should be retained at site level and which should be delegated to the project manager. Figures 1 and 2 present in summary the proposed supervision project team organogram (supervision organogram for EDF contracts) *vis à vis* the traditional system (supervision organogram for FIDIC contracts). The proposed system identifies and separates in the supervising team the following two main functions:

- Technical/Monitoring function to be assigned to the resident site team (RE);
- Administrative/Claims/Reporting function to be allocated to a Project Manager.

Based on experience to date, it is reasonable to expect that the project manager's input on each contract will involve between 30 and 40% of his time, i.e. one project manager could effectively deal with 2 or 3 significantly sized contracts at any one time. The logistics of travel, which should include at least 1 week/month on site, are probably the major factor in deciding an acceptable and efficient disposition of project management personnel. The cost of having an experienced project manager based in the host country capital, as distinct from being based in the consultant's head office dealing with up to 5 or 6 projects in various countries, typically accounts for an additional 5 to 7% of the consultant's total supervision charges. This extra cost may, in a competitive tendering environment such as exists in Mozambique, result in the consultant who chooses to adopt this format in his proposal, being uncompetitive. This can overcome by the contracting authority configuring the terms of reference to include the concept of a more involved project manager.

7. CONCLUSION

There is a need to reassess completely the role of the supervising engineer in large scale infrastructure projects namely roads in developing countries. The Engineer should be equipped with enough expertise to manage properly road works contracts in order to minimise if possible the "illegitimate" escalation of the contract costs.

The IFIs and Donor Community should then put forward adequate financial resources to the services contracts and monitor closely the performance of the contracts.

This paper presents a new model for project supervision with more emphasis and efforts to be placed on the management and administrative aspects of the supervision of the projects.

The proposed system identifies and separates in the supervising team the following two main functions:

- Technical function to be assigned to the Resident Engineer (RE);
- Administrative/Contractual functions to be allocated to a Project Manager.

The reason behind this proposed system, as opposed to the traditional one where the RE retains all the functions, arises from the difficulty in management of larger projects located long distances from most of Road Authorities Head offices. It has become evident that a limited number of contractors who tend to win the majority of the projects with prices well below the supervisor's estimate, therefore putting a lot of "pressure" on the supervising team during construction, in particular with claims.

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