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Eco-parcel: An approach to identify and describe attractions to support adapting nature-based tourism destinations to climate-change impacts

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Abstract

Informing climate-change adaptation measures for nature-based tourism destinations is contingent on understanding how individual attractions respond to the impact of climate change. There is, however, no evidence of the existence of specific approaches for linking individual attractions to climate change. The eco-parcel approach is therefore devised to address the gap. The approach follows three simple steps: (1) identifying and defining individual tourist attractions (2) describing and creating a link between individual attractions and their supporting ecosystems using land cover as a proxy; (3) assessing the importance of discrete landscape patches (eco-parcels) for tourism. The three steps employ literature reviews, tourists' preference surveys and GIS data collection techniques. The operationalisation of the approach in Tanzanian Serengeti and Kilimanjaro National parks case studies shows that the approach is capable of establishing a list of attractions that a destination has and creating spatial–temporal links between attractions and their supporting ecosystems. In conclusion, the eco-parcel approach allows accurate assessment of the likely losses or gains of individual attractions in the event of climate change, providing information on destination-specific climate adaptation strategies and, thus, a useful tool for adapting NBT to climate-change impacts.

KEYWORDS
climate change, environmental change, Kilimanjaro National park, nature-based tourism, Serengeti National Park, Tanzania

Résumé

L'élaboration de mesures d'adaptation au changement climatique pour les destinations touristiques basées sur la nature dépend de la compréhension de la manière dont chaque attraction réagit à l'impact du changement climatique. Toutefois, il n'existe aucune preuve de l'existence d'approches spécifiques permettant d'établir un lien entre les attractions individuelles et le changement climatique. L'approche des parcelles écologiques a donc été conçue pour combler cette lacune. L'approche se fait en trois étapes simples: (1) l'identification et la définition des attractions touristiques individuelles; (2) la description et la création d'un lien entre les attractions individuelles et les écosystèmes qui les soutiennent, en utilisant l'occupation du sol comme indicateur; (3) l'évaluation de l'importance de parcelles de paysage distinctes (écoparcelles) pour le tourisme. Ces trois étapes font appel à une analyse documentaire, à des enquêtes sur les préférences des touristes et à des techniques de collecte de données SIG. La mise en œuvre de l'approche dans les études de cas des parcs nationaux tanzaniens du Serengeti et du Kilimandjaro montre que l'approche est capable d'établir une liste des attractions d'une destination et de créer des liens spatio-temporels entre les attractions et les écosystèmes qui les abritent. Enfin, l'approche des écoparcelles permet d'évaluer avec précision les pertes ou les gains probables des attractions individuelles en cas de changement climatique. Elle fournit des informations sur les stratégies d'adaptation au climat propres à chaque destination et constitue donc un outil utile pour l'adaptation des NBT aux effets du changement climatique.

1 | INTRODUCTION

Tourism is growing rapidly worldwide (Borah & Swargyari, 2018; Du et al., 2016; Rinn et al., 2023), and its fastest-growing segment is nature-based tourism (Aas et al., 2023; Silva et al., 2023). Nature-based tourism is a tool for economic development, poverty alleviation and job creation, especially in the global South (Bank, 2020; Kimaro & Saarinen, 2019). In Tanzania, nature-based tourism contributed 10.7% of the GDP, 25% of the export earnings and 11.1% of the country's total employment in 2019 (WTTC, 2020). This form of tourism typically involves experiencing wildlife biodiversity, snow and enjoying the natural environment and climate.

This contribution is, however, in jeopardy as evidence shows that Nature-Based Tourism (NBT) is affected by the changing environment and climate because of the close connection of its attractions to natural ecosystems and climate (Dube et al., 2022; Kilungu et al., 2019; Scott, 2021; Scott et al., 2023). For instance, changes in rainfall patterns were speculated to affect tourist visitations to the Canadian Rocky Mountains National Park (Scott et al., 2007). In Australia, variation in water temperature combined with a sea-level rise between 2007 and 2017 caused a fall in the survival rate of dolphins by 12% in the Western Shark Bay following a heat wave in early 2011 (Mann et al., 2021; Wild et al., 2019). Likewise, distortions of the wildebeest migration calendar and synchronised breeding phenomenon, key NBT attractions in the Serengeti National Park in Tanzania have been attributed to changes in rainfall amounts and patterns (Boone et al., 2006; Kilungu et al., 2017). These changes might have substantially affected NBT, although studies that integrate the impacts of climate change on tourism are inadequate worldwide (Scott et al., 2023), in Africa (Dube et al., 2023) and in Tanzania Kilungu, 2023). Consequently, NBT lacks informative adaptation measures.

Inadequate climate-change adaptation for NBT is likely due to a lack of comprehensive approaches to describe attractions to support climate-change impacts assessment from a tourism point of view. This is attributed to the fact that the types of attractions that tourists seek are either not well identified or their supporting ecosystems are neither described nor known (Kilungu et al., 2019). Consequently, climate-change adaptation strategies in NBT rely highly on climate perception studies (e.g., Dube & Nhamo, 2020b; Hambira, 2017; Mushawemhuka et al., 2018) and not on the actual spatial and temporal changes in attractions and their environments.

Steadfast environmental impact assessments for NBT destinations are therefore needed to evaluate the effects of climate change on individual attractions and inform adaptation. This requires (i) identifying and defining key attractions a destination has comprehensively, (ii) assessing the value of individual attractions for tourism and (iii) creating a spatial connection between specific attractions and the ecosystems in which they are embedded. Such requirements have not been achieved in many nature-based tourism destinations because the definition of attractions is in broad terms such as 'wildlife' as opposed to types or specific species of significance to tourists (Kilungu, 2019). The present classification is too homogenous for informing adaptations, given that each wildlife species reacts differently to climate change. For instance, according to Nyamwange (2016), the impacts of the flash floods that displaced flamingos in Lake Nakuru also made most Kenyan roads impassable. The study, nevertheless, failed to show how many tourists failed to visit Kenya, especially Lake Nakuru, due to such climatic impacts. Integrating these impacts into tourism would be informative for Kenya's NBT adaptation strategies.

Various approaches have been devised to describe attractions to support impact assessments and, in turn, adapt NBT to the impact of climate change. The consensus approach was developed to qualify the outstanding beauty of the scenic environments. Nevertheless, the approach evaluates a general ecosystem (e.g., Priskin, 2001) instead of specific attractions. This generalisation makes the consensus approach more suitable for informing global, regional and/or national policies. To complement the consensus approach, descriptive approaches, such as Visual Unit Analysis and Scenic Beauty Estimation, were devised. Yet, the approaches are subjective as they are solely based on simulated mathematical computations and experts' opinions (see Daniel & Meitner, 2001;

Sahraoui et al., 2021). Experts may be important in guiding public choices (France & Briggs, 2017), but they should not undermine tourists' opinions given that tourists are the main users of attractions. To incorporate public opinions, preference approaches were introduced (see Chaminuka et al., 2012; Jacobsen & Jens, 2007; Tveit et al., 2018; Williams et al., 2023; Yang et al., 2023). Unfortunately, the preference approach also largely depends on experts to identify and qualify attractions by relying on the use of visual stimuli (e.g., video clips, maps, voice notes and photographs) accompanied by questionnaires. Neither the questionnaires nor the visual stimuli are designed to collect information on the environments that support attractions.

In summary, neither the preferences, descriptive, nor consensus approaches simultaneously group attractions in fine categories, link tourists to specific attractions, create a spatial link between an individual attraction and its supporting characteristic environments, and describe the ecosystem into discrete landscape patches of touristic potential. Rather, the approaches assess the general ecosystem (e.g., a national park) as an entity of outstanding beauty. This makes it difficult to understand the impact of losses or gains of any attractions in a specific NBT destination. As budgets for conservation, particularly in developing countries, are inadequate (Abdeta, 2022), knowing the relative importance of individual attractions for tourism is paramount to informing adaptation measures.

The present study, therefore, developed a novel, low-cost and generic approach that identifies and spatially describes attractions in fine categories to support a comprehensive environmental impact assessment and, in turn, helps the process of adapting NBT to the impacts of climate change. This meaningful approach for both ecological experts and tourists is termed an 'eco-parcel' or ecological parcel approach. The eco-parcel approach was demonstrated in the two most frequently visited Tanzania tourism destinations: the Serengeti National Park (SENAPA) and Kilimanjaro National park (KINAPA). The two parks harbour a multitude of climate-sensitive attractions in different altitudinal gradients, ranging from wildlife migration in savannah to tropical snow, thus serving as a representative case study for a generic approach.

This study is guided by the 'ecosystem core' hypothesis (see Wang & Zhai, 2019) that ecosystems are continually changing, with or without human involvement and that tourism attractions embedded in them are also likely changing. Changes in vegetation or climate, for example, also change wildlife migration and plant flowering patterns. These changes are likely to change tourists' preferences or visitation patterns. Thus, tourism planners need to be informed to adapt NBT to these changes.

This study addresses three research questions.

1. How can tourist attractions be identified and linked to their supporting environment to support climate impact assessment for NBT?
2. What are the key features and steps in the eco-parcel approach development as a generic approach?
3. How relevant is the eco-parcel to support climate change assessments on individual attractions and, in turn, NBT?

2 | MATERIALS AND METHODS

2.1 | The eco-parcel concept and its rationale

The eco-parcel concept assumes that with climate change, some attractions will vanish, new ones will appear and some will adapt to new environmental conditions (Figure S1), and tourists' perceptions will also change accordingly, consequently, NBT needs to adapt. The need to establish the assets of attractions that a destination has and link each attraction with its supporting environments is thus paramount. To achieve this, the eco-parcel concept follows three steps: (i) defining attractions in fine categories (i.e., wildlife into species, plants and non-living attractions), (ii) creating a spatial link between an attraction and its supporting characteristic environments (e.g., water quality and quantity, vegetation type, rainfall, temperature and soil types) and (iii) qualifying the attractiveness of discrete landscapes within each NBT destination. The three steps, when comprehensively done, simplify monitoring of changes in the attractions and attractiveness of different NBT destinations over time.

The eco-parcel terminology originates from landscape ecology, whereas 'eco' represents the ecosystem/environment and 'parcel' represents a discrete landscape patch differing from its surrounding macro-environment (Forman & Godron, 1981). From a tourism perspective, eco-parcel *denotes a discrete landscape patch with distinct physical and/or ecological conditions where one or multiple attractions occur* (*modified from* Kilungu, 2019). According to the concept, tourists are attracted to discrete landscape patch(es) that contain a higher proportion of specific attractions of their interest than the whole ecosystem.

2.2 | The eco-parcel approach

The key features of this approach are a definite landscape patch with distinct characteristic environments and unique attraction(s). The approach comprises three steps. Step 1 is defining attractions in fine categories; Step 2 is spatially linking each attraction with its micro-environment and delineating individual attractions' unique landscape patches based on common environmental characteristics using land cover as a proxy. Step 3 is evaluating the significance of individual landscape patches for tourism based on the tourists' ratings of individual attractions from the previous steps.

2.3 | Demonstration of the eco-parcel approach

A demonstration of the eco-parcel approach was done in Kilimanjaro National park (KINAPA) and Serengeti National Park (SENAPA), which are ecologically and climatically different, have climate-sensitive attractions that serve as the perfect model for devising a generic approach, and these parks strongly call for informing adaptation measures for their sustainability. SENAPA (14,763 km^2) is located between 2°19′S and 34°34′E, and represents a lowland ecosystem (920–1850 masl) that receives a minimum amount of rainfall in a year. The key attractions' supporting environments are woodlands, riparian waters, extensive savannah grasslands and kopjes. KINAPA (1668 km^2) is located between 2°45′–3°25′S and 37°00′–37°43′E and represents a highland ecosystem (5895 masl: the highest point in Africa) that receives the highest amount of rainfall in East Africa. The key attractions' supporting environments are the montane forests, heath/moorland, alpine desert and arctic-like conditions in a tropical environment. KINAPA and SENAPA together represent a small proportion of Tanzania's 2 parks (Figure S2), yet contribute to more than 80% of the total revenue collected by the National Parks Authority annually (World Bank, 2015).

The demonstration of the eco-parcel approach followed three steps: (i) identifying and rating tourist attractions, (ii) delineating the attractions' supporting environments and (iii) quantifying the attractiveness of discrete landscape patches for tourism.

2.3.1 | Step 1: Identification and rating of tourist attractions.

The step involved identifying attractions to create a comprehensive list of all attractions in an NBT destination. In SENAPA and KINAPA, this was achieved by field surveys and interviews administered to Tourism Managers and direct field observations on tourists' undertakings and their focal areas/issues of observation within the parks. Interviews with the park management, complemented by tour guides, collated a comprehensive list of attractions in the respective parks.

The present study revealed that more than 90% of tourists to KINAPA and SENAPA (92%) were visiting the parks for the first time, and their knowledge of tourism was mainly based on showcased attractions from the media. As revealed by Eagles and Wade (2006) and Kaltenborn et al. (2011), the literature on attractions in Tanzania's parks is inadequate.

Tourists as respondents participated in an exit questionnaire survey to capitalise on their tourism experiences after visiting the parks and sought to rate tourists' preferences based on the listed attractions. The rating was based on a 5-point Likert score rating scale, whereby 5 denoted least important, 4 quite important, 3 important, 2 very important and 1 extremely important. About 806 questionnaires were completed (500 in SENAPA and 306 in KINAPA).

Data were analysed using the Statistical Package for Social Sciences (SPSS) program to determine tourists' preferences for groups of attractions or individual attractions. If an attraction is, for example, rated as extremely and very important, this means it is the main pull for tourists to visit, whereas the least important (5) is an add-on to a particular tourist; its loss has no adverse impact on tourism in the meantime. The results were presented as frequency and mean scores. The high-frequency percentage and low mean score were used to indicate the importance of a group of attractions or individual attractions.

2.3.2 | Step 2: Delineating the supporting environments for attractions.

All attractions identified in Step 1 were geo-referenced, and their supporting micro-environmental features were described. The description of the characteristic environmental features supporting attractions was given based on the knowledge and experience of park wardens, tour guides and researchers in the two parks. The descriptions included wildlife behaviour (e.g., migration), distinct attractions' supporting micro-environments (e.g., grasslands, forest, water, etc.) and uniqueness (e.g., kopjes in grasslands, the highest point in Africa and ice sheets in the tropics).

Spatial layers of attractions were created by using the geo-referenced attractions in each park overlaid with land-cover maps. In KINAPA, spatial layers of attractions were overlaid with the montane forests, heathlands, moorlands, gravel/boulders of the alpine desert and snow on the mountain's peak. In SENAPA, the attractions' spatial layers were overlaid with savannah grasslands, water bodies (i.e. dams, rivers and lakes), forests, bushes, Kopjes and woodlands.

The delineation of the eco-parcels from a wider landscape environment (e.g., grasslands) was done by using attractions' qualitative environmental descriptions and coordinates. Unique eco-parcels were those with distinct attractions within the same geographical location. The distinct distribution of eco-parcels as in Figures 1 and 2, demonstrates that eco-parcels are defined by unique land covers. This interdependence suggests that land-cover changes are likely to affect attractions differently. The assessment named all the delineated eco-parcels based on either intrinsic scenery or key attraction(s) (Figures 1 and 2).

2.3.3 | Step 3: Analysing the scenic quality of discrete landscape patches for tourism.

For tourism purposes, the importance of all delineated discrete landscape patches in Step 2 was assessed by using the ratings of a group of attractions or individual attractions obtained in Step 1. For over 10 years, scholars have advocated assessing the attractiveness of a whole landscape by aggregating the values of environmental attributes (see The James Hutton Institute, 2010). Nevertheless, the eco-parcel approach proposes to assess the importance of discrete patches based on the merit of key attractions and not aggregating the value for the whole landscape. This rating technique is novel and helps not to marginalise discrete landscapes that have diverse attractions with varied ratings. The importance of discrete landscape patches with multiple attractions was represented by the highest rating of attractions within them and not the average of varied ratings.

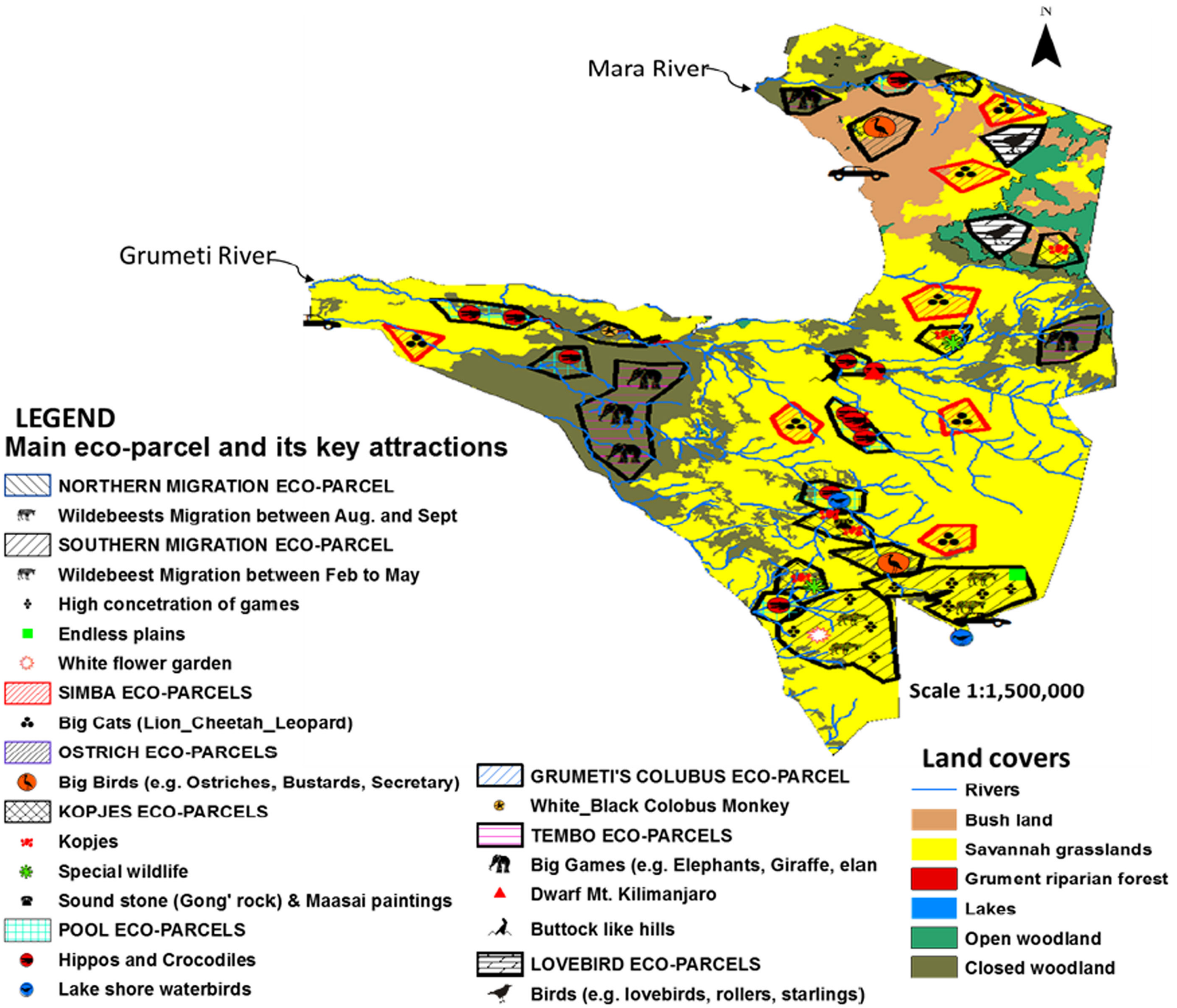

FIGURE 1 Spatial representation of the delineated key eco-parcels and attractions in SENAPA (modified from Kilungu, 2019).

This is because patches with diverse attractions are likely to be more buoyant to climate change impacts. Thus, if one attraction disappears, other attractions will still keep the patch attractive. In this case, the approach slightly modifies the James Hutton Institute's concept to avoid marginalising the role of each attraction (Tables 1 and 2).

3 | RESULTS

3.1 | Key attractions asset in the NBT destination

Table S1 presents a comprehensive list of key attractions in the KINAPA and SENAPA case studies. In these parks, attractions were many, but the key ones were the Kibo Peak in KINAPA and the Wildebeest migration in SENAPA. In the present study, an attraction is a physical, environmental or cultural feature that meets a specific tourist's desire to travel.

3.2 | Delineating attractions' supporting environments

Based on attractions' supporting characteristic microenvironments, the georeferenced attractions are classified into distinct landscape patches (i.e., eco-parcels). The individual attractions were linked to specific land covers that support their attractiveness seasonally and spatially. Wildebeests in SENAPA were linked to different land covers due to their migratory behaviour (Figure 1). The eco-parcels were named based on either their key attractions or key land-cover types supporting their attractiveness or geographic location, as spatially presented in Figure 1. The names of the eco-parcels are capitalised to differentiate them from the normal text. This includes the nine eco-parcels, namely the SOUTHERN and NORTHERN MIGRATION, KOPJES, SIMBA, POOL, GRUMETI'S MBEGA, OSTRICH, LOVEBIRD and TEMBO eco-parcels (Figure 1).

FIGURE 2 Spatial representation of delineated key eco-parcels with their unique attractions in the Kilimanjaro National park (modified from Kilungu, 2019).

The key attraction in the NORTHERN and SOUTHERN MIGRATION eco-parcels is the wildebeest migration, and the supporting characteristic environments are the perennial Mara River (between June and September) and short grass (from December to March) that provide key nutrients for lactating cows and calves in the breeding season. This implies that the attractiveness or importance of the NORTHERN and SOUTHERN eco-parcels varies in space and time. Moreover, the attractiveness of the SOUTHERN eco-parcel is not limited to wildebeest but also extends to a high concentration of other game species (i.e. zebra, resident wildebeest, impalas, etc.). Another eco-parcel is SIMBA. In this eco-parcel, the key attractions are big cats, and the supporting characteristic environment is short grass. These eco-parcels are discretely and spatially distributed in the Serengeti grasslands. The bushes/grasslands of the Serengeti support the named OSTRICH eco-parcels and the key attractions are large birds like secretary, bustards and ostriches. Within the Serengeti, kopjes are the key and distinct attractions. The KOPJES eco-parcel was named after them. Kopjes and their unique wildlife species such as hyraxes, klipspringers, agama lizards, mongooses, birds and porcupines are the major attractions in this eco-parcel. Water resources in SENAPA harbour attractive landscape patches named POOLS eco-parcels in this paper. These eco-parcels are supported by either slow-moving fresh or alkaline water in the Grumeti, Mara, Mbalageti or Simiyu rivers, lakes Ndutu and Magadi and other created dams. Figure 1 presents the eco-parcels, their supporting key environments and attractions.

In KINAPA, eight eco-parcels were identified, with a description of their key attractions and supporting environments (Figure 2). These eco-parcels include SUMIT, ROCKY, GROUNSELS, GARDEN OF GOD and MOUNDI CRATER. Others are KILIMANJARO ZOO, WATERFALL and MONTANE GARDEN (Figure 2). The Kibo peak, covered by ice sheets of more than 50 m high, was the major attraction on the SUMMIT eco-parcel. The supporting micro-environment is an extremely cold climate. The supporting

TABLE 1 Valuable landscape patches for tourism in Serengeti National Park as qualified by tourists based on attractions ($N = 500$). The level of importance ranges from extremely important to least important.

S No.	Key eco-parcels	Key attractions	Respondents ($N = 500$)	% Preferences of tourists on an attraction or a group of attractions: Level of importance: Extremely (%)	Very (%)	Medium (%)	Quite (%)	Least (%)	SD	Importance of an eco-parcel for tourism[a]
1	NORTHERN MIGRATION	Wildebeest migration	500 (100%)	68.8	19.8	11.8	0.0	0.0	0.7	1.4
2	SOUTHERN MIGRATION	Wildebeest migration								
		High concentration of wildlife other than migrating wildebeests in the wilderness plains	489 (98%)	20.9	57.7	19.8	1.8	0.4	0.7	2.0
3	SIMBA	Big cats (leopards, lions & cheetahs)	484 (97%)	39.3	36.8	22.7	0.2	1.0	0.8	1.9
4	OSTRICH	Big birds (e.g., raptors, secretary birds, ostriches, Kori bustards)	72 (14%)	66.7	18.1	6.9	4.2	4.2	0.8	1.6
5	KOPJES • Moru • Seronera, • Simba and • Massai • Klipspringer	Kopjes Kopjes specialised wildlife (e.g., klipspringers and rock hyraxes) Maasai paintings and gong rock (sound stone) Black rocks & white rocks Pancake-like rocks	367 (73%)	71.1	17.7	10.9	0.3	0.0	0.7	1.4
6	POOL • Hippo pools • Lakeshore	Hippos, crocodiles, cranes and water birds (e.g., lesser and greater flamingos)	256 (51%)	59.0	35.9	4.7	0.4	0.0	0.7	1.4
7	GRUMETI'S MBEGA	Black and white colobus monkeys	115 (23%)	68.7	16.5	9.6	4.3	0.9	0.7	1.5
8	TEMBO	Big games such as giraffes, elands, Buffaloes, elephants Hills that look like dwarf Kilimanjaro and human buttocks	19 (4%)	42.1	26.3	15.8	15.8	0.0	1.1	2.1
9	LOVEBIRDS	Bird species (e.g., Nubian woodpecker, Fischer's and yellow-collared lovebird, grey-headed kingfisher, Rufous-tailed weaver, superb starling, lilac-breasted roller, Rüppell's vulture	147 (29%)	58.5	17.7	19.7	3.4	0.7	0.9	1.7

Abbreviation: SD, standard deviation.

[a]Likert Scale or Mean Score: 1 is extremely important, 2 is very important, 3 is important, 4 is quite important and 5 is least important.

TABLE 2 Valuable discrete landscape patches for tourism in Kilimanjaro National park as qualified by tourists based on attractions ($N = 306$). The level of importance ranges from extremely important to least important.

				% Preferences of tourists on an attraction or a group of attractions						
				Level of importance						
S No.	Key eco-parcel	Key attractions	Respondents ($N = 306$)	Extremely (%)	Very (%)	Medium (%)	Quite (%)	Least (%)	SD	Importance of an eco-parcel for tourism[a]
1	SUMMIT	Kibo Summit/Uhuru Peak (the highest peak (5985 masl) on Africa)	301 (98%)	84	6	5	3	2	0.9	1.4
		Snow piles of about 50 m high	243 (79%)	31	38	16	11	5	1.1	2.2
2	ROCKY • Zebra • Church • Pinnacle • Tower • Wall and • Mushroom	Unique rocks such as rock-like a cathedral, zebra-striped rocks, rock pinnacles, club mushroom rocks, turtle-like rocks Lava tower The Barranco wall	118 (38%)	7	12	23	27	31	1.2	3.6
3	GROUNDSELS	Giant senecio and lobelia (the Kilimanjaro's groundsels) Senecio farm The sound of the underground falling waterfall	157 (51%)	4	14	17	26	39	1.2	3.8
4	MAUNDI CRATER	Crater and its wilderness Lake Chala view point	219 (72%)	15	32	28	17	9	1.2	2.7
5	GOD'S GARDEN	Shira plateau The everlasting and stoebes flowers of the genus helichrysum Protea flowers	14 (5%)	71	7	21	0	0	1.2	1.5
6	MONTANE GARDEN	Rainforest flowers (e.g., *Impatiens kilimanjarii*, fireball lily, red-hot poker, etc.) Birdlife (e.g., Raucous silvery-cheeked hornbill, Hartlaub's turaco)	237 (76%)	19	30	28	13	11	1.2	2.6
7	KILIMANJARO ZOO	Big game encounter (e.g., black and white colobus monkeys elephants) Tree hyrax, Abbott's duiker, elands, etc	170 (56%)	11	25	27	22	15	1.2	3.0
8	WATERFALLS	Waterfalls and ritual area	145 (47%)	6	15	17	28	34	1.2	3.7

Abbreviation: SD, standard deviation.

[a]Likert Scale or Mean Score: 1 is extremely important, 2 is very important, 3 is important, 4 is quite important and 5 is least important.

environments for the ROCKY eco-parcels are patches of bare soils, gravel or rocks in the alpine desert. The key attractions are rocks with unique patterns and shapes (cathedral-like structures, zebra-looking rocks and rocks that look like mushrooms). In GROUNDSEL eco-parcels, the supporting environment was heath/moorland vegetation, and the key attractions were giant groundsels (e.g., lobelia and senecio) and the sound of the underground waterfall. In the Shira Plateau, GOD's GARDEN eco-parcels occur. This is the flattest area on Mount Kilimanjaro. The key attractions are *Protea* species (*Protea kilimandscharica* (Engler, 1892)), everlasting flowers (e.g., *Helichrysum newii* (Olive & Heirn, 1877), *Helichrysum meyeri-johannis* (Engler, 1892) and *Helichrysum kilimanjari* (Oliver, 1887)) and the unique plateau.

3.3 | The significance of discrete landscape patches for tourism

Implementing the eco-parcel approach in KINAPA and SENAPA revealed that defining attractions in fine categories can lead to assessing the significance of individual attractions and discrete landscape patches using tourists' preferences. The importance of individual attractions varies greatly within the national park. This implies that the value of discrete landscape patches within the same park varies because of the different attractions. The level of importance ranges from extremely important to least important. The extremely important landscape patch has attractions that are the main motive/pull for a tourist to visit a specific destination, while the least important is an add-on to the visitation.

In SENAPA, for example, the SOUTHERN and NORTHERN, KOPJES and SIMBA eco-parcels are the most valuable landscape patches for tourism (Table 1). This is because more than 50% of the interviewed tourists considered the attractions in these eco-parcels extremely important. For instance, about 70% ($N=500$) of tourists rated wildebeest migration as an extremely important attraction for the Serengeti's tourism. Nevertheless, this should not be taken for granted, as some tourists did not visit SENAPA because of wildebeest. About 39% visited Serengeti for big cats. The cats give the grasslands landscape patches or SIMBA eco-parcels a touristic value in Serengeti. The beauty of the SOUTHERN eco-parcel does not solely depend on migrating wildebeest but also on a high concentration of numerous wildlife species all year round (Table 1). Other landscape patches of touristic significance in SENAPA are the kopjes and water POOLS. The majority (~70%) were interested in Kopjes because of how the Kopjes outcrop protrudes in the endless plains and the specialised wildlife species they harbour. Water POOL discrete landscape patches were important (~60%) for hippos and crocodiles and, most importantly during dry seasons, when many wildlife species gather for water and give a spectacular view for photographic tourism. Other landscape patches whose attractions are seen as extremely important by a relatively small number of tourists were considered as of special interest tourism. These include the OSTRICH and LOVEBIRD eco-parcels (Table 1).

Furthermore, in KINAPA, different vegetation gradients and landscapes have varying importance from a tourism perspective (Table 2). The most important (~ preference by 84% of tourists: $N=306$) landscape patch is the SUMMIT. The summit harbours the highest point in Africa (Kibo Peak 5985 m) and ice sheets in a tropical climate. Ice sheets revealed important results when assessed as an individual attraction. Ice sheets were the second-most valuable attraction, though with wide variation in preferences. A good proportion (38%) of tourists considered ice sheets very important, 31% extremely important and 16% as important. Ice sheets were not expected to be ranked by some tourists as the least important attraction. The ice sheets on Mount Kilimanjaro have been portrayed as extremely important attractions by several scholars (Minja, 2014; Wakibara et al., 2009) and in the media. Another very important landscape for tourism in KINAPA is the montane forest, with its landscape patches such as MONTANE GARDEN, which harbours unique flowers and bird species. This landscape was considered very important (30%) by tourists.

4 | DISCUSSION

NBT depends on diverse ecosystems and biodiversity (Gupta et al., 2023). Ecosystems across the globe are changing substantially due to climate change (Shekhar et al., 2023), leading to diverse impacts on NBT (Scott et al., 2007). Unlike climate-smart built attractions (e.g., amusement parks, theme parks and aquariums), NBT that depends on natural ecosystems and their natural components is extremely vulnerable to even slight changes in the climate (Dube & Nhamo, 2020a). Nevertheless, globally, tourism-climate-related content has declined for the past 10 years, with limited discussion on impacts and adaptation strategies at the destination scale, particularly in Africa, South America, the Middle East and South Asia (Scott et al., 2023). Informed climate-change adaptation measures for NBT at the destination scale need knowledge on how individual attractions respond to the impact of climate change. This information is, however, lacking as it requires a thorough understanding of the attractions' assets that a destination has, how important each attraction is for tourism, where the attraction is and how these attractions are linked to climate and other ecological features temporally and spatially. This information is paramount, as knowing where to visit and what to see in a specific period at the age of rapid climatic change has been a challenge for tourists, destination managers and travel agents. This is evidenced by the increasing urge of tourists to visit social media to learn about individual attractions before visiting destinations (Martins & Martins, 2022; Soltani-Nejad et al., 2022; Yoo et al., 2016). As a result, tourism planning relies heavily on attractions posted by tourists on TripAdvisor and Flickr. The posted attractions' information might be misleading for adaptation, especially for destinations with few tourist visitations.

Inadequate information on attractions is a challenge for tourism planning. Studies addressing NBT climate adaptation strategies are few and localised (Dube et al., 2023; Scott et al., 2023). A Google

Scholar search found two studies, which were conducted in four provinces of Zimbabwe (Mushawemhuka et al., 2022) and a recent one in Portugal (Lopes et al., 2022). These studies argue that the availability and sharing of climate knowledge and information is a basic requirement for successful NBT adaptation to climate change impacts. Nevertheless, these studies did not discuss the type of information to be shared.

The eco-parcel approach developed in this study likely defines the necessary attraction information to be shared and provides a useful beginning in devising informative adaptation strategies for NBT from an ecological perspective. The three steps in the approach help to transparently put much attention on the attraction assets a destination has and micro-ecosystems that support the attractiveness of individual attractions and not a whole ecosystem in NBT destination. The list of attractions and the spatial and temporal links created between attractions and the supporting ecological parameters act as a building block to assess the impacts of climate change on specific attractions across space or time horizons using changes in land cover as a proxy. For instance, if Merkel and Aars (2022) had integrated the impact of the drastic loss of sea ice and the distribution of the Polar bear (the key attraction in the Arctic) with tourism, the study would have been instrumental to tourism planners' adaptation strategies in the Arctic.

Comprehensive information on the diverse attractions a destination has is paramount to making informed decisions (Khairi & Darmawan, 2021). Before the operationalisation of the eco-parcel approach in Serengeti and Kilimanjaro National parks, the authors believed that tourists are only attracted to snow and wildebeest migrations as these attractions are well publicised in different media and published literature (Hemingway, 1974; Lekan, 2011; Pollock, 1971; Steiger et al., 2013). Nevertheless, the results reveal that, if a comprehensive list of attractions is established, tourists are also attracted to other newly identified and unpublicised attractions. This is evidenced by high preferences for kopjes and big cats in SENAPA and unique wildlife, flowers, waterfalls and high-altitude climatic conditions in KINAPA (cf. Tables 1 and 2). The results imply that defining attractions in fine categories is a basis for devising informative adaptation strategies as each attraction responds to environmental change differently and, in turn, this will also influence tourists' preferences differently. Thus, instead of having cater-it-for-all adaptation strategies for the whole park, a fine classification of attractions enables the adaptation measures to focus on a specific niche of attractions that might be at risk but likely marginalised in the general classifications. Classifying attractions into fine categories serves to maximise the utilisation of scarce financial resources for conservation. For instance, in SENAPA, kopje micro-habitats are about to disappear, and conservation measures are unfortunately inadequate (Trager & Mistry, 2003), despite 71% of tourists being extremely attracted to kopjes and their specialised wildlife species. Detailed results like these are key to devising specific adaptation measures that are timely and cost-effective for any NBT destination.

Integrating the value of specific ecological attributes in tourism is timely for informing tourism stakeholders, park managers and ecologists at large. Due to the lack of ecology-tourism integration, the development of tourism products is largely guided by either perceptions or economic models. This has led to a multitude of impacts on ecosystems, including the loss of biodiversity (Niella et al., 2023). The capacity of the eco-parcel approach in defining the relative significance of individual attractions in each discrete landscape and introducing into it the ecological attributes of ecosystems is likely to inform on either the effects of losing attractions or gaining attractions resulting from climate-change impacts on ecosystems. For instance, the results in KINAPA revealed that ice sheets are not the key attraction, as is believed, rather it is the Kibo peak. This suggests that the loss of snow on Mount Kilimanjaro will not likely collapse the park's tourism as anticipated (see Minja, 2014) rather other unique attractions may still attract tourists to the mountain. The results imply that classifying attractions heterogeneously likely informs tourism stakeholders and policymakers more than would a homogeneous or general classification of attractions. Such comprehensive classification of attractions is timely because, at present, the world is struggling to adapt NBT to environmental change (WTTC, 2021, 2022) but lacks an informed approach for classifying and diversifying attractions to attract a diversified pool of tourists. In the eco-parcel, each attraction is considered based on its merit for tourism, and this is seen as gearing up conservation efforts (see Holland et al., 2022; Sharma & Kumar, 2023).

The advantages of linking attractions with their supporting ecosystems should not be undermined in adapting NBT to climate change's impact. According to UNWTO/UNEP (2008), assessing the impact of climate change on NBT has been seemingly impossible. This is because NBT is supported by diverse attractions that are supported by diverse ecological attributes, unlike ski tourism, which relies on the existence of snow, and coastal tourism, which relies on sunshine and the quantity and quality of water. Fine classification of discrete microenvironments that support individual attractions in space and time enables handling such diversity to support environmental impact assessment. In turn, this assessment helps to devise informed adaptation strategies for individual attractions and the whole destination. Arthur et al. (1977) argued that knowing the supporting environmental conditions of individual attractions allows the use of changes in those environmental conditions as a proxy for understanding possible changes in respective attractions. This knowledge is important, especially in the global South, where information about specific environments that support wildlife and other tourist attractions is scanty or lacking (Aleuy et al., 2022). The demonstration of the approach in SENAPA suggests that the ongoing changes in vegetation around the world will likely have severe impacts on tourism.

Lastly, the dependence on easily collected data from park wardens, tourists, tour guides and freely available satellite images makes the eco-parcel approach cost-effective, generic and likely instrumental, especially in the global South, where research and conservation budgets are prohibitively inadequate. Priskin (2001) argues that approaches that rely highly on a team of experts (e.g., consensus approaches) and other sophisticated datasets (e.g., descriptive approaches), yet are neither simultaneously defining attractions into fine categories nor linking individual attractions to their supporting characteristic environments or tourists, prove to be costly. In addition, the spatial creation of the attractions dataset simplifies information storage and thus speeds up the retrieval and integration of the data with other land-use plans. This integration enhances NBT adaptation planning at the local destinations' level. The eco-parcel approach is likely to be an instrument to resolve the ongoing land-use crisis between tourism, conservation, agriculture and human occupancy/settlement (see Gatwaza & Wang, 2023; Khan, 2023; Linuma et al., 2022).

4.1 | Limitations of the study

Although NBT not only depends on wildlife but also plants and non-living attractions, tourist attractions have been classified in a general category, such as wildlife. Even wildlife needs to be classified into types or species, as each species responds to climate change differently. The general classification is informative to understand the effect of either losing or gaining specific attractions. The eco-parcel approach identifies key attractions a destination has, classifies attractions into fine categories (e.g., wildlife in species, plants and non-living) and assesses the relative importance of each discrete landscape from a tourism perspective. In addition, information about attractions' supporting microenvironments (i.e. vegetation types, climate, moisture, types of soil and water quantity and quantity) is always lacking yet necessary for impact assessment. Nevertheless, the novel eco-parcel uses land-cover types as a substitute for attractions' supporting environments. Land cover supports the attractiveness of a multitude of attractions and provides habitats for different organisms of tourist interest. The use of land-cover types simplifies the link between each attraction and its supporting ecosystem. Land cover change has been used as an indicator of changes in the distribution and extinction of wildlife species (Anthony et al., 2023; Xian et al., 2020; Yuh et al., 2019). The approach might not be adequately applied to first-time tourists in a given destination. This is because their knowledge of relevant attractions would be limited, thus potential for undervaluing the attractiveness and tourism potential of a given destination.

5 | CONCLUSION

Unnoticeable and variable climate-related losses of tourist attractions in many ecoregions urgently call for adapting NBT to the impact of climate change. Therefore, informing NBT adaptation strategies is contingent on defining each attraction based on its merit for tourism and its supporting characteristic environments. The novel eco-parcel approach developed in this study enables the classification of attractions into fine categories (i.e. wildlife into species, plants and non-living attractions), creating a spatial and temporal link between attractions and their supporting characteristic environments (i.e., vegetation types, climate, water quality and quantity, soil, etc.) and assessing the significance of each attraction for tourism. The results reveal that each NBT destination has diverse attractions that are unevenly distributed and occur in discrete landscape patches, and tourists are attracted to these patches and not the whole protected ecosystem. The attractiveness of these landscape patches is supported by different climatic and environmental characteristics and differing vulnerabilities to climate change. Thus, the use of land-cover types and climate as proxies to create a temporal and spatial link between attractions and their supporting environments is a tool to assess future changes in attractions. This implies that the approach can be used adequately to assist in planning and designing climate-change adaptation strategies in tourism destinations.

As demonstrated in the Serengeti and Kilimanjaro National parks case studies, the eco-parcel approach is pertinent in equipping ecologists and tourism stakeholders with information and destination-specific climate adaptation strategies. This knowledge helps destination managers to adapt NBT to the impact of climate change based on the ecological characteristics of a destination. This study recommends expanding the analysis to other destinations using the same approach for comparative assessments elsewhere. The comparative assessments should focus on determining the vulnerability and climatic thresholds of tourist attractions in different destinations to assist in mitigation/adaptation strategies, especially in climate-sensitive NBT destinations where conservation, climate change and tourism development trade-offs are always inevitable.

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CONFLICT OF INTEREST STATEMENT

The authors declare that they have no conflict of interest.

DATA AVAILABILITY STATEMENT

The data that support the results of this study are available from the authors upon request.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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