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Sustainable roads in Serengeti National Park: - gravel roads construction and maintenance

Michael Tarimo^{a,*}, Paulos Wondimu^{a,b}, James Odeck^{a,b}, Jarda Lohne^a, Ola Lædre^a

^a*Department of Civil and Environmental Engineering, Norwegian University of Science and Technology (NTNU), 7491, Trondheim, Norway*

^b*Norwegian Public Roads Administration (NPRA), Norway*

Abstract

All weather road networks in protected areas are important to facilitate management of wildlife, routine park operations and to facilitate tourist accessibility to the attractions sites and hence improving their satisfaction. However, road construction in protected areas should be sustainable in terms of availability of quality materials within economic haulage distance and the entire construction, operation and maintenance process should have less environmental impacts like habitat fragmentation and dust pollution. Several studies have been done in protected areas concerning roads but most of them had concentrated on the ecological impacts of roads. Few studies have been done from the engineering perspective of sustainable construction and maintenance of roads. Thus, the purpose of this study is to assess the sustainability and challenges of construction and maintenance of gravel roads in protected areas. To accomplish objectives of these study four types of data were collected in Serengeti National Park (SENAPA). The data collected were from soil material test in the existing borrow pits, traffic volume counting, document study and interview with fifty (50) road stakeholder. Results show that the current poor performance of the studied road sections may be due to lack of financial and human resources, quality gravel materials and existing traffic volume. This study will contribute to the sustainable construction of road networks in protected areas through identifying possible challenges of road construction and maintenance and give the way forward for improvement.

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Keywords: Protected areas; Gravel roads; Sustainability; Construction; Maintenance

* Corresponding author. Tel.: +255 688905353.

E-mail address: michajos@stud.ntnu.no

1. INTRODUCTION

All weather road networks in protected areas like Serengeti National Park (SENAPA) are important to facilitate management of wildlife, routine operations and tourist accessibility to attractions sites and hence improving their satisfaction. Despite having a positive contribution to the existence of the protected areas and nature reserves roads are also widely recognized to have negative impacts such as increased road kills, habitat fragmentation, dust pollution and introduction of invasive species ¹. Moreover, roads can accelerate illegal activities like poaching ². Having both positive and negative impacts, there has been a general debate on which standards of the roads can potentially minimize the impacts in protected areas.

More than 75% percent of the road network in sub- Sahara Africa countries regardless their traffic volume are unsealed roads, mostly surfaced by gravel materials or natural earth materials ⁴. Moreover, about 93% of the road network in Tanzania are gravel or earth roads ⁵ and all roads in national parks in Tanzania are gravel or earth roads. ⁶ argued that gravel materials will continue to be considered as affordable and economical road construction material in most of sub-Saharan Africa countries. Other authors consider unsealed or gravelled roads as antiquities of the 19th century in developed countries. Nevertheless, in certain areas in developing countries and some rural areas in developed countries, gravel roads are part of the 21st century ⁷. As found by ⁸ some of the local agencies in developed countries are reverting to gravel roads in low volume traffic areas.

During the literature study, initiating the research presented in this paper, it was observed that many studies done in protected areas concentrate on the ecological impacts of roads. Only very limited number of studies concerning the engineering perspective of road construction and maintenance have been conducted in these areas. SENAPA is among of sixteen national parks which are managed by Tanzania National Parks (TANAPA) in Tanzania. It covers 14,763km², thus being the second largest national park in the country after Ruaha National Park. It was ascribed as the World Heritage Site by UNESCO in 1981 ⁹ and is among of the world seven wonders ¹⁰. TANAPA is a government institution which is mandated to manage and regulate use of areas designated as National Parks in Tanzania. The core business of SENAPA and TANAPA as a whole is conservation and sustainable tourism. To achieve this, the park is managed with the prime objective of safeguarding wildlife. This is done through regular patrols to combat poaching activities as well as monitoring sustainable tourism activities mostly facilitated by gravel road networks with a length of about 1,726km.

This paper aimed to assess the sustainability and challenges of the current practice of road construction and maintenance in the main roads of SENAPA. The ambition is that the findings from the study will help to improve the understanding of both the current situation of roads in terms of traffic volume and the quality of gravel materials in existing borrow pits (the main source of materials for road construction and maintenance). It will provide information to the park management and the infrastructure department on better practices that will enhance improvement of current road conditions. In line with this, this paper addresses the following research questions;

- What is the current practice of road construction and maintenance in Serengeti National Park?
- What are the advantages and disadvantages of the current practice of road construction and maintenance in Serengeti National Park?
- What are the possible improvement measures for a sustainable road construction and maintenance?

For the purpose of this conference paper, theoretical background, methodology, findings, discussion and conclusions are given in summary. A more detailed presentation of these sections is given by ¹¹

2. THEORETICAL BACKGROUND

Gravel roads can provide the intended transportation services economically and satisfactorily if proper construction and maintenance practices are used. Novelty and long -term strategic planning can keep road user satisfied with low operation cost as possible ¹². Therefore, roads with good satisfaction to the user can be achieved through maintenance to the acceptable level under the increasing traffic volumes and environmental needs at the same time decreasing the budgets and consumption of the suitable available materials. Moreover, the construction and maintenance of gravel roads can be easier, requiring less equipment and probably lower operator skills hence lower costs and less

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