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Perspectives on Applications of Geospatial Technology and Landscape Ecology for Conservation Planning in the Global South

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ABSTRACT

Rapidly changing landscapes and disturbance regimes in the Global South impact the viability of conservation planning. Although conservation planning processes benefit from reliable multi-scale and multi-temporal data on landscape changes, this is not widely understood. In this paper, the authors examine landscape change dynamics and disturbance regimes in the Global South and discuss the methodological needs of characterizing pattern-process relationships of landscape disturbance to facilitate effective conservation planning. For example, geospatial analysis of Nairobi-Namanga Road, in the Kaputei Plains of Kenya, was used to highlight impacts of road infrastructure on wooded grassland and open grasslands, on wildlife migration corridors and livelihoods. The authors discuss how integration of geospatial technologies and landscape ecology metrics could enhance conservation planning and decision-making in the Global South. The benefits of coupling the decision-making process with stakeholder engagements and nature-based solutions to ensure viable conservation of biodiversity were also discussed.

KEYWORDS

Conservation Planning, Disturbance Regimes, DPSIR Framework, Essential Biodiversity Variables (EBVs), Geospatial Science and Technology, Global South, Landscape Ecology, Stakeholder Participation

INTRODUCTION

Conservation planning is gaining global attention but especially in the global south where issues of natural resource degradation are more prevalent. Increases in land degradation coupled with recent global arrangements such as the Sustainable Development Goals (SDGs) and Aichi Biodiversity Targets have generated increased attention on formulating policies and resource planning strategies

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geared toward biodiversity and natural resource conservation, particularly in the Global South. Conservation planning as illustrated in Figure 1 involves the use of a systematic approach to delineate priority areas for biodiversity conservation within the landscape, from local to regional scales. This goes beyond protected area networks to encompass integrated management of critical biodiversity areas. It also involves data-driven and spatially explicit land-use planning and decision-making mechanism to prioritize critical areas in need of biodiversity conservation actions (Knight et al., 2009; Botts et al., 2019; Harris et al., 2019). A critical part in the process of conservation planning is access to reliable data on landscape changes and disturbance regimes occurring or projected to occur at various spatiotemporal scales (Hobbs et al., 2014; Costa et al., 2017; Ward et al., 2018; Mahmoud et al, 2019).

Landscape changes and disturbance regimes often have spatial and temporal characteristics, and these have been studied extensively in the developed countries of the Global North (e.g. Turner, 2010; Johnstone et al., 2016; Summerfield et al., 2018; Newman, 2019) while the Global South context has received less attention. There are differences in contexts and dimensions of landscape changes and disturbances between the Global South and Global North. These differences can be attributed to differences in prevailing climatic, ecological, social, economic and governance structures. In this paper, we discuss key drivers of landscape change and disturbance regimes that often result in habitat loss and threaten biodiversity integrity of landscapes in the Global South. The drivers are mostly anthropogenic and include grazing (transhumance), agricultural expansion, urbanization, mining and drilling, and deforestation.

Landscape disturbances are random or cumulative events that result in a departure from an optimal or desired state of a resource (Perera et al., 2007). Turner (2010) suggested the potential for profound consequences of rapidly changing disturbance regimes on ecosystems and linked social-ecological systems. Newman (2019) also noted that there are "large shifts in characteristics of individual disturbances and disturbance regimes". These observations indicate that there are opportunities for landscape ecologists and conservation practitioners to learn more about the pattern–process interactions across different landscape scales (Turner, 2010; Newman, 2019).

The focus of this paper is to discuss the nature of rapidly changing landscape dynamics and disturbance regimes (including grazing, cropland expansion, urbanization, deforestation, as well as mining and drilling) in the Global South (specifically Sub-Saharan Africa and Latin America), and to examine how Landscape ecology and geospatial technology has facilitated or could further facilitate conservation planning in the Global South. The approach for this paper involved the

Figure 1. From theory to practice: Designing and situating spatial prioritization approaches to better implement conservation action (Source: Knight et al., 2009)