

Article

Current Trends and Issues in Research on Biodiversity Conservation and Tourism Sustainability

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Abstract: The rationale of this article is the need to elicit the trending themes relevant to the latest research on biodiversity conservation and tourism sustainability. Hence, the purpose of this study: stocktaking of cutting-edge research articles in this field and eliciting the critical trends and issues shaping the knowledge, future research, and technical development perspectives on biodiversity conservation and tourism sustainability. The focus is on the trends, which are pivotal for achieving the UN Sustainable Development Goals until 2030. A hierarchical cluster analysis was undertaken with a KH Coder 3.0 tool to elicit topical co-occurrence networks for thematic words in academic papers from 2015 to 2020 on the topic, quarried from Google Scholar. The article's main findings are the seven identified major trending research themes on biodiversity conservation and tourism sustainability: (1) Community-based tourism development; (2) National Park management for tourism; (3) Sustainable tourist motivation; (4) Biodiversity conservation and ecotourism; (5) Landscape and land use changes; (6) Visitor satisfaction monitoring; and (7) Ecotourism modelling. The article's main conclusion is that the criteria and conditions for responsible low-key tourism in protected areas, both for biodiversity and local communities, are pivotal factors to consider for future research on biodiversity conservation and tourism sustainability.

Keywords: community impact; current trends; ecotourism; national parks; tourism sustainability; tourist experience



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1. Introduction

Biodiversity conservation has long traditions and has experienced many vicissitudes since the sacred pagan groves, medieval royal hunting reserves, and the first national parks of the 1800s. In a modern interpretation, the Convention on Biological Diversity (CBD, 1993) considers biodiversity conservation as a comprehensive system of concerted off-site and on-site measures securing biological diversity in its broadest sense. CBD defines biological diversity as ‘the variability among living organisms from [. . .] terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems.’ [1].

CBD considers off-site biodiversity conservation measures as those preserving components of biological diversity outside their natural habitats, including the system of legal measures and the storage of genetic material, i.e., any material of plant, animal, microbial, or other origin comprising functional heredity units. Likewise, CBD considers on-site biodiversity conservation measures to preserve natural habitats and ecosystems, maintaining and restoring viable species’ populations in their natural environment and, in the case of cultivated or domesticated species, in the environment of the evolution of their characteristic features.

CBD came into force in 1993, ratified by all the United Nations (UN) member states, except the United States. Biodiversity conservation as a system of measures prioritizes

the protection of endangered wildlife species and also contributes to the preservation of the Earth's ecosystems, delivering, in this way, unique ecosystem services and goods. The most vital services and goods of the Earth's ecosystems include the provision of refuge, food, breeding, and nursing grounds for biological species as well as preserving the Earth's genetic resources, to mention just a few essential ones.

Biodiversity as a resource for nature-based tourism and ecotourism delivers essential ecosystem services and goods for sustainable use. The ecotourism concept was introduced in the 1960s, when environmentalists became concerned with the misuse of biological diversity and natural resources [2]. Claus-Dieter 'Nick' Hetzer was the first who had introduced and outlined the term 'ecotourism' in 1965 [2,3]. Héctor Ceballos-Lascuráin further developed these ideas in the 1980s. The work of Ceballos-Lascuráin enjoyed a wide-ranging proliferation thanks to his collaboration with the International Union for Conservation of Nature (IUCN) [4], due to a growing worldwide interest in coalescing nature conservation and sustainable development agendas.

After a few elaborations, Ceballos-Lascuráin defined ecotourism as: *'environmentally responsible travel and visitation to relatively undisturbed natural areas, in order to enjoy and appreciate nature (and any accompanying cultural features—both past and present) that promotes conservation, has low negative visitor impact, and provides for beneficially active socio-economic involvement of local populations'* [4] (p. 20). In 1990, the International Ecotourism Society proposed a similar definition: *ecotourism is responsible travel to natural areas conserving the environment and improving the wellbeing of local people* [5]. Despite some of its limitations, aspects of the ecotourism definition coined by Ceballos-Lascuráin have served as a background for later ecotourism definitions [6].

The necessity to distinguish ecotourism resulted from the need to discern a new, alternative tourism paradigm that deliberately sought to minimize negative effects as opposed to mass tourism, which was deemed unsustainable [7–9]. It was a broad term comprising many labels ('appropriate', 'controlled', 'cottage', 'eco-', 'green', 'people to people', 'responsible', 'small-scale', and 'soft' tourism), meant to offer a more caring alternative to mainstream mass tourism [10]. Although referred to by many names, this 'new' tourism was promoted as environmentally sound and low impact [11]. Ralf Buckley [12] coined the term NEAT (nature, eco-, and adventure tourism) to delineate the distinct nature-based tourism sub-sector within the broader tourism industry.

However, the precise delineation of ecotourism has proven to be a tricky task. James E.S. Higham noted that *'few issues in the academic study of travel and tourism are as contentious, drawing divided and polarized lines of debate, as the concept of ecotourism'* [3] (p. 2). The distinctions between ecotourism and other forms of tourism were often fuzzy and widely debated. Discrepancies resulted from the diversity of different perspectives and criteria used to distinguish emerging ecotourism from other tourism sectors [13]. Failure to coin a precise definition for ecotourism had led to such a multiplication of definitions that Fennell [6] conducted content analysis of 85 definitions [14]. Indeed, *'ecotourism is often lumped together with nature, wildlife, and adventure tourism'* [15] (pp. 6–7).

It became evident that ecotourists were a heterogeneous group characterized in various ways [16]. Sharpley [17] elicited three broad tenets or pillars for ecotourism development: conservation, development, and experience. Sirakaya et al. [18] surveyed US eco-tour operators (N = 282), identifying 14 themes. The term 'ecotourism' was typically associated with community involvement, eco-cultural tourism, educational travel, environmentally friendly travel, low-impact travel, responsible travel, and sustainable/non-consumptive tourism. Donohoe and Needham [19] identified six key themes or tenets representing a set of notions critical for ecotourism as a result of the content analysis of 30 academic definitions of ecotourism published between 1991 and 2004 in English and French:

- A. Nature-based (mentioned in 80% of definitions);
- B. Preservation/conservation (77% of definitions);
- C. Environmental education (63% of definitions);
- D. Sustainability (57% of definitions);

- E. Distribution of benefits (57% of definitions);
- F. Ethics/responsibility/awareness (50% of definitions).

Summing up, the previous trends in research on biodiversity conservation and tourism sustainability were shaped by the deliberations on ecotourism and the interdependence among local stakeholders, nature conservation, and tourism. Reciprocally, previous research on biodiversity conservation and ecotourism significantly shaped the global discourse on the holistic approach towards conservation, protected area (PA) management, and enabling local communities under the aegis of the UN and IUCN. In 2015, the UN General Assembly identified 169 targets to gauge progress towards global sustainability under 17 Sustainable Development Goals (SDGs) to be met by 2030. However, insufficient resources, mono-sector resource management and environmental pollution hamper meeting SDGs [20,21].

The 17 SDGs included Goal 14: Life Below Water (the “Oceans’ goal”) and Goal 15: Life on Land. To achieve these two goals, essential for our subject of investigation, by 2030, the UN has identified 22 tangible targets for measuring the progress in conservation-related sustainable development—10 targets contributing to Goal 14 and 12 targets contributing to Goal 15. SDGs opened new research fields in biodiversity conservation and sustainable tourism development by emphasizing local participation, monetizing ecosystem services and goods or introducing the concept of symbolic wildlife recognized as a cultural ecosystem service [22–24]. The three ecotourism development notions elicited by Sharpley [17] epitomize the main research trends in biodiversity conservation and tourism development related to the process and progress in the UN SDG deliberations:

- A. Conservation: research on how tourism management in PAs contributes to wildlife conservation;
- B. Development: research on how to ensure local control and engagement of local communities in developing tourism-related services aimed to deliver them sustainable benefits;
- C. Experience: research on how tourists are offered and exploit opportunities for learning and meaningful encounters with the environment and local community.

The emerging research trend on biodiversity conservation and PA management for sustainable tourism aims to elicit conditions under which tourism in PAs is least harmful to wildlife. Hence, the need arises for a comprehensive investigation of issues implied by uncontrolled visitation to PAs. This need brings the issue of carrying capacity to the forefront with the increasing research focus on overtourism and a wide array of approaches and principles aimed to minimize and mitigate adverse effects of tourism on PAs—the Limits of Acceptable Change (LAC), Visitor Impact Management Model (VIMM), and Tourism Optimization Management Model (TOMM) as well as the Integrated Monitoring and Adaptive Management System (iMAMS) [24].

The research trend focusing on community-based tourism development involves empowering local communities and augmenting local control in tourism-related services. The studies address a wide array of issues ranging from the stakeholder involvement and sustainable delivery of benefits from tourism-related ecosystem goods and services to local communities, in line with the SDGs, to exotic concepts such as eco-sanatorium (nature-based convalescence services) [22]. Many analyzed studies focus on transferring financial revenues from ecosystem services from tourist generating regions to PA communities. The overall insight is that adverse impacts of conservation restrictions on local communities can be addressed by involving local people in PA management and directly paying for ecosystem services to locals.

The emergence of a trending research theme on how tourists are offered and use opportunities for learning and meaningful encounters with the environment and local community is also very distinctive [10]. The research focuses on socio-psychological investigations of ecotourist motivations regarding various aspects of sustainability and self-realization. Furthermore, it deals with tourist perceptions of ecotourism as a distinct concept that seeks to minimize the adverse effects of mainstream mass tourism. Moreover, this trending research focuses on the marketing of ecotourism promoted as low impact

and ecologically sound, emphasizing the above-mentioned symbolism of wildlife, pristine ecosystems, and their importance for local communities [23].

Hence, an overarching megatrend in biodiversity conservation and sustainable tourism research in recent decades is in line with the combined definitions of ecotourism coined by Ceballos-Lascuráin and the International Ecotourism Society. It is environmentally responsible travel to natural areas for enjoying and appreciating nature that conserves the environment, has low negative visitor impact, and improves the wellbeing of local communities. The research megatrend comprises participatory experiences in the natural environment, including promoting environmental conservation, international understanding and cooperation, socio-economic and political empowerment of local populations, and cultural preservation [8].

Taking all these older and newest research findings and gaps into consideration, we have defined the objective of our research as twofold. The first sub-objective was to garner the latest cutting-edge research articles on biodiversity conservation and tourism sustainability using Google Scholar. The second sub-objective was to highlight the trending themes as well as the knowledge and future research avenues in this field, which is of utmost relevance for meeting the UN SDGs until 2030. This approach allows us to assess the progress in research on biodiversity conservation and tourism sustainability as well as identify the relevant research directions and practical applications in PA management.

The research scenario was as follows: we initially screened the extracted 1728 academic papers using a ‘nuts-and-bolts’ method [25–27]. This enabled the selection of 526 articles pertinent to biodiversity conservation and tourism sustainability research. We then converted the selected 526 publications to .txt files by removing figures, tables, and references. Data were then rendered for content analysis using KH Coder 3.0 software to elicit topical co-occurrence networks and hierarchical clusters for the words occurring in academic papers in research on biodiversity conservation and nature tourism sustainability [28]. Then, we have compared the results of our content analysis with the ecotourism definition content analyses from the turn of the century [6,18,19].

2. Materials and Methods

The stock for the survey was obtained from the Google Scholar academic publications’ platform. We collected academic papers using the keywords “biodiversity”, “conservation”, “nature”, “park”, and “tourism”. To elicit the main trends and issues, we limited the quarrying to academic publications published between 2015 and 2020. The publications were downloaded in February 2021. The compiled database contains 1728 papers in the English language on one or several matters of interest. The geographical scope of the authors and their topics is wide, covering all habitable continents.

We used the selection of exclusion for the papers that did not meet the selection criteria. We initially screened the extracted 1728 academic papers using a ‘nuts-and-bolts’ method [25–27]. This approach implies several stages:

- i. Skimming (superficial examination);
- ii. Reading (thorough examination);
- iii. Iterative interpretation of the collection of publications.

This first step aimed to elicit the information of interest and any other knowledge on the research subject that could be helpful in the following analysis steps, i.e., an AI-based content analysis applying KH Coder 3.0 software (manufacturer, city, country). This first step of the content analysis enabled the selection of 526 articles, which are indeed pertinent to research on biodiversity conservation and tourism sustainability.

To ensure smooth use of our PC’s processing resources, we have converted the selected 526 publications to .txt files by removing figures, tables, and references for further analysis. Thus, we have produced a seamless text comprising a database of more than 0.7 million nouns, adjectives, verbs, and adverbs for content analysis. This approach to data-base formation has enabled us to focus the KH Coder-based content analysis on the pivotal thematic issues, without losing the information available in the database of investigated

publications. Data were then rendered for content analysis using KH Coder 3.0 software, an AI-based analytical tool for text mining and quantitative content analysis [28].

KH Coder is an open-source text quarrying and processing AI-based software, for quantitative content analysis and computational linguistics [29,30]. It enabled us to conduct a content analysis of the extracted nouns, verbs, adverbs, and adjectives and elicit the key topical associations. We have undertaken the analysis with the KH Coder 3.0 tool to elicit topical co-occurrence networks and hierarchical clusters for nouns, verbs, adverbs, and adjectives occurring in academic papers in research on biodiversity conservation and nature tourism sustainability. KH Coder supports many text analysis methods described in content analysis investigations, and over 900 research projects used the software [30].

The KH Coder 3.0 function of the Co-Occurrence Network (KH Coder, Co-Occurrence Network) allowed us to create a network diagram with different colors, signifying different trending research themes expressed as the prevalent words (Figure 1). The network diagram helps perceive the co-occurrence structures within the complete database of the 526 publications, i.e., within and among different documents. Furthermore, the hierarchical cluster analysis of thematic words using another function of KH Coder 3.0 (KH Coder, Hierarchical Cluster) played an ancillary role in eliciting and analyzing the pivotal thematic associations. Finally, the results of our content analysis were compared with the ecotourism definition content analyses from the turn of the century [6,18,19].

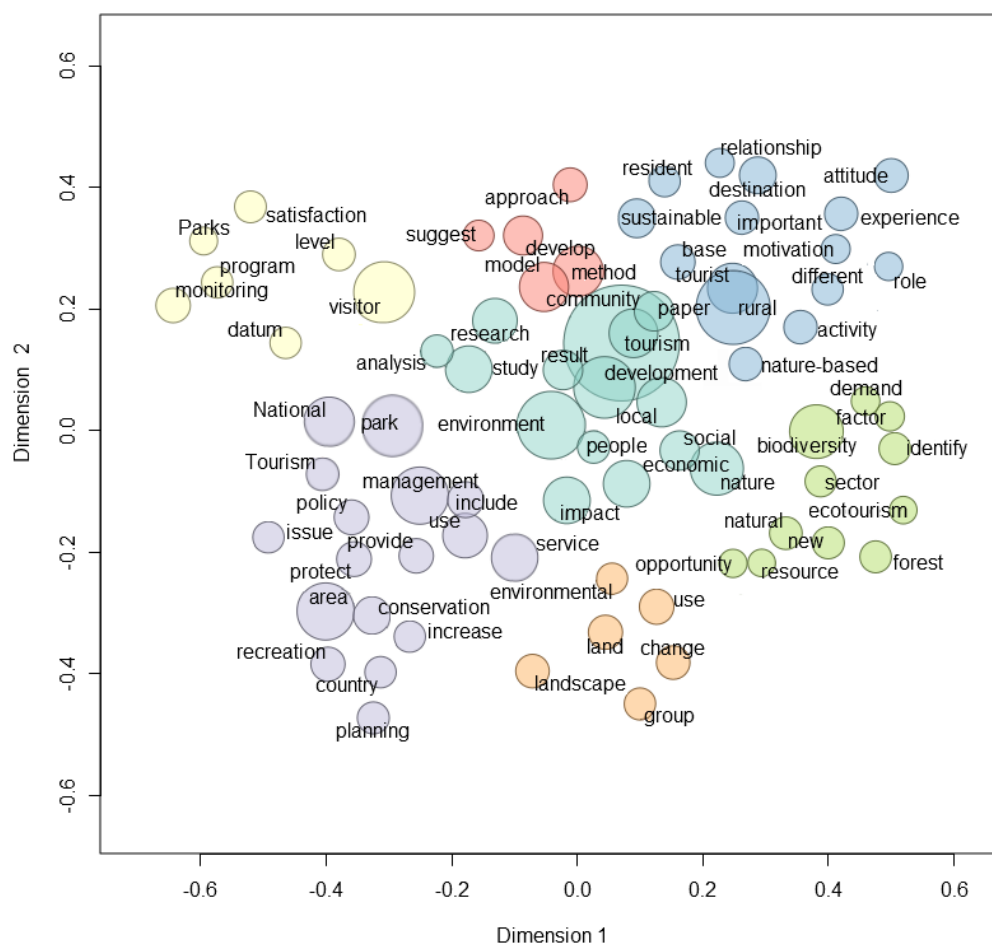


Figure 1. A topical co-occurrence network of nouns, adjectives, verbs, and adverbs occurring in academic papers in research on biodiversity conservation and tourism sustainability.

3. Results

The display of the content analysis outputs from the KH Coder rendering to elicit topical co-occurrence networks of nouns, adjectives, verbs, and adverbs is given in Figure 1. The

relevant excerpts from the rendered hierarchical clusters are displayed from Figures 2–5. The outputs of KH Coder-rendered content analysis are displayed in the correlated pictures and provide a coherent insight into trending themes in research on biodiversity conservation and tourism sustainability. As mentioned, we have further compared the results of our content analysis with those obtained by previous researchers.

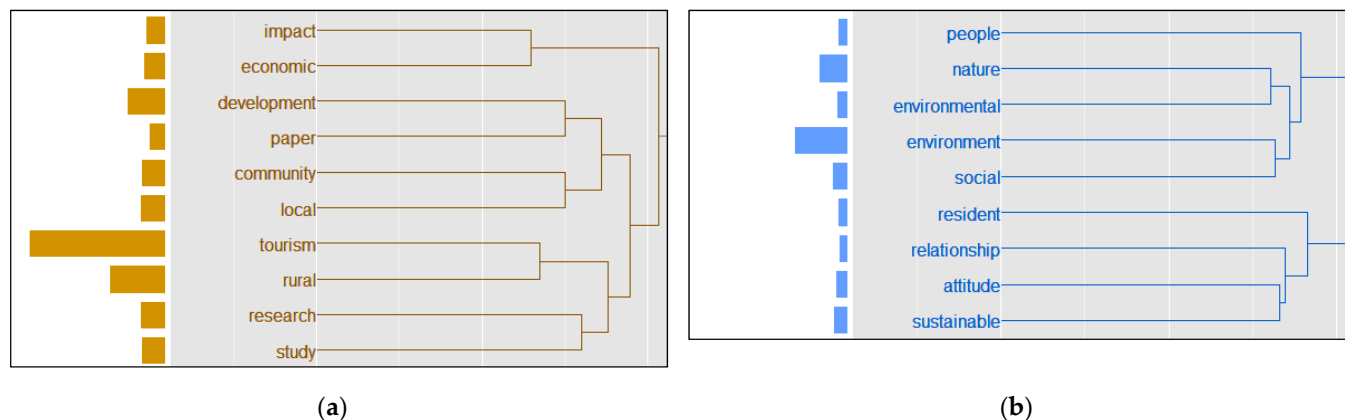


Figure 2. Hierarchical clusters of nouns, adjectives, verbs, and adverbs occurring in academic articles on the trending theme of Community-based tourism development: (a) Community tourism trending sub-theme; (b) Sustainable development trending sub-theme.

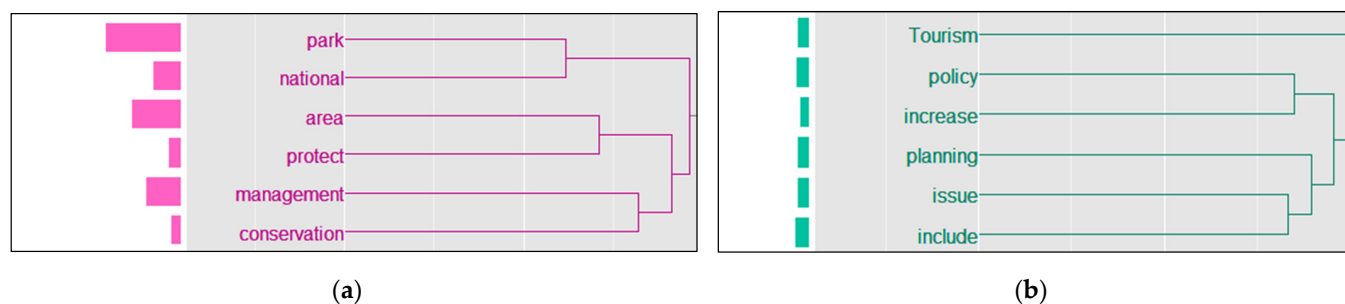


Figure 3. Hierarchical clusters of nouns, adjectives, verbs, and adverbs occurring in academic articles on the trending theme of National Park management for tourism: (a) National Park conservation and management; (b) Tourism policy and planning.

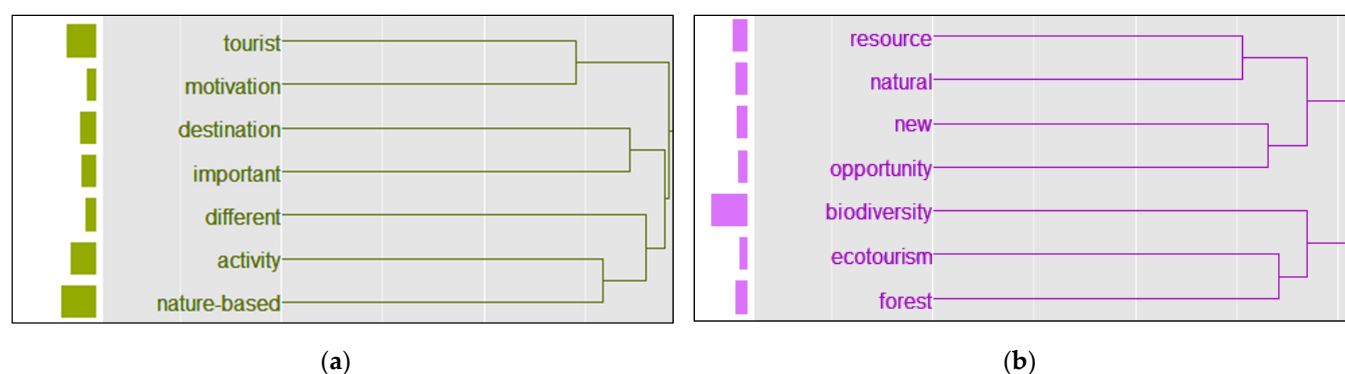


Figure 4. Hierarchical clusters of nouns, adjectives, verbs, and adverbs occurring in academic articles on the trending themes: (a) Sustainable tourist motivations; (b) Biodiversity conservation and eco-tourism.

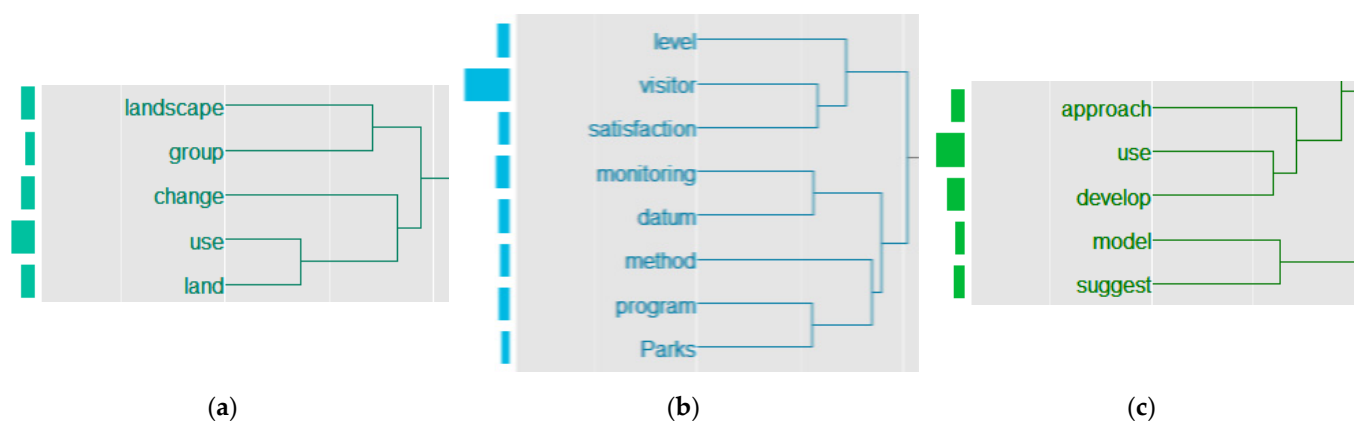


Figure 5. Hierarchical clusters of nouns, adjectives, verbs, and adverbs occurring in academic articles on the trending themes: (a) Landscape and land use changes; (b) Visitor satisfaction monitoring; (c) Ecotourism modelling.

With the aid of KH Coder, we have elicited seven different co-occurrence networks of nouns, adjectives, verbs, and adverbs. Ignoring the most generic research-related words such as ‘apply’, ‘focus’, ‘survey’, or ‘use’ from the content analysis, we can see that the seven elicited co-occurrence networks may be grouped, regarding their relevance, into three groups for further study and deeper scrutiny as significant trending research themes on biodiversity conservation and tourism sustainability between 2015 and 2020:

- A. Central trending theme—31% of the terms attributed to that trending theme;
- B. Priority trending themes—55% of the terms;
- C. Secondary themes—14% of the terms.

We have conventionally labelled the central trending theme as ‘Community-based tourism development’, the three priority trending themes as ‘National Park management for tourism’, ‘Sustainable tourist motivation’, and ‘Biodiversity conservation and ecotourism’. Meanwhile, we have labelled the secondary themes as ‘Visitor satisfaction monitoring’, ‘Landscape and land use changes’, and ‘Ecotourism modelling’. All seven themes elicited using the KH Coder 3.0 Co-occurrence Network tool are coherent with the outputs gained using the KH Coder 3.0 Hierarchical Cluster tool. In this article, our attention will be on the first four themes, briefly highlighting the remaining three secondary themes. Like with any semantic analysis, the validity of the whole picture depends on the researcher’s attentiveness [24].

3.1. Community-Based Tourism Development

Besides generic terms such as ‘study’, ‘research’, ‘analysis’, and ‘result’, the central sub-graph contains a series of suggestive and closely-clustered terms revolving around the four key terms—‘tourism’, ‘community’, ‘environment’, and ‘development’. It highlights the first co-occurrence sub-network denoting a trending theme—Community-based tourism development. Three satellite terms include ‘social and economic impact’, ‘nature’, and ‘local people’. As mentioned, 31% out of 0.7 million processed terms can be attributed to this trending theme. The articles focusing on this theme highlight different aspects of sustainable tourism development, focusing on tourism’s social and economic impact on local communities and people.

The sustainable development triad—social, environmental, and economic facets—is unmistakable in this central theme, making it a pivotal trend in the recent studies on biodiversity conservation and tourism sustainability. This trending theme is rectified and explicated by the first two excerpts from the hierarchical cluster elicited using KH Coder (Figure 2a,b). From these excerpts, we can see that the priority focus in the recent studies on biodiversity conservation and tourism sustainability is indeed on the social, environmental, and economic aspects of the conditions of tourism sustainability. The research focuses on

ecotourism and various other kinds of nature-based tourism being in close relationship with local communities and people.

From Figure 2, we see that the central trending theme is, in semantic terms, closely linked to similar themes such as rural tourism and residents' attitude towards tourism. These results of our application of the KH Coder method for content analysis are very much in line with those mentioned above similar previous content analyses of the ecotourism definitions conducted at the century's turn [6,18,19]. Those results list community involvement among the priorities when defining ecotourism, albeit not among the top terms. It is understandable bearing in mind the above-described specifics of ecotourism.

Thus, Sirakaya et al. [18] used a supply-side approach and analyzed 282 US-based eco-tour operators eliciting a set of 14 themes. The term 'ecotourism' was most often associated, inter alia, with responsible travel, educational travel, eco-cultural tourism, sustainable/non-consumptive tourism, and community involvement. Fennell elicited 'Culture', 'Benefits to locals', and 'Education' among the five most frequently cited variables. Environmental education (63% of definitions), Sustainability (57% of definitions), Distribution of benefits (57% of definitions), and Ethics/responsibility/awareness (50% of definitions) as among the six key themes central to ecotourism, which Donohoe and Needham [19] had identified as a result of the content analysis of 30 academic definitions of ecotourism published between 1991 and 2004 in English and French.

3.2. National Park Management for Tourism

Besides generic terms such as 'include', 'issue', 'provide', and 'use', this sub-graph contains a series of closely-clustered terms highlighting the main terms of 'National Park', 'protected area conservation', 'Tourism policy', 'planning', 'recreation', and 'services'. It highlights the second most prevalent co-occurrence sub-network denoting a trending theme—national park management for tourism. Out of 0.7 million processed terms, 21% can be attributed to this trending theme. The articles focusing on this theme highlight various aspects of national park management for tourism. The majority of publications investigate the role of national parks and managed nature reserves in different countries in providing tourism services and how this necessity is reflected in planning and management tools.

This trending theme can be split into two sub-themes—national park conservation and management as well as tourism policy and planning. These two sub-themes of the trending theme are rectified by the two excerpts of the hierarchical cluster elicited using the KH Coder (Figure 3a,b). According to Sirakaya et al. [18], the term 'ecotourism' was most often associated, inter alia, with environmentally friendly tourism within the framework of this theme. Fennell elicited 'Reference to where ecotourism occurs, e.g., natural areas' and 'Conservation' as among the five most frequently cited variables. Nature-based (mentioned in 80% of definitions) and Preservation/conservation (77%) are among the six key themes central to ecotourism that Donohoe and Needham [19] had identified.

3.3. Sustainable Tourist Motivations

The third priority sub-graph also contains several interrelated significant terms: 'rural tourist/tourism' as the most frequently mentioned term, and also 'destination experiences', 'motivations', 'nature-based', 'resident attitude', and 'sustainable'. It highlights the third co-occurrence sub-network signifying a trending theme of Sustainable tourist motivations, closely related to the first co-occurrence sub-network (Figure 1). Out of 0.7 million processed terms, 18% can be attributed to this trending theme. The research publications, addressing this trending theme, highlight different aspects of the relationships between tourists visiting PAs and keen to behave responsibly and sustainably in the destination in social, environmental, and economic terms.

Notably, rural and nature-based tourism seems to form a synergy in the vast array of sustainable tourist motivations. The excerpt from the hierarchical cluster explicates this trending theme elicited using KH Coder (Figure 4a). From the excerpt, we may note that

the main focus of this hierarchical interrelation is on tourists' motivation and nature-based activities. Meanwhile, in the co-occurrence network, the research on the destination's features focuses on the residents' relationships with tourists and their attitudes (Figure 1). Hence, we note rather fuzzy associations of the third trending theme.

The lack of clear-cut definitions of tourism sustainability for a need to preserve biodiversity values and ensure residents' satisfaction is coherent with the decades-long debate on the definitions of ecotourism, sustainable tourism, and responsible tourism. Referring to Sirakaya et al. [18], 'ecotourism' as environmentally friendly as well as responsible travel and community involvement are best suited to the modern trending research theme of sustainable tourist motivations. Comparing the five most frequently cited variables identified by Fennell [6], our trending research theme best correlates with 'Benefits to locals' and 'Education'. Similarly, this trending theme continues the 'Distribution of benefits' and 'Ethics, responsibility, awareness' key themes or tenets, representing a set of beliefs central to ecotourism elicited by Donohoe and Needham [19].

3.4. Biodiversity Conservation and Ecotourism

The fourth sub-graph of the priority co-occurrence sub-network is the best expressed. It contains a concise but eloquent series of nouns, adjectives and verbs: 'biodiversity', 'ecotourism', 'forest', 'natural', 'resource', 'new', 'opportunity', 'identify', 'demand', 'factor' and 'sector'. Out of 0.7 million processed terms, 16% may be attributed to this overarching theme. This sub-graph denotes a trending theme that we may conventionally label as Biodiversity Conservation and Ecotourism (Figure 4b). In the surveyed research publications, these words usually produce combined concepts: 'natural resource', 'new opportunity', 'identify demand', 'ecotourism sector', but for 'biodiversity', which stands alone.

These complex terms, along with the clear-cut hierarchical cluster of the biodiversity conservation and ecotourism (Figure 4b), show the pivotal role of this overarching trending theme. It also shows that biodiversity conservation in synergy with tourism sustainability prioritizes forest habitats and ecosystems. Remarkably, this integrated research primarily targets a wide range of forest ecosystems worldwide—from rainforests to boreal taiga. The cause of such a focus on forest ecosystems has a very distinctive research rationale: the in situ biodiversity conservation of forest ecosystems opens new opportunities to use them as ecotourism destinations, i.e., as a sustainable natural resource, an alternative for unsustainable timber harvesting.

Once again, referring to the previous content analyses of ecotourism definitions and connotations, none of the themes identified by Sirakaya et al. [18] from the analysis of US-based eco-tour operators made a quarter-century ago directly resembles the modern trending integrated research theme of biodiversity conservation and ecotourism. However, Fennell's content analysis of 85 ecotourism definitions shows that 'reference to where ecotourism occurs' was the top priority in the overview of the broad base of the ecotourism definitions [6]. Donohoe and Needham [19] identified 'Nature-based' and 'Preservation/conservation' as the top two key tenets representing a set of beliefs central to ecotourism between 1991 and 2004, stated in the absolute majority of definitions.

3.5. Secondary Themes

Last but not least, the fifth to seventh sub-graphs of the co-occurrence sub-network contain a relatively small series of nouns, adjectives, and verbs. Out of 0.7 million processed terms, we may attribute 14% to these trending themes. The fifth sub-graph denotes a trending theme that we may label as 'Landscape and land use changes' comprising co-occurring terms 'use', 'land', 'landscape', 'change', and 'group' (Figure 5a), with the term 'environmental' standing alone. In the surveyed research publications, these words usually produce the combined trending themes of 'landscape or land-use changes' and 'landscape group'.

'Visitor satisfaction monitoring' is another secondary trending theme comprising seven terms: 'visitor', 'datum', 'monitoring', 'program', 'Parks', 'satisfaction', and 'level'.

Like with other trending themes, from the co-occurrence network and hierarchical cluster, we may elicit several combined trending complex terms: ‘visitor satisfaction level’, ‘park monitoring program’, and ‘monitoring data/datum’, with the term ‘method’ standing alone (Figure 5b). The term ‘method’ belongs to the last and smallest trending theme of ‘Ecotourism modelling’ in the semantic co-occurrence network. The trending theme of ‘Visitor satisfaction monitoring’ correlates very well with the trending theme of sustainable tourist motivation elicited both in our survey and in the earlier studies mentioned above.

The co-occurrence network of the smallest trending theme ‘Ecotourism modelling’ comprises five terms: ‘model’, ‘method’, ‘develop’, ‘approach’, and ‘suggest’. While the overall contents of the trending theme are clear, it lacks more concrete terms, which could guide it in a particular direction, revealing a more comprehensive research trend. The trending theme of ‘Ecotourism modelling’ is somewhat fuzzy, and the term ‘use’ is available in the hierarchical cluster but missing from the co-occurrence network, whereas the term ‘method’ is the opposite. Furthermore, in the hierarchical cluster, ‘approach’, ‘use’, and ‘develop’ belong to one sub-cluster, while ‘model’ and ‘suggest’ another.

4. Discussion

The main result of our investigation is that it elicited community-based tourism development as the central research trending theme on biodiversity conservation and tourism sustainability, along with National Park management for tourism; Sustainable tourist motivation and Biodiversity conservation and ecotourism are the priority trending themes. These four themes show that current research on biodiversity conservation and nature tourism sustainability directly contributes to achieving UN SDG goals—Goal 14: Life Below Water (the “Oceans’ goal”) and Goal 15: Life on Land. The research also looked for the roads towards SDGs for preserving heritage and sustainable communities (SDG 11), more effective institutions (SDG 16), and fair and non-hegemonic partnerships throughout the whole world (SDG 17) [31].

Content analysis of the selected 526 articles, and the comparison of trending themes with the content analysis of ecotourism definitions done a couple of decades ago, has confirmed the continuity of the conceptual approaches in research on biodiversity conservation and tourism sustainability. However, our investigation has also revealed several new perspective avenues for future research on biodiversity conservation and tourism sustainability. First, this field’s progress depends on the application of ‘citizen science’ as an information source to supplement the professional biodiversity monitoring data (open-source databases and data provided by PA managers, rangers, and trained or lay tourists).

Citizen science is a rapidly developing research approach in many fields, including the biodiversity conservation and sustainable tourism [32–38]. The data is of adequate quality to assess the efficiency of PA conservation and tourism management. The main requirement for such data is to be collected in a standardized way along with information validation and cross-checking, using social research methods such as the Delphi technique and focus groups, questionnaires, and socio-economic surveys. However, without rigid data collection and sampling guidelines, the validity of information on the endangered species and habitats delivered by PA managers, rangers, and other local stakeholders will have limited value [39–45].

The design of a system for collecting ‘citizen data’ to support the long-term biodiversity monitoring may need modifications to ensure data compatibility over time for mitigating the “shifting baselines syndrome”. This syndrome means that missing documented baseline knowledge allows a decline in the scale of baseline assessments of human impact on biodiversity by the PA managers [46]. The gap between the PA managers’ perception and professional monitoring results comes from missing reference situations for the species and habitats, making any inter-temporal and inter-spatial comparison complicated. Therefore, we need rigid accuracy testing rules and solid reference baselines for the data inputs from ‘citizen science’ since any misjudgment about species, or habitat change can lead to inadequate management response [47–52].

Another prevailing research focus related to the inadequate management response is on various aspects of contestation over priorities in biodiversity conservation and nature-based tourism, especially in PAs. Jamal and Higham [53] note that tourism planning and policy are often political, involving multi-stakeholder contention over self-determination, voice, and control of tourism development. As mentioned in the Introduction of this article, there are essential differences in biodiversity conservation and nature-based tourism management systems in different countries. The difference between two extremes can be summarized as follows: where the prescriptive approach towards conservation prevails “everything is forbidden which is not explicitly allowed”, whilst where the negotiative approach prevails, “everything is allowed which is not explicitly forbidden” [24].

A current critical strand of research on biodiversity conservation and tourism sustainability deals with transformations of the strict top-down, ‘prescriptive’ approach, particularly in countries with strong traditions of centralized planning (e.g., Central and Eastern Europe, France, Germany, and Spain, as well as Brazil, Russia, India, and China (the BRIC countries), plus South and Southeast Asia). The main problem with the top-down approach to biodiversity conservation and tourism sustainability is that it does not facilitate nature-based tourism development in PAs but hampers entrepreneurial initiatives of local communities and small businesses. Thus, the top-down approach excludes people from the process of biodiversity conservation [54–58].

In many countries with top-down biodiversity conservation, nature-based tourism is often developed by larger tourism companies [57]. They are more advantageous regarding lobbying and ‘bending’ the conservation restrictions but ignore local socio-economic conditions. Hence, the deterioration of ecosystems increases along with the rise of ecotourism. It, in turn, favors ‘top-down’ supervision as having a positive effect on ecotourism performance [58]. Therefore, the ‘negotiative’ approach to biodiversity conservation and tourism sustainability is preferable combining top-down policy intervention with bottom-up local initiatives to enhance the value of the sustainable tourist experiences and the holistic sustainability of the destination. It is of more interest for scholars and practitioners than the ‘prescriptive’ approach, though it has its caveats [57–62].

Tourism impacts are heavily context-dependent, making generalizing conservation relationships with tourism experiences difficult [60]. Tourists often ignore evocative and sophisticated meanings that those studying tourism’s effects on biodiversity usually apply for ecotourism. The research on biodiversity conservation and tourism should instead answer questions such as ‘what measures could maximize benefits and minimize harms?’ and ‘under what conditions is tourism in PAs least harmful and most beneficial?’ This latest observation brings us to the issue of carrying capacity with the increasing research focus on overtourism and acceptable practices to mitigate it [63].

The concept of overtourism is applied to define the adverse consequences of tourism in cultural and natural heritage destinations and, thus, can be regarded as a new issue for future research in the discussed field. Mitigating overtourism in PAs requires understanding ecosystems’ complexity and non-linear relationships between ecological causes and consequences [64]. The need of mitigating overtourism in PAs is a trigger facilitating the emergence of a research trend for a comprehensive investigation of issues implied by uncontrolled visitation to PAs. Research into identifying carrying capacities and outlining codes of conduct for tourists, as have been highlighted above, is trending and focuses on finding optimal spatiotemporal management patterns (choreography and chronography) of visitor flows [31,61,65].

5. Conclusions

The article’s main conclusion is that criteria and conditions for responsible low-key tourism in PAs, both for biodiversity conservation and for the wellbeing of local communities, are pivotal factors to consider for future research on biodiversity conservation and tourism sustainability. Three main challenges are:

- (1) Augmenting the environmental awareness of lay visitors and tourism service providers in PAs, ensuring smooth choreography, and avoiding overtourism;
- (2) Better use of remote sensing data, geographical information systems (GIS), and citizen science input to monitor biodiversity and tourism;
- (3) Using the shock caused by the COVID-19 pandemic to gear nature-based tourism towards genuine sustainability.

Hence, the current limits of research can be identified as the ones primarily related to the deficit of high-quality AI-based tools for the cross-referenced interpretation of ‘citizen science’ data, first of all, such as open-source visual materials, i.e., geotagged photos and videos posted on Instagram, Tik-Tok, and other social media platforms, especially in peri-urban coastal and marine PAs. The standardization of the hybrid approaches to monitor, classify, and map coastal and marine environments pertinent for nature-based tourism is the most stringent limit or bottleneck hampering rapid advances in research on biodiversity conservation and tourism sustainability. Apparent technical limits exist for monitoring, classifying, and mapping certain seabed habitats popular with tourists, e.g., coral reefs.

Therefore, the future research intention, at least by the research team behind this article, is to focus on a broad array of research and technical development (RTD) challenges pertinent to systemic quarrying and the use of ‘citizen science’ data for the assessment of the limits of acceptable change and optimizing spatiotemporal visitation patterns, particularly in peri-urban coastal and marine PAs. The most promising future research avenue, in our opinion, lies in applying sophisticated geostatistical algorithms for the development of a comprehensive AI- and GIS-based decision-support toolbox based on broad and dedicated usage of ‘citizen science’ data.

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