



Discourses on landscape governance and transfrontier conservation areas: converging, diverging and evolving discourses with geographic contextual nuances

Ephraim Mpofu^{1,5} · Verena Radinger-Peer^{2,5} · Walter Musakwa³ · Marianne Penker^{4,5} · Katharina Gugerell^{1,3,5}

Received: 19 November 2022 / Revised: 1 September 2023 / Accepted: 20 September 2023 /
Published online: 17 October 2023
© The Author(s) 2023

Abstract

Transfrontier conservation areas (TFCAs) are regarded as crucial instruments for biodiversity conservation as they connect landscapes across country borders. The TFCA framework is built on multi-actor, multi-sector and multi-level negotiations, a concept that incorporates principles of landscape governance (LG). This article is driven by our interest in the governance of transfrontier landscapes such as the Great Limpopo Transfrontier Park. The study aims to explore the narratives of two academic discourses of TFCA and LG. The study uses a bibliometric analysis and systematic review based on PRISMA to determine (i) to which degree the two discourses share commonalities in their narratives and take each other into account (ii) how the discourses have developed between 1998 and 2022 (iii) the geographical distribution of publications on the two discourses. Our results identified six clusters which include: African Wildlife Conservation, Governance for Biodiversity Conservation, TFCA Wildlife Connectivity, Policies and Strategies, Political Ecology, and Management of Protected Areas. The discourses depict commonalities attributed to conservation, power and actor roles. However, LG is more governance-oriented while TFCA is more skewed towards wildlife management. The TFCA discourse is a more Southern African-centred debate whilst the LG debate is more rooted in the global North resulting from unique challenges, priorities, and approaches to landscape management. Moreover, a shift from a conservation-centred approach to a more holistic social-ecological system approach is evident. By leveraging on LG and TFCA strengths, cross-fertilization can foster meaningful cross-collaborations in managing different landscapes through dialogue, knowledge sharing, and identifying common goals, challenges and opportunities.

Keywords Landscape governance · Transfrontier conservation areas · Peace parks · Protected areas · Natural resources management · Biodiversity conservation

Communicated by Alison Nazareno.

Extended author information available on the last page of the article

Introduction

Transfrontier conservation areas (TFCAs) play an important role in the long-term cooperative conservation of biodiversity, cultural values, and supporting ecosystem management. They cover vast landscapes spanning borders between two or more countries and include at least one protected area (Wolmer 2003; Lunstrum 2011). TFCAs (also referred to as ‘Peace Parks’) pursue peace, conservation, and socio-economic development across ‘man-made’ borders (van Aarde and Jackson 2007; Hanks and Myburgh 2015). More specific objectives include (i) long-term cooperative conservation of biodiversity and cultural values (ii) promoting landscape-level ecosystem management; (iii) trust and capacity building amongst actors; (iv) joint learning and knowledge co-creation; (v) sharing resource management skills, information, and experience and (vi) promoting access to natural resources and their equitable and sustainable use (Hanks 2003; McKeever 2008; Chitakira et al. 2022). The wide range of objectives that spread across different countries and administrative levels in TFCAs pose unique challenges in the governance of such transfrontier landscapes.

With the growing human-induced transformation of landscapes over the past decades, landscapes have become more fragmented and hence vulnerable to biodiversity loss (Elliot et al. 2014; Cushman et al. 2018). One of the fundamental objectives of the TFCA is biodiversity conservation which entails connecting and jointly managing fragmented habitats and natural systems (Elliot et al. 2014; Loveridge et al. 2022). Biodiversity conservation is considered a vital approach for protecting ecologically valuable landscapes and wildlife (Wolmer 2003; van Aarde and Jackson 2007; Hanks and Myburgh 2015). Various strategies which include habitat restoration, protected area management, community-based conservation programs, and the development of transboundary policy frameworks have been implemented to foster the conservation of biodiversity in TFCAs (Michel et al. 2006; Loarie et al. 2009; Kansky et al. 2021). Therefore, TFCAs serve as a supporting concept for the improved management of large-scale, naturally interconnected areas for biodiversity conservation. Successful biodiversity conservation also depends on socio-economic aspects (Selier et al. 2016; Ntuli et al. 2019). Supporting local livelihoods and pursuing community-based conservation and natural resource management is expected to serve, secure, and even improve conservation outcomes and the well-being of local communities (Selier et al. 2016; Kansky et al. 2021). Balancing conservation with sustainable development is vital for the long-term viability of TFCAs. TFCAs pursue the management of vast and biodiversity-rich landscapes through fostering a sense of ownership and responsibility among local actors by acknowledging the significance of biodiversity and wildlife (Hanks 2003; Chitakira et al. 2012; Chiutsi and Saarinen 2017). This sense of ownership encourages a deeper connection and commitment to the landscape, resulting in increased engagement, collaboration, and efficient application of governance strategies (Chitakira et al. 2012; Chirozva et al. 2013). These outcomes also illustrate the principles of landscape governance, which calls for integrated management approaches to protect ecological connectivity, biodiversity hotspots, and promote sustainable development of transfrontier landscapes (Sayer et al. 2013; Ros-Tonen et al. 2014).

Landscape Governance (LG) refers to the collective, multi-level processes, institutions, and mechanisms through which decisions and actions regarding landscapes are made, implemented, and monitored (Lemos and Agrawal 2006; Penker 2009; Bennett and Satterfield 2018). It involves the coordination and management of various stakeholders (Görg 2007; Elbakidze et al. 2010; Njoroge et al. 2020), including governments, communities, civil society organizations, and businesses, to achieve sustainable and equitable landscape

outcomes. By involving local communities and stakeholders in decision-making processes, LG can contribute to improved livelihoods, social equity, and well-being. It recognizes the importance of local knowledge (Olsson et al. 2004; Angelstam et al. 2013), traditional practices (Langston et al. 2017; Špaček et al. 2022), and cultural values (Olsson et al. 2004; Plieninger and Bieling 2012). Active involvement of different actors (multi-actor) in such governance processes, supports the activation and integration of different ‘bodies of knowledge’ (Lang et al. 2012), knowledge systems (Rathwell et al. 2015; Ingram 2018), and different types of expertise (e.g., know-how; know-what) (Bammer et al. 2010). Consequently, LG is also expected to strengthen the resilience of landscapes and communities by fostering adaptive management. It supports the integration of relevant issues like climate change adaptation, disaster risk reduction, land degradation, biodiversity loss, and food insecurity (Hoole and Berkes 2010; Ros-Tonen et al. 2014; Robinson and Kagombe 2018; van Oosten et al. 2021) and thus ensures that landscapes and communities are better prepared for future challenges. Thus, LG recognize landscapes as complex socio-ecological systems where nature, humanity, and culture interact and influence one another. It acknowledges that effective management and decision-making require a holistic and integrated approach that takes into consideration competing interests, values, perceptions, and objectives (Dressler and Büscher 2008; Reed et al. 2016; Levin et al. 2018). Governing transfrontier landscapes that span large geographical areas, encompassing different institutional systems (countries), and involving numerous stakeholders with competing interests create specific challenges. Effective communication, transnational and intra-country (horizontal and vertical) coordination, and collaboration among stakeholders can be demanding when dealing with diverse values, perspectives, conflicting priorities, power dynamics and legacies (Elbakidze et al. 2010; Sayer et al. 2013; Reed et al. 2016).

While LG can be a valuable approach to landscape management, it is important to be attentive to potential governance failures resulting from the multifaceted context. Governance failures can result in environmental crises such as the degradation of vital landscapes (Pahl-Wostl 2009; Plieninger et al. 2014; Foli et al. 2018). While governance failures are only modestly addressed in LG discourses, there is ample evidence in related scholarly debates covering forested landscapes (Neudert et al. 2017; Gellert 2022) and water resources (Walker 2014; Nicollier, et al. 2022). Governance failures cover different modes of governance, such as legal, market and network governance (Howlett and Ramesh 2014; Pahl-Wostl 2019). Hence governance failure can be attributed to a mismatch of the governance mode to problem context (governance design) or governance capacity (resources and skills) (Howlett and Ramesh 2014; Jessop 2023). Such governance failures can be attributed to different reasons, such as (i) outdated LG practices with shortcomings regarding local participation (Reed 2008; Milder et al. 2014), power struggles, and asymmetries (Dawson and Martin 2015; Ros-Tonen et al. 2018) or (ii) the strong reliance on single-objective based strategies which are only conservation oriented neglecting integration of socio-economic or other policy goals (Kostov and Lingard 2004; Sayer et al. 2013; Reed et al. 2016). Operating within existing institutional frameworks and governance structures that predominantly focus on specific sectors and remain fragmented can result in a lack of coordination and integration across sectors, leading to conflicting policies, inefficient resource allocation, and missed opportunities for holistic and sustainable LG. Overcoming sectoral silos requires improved cross-sectoral collaboration and the development of integrated governance mechanisms and approaches (Milder et al. 2014; Ros-Tonen et al. 2014; den Uyl and Driessen 2015). These approaches highlight integrated policy alignment, as well as horizontal and vertical coordination at different governmental levels (Sayer et al. 2013; Arts et al. 2017a).

Pursuing such integrated approaches on the landscape scale follows a set of principles which include: continual learning and adaptive management, shared values and objectives, trade-offs on differing landscape uses, awareness of various governance levels, recognition of all actors, transparency through mutual understanding amongst actors, clarity on rights and responsibilities of the actors, participatory monitoring whilst recognizing different knowledge systems, resilience and enhancing the capacity of actors to engage (Sayer et al. 2013; Ros-Tonen et al. 2014; Foli et al. 2018; Reed et al. 2019). Trade-offs emerge as a central facet for integrated governance mechanisms. With conflicting interests, goals, and priorities, trade-offs are inevitable outcomes of decision-making and mutual understanding among actors (Ros-Tonen et al. 2014; van Oosten et al. 2021a). LG principles have been adopted by international organizations (e.g. the International Union for the Conservation of Nature, World Wildlife Fund, the United Nations Environmental Programme, and the World Bank), government departments (e.g. conservation, agriculture, economic development), and transboundary conservation areas (e.g. Serengeti-Mara ecosystem shared between Tanzania and Kenya) (Freeman et al. 2015; Arts et al. 2017b; Veldhuis et al. 2019). Some of these principles such as continual learning and adaptive management, enhancing the capacity of actors to engage, and participatory monitoring, are closely related to Pahl-Wostl's (2009) concept of 'Learning for Governance'.

This article is driven by our interest in the governance of large-scale transfrontier landscapes, such as the Great Limpopo Transfrontier Park (GLTP) which spans South Africa, Zimbabwe, and Mozambique. The initial preparation for a research project and data collection pointed us towards a research gap. We noticed that despite the daily governance tasks in transfrontier landscapes, most of the local literature and references strongly focus on biodiversity conservation, while governance perspectives are only modestly represented. Given the TFCA's cross-border nature, multifaceted challenges are often experienced in issues of coordination and policy harmonization (Wolmer 2003; Bhatasara et al. 2013) to which LG principles are imperative. Likewise, LG inherently includes a wide spectrum of landscapes (intra and cross-border) encompassing natural border features such as mountain ranges, river basins, forests, wetlands, and coastal areas (Beunen and Opdam 2011; Arts et al. 2017). Valuable lessons can be drawn from TFCA's in aspects related to cross-border cooperation, collaborative wildlife conservation, human-wildlife conflict resolution, and community involvement (Wolmer 2003; Munthali 2007; Hanks and Myburgh 2015). This observation fuelled our interest with regards to the extent to which these two discourses and their related topics share commonalities. While previous studies have highlighted the principles of LG (Sayer et al. 2013; Oosten et al. 2018; Ros-Tonen et al. 2021) which also relate to the objectives of TFCA (Hanks 2003; Wolmer 2003; Kansky et al. 2021), a systemic analysis to comprehend the degree to which these academic discourses are linked or take each other into account, is still lacking. As a first step to bridge this gap, we investigate the following research questions: (i) To which degree do the two discourses share commonalities in their narratives and take each other into account? (ii) How have the discourses developed from 1998 to 2022? (iii) What is the geographical distribution of publications on the two discourses? To answer these research questions, we use a bibliometric study and a qualitative content analysis using PRISMA.

Materials and methods

This study covers the period from 1998 to 2022 and is based on the combination of a bibliometric analysis (Ellegaard and Wallin 2015; Donthu et al. 2021) and qualitative content analysis using PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analysis protocol) (Liberati et al. 2009; Moher et al. 2009; Page et al. 2021). 1998 was selected as the starting point since it marks the publication year of the first TFCA Web-of-Science (WoS) publication whereas the first LG publication dates to 2004. Whilst bibliometric studies are regularly used for the quantification of published research articles, they can also play a role in the qualitative exploration and construction of narratives (van Eck and Waltman 2010; Herrera-Franco et al. 2021). Bibliometric methods support broad, systematic, and cross-sectional analysis that illustrate the evolution of academic discourses over time and along with their conceptual backgrounds, research trends, and gaps employing both qualitative and quantitative methods (Manriquez et al. 2015; Retrouvey et al. 2020). Nonetheless, there are limitations associated with bibliometrics and network analysis methods for this purpose. The method tends to overemphasize the core themes of a cluster, while smaller niche topics only appear in the peripheries of the network analysis maps hence might not be well represented in the narratives. PRISMA on the other hand demonstrates that a systematic review is an explicit way to identify, select, and evaluate relevant research. PRISMA is a set of guidelines for systematic reviews which enable researchers to report reviews of the existing literature clearly, transparently, and with sufficient detail to enable reproducibility (Cruz-Garcia et al. 2017; Malapane et al. 2022). We selected PRISMA because previous research emphasises its comprehensiveness, improved validity, and strong reliability across reviews (Page et al. 2021). Both bibliometrics and PRISMA methods have proven useful in previous research for conducting robust and comprehensive analysis of existing literature (López-Rodríguez et al. 2022; Diwan and Amarayil Sreeraman 2023). The combination of these two methods offers a comprehensive overview of the existing literature while also providing insights into the scholarly landscape and academic networks within specific discourses. Previous researchers also highlighted the added value of combining qualitative and quantitative methods and stressed that quantitative methods alone should not be overestimated as they can sometimes overlook the ambiguity of scientific measurements (Jordan et al. 2017; Retrouvey et al. 2020).

Data collection and search criteria

For this research, WoS served as a database, based on two considerations: (i) focus on the academic discourse in high-quality publications (SCI, SSCI) (Li et al. 2018) while acknowledging the limitation that parts of the discourse might not be reflected; and (ii) WoS encompasses a wide range of scientific domains over an extensive time span (Falagas et al. 2008; Pranckutė, 2021). The search strategy involved separate searches for the two discourses using the following keywords: (i) “landscape governance” and (ii) “transfrontier conservation areas” OR “peace parks”. The term “peace parks” was also used in combination with TFCA, as the two refer to the same concept and are often used interchangeably (Aarde and Jackson 2007; Hanks and Myburgh 2015). The search strategy employed in this study was comprehensive, as the query was set to “All field”, enabling a full text search across entire articles. A filtering date range from 1998 to 2022 was also used to retrieve all article records published within this period.

Furthermore, filtering was also done to select only “Articles” written in the “English” language. After the filtering process, the number of records on LG amounted to 112 records whereas the search on TFCA yielded 198 results. These records were exported as CSV (Comma-Separated Values) files which formed the basis of both bibliometric and PRISMA analysis. The bibliometric analysis was conducted in the VOSviewer software using the co-occurrence and the co-authorship technique. Since the results from the bibliometric analysis only provided limited information for constructing narratives, qualitative content analysis was conducted as a second phase to provide comprehensive results. Further analysis was done to link the publications and their respective geographic locations based on the countries where they were published. This was necessary to gain insight into the research focus and areas of expertise in each country regarding the two discourses.

Bibliometric analysis: phase one

The bibliometric analysis was conducted using the LG (112) and TFCA (198) record files which were downloaded as CSVs. For this phase, the VOSviewer software (van Eck and Waltman 2010) was used to perform the bibliometric analysis using the co-occurrence and co-authorship technique. Co-occurrence technique is an analysis method embedded within the VOSviewer software used to analyse and visualize the patterns of co-occurrence of keywords within a dataset. The method is used to identify the relationships amongst keywords, providing insights into the thematic structure and interconnections within a particular study field. This analysis was used to determine (a) associations between keywords within the two discourses, and (b) the emerging keywords to emphasize the recent developments and emerging topics within our research. The ‘*minimum number of occurrences of a keyword*’ was set to four for the analysis. This resulted in a co-occurrence network map (van Eck and Waltman 2010). The analysis for this map was based on network morphology, total link strength, node proximity, and cluster density (Table 1). The ranking number assigned to each cluster in the keyword co-occurrence map was based on the size of the cluster, which is determined by the number of keywords assigned to that particular cluster (Fig. 1).

We also conducted an overlay visualisation on the co-occurrence network map to determine the emerging keywords. This was done to capture significant developments and shifts in the research focus within the LG and TFCA discourses. The second analysis within phase one was conducted using the co-authorship technique, which was also done in VOSviewer using the downloaded records for LG (112) and TFCA (198). This analysis identifies author connections based on their affiliations in publications. One of the features of this analysis is the ability to identify the countries associated with an article through examining the affiliations of the co-authors. In this analysis, the focus was to identify the geographic distribution of the two discourses. In this case, geographic distribution refers to the distribution of articles based on location of affiliation, production, or publication which provides insights into the geographic representation and contribution of different countries. A ‘*minimum number of documents per country*’ was set to one in order to retrieve all countries which have published on the topic. This analysis also complimented the co-occurrence analysis to reveal locations in which the discourses are being frequently investigated.

Table 1 Definition of terms in Bibliometric analysis

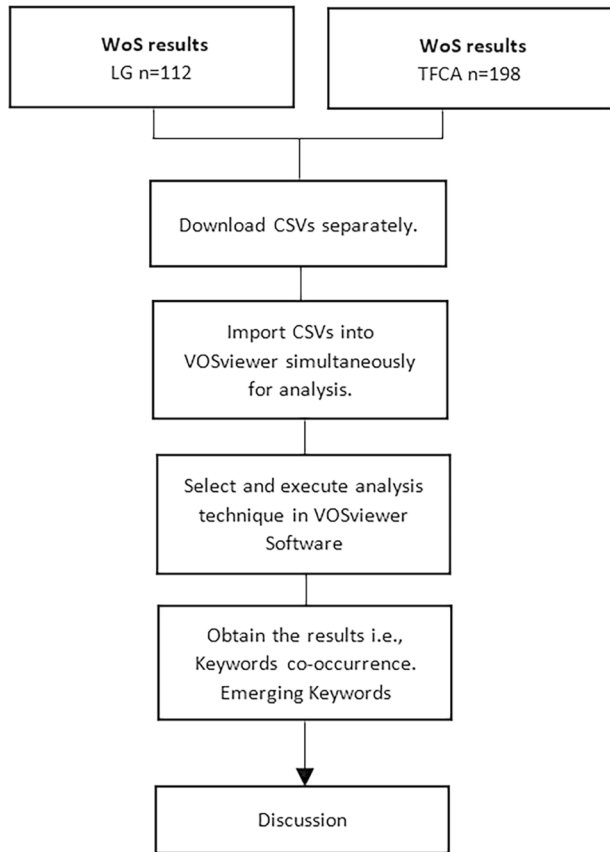
Analysis/term	Description
Co-occurrence analysis	Examines the frequency and patterns of terms appearing together within a dataset to identify thematic relationships and clusters
Co-authorship analysis	Analyses collaborations between authors based on shared publications, providing insights into research networks and collaborations
Link	A link represents a connection between two nodes. A link between two nodes indicates that the respective keywords occur together in at least in one publication, while the width of the links represents the strength of the relationship
Total link strength	The total strength of the links connecting nodes in a network indicates the intensity of relationships between nodes. It represents the frequency or strength of co-occurrence, co-authorship, or other connections
Network morphology	Refers to the structure and characteristics of the network visualization, including the arrangement, density, and connectivity of nodes and links
Node size	Node size represents the relative prominence or importance of a node within a network visualization, with larger nodes indicating higher centrality or influence in the network
Node proximity	The physical proximity or closeness of nodes in a network visualization indicates their relatedness or similarity. Nodes that are closer together are more likely to be interconnected
Clustering analysis	Identifies groups or clusters of closely related nodes within a network based on their co-occurrence, co-authorship, or other relationships. Helps in identifying thematic clusters or research communities
Overlay visualization	Combines different types of data or analyses, such as co-occurrence and co-authorship, to create layered visualizations that reveal multiple aspects of the research landscape
Keyword analysis	Analyses the frequency, distribution, and relationships between keywords in a dataset, enabling researchers to explore the main topics and themes within a discourse

PRISMA: phase two

In the second phase of the analysis process, WoS was also used to identify the article records associated with the two discourses LG and TFCA. The initial results amounted to 122 records for LG and 214 for TFCA. From the identified records, we filtered the records based on the “English”, and “Articles” query and removed the duplicates. This resulted in 112 records for LG and 198 records for TFCA. For this phase, the records were downloaded in Excel format and combined into one Excel sheet for ease of manipulation, resulting in a total of 310 records. The 310 records were the same article records used in the bibliometric analysis which generated the co-occurrence results from which we selected the top five keywords based on the total link strength (TLS) and node size (Fig. 2).

The top five keywords per cluster were then used as filtering keywords to retrieve articles for qualitative content analysis. These keywords were incorporated simultaneously using the Boolean operator “OR” to retrieve the articles from the pool of 310 records. Further filtering was done to refine the dataset to a viable number for content analysis. For each cluster, the following scheme was used to identify the articles for content analysis: (i) three most highly cited articles, (ii) three most recently published articles (iii) three oldest articles, and (iv) three of the recent and highly cited articles in the last five years (2017–2022). This process resulted in a total of 72 articles that were included for qualitative content

Fig. 1 The flowchart of the bibliometric analysis which served as the first phase of the literature review. Phase one provided the central keywords for qualitative content analysis from the keyword co-occurrence results



analysis. A qualitative content analysis which informed the narrative of the clusters was then carried out as part of the qualitative synthesis process based on Kuckartz (2019). The titles for each cluster reflect the core concepts of each cluster resulting from the content analysis.

Results of the bibliometric and qualitative content analysis

Since 1998, we can see a continuous increase in publications in the discourses of LG and TFCA (Fig. 3). Whilst LG emerged in publications only in 2004, some of the LG principles which include enhancement of actors' capacity to engage, awareness of various governance levels, and recognition of all actors had already been addressed earlier in the TFCA discourses. The results provide insights into the temporal and geographical focus of publication activity in both academic discourses. For LG, 90% of all articles have been published between 2013 and 2022, whilst for TFCA it is still more than 70%. The number of TFCA publications have been consistently higher than the number of LG publications throughout the years since 2004 with a maximum peak of 21 in 2020, despite some fluctuation in this trend.

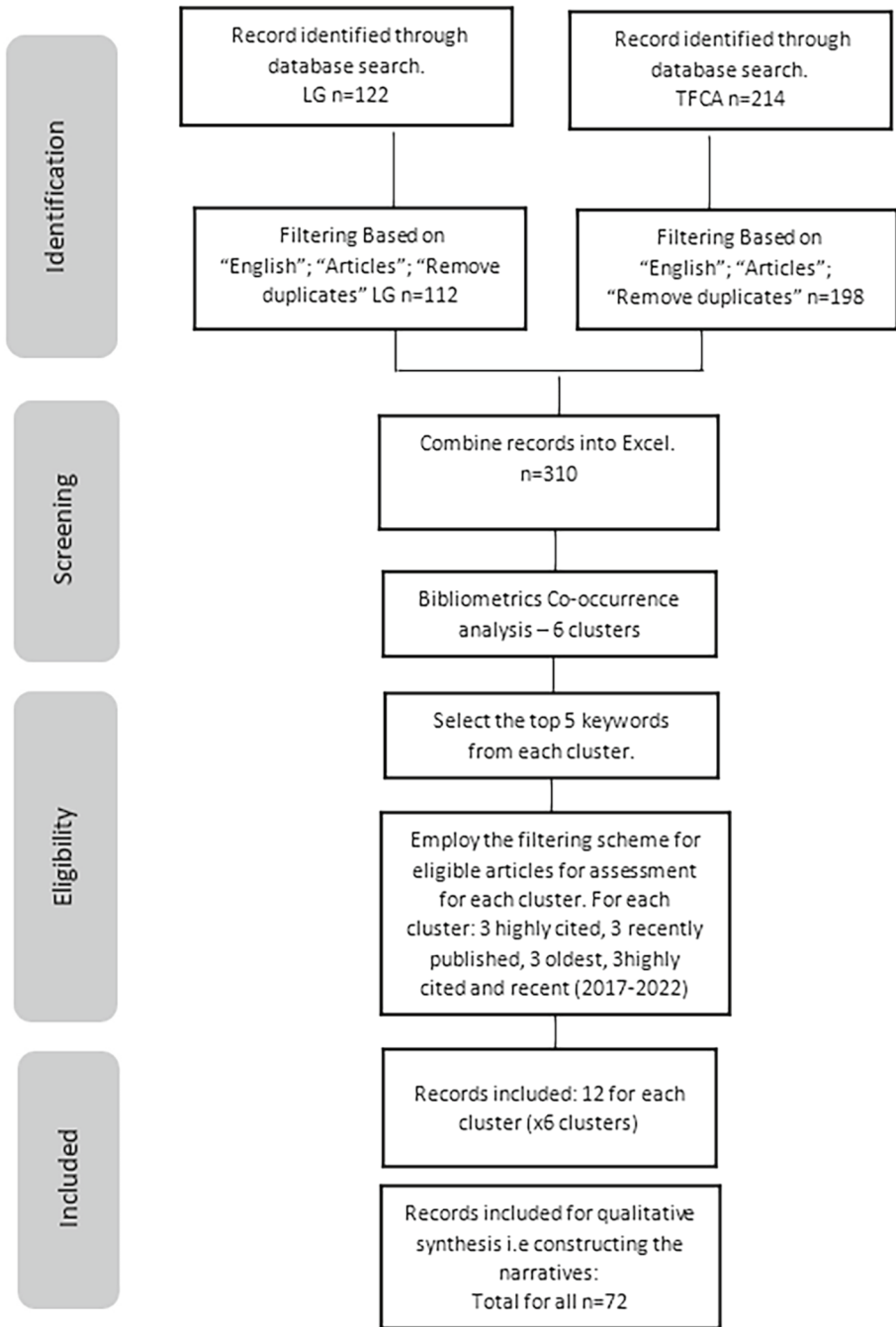


Fig. 2 Qualitative content analysis flowchart based on the PRISMA (Moher et al. 2009). Keywords from the bibliometric analysis were used for filtering articles for each cluster

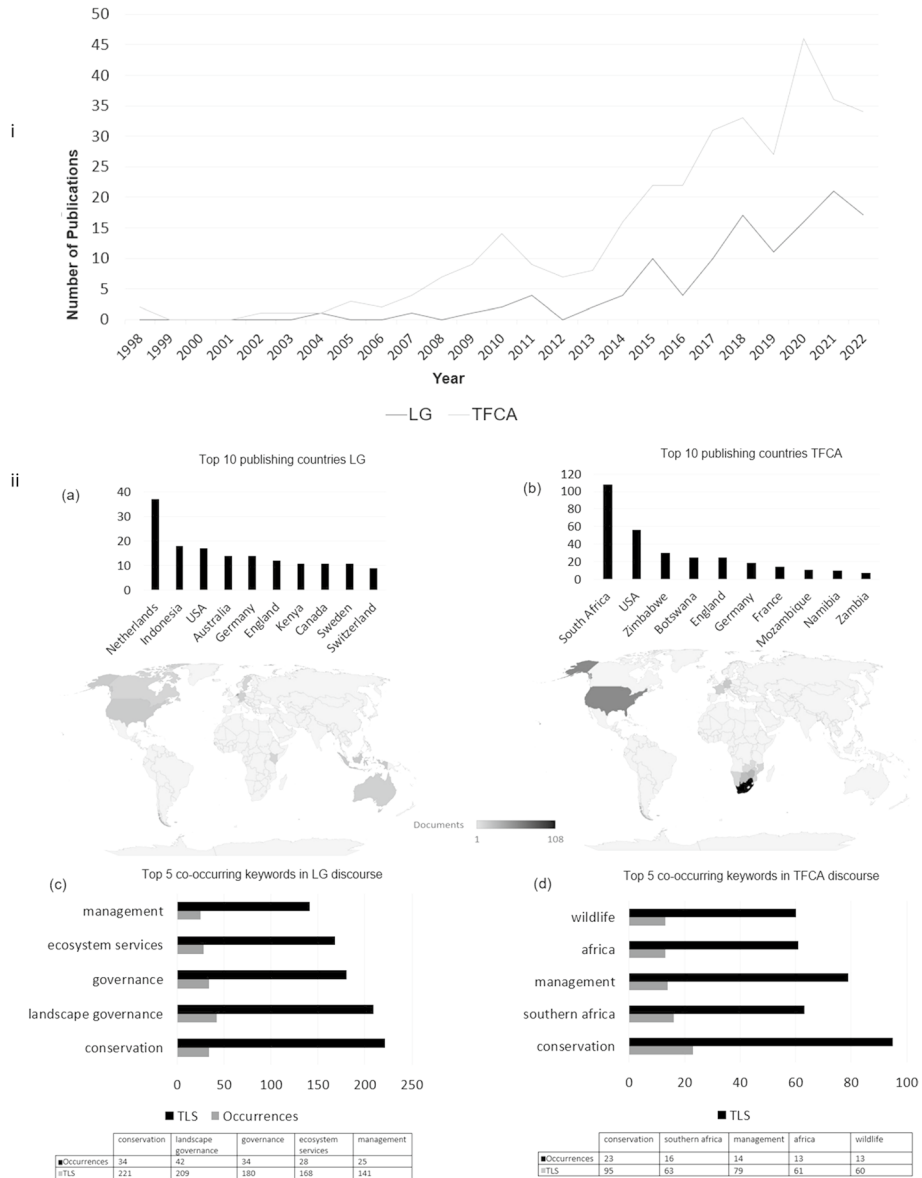


Fig. 3 The figure shows row (i) the publication output for the two academic discourses from the time of initial publication of the TFCA in 1998, and the LG in 2004, (ii) Publication distribution and ranking by country for LG (a) and for TFCA (b), and (iii) the top five most occurring keywords in LG (c) and TFCA (d). The Total Link Strength (TLS) represents the cumulative strength or intensity of the links between keywords in the co-occurrence network within the bibliometrics software (VOSviewer)

With regards to publications by location, the geographic distribution of the LG discourse is primarily rooted in the global North making 80% of the top 10 list globally. The Netherlands is by far the most publishing country in the LG discourse with a total of 34 publications. Other countries in the global North which have significant publications on

this discourse in the global North include the United States of America (15), Australia (13), Germany (13), Canada (10) England (10), Sweden (9), and France (7). The LG debate is also well established in countries like Indonesia (18) and Kenya (11), which show a substantial number of publications despite not being geographically located in the global North. In contrast, 70% of the articles published on the TFCA topic are from the African continent, with South Africa (108) having the highest number of publications. The top African publishing countries in the list are specifically Southern African countries which include Zimbabwe (30), Botswana (25), Mozambique (11), Namibia (10), and Zambia (7). Despite the large volumes of publications in the TFCA discourse, LG has a broad spectrum of publishing countries (49) with each having at least 1 publication whilst TFCA has only 29 publishing countries.

Co-occurrence analysis

The co-occurrence analysis illustrates a distinct grouping of keywords emanating from both the TFCA and LG discourses (Fig. 4). The cluster ranking is based on the number of keywords assigned within that particular cluster, with the allocations as follows: cluster one (31), cluster two (23), cluster 3 (20), cluster 4 (19), cluster 5 (14) and cluster 6 (13). Clusters one (African Wildlife Conservation) and three (TFCA Wildlife Connectivity) are centred around topics close to TFCA whilst clusters two (Governance for Biodiversity Conservation) and four (Policies and Strategies) are strongly anchored in LG. While the first clusters are clearly delineated from each other, clusters five (Political Ecology) and six

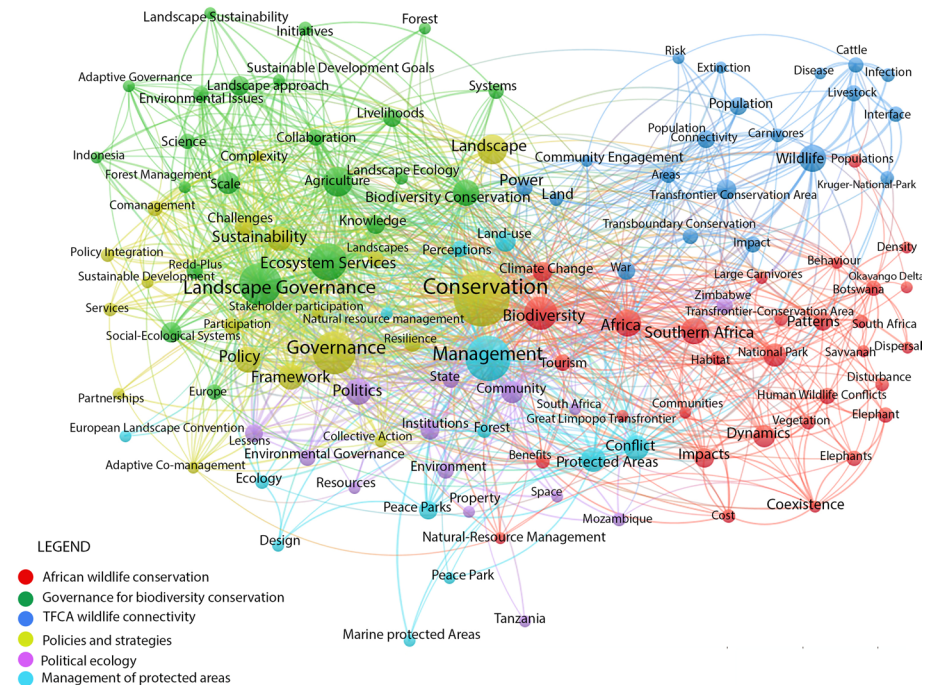


Fig. 4 Keyword Co-occurrence map for LG and TFCA. The bigger the node the larger the weight and the closer the node the stronger the connection

Table 2 Overview of key challenges and conceptual underpinning of each cluster. Conceptual underpinning articles directly address the central concepts or theories relevant to the cluster. Core articles present the narrative for each cluster and are based on high citations

Cluster	Key challenges identified in the clusters	Conceptual underpinning	Core Articles for the content analysis
Cluster one: African wildlife conservation	Wildlife biodiversity, vulnerability, extinction, habitat loss; Human-wildlife conflicts	Wildlife conservation and ecology: Michel et al. (2006), Loarie et al. (2009); Büscher and Ramutsoindela (2015) (2009); Büscher and Ramutsoindela (2015)	Michel et al. (2006); Loarie et al. (2009); Büscher and Ramutsoindela (2015); Loarie et al. (2009); Loveridge et al. (2022); Dures et al. (2019)
Cluster two: governance for biodiversity conservation	Adaptive approaches, integrated approaches; wicked problems, knowledge cocreation	Landscape approach: Ros-Dawson and Martin (2015); Elbakidze et al. (2010); Ros-Tonen et al. (2010); Ros-Tonen et al. (2015)	Dawson and Martin (2015); Elbakidze et al. (2010); Ros-Tonen et al. (2015); Pedroza-Arceo et al. (2022); Ros-Tonen et al. (2021)
Cluster three: TFCA wildlife connectivity	Zoonotic disease, connectivity, landscape resistance, property rights	Landscape connectivity: Elliot et al. (2014); Roever et al. (2013); Zoonotic disease risk: Caron et al. (2016); Lazarus et al. (2021)	Elliot et al. (2014); Omoding et al. (2020); Roever et al. (2013); Lenggenhager and Ramutsoindela (2021); Sinthumule (2017)
Cluster four: policies and strategies	Co-management, institutional arrangements; local community integration	Co-management and Partnerships: Arts et al. (2017); Olsson et al. (2004); McKeever (2008)	Arts et al. (2017); Olsson et al. (2004); Robinson and Kagombe (2018); McNeely, (2003); Kark et al. (2015); van Oosten et al. (2021)
Cluster five: political ecology	Power asymmetry, scale politics, decision-making, decentralized institutions	Governance, politics of scale: Görg (2007); Chiutsi and Saarinen, (2017); Njoroge et al. (2020); Sinthumule (2017)	Görg (2007); Chiutsi and Saarinen (2017); Njoroge et al. (2020); Sinthumule (2017); Castella et al. (2014); van Oosten et al. (2018)
Cluster Six: Management of Protected Areas	Natural resource management, human pressure, conflicts, animal migration routes	Natural resource management: Amaruzaman et al. (2022); Nzyoka et al. (2021); Ros-Tonen et al. (2021); Ros-Tonen et al. (2021)	Amaruzaman et al. (2022); Nzyoka et al. (2021); Ros-Tonen et al. (2021); Tshipa et al. (2017); Mpakairi et al. (2019); Selier et al. (2016)

(Management of Protected Areas) link more strongly to both discourses by addressing the importance of different scales and actors (co-management/co-governance) and the role of policy. Figure 4 illustrates six delineated clusters followed by a detailed narrative from a systematic review of the literature (Table 2).

Cluster one: African wildlife conservation

Cluster one thematically focuses on wildlife biodiversity in African conservation areas revealing the intricate challenges, strategies, and triumphs that define conservation efforts across the continent. While the cluster provides context on the entire Africa, the main emphasis is geared towards Southern Africa (Michel et al. 2006; Loarie et al. 2009; Martin et al. 2011; Büscher and Ramutsindela 2015). The cluster underscores the significance of national parks and TFCAs, highlighting their significance for conservation and establishing connectivity through wildlife corridors. (Ros-Tonen et al. 2018; van Oosten et al. 2018). While corridors serve different purposes (e.g., wildlife migration, landscape connectivity) they play a vital role for wildlife to cope with climate change impacts (e.g., water availability, drought). The cluster pinpoints some of the key regions of biodiversity concentration such as the Okavango Delta and the GLTFCA. Cluster one also indicates how the success of wildlife conservation in Africa has resulted in the abundance of large herbivores that require large habitats and spatial resources (van Aarde and Jackson 2007; Gaughan et al. 2019). Increased landscape fragmentation, and the abundance of wildlife have resulted in increased human-wildlife conflicts (HWC) (Loarie et al. 2009; Kansky et al. 2021). Predators (Meer et al. 2016; Cushman et al. 2018; Dures et al. 2019) and large herbivores (e.g., elephants) (Loarie et al. 2009; Tshipa et al. 2017; Kansky et al. 2021), are increasingly roaming into settlements and agricultural land (discourses, pastures), exacerbating these conflicts. On the other hand, increased human activities such as farming and settlement development (due to population growth) and poaching (Büscher and Ramutsindela 2015; Ntuli et al. 2021) challenge the survival of several key species (e.g. African savannah elephant and large carnivores) (Loarie et al. 2009; Loveridge et al. 2022; Searle et al. 2020). These human activities increase the vulnerability of wildlife and threaten wildlife populations due to habitat loss, fragmentation, and restricted movement (Loarie et al. 2009; Young and Van Aarde 2010). Key species, such as lions (*Panthera leo*) and elephants are particularly vulnerable to habitat fragmentation (e.g., due to fences) and poaching, which results in lower levels of genetic diversity (Dures et al. 2019; Loveridge et al. 2022; Searle et al. 2022). Therefore, conservation areas in Africa are essential to address these problems (Ramutsindela 2017; Cushman et al. 2018).

Cluster two: governance for biodiversity conservation

Cluster two illustrates the role of governance in biodiversity conservation and facilitating agricultural activities. It strongly illustrates the multi-actor, multi-tier, and multi-level characteristics of governing landscapes on the landscape scale (Dawson and Martin 2015; Elbakidze et al. 2010; Ros-Tonen et al. 2015; Visseren-Hamakers 2015). The growing demand for food and natural resources (e.g., rural land) has become a major driver for landscape change, affecting ecosystem services, rural land use, and livelihoods (Foli et al. 2018; Ros-Tonen et al. 2021). Approaches such as the integrated landscape approach have become instrumental in addressing these challenges in LG (Sayer et al. 2015; Arts et al. 2017; Angelstam et al. 2019). The integrated landscape approach is based on previous

efforts to reconcile conservation with agriculture, forestry, and other land uses (Pedroza-Arceo et al. 2022; Reed et al. 2020; Ros-Tonen et al. 2021). The need to balance multiple objectives, engage relevant actors equally and address power as well as gender imbalances across sectoral, jurisdictional, and administrative silos has resulted in the evolution of LG (Elbakidze et al. 2010; Kusters et al. 2018; Mugo et al. 2020). LG challenges underscore the strong need for (vertical and horizontal) integrated policies, since sectoral approaches have failed to adequately address so-called ‘wicked’ policy problems (such as biodiversity conservation, often ignoring the livelihood needs of the poor), and the need to address inequalities and trade-offs among competing and/or conflicting actor interest (e.g. biodiversity conservation, hunting, settlements agriculture, mining) (Foli et al. 2018; Ros-Tonen et al. 2018; Riggs et al. 2021). Consequently, different actors are expected to collaborate, co-produce novel knowledge and integrate different knowledge types (Elbakidze et al. 2010; Pedroza-Arceo et al. 2022). It shows that local actors have a wide range of tacit knowledge on ecosystem dynamics and management practices (Elbakidze et al. 2010; Ros-Tonen et al. 2015). Integrating different knowledge types is considered a complex process due to three main reasons (i) questioning of local knowledge by incumbent knowledge types like policy knowledge or scientific knowledge (ii) challenge of articulation and comprehension of tacit knowledge which is often not documented (iii) diverse perception of knowledge from indigenous groups with different, assumptions, rules and starting points (Dawson and Martin 2015; Elbakidze et al. 2010; Reed et al. 2019; Ros-Tonen et al. 2015). Hence, landscapes and communities require adaptive capacity to respond and adapt to changing conditions (Folke et al. 2005; Ros-Tonen et al. 2014).

Cluster three: TFCA wildlife connectivity

Cluster three addresses the role of TFCAs in various aspects of connectivity relating to habitats and ecosystems (Roever et al. 2013; Elliot et al. 2014; Sulistyawan et al. 2019; Omoding et al. 2020). Wildlife corridors are considered essential for ecological connectivity across borders in TFCAs. While connectivity is essential, the co-existence of humans and wildlife in TFCAs has resulted in cases pertaining to zoonotic diseases such as Brucellosis (Gomo et al. 2012), Bovine Tuberculosis (Caron et al. 2016) and Foot and Mouth Disease (Lazarus et al. 2021) which threaten the survival of species. Human interference is considered a contributing factor to landscape fragmentation which in turn disrupts connectivity while destroying wildlife habitats (Naidoo et al. 2018; Lines et al. 2021a, b). Human population growth further causes fragmentation through the establishment of more settlements and agricultural land (Elliot et al. 2014; Bradshaw and Leonard 2020; Petracca et al. 2020) raising concerns over potential negative biodiversity impacts (Roever et al. 2013; Sinthumule 2017). The degree of range loss, fragmentation, and dispersal amongst species emphasize the importance of corridors in maintaining and re-establishing connectivity to protect wildlife (Roever et al. 2013; Elliot et al. 2014). TFCA governance is constrained by inter-state differences, power imbalances, and institutional tensions which affect institutional alignment across legal systems to achieve wildlife connectivity (van Amerom and Büscher 2005). Property rights arrangements further underpin power relations and determine the possibilities for establishing TFCAs (Lenggenhager and Ramut-sindela 2021). Well-defined and recognized property rights provide a negotiation platform for TFCA establishment whilst unclear property rights create challenges, resistance, and disputes among actors, constraining the establishment of TFCAs (Lenggenhager and Ramut-sindela 2021; Sjöstedt and Linell 2021). While state-owned land has been instrumental

in the establishment of TFCAs, private land presents legal and financial constraints which make it difficult to negotiate in TFCA initiatives to enable wildlife connectivity (Sinthumule 2017; Lenggenhager and Ramutsindela 2021).

Cluster four: policies and strategies

Cluster four illustrates a strong institutional perspective on conservation that promotes the relevant role of policies and partnerships on landscape levels. The quest to foster integrated management of landscapes has sparked a growing interest in strategies like ecosystem-based management and eco-regional conservation planning (Olsson et al. 2004; Arts et al. 2017; Robinson and Kagombe 2018). They promote landscape resilience through afforestation, conserving indigenous forests, reducing deforestation, and improving access to clean energy (McNeely 2003; Murungweni et al. 2011; Kark et al. 2015). For policy and strategy development, different forms of partnerships between multiple actors are considered important (Olsson et al. 2004; Görg 2007). Partnerships establish interactions amongst actors from different sectors such as agriculture, forests, biodiversity, natural resource conservation to achieve multifunctional landscapes which provide food security, livelihood opportunities, and other ecosystem services such as carbon sequestration and cultural services (McNeely 2003; Plieninger and Bieling 2012; Arts et al. 2017; Kalvelage et al. 2021; van Oosten et al. 2021). In both LG and TFCAs, those partnerships must permeate political boundaries to establish and institutionalize the collaboration of actors spanning political borders if conservation approaches are to be effective (Kark et al. 2015; Njoroge et al. 2020). In TFCAs, partnerships are crucial for the conservation of flagship species (e.g., rhinos, elephants, leopards, lions, and buffalos) that require large areas for migration and also to secure genetic diversity (Lunstrum 2015; Purdon et al. 2018). The co-existence of humans and wildlife is an important concern in landscape management. Planners and conservation practitioners are increasingly faced with the challenge of reconciling past mistakes and developing governance and conservation strategies that respect different bundles of property rights of local communities. (Chirozva et al. 2013; Pricope et al. 2020). At this point, formal plans, strategies, and institutions must also meet informal norms, rules, and customs and form area-based co-management arrangements, that deliver the required integration. They are based on sharing of power and responsibilities between the government, communities, and local resource users, which is essential for joint learning and knowledge co-creation to sustainably manage the shared resources (Olsson et al. 2004; Kark et al. 2015; Portman and Teff-Seker 2017).

Cluster five: political ecology

Cluster five, ‘Political Ecology’, addresses power asymmetry, scale politics, decision making, and decentralised institutions (Görg 2007; Chiutsi and Saarinen 2017; Njoroge et al. 2020), as core characteristics. It focuses on shaping relationships and acknowledges the role of power relations condition in the creation, management, and governance of nature by different actors. (Büscher 2013; Buizer et al. 2016). Hence it recognises the political dimension as a formative element of governance arrangements and decision making (Görg 2007; Ide 2019; Linell et al. 2019; Movik et al. 2021). In this narrative, particular attention is paid to how the local actors are overlooked in instances of decision making and governance related issues (Castella et al. 2014; van Oosten et al. 2018). The socio-political relevance of local actors has become widely

accepted and requires hybrid or polycentric institutional arrangements. There is a growing demand for authentic involvement of local and indigenous communities in decision making processes. This demand has strengthened their calls for official recognition of their territories and their rights to land and resources (Görg 2007; Plieninger et al. 2015; Chiutsi and Saarinen 2017; Movik et al. 2021). This is of particular importance in transboundary settings, that tie together different countries, institutional systems, legal instruments, and land-tenure systems (van Amerom and Büscher 2005; Lejano 2006; Munthali 2007). These transboundary settings can cause power struggles and/or power imbalances within and between different spatial and administrative scales and social entities/or communities (Lunstrum 2014; Sinthumule 2017). Hence, there is a need for continual improvement and development of novel transboundary governance approaches that support mutable, non-territorial structures and relationships among involved actors, rights- and title holders (Duffy 2006). However, a strand of literature in this cluster illustrates these challenges in the context of Southern African countries particularly those in the Southern African Development Community (SADC) region (Chiutsi and Saarinen 2017; Sinthumule 2017; Njoroge et al. 2020). It also focuses on the notion that TFCAs provide integrated management for regions that have encountered political conflicts and still experience tensions, whilst cooperating in transboundary conservation actions such as re-establishing migration routes (Purdon et al. 2018; Meyer et al. 2022). TFCAs are considered as frameworks that have been implemented to foster integration of biodiversity conservation and rural development to alleviate poverty which results in peaceful co-existence between countries (Milgroom et al. 2014; Ide 2019).

Cluster six: management of protected areas

Cluster six, ‘Management of Protected Areas’ revolves around ecosystem-based management (Robinson and Kagombe 2018), adaptive management (Riggs et al. 2021; Gonçalves and Pinho 2022), and the integrated management of natural resources and/or landscapes (Nzyoka et al. 2021; Ros-Tonen et al. 2021; Amaruzaman et al. 2022). It emphasises that integrated management approaches are essential for balancing environmental demands, land-use options, and socio-economic pressures (Acheampong et al. 2016) and that they contribute to conflict resolution (Amaruzaman et al. 2022). Integrated management strategies are considered to counteract habitat and ecosystem fragmentation and support the conservation of key species such as leopards and lions (Curveira-Santos et al. 2021; Rogan et al. 2022; Sultan et al. 2022) as well as key migratory species like elephants (van Aarde and Jackson 2007; Gross et al. 2022). Increasing pressure from developments like housing or infrastructure around protected areas such as TFCAs further strain human-wildlife relations in developing nations (Selier et al. 2016; Mpakairi et al. 2019). In addition to pursuing conscious land-use, knowledge of migratory routes and migratory connectivity are essential for developing and implementing governance strategies (Lines et al. 2021b; Tshipa et al. 2017). In TFCAs and various protected areas, one specific governance approach which increases tolerance to wildlife is community-based natural resource management which provides more sustainable mechanisms to live with wildlife (Kalvelage et al. 2021; Meyer et al. 2022). However, the possible establishment of such an approach hinge on the successful negotiations with property rights holders (Lenggenhager and Ramutsindela 2021).

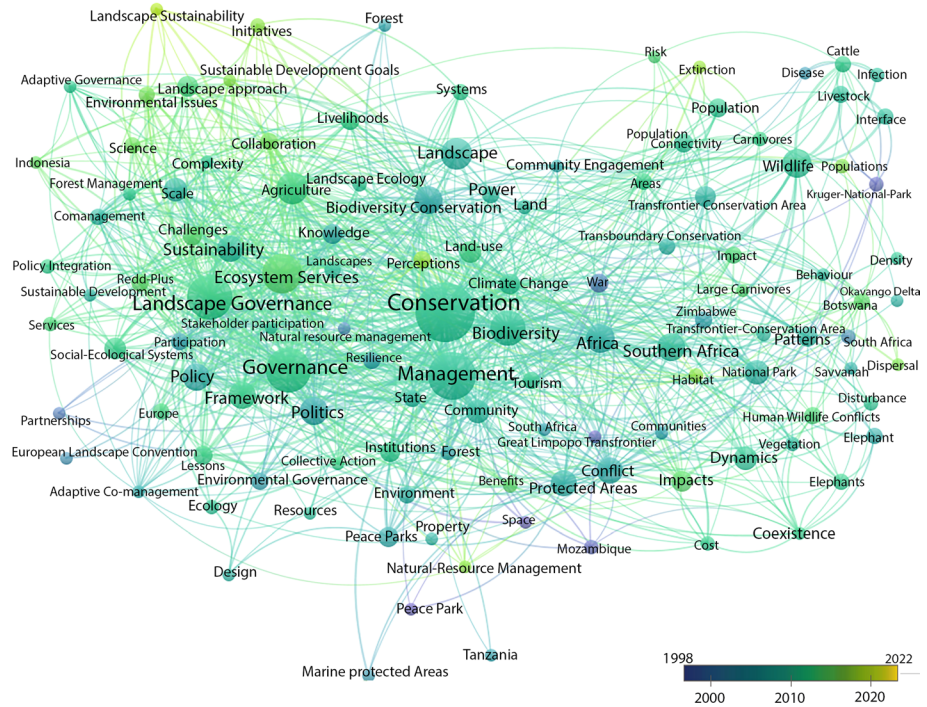


Fig. 5 The diagram shows an overlay visualisation of keywords for both LG and TFCA discourses from 1998 to 2022

Changes in the discourses over time

The analysis illustrates how the discourses have been changing over time based on the emerging topics within the publication timeline (Fig. 5). Both examined research discourses are strongly rooted in the topic of ‘conservation’ which is at the centre of the co-occurrence map. The oldest keywords within these two discourses address topics such as ‘Peace Park’, ‘Great Limpopo Transfrontier’, ‘Mozambique’, ‘Kruger-National Park’, ‘South Africa’, ‘Zimbabwe’, ‘War’, ‘Natural resource management’, ‘Disease’ and ‘Space’ in clusters one and three. The map shows that these topics emerged between 1998 and 2005. Between 2005 and 2015, a number of newly emerging topics gained significant influence as indicated by their node size and total link strength. Some noteworthy keywords in this period include, ‘landscape governance’, ‘governance’, ‘management’, ‘landscape’, ‘policy’, ‘politics’, ‘landscape’, and others. The analysis also shows that a large proportion of the latest emerging topics post-2015 are attributed to cluster two (Governance for Biodiversity Conservation) which is mainly rooted in the LG discourse. This cluster has the second largest number of keywords (23) assigned to it with eight of the keywords emerging as recent topics. These include ‘ecosystem services’, ‘initiatives’, ‘landscape sustainability’, ‘environmental issues’, ‘collaboration’, ‘redd-plus’, ‘Indonesia’, and ‘sustainable development’. The topic ‘ecosystem services’ had the highest level of occurrence as an emerging keyword within cluster two. In the TFCA discourse, some of the recent emerging topics post-2015 include: ‘Botswana’, ‘impacts’, ‘populations’, ‘benefits’, ‘natural-resource

management’, ‘risk’, ‘extinction’, and ‘dispersal’. These topics within TFCA are only encompassed in clusters one (African Wildlife Conservation) and three (TFCA Wildlife Connectivity).

Discussion

The discourses of LG and TFCA represent two distinct yet interconnected approaches to addressing conservation and landscape management. While both aim to foster sustainable land use and conservation, they exhibit both commonalities and differences in their conceptual frameworks, objectives, and practical implementations.

Commonalities and differences between the discourses represented in the clusters

Results show that the key commonalities between LG and TFCA discourses are (i) conservation, (ii) power, and (iii) actor roles. Both discourses underscore the essence of conservation which is central to TFCA and LG objectives relevant in clusters one, two, three, and four (Mugo et al. 2020; Ros-Tonen et al. 2021; van Oosten et al. 2021). Qualitative content analysis indicates that clusters two (Governance for Biodiversity Conservation), and four (Policies and Strategies) which lean towards LG share commonalities with clusters one (African Wildlife Conservation) and three (TFCA Wildlife Connectivity) which lean towards TFCA. The conservation aspect within clusters two and four pertains to the sustainable management of natural resources and ecosystems within various regions and landscapes (urban, rural, agriculture) (Ros-Tonen et al. 2014; Buizer et al. 2016; Carta et al. 2022). This is because the conservation aspects in LG are not constrained to one specific landscape but include a wide range with focus on resources such as water, forests, and biospheres (Robinson and Kagombe 2018; Hedden-Dunkhorst and Schmitt 2020; Best et al. 2021). In the TFCA discourse, which is mainly reflected in clusters one and three, conservation is expressed in transboundary contexts between multiple countries to protect biodiversity and promote sustainable development (Sinthumule 2017; Lenggenhager and Ramutsindela 2021). Conservation efforts in TFCA and LG however require navigating intricate power dynamics among diverse actors. Power is a common topic that is explored in discourses around TFCA and LG, represented in cluster five (Görg 2007; Ros-Tonen et al. 2018; Mugo et al. 2020). Articles highlighting power struggles in TFCAs are mainly related to two aspects: the distribution of property rights (Sinthumule 2017; Lenggenhager and Ramutsindela 2021) and on the other hand, the colonial history and legacies which play a significant role in shaping previous and current power dynamics within TFCAs (Sibanda 2015; Chiutsi and Saarinen 2017; Bourgeois et al. 2023). In LG discourses ‘power’ is strongly connected to aspects of actor-constellations and their roles and capacities in and resources for agenda-setting and decision-making processes (Lazdinis et al. 2019; Mugo et al. 2020; Amaruzaman et al. 2022). These diverse actor constellations play a crucial part in navigating competing and conflicting interests (Robinson and Kagombe 2018; Reed et al. 2019). The analysis shows that the roles of actors are well-established in both discourses: clusters one, two, three, and five acknowledge the relevance of involving different actor groups, indigenous communities in LG and/or TFCA management (Ros-Tonen et al. 2014; Langston et al. 2017; Best et al. 2021). They also hold specific knowledge types and expertise, relevant to ‘re-solve’ wicked problems (addressed in cluster two) and contribute ideas and strategies for sustainable development (Robinson and Kagombe 2018; Reed et al.

2020; Best et al. 2021). This ultimately leads to sustainable outcomes that consider the diverse array of factors at play within different landscape contexts. 2021).

Results also revealed disparities between the two discourses. Despite LG's acknowledgment of the importance of collaboration and coordination amongst diverse actors (Opdam et al. 2016; Njoroge et al. 2020) the discourse falls short in terms of transboundary settings. While LG has found application across various contexts which include forests, agriculture, urban areas, and water, TFCAs have been notably absent from these discussions. This is related to the geographic focus (see Fig. 3, e.g., Australia, Europe, North America), where transboundary governance settings are or have been a lesser issue yet (e.g., Europe: with few numbers of transboundary nature conservation areas, particularly not on the scale of those in Africa). Given the increasing numbers of migratory large carnivores which traverse various protected areas (on national scale) particularly in Europe (e.g., Wolves, Brown Bear, Eurasian and Iberian lynx) and the associated wildlife-human conflicts (e.g., conflicts on livestock predation, tourism) (Ordiz et al. 2013; Bautista et al. 2019; Martínez-Abraín et al. 2023), European discourses can benefit from long-standing practise experience and academic knowledge from African large-scale protected areas. The increased call for rewilding approaches in Europe and North America (Trouwborst et al. 2017; Thulin and Röcklinsberg 2020; Papp et al. 2022), points to the relevance of learning from the TFCA literature and better linking these discourses. The TFCA-related discourses can be beneficial, emphasizing the need for addressing challenges arising from cross-country and cross-institutional collaborations and dealing with human-wildlife-coexistence in formerly human-dominated landscapes (Dressler and Büscher 2008; Chitakira et al. 2012; Muboko 2017).

Cluster two and four which are more inclined towards LG exhibit a strong governance focus. The qualitative content analysis highlights concepts such as adaptive governance, knowledge co-creation, and collaborative governance (Elbakidze et al. 2010; Dawson and Martin 2015; Ros-Tonen et al. 2015; Reed et al. 2019). Considering the diverse and intricate scenarios in which LG has been employed, effective governance approaches become imperative for managing conflicting interests within these landscapes (Ros-Tonen et al. 2018; van Oosten et al. 2021). Contrary to this discovery, clusters one (African Wildlife Conservation) and three (TFCA Wildlife Connectivity) are embedded in discourses strongly rooted in plant and wildlife ecology. Hence our results indicate a potential blind spot of LG on these issues. Considering the prevalence of governance-related challenges in TFCAs emanating from poor coordination and incoherent policies, LG can be essential in addressing these challenges due to its strong focus on (horizontal and vertical) coordination (Beunen and Opdam 2011; van Oosten et al. 2021). Conversely, TFCA can be essential in addressing challenges emanating from wildlife or cross-border (intra and international) issues adequately. Therefore, there is need for cross-fertilization of these two discourses to fully leverage the strategies, principles, and models that either of the discourses offer.

From conservation-centric to holistic approaches

Over the past years, topics within LG and TFCA have evolved increasing the scope, focus, and relevance of the discourses. The results from our visual overlay (Fig. 5) show that the discourses have evolved from a conservation-centred approach (Barnard et al. 1998; Westing 1998) to more integrated and holistic approaches in conservation (Chiutsi and Saarinen 2017; Sari et al. 2019; Best et al. 2021). This acknowledges the intertwined relationships between people and the environment (Chiutsi and Saarinen 2017; Sari et al. 2019; Best et al. 2021). Our findings correspond with previous work, such as

Mace (2014) emphasizing that conservation incrementally shifted from ‘nature itself’ towards ‘people and nature’ (e.g., expressed in cluster four) thus illustrating a conceptual reframing of nature conservation towards more contemporary understandings of human-nature relationships (Flint et al. 2013; Mace 2014; Braito et al. 2017). The integration of the ‘human’ dimension is further expressed by the reoccurring themes such as ‘initiatives’, ‘collaboration’, ‘sustainable development goals’, and ‘landscape sustainability’. They demonstrate the evolution towards “people and nature” emphasizing more recent themes such as the links between human well-being and nature conservation (Ros-Tonen et al. 2015; Westerink et al. 2017). This evolution towards a more holistic approach has resulted in numerous practical applications (e.g., integrated land-use planning; community engagement and participation; ecosystem-based management) which entail the design and implementation of more inclusive conservation strategies (Visseren-Hamakers 2015; Gaughan et al. 2019; Chitakira et al. 2022). Furthermore, the evolution to a more holistic approach has driven the adoption of LG frameworks that facilitate the interplay between conservation and human activities (Flint et al. 2013; Braito et al. 2017; Sari et al. 2019; Best et al. 2021).

LG prominence in global North, TFCA in Southern Africa

Geographic location also plays a significant role in the publication output in both discourses. The publication distribution from the identified clusters shows that LG debates are strongly rooted in the global North. This is also due to robust governance, institutional structures, and well-established land use planning systems embedded in the spatial planning traditions of these countries (Plieninger et al. 2015; Wallner et al. 2017). Additionally, conventions in the global North such as the European Landscape Convention, played a significant role in advancing the concept of LG and human-nature relatedness (Pătru-Stupariu and Nita 2022). On the other hand, TFCA discourses reflect a Southern African-centred debate due to the region’s higher concentration of TFCAs compared to any other region globally. Hence Southern Africa has been at the forefront of transboundary conservation initiatives, emphasizing cross-border cooperation and collaboration (Duffy 2006; Chiutsi and Saarinen 2017). The difference and prominence of the LG debate in the global North and the TFCAs debate in Southern Africa are a result of response to the unique regional challenges, priorities, and approaches to landscape management and conservation. Whilst both academic discourses share common goals of sustainability and collaboration, their specific emphasis and strategies vary based on the regional context and the unique characteristics of the landscapes involved. With the growing concern of governance challenges within TFCAs in Southern Africa (Bhatasara et al. 2013; Chitakira et al. 2022) and the increasing wildlife population in the global North particularly carnivores (Trouwborst 2015), policymakers are calling for the establishment of transboundary conservation areas hence there is need for exchange of knowledge across these specific regions (Trouwborst et al. 2017; Papp et al. 2022). Principles developed in the context of TFCAs, which primarily focus on cross-border conservation across national boundaries, can be expanded beyond the cross-border context. LG can benefit from adopting these principles to address challenges arising in different landscapes where natural features serve as borders across a range of scenarios such as international, regional, or local. This cross-fertilization of knowledge, strategies, and practices can potentially enhance the efficacy of conservation and landscape management at the conceptual and practical levels.

Conclusion

The present paper investigates the narratives in the LG and TFCA discourses, and their commonalities and differences. The meta-analysis of 72 research articles resulted in six distinct narratives that are fuelled by debates on nature conservation, wildlife, governance, and integrated management. While the TFCA discourse has strong roots in conservation and ecological perspectives, it also acknowledges challenges such as human-wildlife relationships and conflicts. These topics are crucial for achieving the core objectives of TFCAs, particularly in relation to biodiversity, ecosystem management, and long-term conservation. However, they have so far fallen short of the actor and governance-oriented objectives of TFCAs, such as adaptive governance, learning, and knowledge co-creation. LG scholars have created robust knowledge and expertise on precisely these topics, which makes it sensible to bridge these discourses. At the same time, this bridging requires caution and sensitivity to whether their context is a good fit and suitable in other socio-cultural contexts, avoiding stereotype North–South ‘lecturing’.

LG has a strong foundation in the scholarly debates in the global North and should therefore not be adopted on a par-for-par basis in other socio-cultural and institutional contexts. In addition, LG has so far paid very modest to almost no attention to issues of transboundary and transfrontier landscapes, which we have identified as a blind spot in the LG discourse. On the other hand, the TFCA scholarship provides extensive knowledge and academically reflects experiences on human-wildlife conflicts, co-existence, and transboundary cooperation. These key issues are highly topical and relevant, at least in the current European context, where policy and conservation practice are confronted with increasing human-wildlife conflicts and require re-establishing the co-existence of humans with carnivores. This not only concerns issues such as livestock/herd protection, nature conservation, and tourism but also the management of (previously) human-dominated landscapes (e.g. (abandoned) alpine pasture systems). Increased efforts in rewilding in the European context make this South-North knowledge transfer particularly relevant. While this study specifically focused on LG and TFCA the results suggest the incremental integration of different approaches and scholarly debates. The results show that more recent topics focus on knowledge co-creation, indigenous knowledge, social equity, ecosystem services, learning, and climate change adaptation. Hence, other scholarly debates and conceptual approaches, such as environmental governance (Wilson 2019; Ruan et al. 2022), rewilding (Root-Bernstein et al. 2018) or transdisciplinarity (Gugerell et al. 2023), will become more prominent in the future. A potential next step would be to explore potential niches for integration of either of the discourses in practice as case studies.

Supplementary Information The online version contains supplementary material available at <https://doi.org/10.1007/s10531-023-02720-w>.

Author contributions EM: Conceptualisation, Data curation, and analysis, Writing—Original Draft; Conceptualisation. WM: Conceptualisation, Methodology, Writing—Review and Editing, Supervision. VRP: Writing—Review and Editing, Supervision. MP Validation, Writing—Review and Editing. KG: Conceptualisation, Methodology, Writing—Review and Editing, Supervision.

Funding Open access funding provided by University of Natural Resources and Life Sciences Vienna (BOKU). The authors have not disclosed any funding.

Data availability Data available on request.

Declarations

Competing interests The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Ethical approval Not Applicable.

Open Access This article is licensed under a Creative Commons Attribution 4.0 International License, which permits use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons licence, and indicate if changes were made. The images or other third party material in this article are included in the article's Creative Commons licence, unless indicated otherwise in a credit line to the material. If material is not included in the article's Creative Commons licence and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this licence, visit <http://creativecommons.org/licenses/by/4.0/>.

References

- Acheampong E, Insaioo TFG, Ros-Tonen MAF (2016) Management of Ghana's modified taungya system: challenges and strategies for improvement. *Agrofor Syst* 90(4):659–674. <https://doi.org/10.1007/s10457-016-9946-7>
- Amaruzaman S et al (2022) Polycentric environmental governance to achieving SDG 16: evidence from Southeast Asia and Eastern Africa. *Forests* 13(1):68. <https://doi.org/10.3390/f13010068>
- Angelstam P et al (2013) Measurement, collaborative learning and research for sustainable use of ecosystem services: landscape concepts and Europe as laboratory. *Ambio* 42(2):129–145. <https://doi.org/10.1007/s13280-012-0368-0>
- Angelstam P, Munoz-Rojas J, Pinto-Correia T (2019) Landscape concepts and approaches foster learning about ecosystem services. *Landsc Ecol* 7:1445–1460. <https://doi.org/10.1007/s10980-019-00866-z>
- Arts B et al (2017) Landscape approaches: a state-of-the-art review. *Ann Rev Environ Resour* 42(1):439–463. <https://doi.org/10.1146/annurev-environ-102016-060932>
- Bammer G, Michaux A, Sanson A (2010) Bridging the 'Know-Do' Gap: knowledge brokering to improve child wellbeing. ANU Press, Acton
- Barnard P et al (1998) Extending the Namibian protected area network to safeguard hotspots of endemism and diversity. *Biodivers Conserv* 7(4):531–547. <https://doi.org/10.1023/A:1008831829574>
- Bautista C et al (2019) Large carnivore damage in Europe: analysis of compensation and prevention programs. *Biol Conserv* 235:308–316. <https://doi.org/10.1016/j.biocon.2019.04.019>
- Bennett NJ, Satterfield T (2018) Environmental governance: a practical framework to guide design, evaluation, and analysis. *Conserv Lett* 11(6):e12600. <https://doi.org/10.1111/conl.12600>
- Best L et al (2021) Toward inclusive landscape governance in contested landscapes: exploring the contribution of participatory tools in the upper Suriname river basin. *Environ Manag* 68(5):683–700. <https://doi.org/10.1007/s00267-021-01504-8>
- Beunen R, Opdam P (2011) When landscape planning becomes landscape governance, what happens to the science? *Landsc Urban Plan* 100(4):324–326. <https://doi.org/10.1016/j.landurbplan.2011.01.018>
- Bhatasara S, Nyamwanza AM, Kujinga K (2013) Transfrontier parks and development in southern Africa: the case of the Great Limpopo Transfrontier Park. *Dev South Afr* 30(4–5):629–639. <https://doi.org/10.1080/0376835X.2013.837377>
- Bourgeois R et al (2023) Using anticipation to unveil drivers of local livelihoods in transfrontier conservation areas: a call for more environmental justice. *People Nat* 5(2):726–741. <https://doi.org/10.1002/pan3.10446>
- Bradshaw K, Leonard B (2020) Virtual parceling. *Int J Commons* 14(1):597–610. <https://doi.org/10.5334/ijc.981>
- Braitto MT et al (2017) Human-nature relationships and linkages to environmental behaviour. *Environ Values* 26(3):365–389. <https://doi.org/10.3197/096327117X14913285800706>
- Buizer M, Arts B, Westerink J (2016) Landscape governance as policy integration “from below”: a case of displaced and contained political conflict in the Netherlands. *Environ Plan c: Gov Policy* 34(3):448–462. <https://doi.org/10.1177/0263774X15614725>

- Büscher B (2013) Transforming the frontier: peace parks and the politics of neoliberal conservation in Southern Africa. Duke University Press, Durham
- Büscher B, Ramutsindela M (2015) Green violence: rhino poaching and the war to save Southern Africa's peace parks. *Afr Aff*. <https://doi.org/10.1093/afraf/adv058>
- Caron A et al (2016) African buffalo movement and zoonotic disease risk across transfrontier conservation areas, Southern Africa. *Emerg Infect Dis* 22(2):277–280. <https://doi.org/10.3201/eid2202.140864>
- Carta M, Gisotti MR, Lucchesi F (2022) Settlements and urban morphological quality in landscape planning—analytical models and regulating tools in the landscape plan of Regione Toscana. *Sustainability* 14(3):1851. <https://doi.org/10.3390/su14031851>
- Castella JC et al (2014) A model of the science–practice–policy interface in participatory land-use planning: lessons from Laos. *Landsc Ecol* 29(6):1095–1107. <https://doi.org/10.1007/s10980-014-0043-x>
- Chirozva C, Mukamuri BB, Manjengwa J (2013) Using scenario planning for stakeholder engagement in livelihood futures in the Great Limpopo transfrontier conservation area. *Dev South Afr* 30(6):771–788. <https://doi.org/10.1080/0376835X.2013.859065>
- Chitakira M, Torquebiau E, Ferguson W (2012) Community visioning in a transfrontier conservation area in Southern Africa paves the way towards landscapes combining agricultural production and biodiversity conservation. *J Environ Plann Manag* 55(9):1228–1247. <https://doi.org/10.1080/09640568.2011.640149>
- Chitakira M et al (2022) Opportunities to improve eco-agriculture through transboundary Governance in transfrontier conservation areas. *Diversity* 14(6):461. <https://doi.org/10.3390/d14060461>
- Chiutsi S, Saarinen J (2017) Local participation in transfrontier tourism: case of Sengwe community in Great Limpopo Transfrontier Conservation Area, Zimbabwe. *Dev South Afr* 34(3):260–275. <https://doi.org/10.1080/0376835X.2016.1259987>
- Cruz-Garcia GS et al (2017) To what extent have the links between ecosystem services and human well-being been researched in Africa, Asia, and Latin America? *Ecosyst Serv* 25:201–212. <https://doi.org/10.1016/j.ecoser.2017.04.005>
- Curveira-Santos G et al (2021) Mesocarnivore community structuring in the presence of Africa's apex predator. *Proc Royal Soc B Biol Sci* 288:20202379. <https://doi.org/10.1098/rspb.2020.2379>
- Cushman SA et al (2018) Prioritizing core areas, corridors and conflict hotspots for lion conservation in southern Africa. *PLoS ONE* 13(7):e0196213. <https://doi.org/10.1371/journal.pone.0196213>
- Dawson N, Martin A (2015) Assessing the contribution of ecosystem services to human wellbeing: a disaggregated study in western Rwanda. *Ecol Econ* 117:62–72. <https://doi.org/10.1016/j.ecolecon.2015.06.018>
- den Uyl RM, Driessen PJP (2015) Evaluating governance for sustainable development—insights from experiences in the Dutch fen landscape. *J Environ Manag* 163:186–203. <https://doi.org/10.1016/j.jenvman.2015.08.022>
- Diwan H, Amarayil Sreeraman B (2023) From financial reporting to ESG reporting: a bibliometric analysis of the evolution in corporate sustainability disclosures. *Environ Dev Sustain*. <https://doi.org/10.1007/s10668-023-03249-2>
- Donthu N et al (2021) How to conduct a bibliometric analysis: an overview and guidelines. *J Business Res* 133:285–296. <https://doi.org/10.1016/j.jbusres.2021.04.070>
- Dressler W, Büscher B (2008) Market triumphalism and the CBNRM “crises” at the South African section of the Great Limpopo Transfrontier Park. *Geoforum* 39(1):452–465. <https://doi.org/10.1016/j.geoforum.2007.09.005>
- Duffy R (2006) The potential and pitfalls of global environmental governance: the politics of transfrontier conservation areas in Southern Africa. *Political Geogr* 25(1):89–112. <https://doi.org/10.1016/j.polgeo.2005.08.001>
- Dures SG et al (2019) A century of decline: Loss of genetic diversity in a southern African lion-conservation stronghold. *Divers Distrib* 25(6):870–879. <https://doi.org/10.1111/ddi.12905>
- Elbakidze M et al (2010) Multi-stakeholder collaboration in Russian and Swedish model forest initiatives: adaptive governance toward sustainable forest management? *Ecol Soc*. <https://doi.org/10.5751/ES-03334-150214>
- Ellegaard O, Wallin JA (2015) The bibliometric analysis of scholarly production: How great is the impact? *Scientometrics* 105(3):1809–1831. <https://doi.org/10.1007/s11192-015-1645-z>
- Elliot NB et al (2014) The devil is in the dispersers: predictions of landscape connectivity change with demography. *J Appl Ecol* 51(5):1169–1178. <https://doi.org/10.1111/1365-2664.12282>
- Falagas ME et al (2008) Comparison of PubMed, Scopus, Web of Science, and Google Scholar: strengths and weaknesses. *FASEB J* 22(2):338–342. <https://doi.org/10.1096/fj.07-9492LSF>

- Flint CG et al (2013) Exploring empirical typologies of human–nature relationships and linkages to the ecosystem services concept. *Landsc Urb Plann* 120:208–217. <https://doi.org/10.1016/j.landurbplan.2013.09.002>
- Foli S et al (2018) Natural resource management schemes as entry points for integrated landscape approaches: evidence from Ghana and Burkina Faso. *Environ Manag* 62(1):82–97. <https://doi.org/10.1007/s00267-017-0866-8>
- Folke C et al (2005) Adaptive governance of social-ecological systems. *Ann Rev Environ Resour*. <https://doi.org/10.1146/annurev.energy.30.050504.144511>
- Freeman OE, Duguma LA, Minang PA (2015) Operationalizing the integrated landscape approach in practice. *Ecol Soc* 20(1):24. <https://doi.org/10.5751/ES-07175-200124>
- Gaughan A et al (2019) Operationalizing vulnerability: land system dynamics in a transfrontier conservation area. *Land* 8(7):111. <https://doi.org/10.3390/land8070111>
- Gellert PK (2022) Forest conservation and sustainability in Indonesia: a political economy study of international governance failure. *J Contemp Asia* 52(2):343–346. <https://doi.org/10.1080/00472336.2021.1890802>
- Gomo C et al (2012) Survey of brucellosis at the wildlife–livestock interface on the Zimbabwean side of the Great Limpopo transfrontier conservation area. *Trop Anim Health Prod* 44(1):77–85. <https://doi.org/10.1007/s11250-011-9890-5>
- Gonçalves C, Pinho P (2022) In search of coastal landscape governance: a review of its conceptualisation, operationalisation and research needs. *Sustain Sci*. <https://doi.org/10.1007/s11625-022-01147-6>
- Görg C (2007) Landscape governance. *Geoforum* 38(5):954–966. <https://doi.org/10.1016/j.geoforum.2007.01.004>
- Gross EM et al (2022) Exploring routes to coexistence: developing and testing a human–elephant conflict-management framework for African elephant-range countries. *Diversity* 14(7):525. <https://doi.org/10.3390/d14070525>
- Gugerell K, Radinger-Peer V, Penker M (2023) Systemic knowledge integration in transdisciplinary and sustainability transformation research. *Futures* 150:103177. <https://doi.org/10.1016/j.futures.2023.103177>
- Hanks J (2003) Transfrontier conservation areas (TFCAs) in Southern Africa. *J Sustain for* 17(1–2):127–148. https://doi.org/10.1300/J091v17n01_08
- Hanks J, Myburgh W (2015) The evolution and progression of transfrontier conservation areas in the Southern African development community. In: van der Duim R, Lamers M, van Wijk J (eds) *Institutional arrangements for conservation development and tourism in Eastern and Southern Africa*. Springer, Dordrecht, pp 157–179
- Hedden-Dunkhorst B, Schmitt F (2020) Exploring the potential and contribution of UNESCO biosphere reserves for landscape governance and management in Africa. *Land*. <https://doi.org/10.3390/LAND9080237>
- Herrera-Franco G et al (2021) Worldwide research on geoparks through bibliometric analysis. *Sustainability* 13(3):1175. <https://doi.org/10.3390/su13031175>
- Hoole A, Berkes F (2010) Breaking down fences: recoupling social–ecological systems for biodiversity conservation in Namibia. *Geoforum* 41(2):304–317. <https://doi.org/10.1016/j.geoforum.2009.10.009>
- Howlett M, Ramesh M (2014) The two orders of governance failure: design mismatches and policy capacity issues in modern governance. *Policy Soc* 33(4):317–327. <https://doi.org/10.1016/j.polsoc.2014.10.002>
- Ide T (2019) The impact of environmental cooperation on peacemaking: definitions, mechanisms, and empirical evidence. *Int Stud Rev* 21(3):327–346. <https://doi.org/10.1093/isr/viy014>
- Ingram J (2018) Agricultural transition: Niche and regime knowledge systems’ boundary dynamics. *Environ Innov Soc Transit* 26:117–135. <https://doi.org/10.1016/j.eist.2017.05.001>
- Jessop B (2023) Governance failure, metagovernance failure, and the pedagogy of failure. In: Mica A, Horolets A, Pawlak M, Kubicki P (eds) *Routledge international handbook of failure*. Routledge, London, pp 237–251
- Jordan J et al (2017) Collaboration patterns as a function of article genre among mixed researchers: a mixed methods bibliometric study. *J Educ Issues* 3(1):83. <https://doi.org/10.5296/jei.v3i1.10699>
- Kalvelage L, Revilla Diez J, Bollig M (2021) Do tar roads bring tourism? Growth corridor policy and tourism development in the Zambezi region, Namibia. *Eur J Dev Res* 33(4):1000–1021. <https://doi.org/10.1057/s41287-021-00402-3>
- Kansky R, Kidd M, Fischer J (2021) Understanding drivers of human tolerance towards mammals in a mixed-use transfrontier conservation area in southern Africa. *Biol Conserv* 254:108947. <https://doi.org/10.1016/j.biocon.2020.108947>

- Kark S et al (2015) Cross-boundary collaboration: key to the conservation puzzle. *Curr Opin Environ Sustain* 12:12–24. <https://doi.org/10.1016/j.cosust.2014.08.005>
- Kostov P, Lingard J (2004) Integrated rural development-do we need a new approach?
- Kuckartz U (2019) Qualitative content analysis: from Kracauer's beginnings to today's challenges. *Qual Sozialforschung Forum Qual Soc Res* 20(3):1–20. <https://doi.org/10.17169/fqs-20.3.3370>
- Kusters K et al (2018) Participatory planning, monitoring and evaluation of multi-stakeholder platforms in integrated landscape initiatives. *Environ Manag* 62(1):170–181. <https://doi.org/10.1007/s00267-017-0847-y>
- Lang DJ et al (2012) Transdisciplinary research in sustainability science: practice, principles, and challenges. *Sustain Sci* 7(S1):25–43. <https://doi.org/10.1007/s11625-011-0149-x>
- Langston J et al (2017) Estate crops more attractive than community forests in West Kalimantan, Indonesia. *Land* 6(1):12. <https://doi.org/10.3390/land6010012>
- Lazarus DD et al (2021) Improving foot-and-mouth disease control through the evaluation of goat movement patterns within the FMD protection zone of South Africa. *Small Rumin Res* 201:106448. <https://doi.org/10.1016/j.smallrumres.2021.106448>
- Lazdinis M, Angelstam P, Püzl H (2019) Towards sustainable forest management in the European Union through polycentric forest governance and an integrated landscape approach. *Landsc Ecol* 34(7):1737–1749. <https://doi.org/10.1007/s10980-019-00864-1>
- Lejano RP (2006) Theorizing peace parks: two models of collective action. *J Peace Res* 43(5):563–581. <https://doi.org/10.1177/0022343306066565>
- Lemos MC, Agrawal A (2006) Environmental governance. *Ann Rev Environ Resour* 31(1):297–325. <https://doi.org/10.1146/annurev.energy.31.042605.135621>
- Lenggenhager L, Ramutsindela M (2021) Property killed a peace park dream: the entanglement of property, politics and conservation along the Gariep. *Land Use Policy* 105:105392. <https://doi.org/10.1016/j.landusepol.2021.105392>
- Levin N et al (2018) Evaluating the potential for transboundary management of marine biodiversity in the Western Indian Ocean. *Australas J Environ Manag* 25(1):62–85. <https://doi.org/10.1080/14486563.2017.1417167>
- Li K, Rollins J, Yan E (2018) Web of science use in published research and review papers 1997–2017: a selective, dynamic, cross-domain, content-based analysis. *Scientometrics* 115(1):1–20. <https://doi.org/10.1007/s11192-017-2622-5>
- Liberati A et al (2009) The PRISMA statement for reporting systematic reviews and meta-analyses of studies that evaluate health care interventions: explanation and elaboration. *J Clin Epidemiol* 62(10):e1–e34. <https://doi.org/10.1016/j.jclinepi.2009.06.006>
- Linell A, Sjöstedt M, Sundström A (2019) Governing transboundary commons in Africa: the emergence and challenges of the Kavango-Zambezi Treaty. *Int Environ Agreements: Politics Law Econ* 19(1):53–68. <https://doi.org/10.1007/s10784-018-9420-2>
- Lines R, Bormpoudakis D, Xofis P, Tzanopoulos J (2021a) Modelling multi-species connectivity at the Kafue-Zambezi interface: implications for transboundary carnivore conservation. *Sustainability* 13(22):12886. <https://doi.org/10.3390/su132212886>
- Lines R, Bormpoudakis D, Xofis P, MacMillan DC et al (2021b) Utility of human footprint pressure mapping for large carnivore conservation: the Kafue-Zambezi interface. *Sustainability* 14(1):116. <https://doi.org/10.3390/su14010116>
- Loarie SR, van Aarde RJ, Pimm SL (2009) Fences and artificial water affect African savannah elephant movement patterns. *Biol Conserv* 142(12):3086–3098. <https://doi.org/10.1016/j.biocon.2009.08.008>
- López-Rodríguez CE, Mora-Forero JA, León-Gómez A (2022) Strategic development associated with branding in the tourism sector: bibliometric analysis and systematic review of the literature between the years 2000 to 2022. *Sustainability* 14(16):9869. <https://doi.org/10.3390/su14169869>
- Loveridge AJ et al (2022) Environmental and anthropogenic drivers of African leopard *Panthera pardus* population density. *Biol Conserv* 272:109641. <https://doi.org/10.1016/j.biocon.2022.109641>
- Lunstrum E (2011) An uncomfortable fit? Transfrontier parks as MegaProjects. In: Brunn SD (ed) *Engineering earth*. Springer, Dordrech, pp 1223–1242
- Lunstrum E (2014) Green militarization: anti-poaching efforts and the spatial contours of Kruger National park. *Ann Assoc Am Geogr* 104(4):816–832. <https://doi.org/10.1080/00045608.2014.912545>
- Lunstrum E (2015) Conservation meets militarisation in Kruger National Park: historical encounters and complex legacies. *Conserv Soc* 13(4):356. <https://doi.org/10.4103/0972-4923.179885>
- Mace GM (2014) Whose conservation? *Science* 345(6204):1558–1560. <https://doi.org/10.1126/science.1254704>

- Malapane OL et al (2022) Bibliometric analysis and systematic review of indigenous knowledge from a comparative African perspective: 1990–2020. *Land* 11(8):1167. <https://doi.org/10.3390/land11081167>
- Manriquez J et al (2015) Bibliometric characteristics of systematic reviews in dermatology: a cross-sectional study through web of science and Scopus. *Dermatol Sin* 33(3):154–156. <https://doi.org/10.1016/j.dsi.2014.12.007>
- Martin A et al (2011) Understanding the co-existence of conflict and cooperation: transboundary ecosystem management in the Virunga Massif. *J Peace Res* 48(5):621–635. <https://doi.org/10.1177/0022343311412410>
- Martínez-Abraín A et al (2023) Increased grey wolf diurnality in southern Europe under human-restricted conditions. *J Mammal*. <https://doi.org/10.1093/jmammal/gyad003>
- McKeever M (2008) Regional institutions and social development in Southern Africa. *Ann Rev Sociol* 34(1):453–473. <https://doi.org/10.1146/annurev.soc.34.040507.134645>
- McNeely JA (2003) Conserving forest biodiversity in times of violent conflict. *Oryx* 37(2):142–152. <https://doi.org/10.1017/S0030605303000334>
- Meyer M et al (2022) Spatially heterogeneous effects of collective action on environmental dependence in Namibia's Zambezi region. *World Dev* 159:106042. <https://doi.org/10.1016/j.worlddev.2022.106042>
- Michel AL et al (2006) Wildlife tuberculosis in South African conservation areas: implications and challenges. *Vet Microbiol* 112(2–4):91–100. <https://doi.org/10.1016/j.vetmic.2005.11.035>
- Milder JC et al (2014) Integrated landscape initiatives for African agriculture, development, and conservation: a region-wide assessment. *World Dev* 54:68–80. <https://doi.org/10.1016/j.worlddev.2013.07.006>
- Milgroom J, Giller KE, Leeuwis C (2014) Three interwoven dimensions of natural resource use: quantity, quality and access in the Great Limpopo transfrontier conservation area. *Human Ecol* 42(2):199–215. <https://doi.org/10.1007/s10745-013-9635-3>
- Moher D et al (2009) Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. *PLoS Med* 6(7):e1000097. <https://doi.org/10.1371/journal.pmed.1000097>
- Movik S, Benjaminsen TA, Richardson T (2021) Making maps, making claims: the politics and practices of visualisation in environmental governance. *Landsc Res* 46(2):143–151. <https://doi.org/10.1080/01426397.2021.1879034>
- Mpakairi KS et al (2019) Human settlement drives African elephant (*Loxodonta africana*) movement in the Sebungwe Region, Zimbabwe. *Afr J Ecol* 57(4):531–538. <https://doi.org/10.1111/aje.12639>
- Muboko N (2017) The role of transfrontier conservation areas and their institutional framework in natural resource-based conflict management: a review. *J Sustain for* 36(6):583–603. <https://doi.org/10.1080/10549811.2017.1320224>
- Mugo T, Visseren-Hamakers I, van der Duim R (2020) Landscape governance through partnerships: lessons from Amboseli, Kenya. *J Sustain Tour*. <https://doi.org/10.1080/09669582.2020.1834563>
- Munthali SM (2007) Transfrontier conservation areas: integrating biodiversity and poverty alleviation in Southern Africa. *Nat Resour Forum* 31(1):51–60. <https://doi.org/10.1111/j.1477-8947.2007.00130.x>
- Murungweni C et al (2011) Application of fuzzy cognitive mapping in livelihood vulnerability analysis. *Ecol Soc* 16(4):8. <https://doi.org/10.5751/ES-04393-160408>
- Naidoo R et al (2018) Evaluating the effectiveness of local- and regional-scale wildlife corridors using quantitative metrics of functional connectivity. *Biol Conserv* 217:96–103. <https://doi.org/10.1016/j.biocon.2017.10.037>
- Neudert R, Ganzhorn JU, Wätzold F (2017) Global benefits and local costs—the dilemma of tropical forest conservation: a review of the situation in Madagascar. *Environ Conserv* 44(1):82–96. <https://doi.org/10.1017/S0376892916000552>
- Nicollier V, Cordeiro Bernardes ME, Kiperstok A (2022) What governance failures reveal about water resources management in a municipality of Brazil. *Sustainability* 14(4):2144. <https://doi.org/10.3390/su14042144>
- Njoroge P et al (2020) Steering energy transitions through landscape governance: case of Mathare informal settlement, Nairobi, Kenya. *Land* 9(6):206. <https://doi.org/10.3390/land9060206>
- Ntuli H et al (2019) Factors influencing local communities perceptions towards conservation of transboundary wildlife resources: the case of the Great Limpopo trans-frontier conservation area. *Biodivers Conserv* 28(11):2977–3003. <https://doi.org/10.1007/s10531-019-01809-5>
- Ntuli H et al (2021) Understanding the drivers of subsistence poaching in the great Limpopo transfrontier conservation area: what matters for community wildlife conservation? *Ecol Soc* 26(1):18. <https://doi.org/10.5751/ES-12201-260118>
- Nzyoka J et al (2021) Landscape governance and sustainable land restoration: evidence from Shinyanga, Tanzania. *Sustainability*. <https://doi.org/10.3390/su13147730>



- Olsson P, Folke C, Hahn T (2004) Social-ecological transformation for ecosystem management: the development of adaptive co-management of a wetland landscape in Southern Sweden. *Ecol Soc*. <https://doi.org/10.5751/ES-00683-090402>
- Omoding J et al (2020) Analysing and applying stakeholder perceptions to improve protected area governance in Ugandan conservation landscapes. *Land* 9(6):207. <https://doi.org/10.3390/land9060207>
- Opdam P et al (2016) Does information on landscape benefits influence collective action in landscape governance? *Curr Opin Environ Sustain* 18:107–114. <https://doi.org/10.1016/j.cosust.2015.12.006>
- Ordiz A et al (2013) Lasting behavioural responses of brown bears to experimental encounters with humans. *J Appl Ecol* 50(2):306–314. <https://doi.org/10.1111/1365-2664.12047>
- Page MJ et al (2021) The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. *Int J Surg* 88:105906. <https://doi.org/10.1016/j.ijso.2021.105906>
- Pahl-Wostl C (2009) A conceptual framework for analysing adaptive capacity and multi-level learning processes in resource governance regimes. *Global Environm Change* 19(3):354–365. <https://doi.org/10.1016/j.gloenvcha.2009.06.001>
- Pahl-Wostl C (2019) The role of governance modes and meta-governance in the transformation towards sustainable water governance. *Environ Sci Policy* 91:6–16. <https://doi.org/10.1016/j.envsci.2018.10.008>
- Papp CR et al (2022) Rapid linear transport infrastructure development in the Carpathians: a major threat to the integrity of ecological connectivity for large carnivores. *Nat Conserv* 47:35–63. <https://doi.org/10.3897/natureconservation.47.71807>
- Pătru-Stupariu I, Nita A (2022) Impacts of the European landscape convention on interdisciplinary and transdisciplinary research. *Landscape Ecol* 37(5):1211–1225. <https://doi.org/10.1007/s10980-021-01390-9>
- Pedroza-Arceo NM, Weber N, Ortega-Argueta A (2022) A knowledge review on integrated landscape approaches. *Forests* 13(2):312. <https://doi.org/10.3390/f13020312>
- Penker M (2009) Landscape governance for or by the local population? A property rights analysis in Austria. *Land Use Policy* 26(4):947–953. <https://doi.org/10.1016/j.landusepol.2008.11.007>
- Petracca LS et al (2020) Modeling community occupancy from line transect data: a case study with large mammals in post-war Angola. *Anim Conserv* 23(4):420–433. <https://doi.org/10.1111/acv.12555>
- Plieninger T, Bieling C (2012) Resilience and the cultural landscape. Cambridge University Press, Cambridge
- Plieninger T et al (2014) Sustaining ecosystem services in cultural landscapes. *Ecol Soc* 19(2):art59. <https://doi.org/10.5751/ES-06159-190259>
- Plieninger T, Kizos T, Bieling C, le Dü-Blayo L et al (2015) Exploring ecosystem-change and society through a landscape lens: recent progress in European landscape research. *Ecol Soc* 20(2):art5. <https://doi.org/10.5751/ES-07443-200205>
- Portman ME, Teff-Seker Y (2017) Factors of success and failure for transboundary environmental cooperation: projects in the Gulf of Aqaba. *J Environ Policy Plann* 19(6):810–826. <https://doi.org/10.1080/1523908X.2017.1292873>
- Pranckutė R (2021) Web of science (WoS) and Scopus: the Titans of bibliographic information in today's academic world. *Publications* 9(1):12. <https://doi.org/10.3390/publications9010012>
- Pricope NG et al (2020) Addressing integration challenges of interdisciplinary research in social-ecological systems. *Soc Nat Resour* 33(3):418–431. <https://doi.org/10.1080/08941920.2019.1680783>
- Purdon A et al (2018) Partial migration in savanna elephant populations distributed across southern Africa. *Sci Rep* 8(1):11331. <https://doi.org/10.1038/s41598-018-29724-9>
- Ramutsindela M (2017) Greening Africa's borderlands: the symbiotic politics of land and borders in peace parks. *Political Geogr* 56:106–113. <https://doi.org/10.1016/j.polgeo.2016.11.012>
- Rathwell KJ, Armitage D, Berkes F (2015) Bridging knowledge systems to enhance governance of environmental commons: A typology of settings. *Int J Commons* 9(2):851. <https://doi.org/10.18352/ijc.584>
- Reed MS (2008) Stakeholder participation for environmental management: a literature review. *Biol Conserv* 141(10):2417–2431. <https://doi.org/10.1016/j.biocon.2008.07.014>
- Reed J et al (2016) Integrated landscape approaches to managing social and environmental issues in the tropics: learning from the past to guide the future. *Global Change Biol*. <https://doi.org/10.1111/gcb.13284>
- Reed J et al (2019) Engaging multiple stakeholders to reconcile climate, conservation and development objectives in tropical landscapes. *Biol Conserv* 238:108229. <https://doi.org/10.1016/j.biocon.2019.108229>
- Reed J et al (2020) Integrated landscape approaches in the tropics: a brief stock-take. *Land Use Policy* 99:104822. <https://doi.org/10.1016/j.landusepol.2020.104822>
- Retrouvey H et al (2020) Cross-sectional analysis of bibliometrics and altmetrics: comparing the impact of qualitative and quantitative articles in the British medical journal. *BMJ Open* 10(10):e040950. <https://doi.org/10.1136/bmjopen-2020-040950>

- Riggs RA et al (2021) Governing the landscape: potential and challenges of integrated approaches to landscape sustainability in Indonesia. *Landsc Ecol* 36(8):2409–2426. <https://doi.org/10.1007/s10980-021-01255-1>
- Robinson LW, Kagombe JK (2018) Institutional linkages and landscape governance systems: the case of Mt. Marsabit, Kenya. *Ecol Soc* 23(1):27. <https://doi.org/10.5751/ES-09933-230127>
- Roeber CL, van Aarde RJ, Leggett K (2013) Functional connectivity within conservation networks: delineating corridors for African elephants. *Biol Conserv* 157:128–135. <https://doi.org/10.1016/j.biocon.2012.06.025>
- Rogan MS et al (2022) Troubled spots: human impacts constrain the density of an apex predator inside protected areas. *Ecol Appl*. <https://doi.org/10.1002/eap.2551>
- Root-Bernstein M, Gooden J, Boyes A (2018) Rewilding in practice: projects and policy. *Geoforum* 97:292–304. <https://doi.org/10.1016/j.geoforum.2018.09.017>
- Ros-Tonen M, Derkyi M, Insaïdoo T (2014) From co-management to landscape governance: Whither Ghana's modified Taungya system? *Forests* 5(12):2996–3021. <https://doi.org/10.3390/f5122996>
- Ros-Tonen MAF et al (2015) Landscapes of social inclusion: inclusive value-chain collaboration through the lenses of food sovereignty and landscape governance. *Eur J Dev Res* 27(4):523–540. <https://doi.org/10.1057/ejdr.2015.50>
- Ros-Tonen MAF, Reed J, Sunderland T (2018) From synergy to complexity: the trend toward integrated value chain and landscape governance. *Environ Manag* 62(1):1–14. <https://doi.org/10.1007/s00267-018-1055-0>
- Ros-Tonen MAF, Willemsen L, McCall MK (2021) Spatial tools for integrated and inclusive landscape governance: toward a new research agenda. *Environ Manag* 68(5):611–618. <https://doi.org/10.1007/s00267-021-01547-x>
- Ruan H et al (2022) Government trust, environmental pollution perception, and environmental governance satisfaction. *Int J Environ Res Public Health* 19(16):9929. <https://doi.org/10.3390/ijerph19169929>
- Sari DA et al (2019) 'Determining the effectiveness of forest landscape governance: a case study from the Sendang landscape, South Sumatra. *For Policy Econ* 102:17–28. <https://doi.org/10.1016/j.forpol.2019.01.014>
- Sayer J et al (2013) Ten principles for a landscape approach to reconciling agriculture, conservation, and other competing land uses. *Proc Natl Acad Sci* 110(21):8349–8356. <https://doi.org/10.1073/pnas.1210595110>
- Sayer J et al (2015) Landscape approaches; what are the pre-conditions for success? *Sustain Sci* 10(2):345–355. <https://doi.org/10.1007/s11625-014-0281-5>
- Searle CE et al (2020) Drivers of leopard (*Panthera pardus*) habitat use and relative abundance in Africa's largest transfrontier conservation area. *Biol Conserv* 248:108649. <https://doi.org/10.1016/j.biocon.2020.108649>
- Searle CE et al (2022) Random forest modelling of multi-scale, multi-species habitat associations within KAZA transfrontier conservation area using spoor data. *J Appl Ecol*. <https://doi.org/10.1111/1365-2664.14234>
- Selier SAJ, Slotow R, Di Minin E (2016) The influence of socioeconomic factors on the densities of high-value cross-border species, the African elephant. *PeerJ* 4:e2581. <https://doi.org/10.7717/peerj.2581>
- Sibanda M (2015) Realms of conservation or "wildlife liberation": a case of Sengwe in Zimbabwe. *Soc Dyn* 41:253–272. <https://doi.org/10.1080/02533952.2015.1072655>
- Sinthumule NI (2017) Resistance against conservation at the South African section of greater mapungubwe (Trans)frontier. *Afr Spectr* 52(2):53–77. <https://doi.org/10.1177/000203971705200203>
- Sjöstedt M, Linell A (2021) Cooperation and coercion: The quest for quasi-voluntary compliance in the governance of African commons. *World Dev* 139:105333. <https://doi.org/10.1016/j.worlddev.2020.105333>
- Špaček M et al (2022) The role of knowledge in supporting the revitalisation of traditional landscape governance through social innovation in Slovakia. *Environ Policy Gov* 32(6):560–574. <https://doi.org/10.1002/eet.2026>
- Sulistiyawan BS et al (2019) Towards more effective landscape governance for sustainability: the case of RIMBA corridor, Central Sumatra, Indonesia. *Sustain Sci* 14(6):1485–1502. <https://doi.org/10.1007/s11625-019-00662-3>
- Sultan H et al (2022) Horizon scan of transboundary concerns impacting snow leopard landscapes in Asia. *Land* 11(2):248. <https://doi.org/10.3390/land11020248>
- Thulin CG, Röcklinsberg H (2020) Ethical considerations for wildlife reintroductions and rewilding. *Front Vet Sci*. <https://doi.org/10.3389/fvets.2020.00163>

- Trouwborst A (2015) Global large carnivore conservation and international law. *Biodivers Conserv* 24(7):1567–1588. <https://doi.org/10.1007/s10531-015-0894-8>
- Trouwborst A et al (2017) International law and lions (*Panthera leo*): understanding and improving the contribution of wildlife treaties to the conservation and sustainable use of an iconic carnivore. *Nat Conserv* 21:83–128. <https://doi.org/10.3897/natureconservation.21.13690>
- Tshipa A et al (2017) Partial migration links local surface-water management to large-scale elephant conservation in the world's largest transfrontier conservation area. *Biol Conserv* 215:46–50. <https://doi.org/10.1016/j.biocon.2017.09.003>
- van Aarde RJ, Jackson TP (2007) Megaparks for metapopulations: addressing the causes of locally high elephant numbers in southern Africa. *Biol Conserv* 134(3):289–297. <https://doi.org/10.1016/j.biocon.2006.08.027>
- van Amerom M, Büscher B (2005) Peace parks in Southern Africa: bringers of an African Renaissance? *J Mod Afr Stud* 43(2):159–182. <https://doi.org/10.1017/S0022278X05000790>
- van Eck NJ, Waltman L (2010) Software survey: VOSviewer, a computer program for bibliometric mapping. *Scientometrics* 84(2):523–538. <https://doi.org/10.1007/s11192-009-0146-3>
- van Oosten C, Uzamukunda A, Runhaar H (2018) Strategies for achieving environmental policy integration at the landscape level. A framework illustrated with an analysis of landscape governance in Rwanda. *Environ Sci Policy* 83:63–70. <https://doi.org/10.1016/j.envsci.2018.02.002>
- van Oosten C, Runhaar H, Arts B (2021) 'Capable to govern landscape restoration? Exploring landscape governance capabilities, based on literature and stakeholder perceptions. *Land Use Policy* 104:104020. <https://doi.org/10.1016/j.landusepol.2019.05.039>
- van der Meer E, Badza MN, Ndhlovu A (2016) Large carnivores as tourism flagship Species for the Zimbabwe component of the Kavango Zambezi transfrontier conservation area. *Afr J Wildlife Res* 46(2):121. <https://doi.org/10.3957/056.046.0121>
- Veldhuis MP et al (2019) Cross-boundary human impacts compromise the Serengeti-Mara ecosystem. *Science* 363(6434):1424–1428. <https://doi.org/10.1126/science.aav0564>
- Visseren-Hamakers IJ (2015) Integrative environmental governance: enhancing governance in the era of synergies. *Curr Opin Environ Sustain* 14:136–143. <https://doi.org/10.1016/j.cosust.2015.05.008>
- Walker G (2014) Water scarcity in England and Wales as a failure of (meta)governance. *Water Altern* 7(2):388–413
- Wallner A, Willi Y, Hammer T (2017) We are the political landscape—governance in European protected areas. Report on the tutorial held at the EUROPARC conference 2016. *J Protected Mt Areas Res* 9(1):40–41. <https://doi.org/10.1553/eco.mont-9-1s40>
- Westerink J et al (2017) Landscape services as boundary concept in landscape governance: building social capital in collaboration and adapting the landscape. *Land Use Policy* 60:408–418. <https://doi.org/10.1016/j.landusepol.2016.11.006>
- Westing AH (1998) A transfrontier reserve for peace and nature on the Korean Peninsula. *Int Environ Aff* 10:8–17
- Wilson R (2019) Authoritarian environmental governance: insights from the past century. *Ann Am Assoc Geogr* 109(2):314–323. <https://doi.org/10.1080/24694452.2018.1538767>
- Wolmer W (2003) Transboundary conservation: the politics of ecological integrity in the Great Limpopo transfrontier park. *J South Afr Stud* 29(1):261–278. <https://doi.org/10.1080/0305707032000060449>
- Young KD, Van Aarde RJ (2010) Density as an explanatory variable of movements and calf survival in savanna elephants across southern Africa. *J Anim Ecol* 79(3):662–673. <https://doi.org/10.1111/j.1365-2656.2010.01667.x>

Publisher's Note Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Authors and Affiliations

Ephraim Mpofu^{1,5}  · Verena Radinger-Peer^{2,5}  · Walter Musakwa³  ·
Marianne Penker^{4,5}  · Katharina Gugerell^{1,3,5} 

✉ Ephraim Mpofu
ephraim.mpofu@boku.ac.at

Verena Radinger-Peer
verena.radinger-peer@boku.ac.at

Walter Musakwa
wmusakwa@uj.ac.za

Marianne Penker
marianne.penker@boku.ac.at

Katharina Gugereil
katharina.gugereil@boku.ac.at

- ¹ Department of Landscape, Spatial and Infrastructure Sciences, Institute of Landscape Planning, University of Natural Resources and Life Sciences, Peter-Jordan-Straße 65, 1180 Vienna, Austria
- ² Department of Landscape, Spatial and Infrastructure Sciences, Institute of Landscape Development, Recreation and Conservation Planning, University of Natural Resources and Life Sciences, Peter-Jordan-Straße 65, 1180 Vienna, Austria
- ³ Department of Geography, Environmental Management and Energy Studies, University of Johannesburg, 5 Kingsway Ave, Rossmore, Johannesburg 2092, South Africa
- ⁴ Department of Economics and Social Sciences, Institute for Sustainable Economic Development, University of Natural Resources and Life Sciences, Feistmantelstraße 4, 1180 Vienna, Austria
- ⁵ Doctoral School Transitions to Sustainability, University of Natural Resources and Life Sciences, Vienna, Austria