Application of Spatial Monitoring and Reporting Tool (SMART) for Improving Law-Enforcement Effectiveness at Nech Sar National Park, Ethiopia.

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Abstract

Ecological monitoring is the regular observation and informing gathering on environmental conditions with a kin purpose detect change at different time intervals coupled with future forecasts of environmental parameters. The Spatial Monitoring and Reporting Tool or SMART is considered among the advanced systems for ecological monitoring. To increase its management effectiveness, Nech Sar National is applying the SMART approach for ecological and threat monitoring. The Park has four patrol stations established at selected parts of the park with due consideration for conservation requirements. The first patrol program using the SMART CyberTracker was initiated in 2022 by deploying 56 rangers in six different teams consisting of 8 to 9 rangers per team. In a a year long patrol; charcoal production, firewood collection, wood logging, illegal grazing, grass cutting, illegal farming, settlement, over fishing, and poaching were the threats recorded in the park. A total of 10 threat types with 1,658 incidents were recorded during the patrol. Illegal firewood collection was the highest recorded illegal activity, followed by illegal fishing, while illegal farming was the least recorded illegal activity. The main reasons behind the anthropogenic pressures are identified to be the park boundary demarcation, poor infrastructure, and low benefit-sharing schemes for the local community.

Key Words: *Anthropogenic, Conservation, CyberTracker, Ecology, Threat*

1. INTRODUCTION

SMART has evolved to become the world's leading and powerful tool in the field of nature conservation and protected area management (**?**; **?**). There are more than 800 National parks and other 29 conservation areas that are currently using SMART technology in more than 70 countries around the world (**?**). Although widely recognized for being implemented at terrestrial sites, SMART can also be readily applied to water bodies' conservation and protected area management in which more than 50 marine sites were implementing SMART globally (**?**; **?**). When applied to increase the effectiveness of law enforcement, it enables the collection, storage, communication, and evaluation of data on patrol efforts, patrol results, and threat levels. As a result, the application of the SMART approach in law enforcement in protected areas has been proven to reduce threats to wildlife and natural resources at numerous sites worldwide (**?**; **?**; **?**).

The first step towards achieving the goal of any biodiversity conservation is to obtain baseline and updated information on the biodiversity as well as existing and prospective threats (**?**). The availability of such information on the ecological condition of the park's ecosystem, for example, the degree of anthropogenic pressure its distribution pattern of threats, is vital for strategic planning, and informed decision-making. Mapping the level of each threat's hotspot area is also essential helping to improve parks management effectiveness, by allowing park managers to improve patrol management and threat monitoring(**?**). On top of this, the tool helps to improve patrol performance and resource allocation and provides adaptive management decisions and patrol deployment. Considering the challenges that park experts and rangers face in data collection, analysis, and data management, CyberTracker and SMART (Spatial Monitoring and Reporting Tool), are now available to improve the effectiveness of ecological monitoring, patrol, and site-based conservation activities on the ground (**?**).

The SMART approach for protected area has been reported to be effective in reducing illegal activities Primorskii Krai in Russia and Marine protected area system in Belize (**?**), Sundarbans in Bangladesh and other African protected areas such as Cross River landscape in Nigeria, Queen Elizabeth National Park in Uganda, Gonarezhou National Park in Zimbabwe, North Luangwa ecosystem in Zambia Mid-Zambezi Valley (**?**). Tanzania also introduced the system in some of its game reserves (trophy hunting areas) and national parks (**?**).

Ethiopia has been establishing several protected areas since the 1960s and has more than 179 protected areas under different categories. However, the natural resources of the country especially the wildlife are still facing a substantial risk of extinction, there is overgrazing and encroachment from pastoral people, illegal human settlements, increased extraction of fuelwood and wood logs, mineral extraction, uncontrolled fires and extraction of other natural resources (**?**; **?**; **?**; **?**; **?**). The causes of biodiversity loss in the country can be associated with high human population growth, poverty, poor enforcement of existing legislation, unsustainable natural resource management, and lack of awareness and coordination (**?**).

Nech Sar National Park is one of the oldest protected areas in Ethiopia which was established in 1967 with the objective for the conservation of the rich flora and fauna resources of the area (**?**; **?**). The park with its diversified habitat types and wild animals has immense potential as a tourist destination (**?**). As Seid (2019), even if the park is rich in biodiversity, there