

Road Construction Industry vs Environmental Performance in Malawi

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Abstract: Malawi as a land locked country depends on the road and rail networks for its freight and passenger traffic. Therefore, the development of road infrastructure is regarded as critical and an accelerator of economic growth. However, such development poses threats of environmental degradation. The study addresses the influence of road construction on the environment in Malawi. A survey of contractors in the road sector shows that while most of the local contractors are not familiar with environmental laws and guidelines set by the government and international standards bodies, they are aware of the Roads Authority guidelines. The result is a high level of non-compliance, which they attribute to lack of financial resources, training, and well trained environmental officers, and institutional support. Road-works contractors also attribute this situation to structural factors such as procurement of works, which do not take into consideration costs of environmental mitigation measures. The study recommends that government should review the current legislation, conduct regular training and periodic environmental audits, introduce environmental assessment on all projects, establish key environmental performance indicators, and apply stiff penalties for non-compliance. The study results point to significant consequences of failure to address environmental issues, including the continued destruction of the environment and subsequent acceleration of global warming.

Key words: Malawi, environment, performance, road construction

1. Introduction

The International Road Federation (IRF) approximates that road-works contribute to over 15% of the world's environmental degradation (IRF, 2010), thereby contributing significantly to global warming. In most developing countries, roads are the dominant mode of transport and constitute the single largest government asset as a large amount of money is invested in this endeavour. In addition to the construction of new roads, other roads are rehabilitated or routinely maintained, in order to accelerate development. It is estimated that over 90% of all international freight and passenger traffic is handled by road transport, while 70% of internal freight and 99% of passenger traffic relies heavily on road transport (Transport Sector Investment Programme (TSIP), 2011). Paradoxically, development of the road sector contributes towards environmental degradation and global warming. To mitigate the negative environmental effects from road construction, the Roads Authority (RA) produced Environmental Management Guidelines (EMG), which all contractors are obliged to follow. This study set out to establish levels of compliance therewith, and factors that account for the status quo. The specific objectives of the study were to:

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• Analyse the levels of contractors' compliance with various international and domestic environmental mitigation instruments, namely the EMG, RA Guidelines, and ISO 1400;

- Investigate factors that account for the existing level of compliance, and
- Identify barriers to adherence of the set environmental guidelines.

2. Literature Review

The total length of the classified road network in the Southern Africa Development Community (SADC) is just over 930,000 kilometres, of which approximately 186,000 kilometres is paved. In addition, SADC has a large network of rural roads, which stretch to an approximate length of 430,000 kilometres (SATCC, 2006). The RA estimates that Malawi has a total road network of 15,451 kilometres of which 26% (about 4038 kilometres) is paved roads (RA, 2009). However, Ministry of Transport and Public Infrastructure (2010) reported an additional 9,478 km of undesignated road network that serves the rural communities, which equates to a total road network of 24,929 km.

2.1 Environmental Management in Malawi — Legal Framework

Environmental management in Malawi involves several institutions. The RA is responsible for the construction, rehabilitation and maintenance of all designated roads in terms of an Act of Parliament No. 5 of 2006. In addition the RA's road management functions, the National Construction Industry Council (NCIC) is mandated to regulate the industry under an Act of Parliament of 1996 (NCIC, 1996). Contractors and consultants are supposed to register with the NCIC and pay annual subscription fees. In Malawi, the Framework for Sustainable Environmental Management (FSEM) is enshrined in the constitution of the Republic of Malawi (1994). The FSEM calls for prudent management of the environment and accords future generations their full rights to a sustainable environment. The provision in the constitution is operational in the National Environmental Action Plan (NEAP), which identifies areas of concern such as soil erosion, deforestation, water resources depletion and degradation, high population growth, depletion of fish stocks, threats to biodiversity, human habitat degradation, climate change, and pollution (NEAP, 2002). The NEAP highlights the areas of priority including efficient utilisation and management of natural resources. The Environmental Management Act (EMA) of 1996 enforces the FSEM through the Environment Impact Assessment (EIA) process. The Act defines the powers, functions, and duties of the Directorate of Environmental Affairs (DEA) and the Environmental Affairs Department (EAD) in implementing the EIA process (EMA, 1996). The EAD in 1997 developed guidelines for EIA in order to ensure compliance with the EIA process by project developers. It provides a list of prescribed projects for which an EIA is mandatory and those that may not require an EIA (Guidelines for EIA, 1997). The EIA process in Malawi is outlined in Figure 1 below.



Source: Environmental Affairs Department

Glasson et al. (2005) define EIA as to the "need to identify and predict the impact on the environment and on man's health and well being of legislative proposals, policies, programmes, projects and operational procedure, and to interpret and communicate information about impacts." The United Kingdom Department of Environment (UKDOE) (1989) describes environmental assessment as "a process by which information about the environmental effects of a project is collected, and taken into account by the planning authority in forming their judgments on whether the development should go ahead or not."

Scholars have identified an array of factors that impede implementation of environmental management. They also assert a variety of impacts of environmental degradation that could inform the role of road-works in environmental management. Due to differences in understanding key barriers to and impact of environmental degradation resulting from road-works, researchers tend to recommend different interventions.

2.2 Constraints to Environmental Management Implementation

Ofori (2009), Chilipunde (2010), Spong and Walmsley (2003) and Kakonge (2006) assert that environmental management problems in developing countries exist side by side with lack of managerial experience, financial resources and legal and administrative systems necessary to deal with the issues (Trethanya et al., 2008). Kakonge (2006) in turn reports that constraints facing the EIA processes include: lack of local skilled manpower to conduct effective EIA studies; trans-boundary EIAs are complex; lack of strong partnership between stakeholders; government lack of commitment on environmental issues, emphasis on poverty reduction and fighting the HIV and AIDS pandemic, while initial EIA may be funded, monitoring and auditing are left out; lack of public participation and involvement in the EIA process, and availability of data to effectively carry out the EIA process. In Malawi, Kalindekafe (2011) identified the following constraints in the EIA process: developments proceeding without any EIA process; inadequate information on alternative design; EIAs conducted just prior to the onset of implementation and not at planning or feasibility stages; EIAs being done by the same firm that designed or is constructing the project, and coercion from the client. Spong and Walmsley (2003) observed the following constraints: limited transport and monitoring equipment; inadequate EIA awareness and lack of referral to the EAD by licensing authorities forcing developers not to comply with EIA requirements; limited services and facilities for effective environmental monitoring for example waste disposal facilities and no hazardous waste sites; socio-economic growth development priorities and basic needs override environmental issues, unclear policies and there are no environmental standards (Trethanya et al., 2008). While these studies illuminate general constraints in implementing EIAs, they are too general to provide sector specific predictions.

2.3 Environmental Management in the Roads Sector

Several studies indicate that road-works affect the environment in various ways. The SMEC report (1998) identifies several effects: extraction of earth, sand gravel and rock; changing the local drainage along the road and in stream beds; restricting flows in streams; use of bitumen, paint, fuels and other hazardous materials; introduction of paved surfaces; construction work activities including earth works, and stockpile, work camps and other temporary work sites. These effects are known to lead to: destruction of wild habitants; loss of biodiversity along the road environment; increased soil erosion during road works; leading to siltation of rivers and streams; soil contamination by chemical oil, bitumen and fuel spillage both during road works, use and increased deforestation (SMEC, 1998). The SMEC study (1998) also reports on social impacts such as: drains ending and flooding people's gardens; dumping of scrapped bitumen and other debris in people's gardens; road widening disrupting farming and commercial activities, and disruption of social and economic activities, particularly during

execution of the works. To mitigate these effects, the RA under the World Bank's Roads Maintenance and Rehabilitation Project (ROMARP) developed an Action Plan for Environmental Management. The ROMARP further identified the following weaknesses in the existing RA standard contract document: most of the specifications were too brief and did not give enough details for the implementation of mitigation measures; specifications gave a lot of latitude to the supervising engineer to make environmental management decisions; no remedies in the conditions of contract for dealing with defaulters, and bills of quantities do not contain items that are directly intended for activities for implementation of mitigation measures.

Figure 2 indicates that air pollution is the most important environmental impact derived from the sector initiatives and wildlife as the least important (NRA, 2001). Further to the action plan RA in 2008 developed its own generic environmental and social management guideline. Table 1 below outlines the major environmental and social impacts to be addressed.



Figure 2 Environmental Issues in the Roads Sector

Source: National Roads Authority Action Plan for Environmental Management in the Roads Sector 2001

Table 1	Environmental and Social Impacts in the Roads Sector	,
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	Environmental Impacts	Social Impacts
1	Air related impacts	HIV and AIDS pandemic
2	Soil related Impacts	Traffic congestion
3	Borrow pits and quarry reinstatement	Theft and vandalism of road furniture
4	Solid waste disposal	Improper and inefficient signage
5	Noise disturbances	Public participation
6	Ecosystem disturbances	Dumping of construction materials
7	Sanitation	Aesthetics
8	Water quality degradation	Encroachment of road reserves
9	Landscape disturbances	
10	Community activity	
11	Displacement and resettlement	
12	Cultural heritage	
13	Human health and safety	

Source: RA - Environmental and Social Guidelines for the Roads sector.

2.4 Enhancing Environmental Performance in the Construction Industry

Varnäs et al. (2009) identify EIAs and Environmental Management Systems (EMS) as the two most important tools to influence a project environmental management success. While EIAs may mainly be used for identifying environmental impacts, the EMS is more suited to managing environmental aspects (Gluch et al., 2005) However, Tse (2001) argues that implementing an EMS leads to less efficient production, and further argues that

to successfully implement standardized EMS in the industry, collaboration between the governments, professional bodies and training institutions is very crucial. In addition, Tam and Le (2007) observed that there is no evidence regarding the effectiveness of EMS, and suggested that the best approach is the application of Environmental Performance Assessment (EPA) as a tool for making regular assessment on site. In defence for EMS, Varnäs et al. (2009) observe that although application of EIAs in Sweden is regulated by legislation and a lot of money and time is spent on the EIA process, the environmental commitment described in the EIA is not always fulfilled in project implementation. Varnäs et al. (2009) therefore argue for the requirement of EIA follow ups; and states that a proper EIA follow up gives the responsible actors the opportunity to take adequate measures to prevent negative environmental effects. It is recommended that several monitoring approaches, which range from simple monitoring techniques to more rigorous scientific monitoring approaches. Since EIA follow ups require human and financial resources, Ofori (2009) recommends that: "where there is legislation and regulations on environmental performance, there is requirement for licenses and approvals; subsidies, tax incentives and grants; certification and labelling of products; market forces — where the client will insist on better environmental performance; institutional initiatives. There should be professional bodies offering advice and support services to members; operational environment — there should be action from pressure groups and well informed users."

3. Research Methodology

The study adopted a quantitative research approach, through a census of road-works contractors. The method is appropriate for the study because it necessitated the collection of a large amount of data from a sizeable population sample in a highly economical way (Saunders et al., 2009). The sample was only confined to senior managers of the road construction firms who have been participating in road construction and maintenance activities with the RA.

3.1 Data Collection Method

A questionnaire instrument was designed for data collection. It had 38 questions based on the key variables from the reviewed literature and was divided into six parts. Part A focused on the general information of the organization, part B focused on the level of legal knowledge of the organization, part C focused on the extent to which the organization strives to mitigate environmental impacts during project implementation, part D focused on the extent to which the organization tries to manage environmental aspects in its daily operations, part E focused on strategies to enhance environmental performance and part F focused on the challenges faced in trying to enhance environmental performance.

3.2 Definition of the Study Population

The sample population for the research was the firms who undertake road construction and maintenance activities for the RA. Currently the NCIC has 760 firms registered as civil engineering constructors in different categories. However, the RA procurement database has only 185 civil engineering construction firms which were active in the past 3 years. Thus the sample population was 185 firms which have been engaged in road maintenance and construction in the past 3 years.

3.3 Data Analysis Method

SPSS 11.5 statistical software was used to compute frequencies. Deductive reasoning was employed to arrive at conclusions in the final analysis.

3.4 Data Analysis, Findings and Discussion

A self-administered questionnaire was sent to 108 contractors because it was getting difficult to get all the contractors to receive questionnaires given the timeframe for the study, randomly selected from the sample population of 185 contractors. 65 completed questionnaires were returned, representing a response rate of 60%. Saunders et al. (2009) argue that a response rate of 35% is acceptable.

4. Results

4.1 Availability of a Qualified Environmental Officer

Only 10.8% of contractors employed a qualified environmental officer as shown in Table 2. This is too low, because most projects were small to medium scale with little adverse environmental impacts and are not under the prescribed list of projects which require mandatory EIA studies. Furthermore, government funded maintenance and rehabilitation projects make no provision for an environmental and H&S Officer as part of the key personnel on a project. This requirement is mostly enforced on donor funded projects.

Yes – Response of total (%)	No –Response of total (%)	
0	3.1	
1.5	16.9	
3.1	29.2	
3.1	18.5	
0	6.2	
1.5	10.8	
1.5	4.6	
10.8	89.2	
	Yes – Response of total (%) 0 1.5 3.1 3.1 0 1.5 1.5 10.8	

Table 2 Availability of Environment Officer in Terms of Registration Categories

4.2 Knowledge of Legal Requirements

Using a Likert Scale 1 to 4, where 1 represent lack of familiarity and 4 represents high levels of familiarity, the levels of knowledge and awareness of environmental laws and guidelines were analyzed and presented in Table 3. The overall results indicate that 35.4% of contractors have limited or no knowledge at all about the relevant environmental laws and guidelines, whilst 36.9% have some knowledge, and the remaining 27.7% have high knowledge of these environmental laws and guidelines of Malawi.

Registration category											
Level of Knowledge	Average	5 million	15 million	50 million	100 million	200 million	500 Million	unlimited	% respondents		
	High	2	2	7	5	3	3	2	36.9		
	Average	0	2	6	6	0	2	2	27.7		
	Low	2	8	8	3	1	3	0	35.4		
Total		2	12	21	14	4	8	4	100		

 Table 3
 Registration Category Against Level of Legal Knowledge

From Figure 3 shows the variations in knowledge with respect to different environmental regulatory instruments. Contractors are more aware of domestic than international instruments. 29.1% of the contractors are

aware of the RA's environmental and social guidelines mainly due to the fact that the guidelines are available in all RA offices and are distributed free of charge to all contractors. A sensitization workshop was conducted prior to the launch of the guidelines which enabled many stakeholders to be aware of the guidelines.



Figure 3 Legal Requirements and Relevant Guidelines

The low level of knowledge regarding ISO 14000 series can be attributed to the fact that ISO certification standards have not been adequately publicised and reinforced in the Malawian construction sector. Lack of awareness of the EMA, NEP and NEAP, may be accounted for by lack of knowledge dissemination to stakeholders. Sensitization workshops are common for specific donor-driven projects as opposed to government initiative.

4.3 Mitigation of Environmental and Social Impacts on Projects

Using a scale of 1 to 4 where 1 represents very low and 4 stands for very high impact perception, contractors are more concerned with the impact of HIV and AIDS than noise pollution project implementation. Figure 4 below presents the overall level of mitigation of individual impacts during project implementation as perceived by the contractors. Overall, HIV and AIDS has a higher level of mitigation at 16.7% followed by solid waste disposal at 15.1%, then deforestation at 15%, soil erosion at 15%, with water pollution 14.2%, then dust pollution at 13%, and the least is noise pollution at 11%.



Figure 4 Extent of Mitigation of Impacts

The responses show that the issue of HIV and AIDS is taken seriously. The current rate of people living with HIV and AIDS in Malawi is 12.5% in the 15–49 years age group (NAC, 2010). It is understood that better mitigation efforts are in place against deforestation, soil erosion, and water pollution because of the measures government has taken to ensure that these natural resources are protected. Increased public awareness has made it possible for this improvement.

4.4 Management of Environmental Aspects

Figure 5 below shows how the different environmental aspects were rated by the contractors in terms of their level of managing them. It shows that H&S measures are rated highest at 21.4% of all aspects. This is mainly due to the high prevalence of HIV and AIDS, which has affected the industry severely. Disposal of solid wastes realised a response rate of 20.5%. This is because mechanisms exist, especially in urban areas, for disposal of solid wastes. Municipal Councils manage and enforce compliance to the set bye-laws. Energy and fuel consumption have been rated at 18.3% and 16.7% respectively. This is due to the current energy crisis prevailing in the country. Electricity has been rationed since 2009 to date due to inadequate generating capacity (Malawi Government, 2010). In terms of fuel consumption the country has been experiencing fuel shortages since 2009, and consumers have been forced to optimize the usage of fuel.



Figure 5 Extent of Management of Aspects

Figure 5 indicates that water consumption conservation has been rated at 12%. This is mainly due to the fact that water is not a problem in the country. There are many available alternative sources. Not much effort has been put to sensitize people on the importance of conserving water. The same applies to usage of recycled materials especially paper as a means of managing environmental aspects of solid waste disposal.

4.5 Challenges Faced by the Construction Industry in Environmental Management

Figure 6 summarizes the challenges: lack of financial resources to effectively carry out environmental management measures is ranked first; lack of training of construction staff to understand environmental issues during project implementation is ranked second; whilst lack of well trained environmental officers is ranked third; lack of institutional support from organizations responsible for environmental management compliance is ranked fourth; environmental issues are not clearly outlined by the client during project procurement is ranked fifth; ranked sixth is poor general public participation during project implementation which sometimes to lead to frictions with the project implementation team; weak regulations which creates loopholes from which non compliance is never penalized, and finally political interference is ranked the last.

4.6 Measures to Enhance Environmental Performance

To enhance environmental performance some mitigating measures need to be taken. Contractors were asked to rate measures according to the level of effectiveness they attach to each intervention. Most contractors have faith in systematic monitoring and behavioural change management among staff and communities as the most effective interventions strategies as shown in Figure 7.





Figure 6 Challenges Faced by the Construction Industry



Figure 7 Measures to Enhance Environmental Performance

Figure 7 summarized the measures as follows: regular monitoring of project sites by the relevant authorities; conducting periodic environmental audits to ensure compliance; conducting sensitization workshops to both the project staff and the surrounding communities; developing key performance indicators to create a benchmark for assessing level of compliance; closer community participation; application of stiff penalties for non-compliance, and contractors should develop their own EMS. Application of stiff penalties and development of EMS have been ranked the least mainly because it involves costs to the contractors, while the rest of the measures will be costs to the contracting authorities.

5. Summary of Key Findings

The industry is characterised by mostly small to medium scale contractors with average experience in the industry of 12 years. Only 10% of the sampled contractors indicated that they employ a qualified environmental officer. The level of environmental legal knowledge amongst respondents is low. However, contractors have better knowledge of RA environmental and social guidelines unlike ISO 14000 certifications. The majority of respondents undertaker activities which do not fall under the prescribed list of projects which require mandatory EIA study. Despite the lack of EIA studies on small and medium scale projects mitigation of impacts is done

following the guidelines produced by the RA and is distributed to all contractors in the construction industry free of charge. Current social economic activities have forced the construction industry to manage some environmental aspects like optimal consumption of energy and fuel due to power shortage and scarcity of fuel in the country. The HIV and AIDS pandemic has affected the sector very hard and everybody is taking drastic measures to contain the pandemic. All these measures are taken without contractors establishing environmental management systems or having a formal environmental policy. Lack of financial resources and lack of training of the construction staff are the major challenges facing the construction industry in enhancing environmental performance. In addition, environmental performance can be enhanced if better mechanisms for monitoring of environmental management can be put in place, conducting periodic environmental audits to ensure compliance and if key performance indicators can be developed which can be used as the benchmark for measuring environmental performance.

6. Conclusion

There is limited knowledge among contractors on environmental laws and guidelines in the industry. However, mitigation of impacts and managing environmental issues during project implementation the industry is performing well. Therefore, it is concluded that the industry is influencing positively in enhancing environmental performance. Development of key performance indicators may give quantitative data which can be used as a benchmark for measuring environmental performance. The constraints faced include; lack of financial resources, lack of environmental management training, lack of well trained environmental officers; lack of institutional support for environmental issues; procurement of works contracts do not take into costs incurred during mitigating environmental impacts; review of current legislation can address most of the challenges faced. In order to enhance environmental performance there is need to: improve monitoring mechanisms by relevant authorities; conducting periodic environmental audits to check on compliance; conducting sensitization workshops; establishing key performance indicators; closer collaboration with the communities; application of stiff penalties for non compliance, and review of current legislation on environmental management.

7. Recommendations

It is recommended that the government should review the current legislation and address all the gaps which are in the current Act. This calls for stiffer penalties for environmental offenders. In addition penalties should be reinforced and pegged in US\$ dollars. Non complying projects should be heavily fined to instil discipline. Projects which do not follow the prescribed list for mandatory EIA should have an Environmental Assessment carried out. There is need to develop key performance indicators for the industry. These will be used as a benchmark for measuring of environmental performance. EIA studies should be carried out by an independent consultant without the input from the design consultant. The client should ensure that the project should compensate all the costs associated with mitigation of environmental impacts. The project costs should include training for environment, health and safety issues. Sensitization workshops should be carried out regularly and the communities surrounding the projects. Closer collaboration with the communities should be encouraged with the right channels of presenting grievances. Awareness of the need to have an environmental policy and develop individual environmental management systems should be used on all projects.

8. Further Study

Future studies should be directed towards finding-out how each of the key stakeholders individually influences environmental performance. In addition how stakeholder as a group influence environmental performance. Doing a case study on an individual project would be ideal for a start up.

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