

**Advancing Sustainable Development Goals through Interdisciplinarity
in Sustainable Tourism Research**

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Abstract

The sustainable development goals (SDGs) address multifaceted problems that lie at the intersection between natural and socio-economic systems. While scholars agree that interdisciplinary research is needed to advance the SDGs, the concept of interdisciplinarity itself has been given limited attention. This article explores the interdisciplinarity of research published in the *Journal of Sustainable Tourism* using references cited by the journal's articles. We use structural topic modeling to analyze research trends. The findings suggest that the research has become more interdisciplinary, however, knowledge is defined primarily by tourism studies and the business management discipline. To advance the SDGs, researchers should engage with disciplines such as anthropology and the humanities that can bring critical issues such as power relations and socio-cultural values to the forefront of sustainability discourses. Research should also conceptualize the SDGs as a network of targets to facilitate the integration of sustainable tourism outcomes with broader development goals.

Keywords: sustainable tourism; sustainable development goals; interdisciplinary; structural topic modeling; knowledge development

Introduction

As research on sustainable tourism has surged over the past decades, its intellectual structure has become an object of scientific interest. The approaches used to study the state of research have evolved from narrative analysis of the concept (e.g., Butler, 1999) to advanced methods based on bibliometric techniques (e.g., Moyle, Moyle, Ruhanen, Weaver, & Hadinejad, 2020). Academic discourses reflect the significance that sustainable tourism holds both theoretically for researchers and practically as a way for the industry to influence the policy narratives. Although sustainable tourism policies have become more innovative at identifying ways to derive societal benefits, research still has to demonstrate more relevance to practice (Bramwell, 2015; Bramwell, Higham, Lane, & Miller, 2017). Repeated re-conceptualization of sustainable tourism, lack of consensus over its definition, case study-based studies, and disciplinary parochialism explain the failure of research to contribute to the broader development agendas (Bramwell & Lane, 2015; Buckley, 2012; Moyle et al., 2020; Ruhanen, Weiler, Moyle, & McLennan, 2015). Bramwell et al. (2017) argue, as researchers, “we are increasingly tasked with producing research that is impactful... but if our research is not impactful, then it could be seen as narcissism” (p. 4).

For sustainable tourism research to be impactful, studies should make a notable contribution to the broader development agendas. In this context, the United Nations Sustainable Development Goals (SDGs) are advocated as a powerful and shared aspiration and an integrative framework that should guide studies (Font, Higham, Miller, & Pourfakhimi, 2019). Since the SDGs came into effect in January 2016, they have influenced sustainable tourism discourses, although contemporary research has yet to engage with these goals fully and explicitly. Moyle et al.’s (2020) bibliometric study on sustainable tourism research, for example, found that the SDGs “constitute a major latent theme, albeit to widely variable extents” (p. 1), while Rasoolimanesh,

Ramakrishna, Hall, Esfandiar, and Seyfi's (2020) scoping review concluded that studies "demonstrate the lack of direct attention to the SDGs..." (p. 1). While the SDGs do not provide much information on how they should be implemented (Schwan, 2019), it is clear from academic discourses in tourism (e.g., Bramwell et al., 2017; Moyle et al., 2020; Rasoolimanesh et al., 2020) and elsewhere (Lam, Walker, & Hills, 2014; Leal Filho et al., 2018) that these goals address multifaceted problems such as climate change, poverty, and persistent inequality that lie at the intersection between natural and socio-economic systems.

Given the interconnectedness and breadth of the SDGs, they cannot be pursued in monodisciplinary research. Their advancement requires interdisciplinary research that borrows concepts, theories, methodologies, and data from various disciplines (Schoolman, Guest, Bush, & Bell, 2012). For example, developments in science and information technology need to be deployed to address issues such as reliance on fossil fuels in aviation which is considered as unsustainable. Thus, a monodisciplinary approach to the problems being tackled by the SDGs would fail to garner knowledge that other disciplines can bring towards a solutions-driven agenda. Drawing from a collection of articles published in a special issue of the *JoST* on 'critical thinking' to realize sustainability in tourism systems, Boluk, Cavaliere, and Higgins-Desbiolles (2019) advocate for SDG research that draws from "multiple worldviews and disciplinary perspectives" (p. 848). At the same time, research should integrate strategies and approaches for operationalizing the SDGs in ways that emphasize their interdependence (Nunes, Lee, & O'Riordan, 2016). These require less hierarchical forms of knowledge than those usually applied within disciplines and innovations in sustainable tourism research.

While tourism scholars agree that interdisciplinary research is needed to advance the SDGs (Boluk et al., 2019; Bramwell et al., 2017; Moyle et al., 2020), the concept of interdisciplinarity itself and its operationalization in existing research on sustainable tourism has been given very limited scholarly attention. For future research on sustainable tourism to have an interdisciplinary foundation and, by virtue of which, a transformational and solution-oriented agenda that contributes to the SDGs, four fundamental research questions must be answered: (1) to what extent current research on sustainable tourism is interdisciplinary and what are the disciplinary gaps? (2) what topics have been studied by researchers? (3) what is the current state of sustainable tourism research that explicitly addresses the SDGs? and (4) what are the implications of (1), (2), and (3) for future tourism research on the SDGs? These questions necessitate an evaluation of the disciplinary foundations of current research on sustainable tourism that can provide valuable directions for future studies that attempt to make a notable contribution to the SDGs.

This study uses articles published in the *Journal of Sustainable Tourism (JoST)* from 1993 (inception of the journal) to 2020 to answer the above research questions. The *JoST* is the only journal that has ‘sustainable tourism’ in its title, and it thus provides a unique collection of articles in this area from the early days of tourism sustainability to the present day. It is a leading outlet that advances critical understanding of the relationships between tourism and sustainable development. Figure 1 presents the conceptual framework of the study. A research field (e.g., sustainable tourism) is a sub-set of a discipline (e.g., tourism) that investigates specific topics of theoretical and practical significance (Coccia, 2020). The disciplinary foundation of a field can be studied using references that reflect the judgement scholars make when acknowledging important works (Agarwal, 2016; Leydesdorff & Cozzens, 1993; Sharma, Nunkoo, Rana, & Dwivedi, 2021). To determine the disciplinary influences on sustainable tourism research, we use

the references cited by the journal's articles. We also analyze all works (within tourism and in other disciplines) in which the journal's articles appear as references. In this way, we observe in an illustrative manner, the disciplinary construction of sustainable tourism research, the ways it is positioned in relation to the scholarship within and outside tourism, and its influence on other disciplines, which are not apparent and explicit in the existing literature. The disciplinary foundation of a field has implications for the areas of research focus that evolve with the development of that field (Abbott, 2001; Tarafdar & Davison, 2018). We use structural topic modeling (STM) to identify research topics and their evolution. In this way, we move beyond exploration to measurement to make inferences about knowledge processes that drive sustainable tourism discourses. We use the analysis to discuss the implications for a sustainable tourism research agenda that can make a notable contribution to the SDGs.

INSERT FIGURE 1 ABOUT HERE

Research Approach

The research approach of this study involved the following steps: (1) collection of data related to each article's title, keywords, abstract, and its cited and citing sources; (2) interdisciplinarity assessment; (3) text corpus preparation by combining the article's title, keywords, and abstract; (4) text preprocessing involving tokenization, converting bigrams and trigrams into unigrams, and removal of stop words, publisher information, punctuation, non-English words, and copyright information; (4) latent topic number selection based on semantic coherence and topic exclusivity; and (5) assessment of topical content, prevalence, and evolution. The latter four steps pertain to the established procedures for STM analysis derived from Bai, Zhang, Li, Zhou, and Yuen (2021) and Vanhala et al. (2020). The section below elaborates on the research approach.

Data Sources

We collected 28 years (1993 to 2020) of data about the *JoST* from Scopus. We use Scopus because compared to other databases, it has a wider coverage of social science and management research (Martín-Martín, Orduna-Malea, Thelwall, & Delgado López-Cózar, 2018). It also provides access to forward and backward citation data useful for analyzing patterns of knowledge inflows and outflows (Sharma et al., 2021). For the 28-year period, Scopus lists 1,566 documents for *JoST*, out of which eight are errata which were excluded from our analysis. The remaining documents consist of empirical articles (1474), review articles (34), editorials (32), research notes (14), and short letters (4). While it is conventional for bibliometric studies to include full-length articles only, in this research we also considered editorials and research notes because they are important sources of knowledge on sustainable tourism.

Interdisciplinarity Assessment

There is little consensus in the academic literature on the definition of and the procedures and approaches to measure interdisciplinarity (Rodríguez, 2017). Interdisciplinarity can be understood at various levels, from researchers and institutions to individual articles and a set of articles in a journal (Larivière & Gingras, 2010; Rodríguez, 2017). In this study, we focus on the interdisciplinarity of the *JoST* and not on the individual articles published in the journal. In the bibliometric literature, to assess interdisciplinarity, most studies use Porter and Chubin's (1985) method which measures interdisciplinarity by considering the disciplinary diversity of references cited in articles published in a journal or citations the journal received from different disciplines (Larivière & Gingras, 2010; Leydesdorff & Goldstone, 2014). This method is based on the premise that references cited in articles represent a significant part of their knowledge base and reveal preferences for ideas and knowledge in a discipline (Meyer, Waldkirch, Duscher, & Just, 2018;

Nunkoo, Hall, Rughoobur-Seetah, 2019). A journal citing and being cited by articles from its own discipline only is considered to be monodisciplinary (Rodríguez, 2017). In tourism, Sharma et al. (2021) used references cited by articles published in *Annals of Tourism Research* to assess the journal's interdisciplinarity. Agarwal (2016) used a similar approach to assess the interdisciplinarity of *Information Systems Research*.

Therefore, we assessed the interdisciplinarity of research published in the *JoST* by analyzing the references cited by articles published in the journal (knowledge inflows) and the citations these articles have received (knowledge outflows). Scopus data indicate that the *JoST*'s articles have cited 32,904 unique sources and have been cited by 3,867 unique sources. Before proceeding with the disciplinary classification of these knowledge sources, we applied a data reduction strategy by removing all sources of knowledge that received or produced less than 25 citations (Agarwal, 2016; Sharma et al., 2021). Four researchers having tourism domain expertise then classified each source of knowledge inflows and outflows into its major disciplinary focus. We adapted the disciplinary classification established by Agarwal (2016), Sharma et al. (2021), and Weiler, Moyle, and McLennan (2012), and made appropriate changes where necessary. In most cases, the journal's name dictated its disciplinary classification. For example, all tourism and related journals (e.g., *Annals of Tourism Research*, *Leisure Studies*, *Annals of Leisure Research*) were classified under "Tourism"; *Academy of Management Journal*, *American Economic Review*, *British Journal of Social Psychology*, and *Environmental Conservation* were classified under "General Business", "Economics", "Psychology", and "Ecology", respectively. When the disciplinary orientation of a journal was not obvious, we consulted journal classification databases, discipline-related indices, and the journal's website and its editorial policy to determine its focus. We assessed inter-rater reliability using Cohen's kappa (κ), while adjusting for agreement by chance using the method

employed by Cohen (1960). We randomly selected fifty knowledge sources which were assigned to their disciplinary classification by two researchers working independently. The κ coefficient was 0.89, which is considered reliable, establishing consistency in our disciplinary classification process (Bakeman & Gottman, 1997).

Structural Topic Modeling

Topic modeling is a machine learning based text analytics technique that automatically extracts the hidden topics from a collection of text documents without any human intervention (Blei, Ng, & Jordan, 2003). This technique uses a probabilistic generative model that conceptualizes each document as a collection of various topics and each topic as a collection of semantically associated terms (Blei et al., 2003). Although Latent Dirichlet Allocation (LDA) is the most prevalent topic modeling technique, recent advances in natural language processing have proposed more sophisticated approaches such as STM. STM overcomes many limitations of LDA by modeling the covariates available in the document metadata (Roberts et al., 2014). Furthermore, while systematic reviews, content analysis, and other conventional analyses of the literature are subject to the researcher's bias, STM generates unbiased research themes and analyzes their trends over time with a high level of effectiveness and efficiency (Bai et al., 2021). It not only allows researchers to explore contents within a given document, but it can also help them to theorize relationships between texts, discourses, and contexts (Aranda, Sele, Etchanchu, Guyt, & Vaara, 2021). STM therefore facilitates the detection of novel and emergent research themes and is useful for theory development (Hannigan et al., 2019).

The document preprocessing before conducting the STM analysis involved the removal of stop words, publisher information, numbers, non-English words, and copyright information.

Furthermore, we concatenated the frequent bigrams and trigrams, which is crucial for the topic modeling, so that the tokenization process treats any bigram and trigram as a single word. For example, ‘sustainable tourism’ and ‘corporate social responsibility’ were converted to ‘sustainabletourism’ and ‘corporatesocialresponsibility’ respectively. Consistent with prior studies, we empirically selected the number of topics relating to the averaged held-out likelihood (Roberts, Stewart, & Airoldi, 2016). We used the results of topic modeling to identify the major topics, analyze the correlations among the topics, and visualize the temporal proportional changes in the topics.

Results

Interdisciplinarity of Sustainable Tourism Research

During the 28 years of its existence, the *JoST* derived its knowledge from 323 unique sources, representing 10 distinct disciplines (Figure 2a). The tourism field constituted the single largest source of knowledge for the journal (64.4%). Ecology (11.05%) and general business (10.46%) also made noteworthy contributions to sustainable tourism research in the journal. Interestingly, however, the journal’s reliance on the tourism field has been decreasing over the years: from 77% in 1993-1997 to 60% in 2018-2020 (Figure 2b). Although the ecology discipline provided vital knowledge to the *JoST* during its early years, its scholarly contribution has also declined from 15% in 1998-2002 to 9.6% during the most recent years (2018-2020). On the other hand, the influence of general business on the journal’s intellectual structure has increased from 2.2% in earlier years to around 15% in 2018-2020. Knowledge inflows from geography and psychology also increased slightly over the lifetime of the journal (Figure 2b).

INSERT FIGURES 2a AND 2b ABOUT HERE

In terms of knowledge outflows, *JoST's* articles have been cited by 303 sources from nine disciplines. As shown in Figure 3a, throughout its whole existence (1993-2020), the journal had the biggest influence on the tourism field that represented around 72% of all knowledge outflows, followed by general business (12.32%), ecology (9.75%), and geography (3.24%). Research in the journal has a negligible influence on disciplines such as sociology, general science, economics, and anthropology. The cross-period variations in knowledge outflows are provided in Figure 3b. Interestingly, while the influence of *JoST* on the tourism field has decreased over the years, from 86.7% in 1993-1997 to 66% in 2018-2020, its impact on the general business discipline increased from 1.02% to 19.15% during the same time. The journal's influence on fields such as ecology and geography is also noteworthy, while the cross-period variations have been negligible for anthropology, economics, information technology, psychology, general science, and sociology (Figure 3b).

INSERT FIGURES 3a and 3b ABOUT HERE

We also show the progressive relative variations in knowledge exchange between the *JoST* and other disciplines. For this purpose, the citation data related to each discipline was normalized based on the total citations originating from that discipline. Of all citations coming from a particular discipline, the period 2013–2020 cumulatively accounts for more than 65% of knowledge inflows - a trend observed across all disciplines (Figure 4a). For some disciplines such as general business, psychology, and information technology, this value is as high as 85% for the same period. While such growth in knowledge inflows can be attributed to an increase in the number of articles published by the journal during the last eight years ($n = 891$, 57%), it also suggests that sustainable tourism research has become more interdisciplinary. In terms of

knowledge outflows, with the exceptions of disciplines such as economics, sociology, and general science, the journal's influence on other disciplines has increased considerably during 2018-2020 (Figure 4b). For example, knowledge outflows from the journal to general business increased from 26% in 2013-2017 to 70% in 2018-2020. For information technology, knowledge outflows increased from 13% to 86% over same period.

INSERT FIGURES 4a and 4b ABOUT HERE

Research Topics

As a discipline evolves, new topics emerge, while others reach their conceptual limits or become obsolete (Tarafdar & Davison, 2018). The STM analysis reveals that the extant literature on sustainable tourism published in the *JoST* focuses on 16 key topics. Table 1 lists these topics and their top-10 associated words. We reviewed these keywords and articles related to each topic exhaustively to determine the most appropriate topic label. The validity and efficiency of the topics are verified using the average semantic coherence and exclusivity scores (Figure 5) and their correlation (Figure 6). The exclusivity measures ensure that the top keywords in each topic are those that appear the least frequently in other topics. Therefore, a topic is considered as exclusive if words with a high occurrence likelihood in that topic have a low likelihood of occurrence in other topics (Kuhn, 2018). Hence, the most differentiating words can be used to define the extracted topics. In this way, the exclusivity scores measure the extent to which topics are conceptually different from one another. Conceptually different topics will have high exclusivity score. The semantic coherence is related to pointwise mutual information which measures the association between word-pairs. It measures the frequency of co-occurrence of a topic's top words. Topics with a high semantic coherence have frequent keywords co-occurring. The relative differences between average semantic coherence and exclusivity place each topic at a distance

from each other suggesting no overlap, confirming that the keywords belonging to a certain topic do not frequently co-occur in other topics (Figure 5). Low correlation values are associated with reliability and efficiency of the topics. The maximum correlation score is 0.21 (between Topic 1 and Topic 14) while all other topics have lower scores (Figure 6). The 16 topics extracted by the STM, therefore, are reliable and efficient.

INSERT TABLE 1 ABOUT HERE

INSERT FIGURES 5 AND 6 ABOUT HERE

In Figure 7, we show the estimation of the topic prevalence from 1993 to 2020. *Mobility* research (Topic 1, e.g., den Hoed, 2020) recognizes that sustainability cannot be achieved by conceptualizing tourism only as a localized and stationary activity, but also as involving the movement of people, underlining the relationship between sustainable tourism and sustainable mobility. Studies on mobility have increased until 2014 but have declined during the most recent years. Research on Topic 2, *poverty and economic development* (e.g., Llorca-Rodríguez, Chica-Olmo, & Casas-Jurado, 2021) displays an erratic trend, increasing from 1993 to 2002, declining from 2003 to 2015, and increasing again from 2016 to 2019 (see Figure 7). Topic 3, *information technology* (e.g., Tomej & Liburd, 2019) includes studies that reflect on the potential of technologies for advancing sustainable tourism. This research area has been increasing over the years. *Carbon footprint* emerged as another important area of research (Topic 4, e.g., Ritchie, Sie, Gössling, & Dwyer, 2020) that has been expanding (see Figure 7). This research focus reflects increasing concerns about climate change and carbon emission as a causal factor, prompting the tourism sector to assess its own contribution to climate change using the carbon footprint indicator.

INSERT FIGURE 7 ABOUT HERE

Research on *cultural and heritage tourism* (Topic 5, e.g., Megeirhi, Woosnam, Ribeiro, Ramkissoon, & Denley, 2020) considers culture and heritage as a cornerstone for sustainable tourism. However, it is an area of research that has declined over the years (Figure 7). *Rural tourism and community development* (Topic 6, e.g., Yachin & Ioannides, 2020) emerged as an important research area that has remained stable over the years. Most studies place emphasis on local community participation in rural tourism development. *Planning and governance* (Topic 7, e.g., Dredge & Jamal, 2013) was most popular in the journal between 1993 and 2011 but declined steadily thereafter. Research on *vulnerability, resilience, and adaptability* (Topic 8, e.g., Chen, Xu, & Lew, 2020) recognizes that human beings and tourism are strongly dependent on ecological systems to survive and, therefore, society is interconnected with nature in complex and dynamic ways. This research area has remained relatively stable over the years. Topic 9 on *CSR* (e.g., Moneva, Bonilla-Priego, & Ortas, 2020) displays an increasing trend that reflects the growing recognition that businesses should address sustainable development concerns in their quest for profitability.

Studies on *Residents' attitudes to tourism* (Topic 10, e.g., Kim, Duffy, & Moore, 2020) place emphasis on residents as an important stakeholder in tourism, without which development cannot be sustainable. Studies on this topic have grown steadily after the diffusion of the principles of sustainable tourism in the 1990s. Research on *ecotourism* (Topic 11, e.g., Phelan, Ruhanen, & Mair, 2020) represented an important area of research in the *JoST* but has been declining recently. Research on *parks and protected areas management* (Topic 12, e.g., Trogisch & Fletcher, 2020) addresses the loss of biodiversity arising from anthropogenic drivers such as tourism development. It has been frequently studied by scholars, however, research on this theme has declined over the

years. Research on *tourism in organic farms* (Topic 13, e.g., Lai, Chuang, Zhang, & Nepal, 2020) include studies linking tourists to organic farms to promote education and cultural exchanges and build a culture of sustainable ecological farming. Research on the topic has declined sharply over the past three decades (see Figure 7).

Topic 14, *SDGs*, includes two groups of studies. The first group includes research published prior to the coming into force of the SDGs in 2016, but nevertheless dealt with concepts that have been referred to in the SDGs and their targets (e.g., gender, health, and well-being). The second group includes research that explicitly connects sustainable tourism to the SDGs. As expected, these studies appeared post 2015 when United Nations member states adopted the 2030 agenda for sustainable development. Topic 15, labeled as *pro-environmental behaviors*, includes research that draws from psychology to investigate human behaviors that advance sustainable tourism (e.g., Wang, Wang, Li, & Zhou, 2020). Implicit to these studies is that much of today's ecological problems are due to human behavior. Research on this topic has grown over the years (see Figure 7). *Volunteer tourism* (Topic 16, e.g., Raymond & Hall, 2008) represents an important research area that has been rising until 2016 and decreasing thereafter (see Figure 7).

Research on the SDGs

We identified articles published in the *JoST* that explicitly address the SDGs using the search function of the journal's website. In order to ensure that no relevant articles were overlooked, the search terms included "sustainable development goal", "sustainable development goals" "SDG", and "SDGs". We examined the treatment of the SDGs in each article using the content analysis method. Although the SDGs came into effect in 2016, articles in the *JoST* started referring to the SDGs in 2019. The period gap (2016-2018) can be explained by the time it usually takes from the

execution of a research project to its publication in the journal. The number of articles that have referred to SDGs has declined from 18 (17.1% of 105 articles) in 2019 to 4 (3.6% of 111 articles) in 2020. However, as of 24 July 2021, there were 19 (15.3% of 124) articles accepted in 2020 that were in press and awaiting publication. Despite the decrease in published articles referring to the SDGs in 2020, an overall upward trend can be deciphered from the articles in press.

The special issue of the *JoST* on ‘critical thinking’ published in 2019 contains the first set of articles engaging with the SDGs explicitly. These articles draw on multiple worldviews and interdisciplinary approaches to question dominant discourses in sustainable tourism, and thus, advance the SDGs (Boluk et al., 2019). Lyon and Hunter-Jones (2019), for example, use critical discourse analysis to challenge hegemonic forms of tourism development in South Africa. Khoo-Lattimore and Yang (2019) adopt a critical feminist approach to assess gender representation in knowledge production, while Kato (2019) uses an ecohumanities perspective to explore the nexus between gender and tourism sustainability. Addressing SDG 1 (ending poverty), Scheyvens and Hughes (2019) advocate the conceptualization of poverty as a multidimensional concept, shifting the focus from economic deprivation only to a consideration of its socio-political aspects and structural inequalities.

For analysis purposes, we combined all articles on the SDGs published in 2019, 2020, and articles accepted in 2020 that were in press as of 24 July 2021 ($n = 41$). As shown in Table 2, several articles that referred to SDGs have done so generally, with no emphasis on specific SDGs (13 articles; 31.7%). Rasoolimanesh et al. (2020), for example, assessed various sustainable tourism indicators in published articles against the 17 SDGs, concluding that many tourism studies fail to explicitly address the goals and that research on countries in the global south is lacking. The

specific SDGs most referred to in the articles are SDG 17, partnership for the goals (10 articles; 24.4%, e.g., Ferrer-Roca, Guia, & Blasco, 2020), followed by SDG 5, gender equality (9 articles; 22.0%, e.g., Khoo-Lattimore and Yang, 2019), and SDG 8, decent work and economic growth (6 articles; 14.6%; e.g., Lyon and Hunter-Jones, 2019). SDGs 2 (zero hunger), 7 (affordable and clean energy), and 9 (industry innovation and infrastructure) were not referred to in any article.

INSERT TABLE 2 ABOUT HERE

We also assessed the number of SDGs addressed in the articles as an indication of research that recognizes the interdependence among the goals (Table 3). We found that while some articles provide a detailed analysis of a single SDG, others engage with several SDGs simultaneously. A total of 13 articles (31.7 %) referred to SDGs generally. Articles referring to only one SDG constitute the single largest proportion (17 articles; 41.5%; e.g., Kato, 2019; Khoo-Lattimore and Yang, 2019). The remaining articles (11; 26.8%) referred to between two and seven SDGs. de Visser-Amundson (2020), for example, explores how multi-stakeholder partnerships in the hospitality industry] (SDG 17) facilitates food waste reduction (SDG 12: responsible consumption and production). Robinson, Martins, Solnet, and Baum (2019) investigate decent work (SDG 8) in tourism and discuss its implications for six other SDGs: 1 (no poverty), 3 (good health and well-being), 4 (quality education), 5 (gender equality), 10 (reduced inequalities), and 16 (peace, justice, and strong institutions). The significance of gender equality (SDG 5) for advancing all the other SDGs is also recognized by some scholars (e.g., Boluk et al., 2019). Studies treating multiple SDGs consider the goals as a network of targets and thus they can facilitate an integrated implementation of the goals in tourism policymaking.

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Network of Topic Correlation

STM analysis is based on soft, not hard clustering. While in soft clustering a data item can belong to several clusters with a fractional degree of membership in each cluster, in hard clustering every data item belongs to only one cluster. Soft clustering therefore allows topics to be correlated and provides insights on how they are conceptually linked, that is, on how topics co-occur within the same research article. A correlation coefficient of 0.02 or higher between different topics suggest interrelationships between them (Bai et al., 2021). We use the correlation coefficients to construct the network of topic correlation (see Figure 8). In this way, we understand the extent to which a research topic is conceptually linked to other topics. Research on poverty and economic development, information technology, parks and protected areas management, ecotourism development, and vulnerability, adaption, and resilience has been studied in a mutually exclusive way. Some of the recent studies on mobility and planning and governance make an explicit link to the SDGs. As research on SDGs evolves, it is likely that studies would conceptualize the goals as a network of targets and consequently they would consider the research implications for multiple goals. Therefore, the link between the different topics would become stronger and denser, which would be an indicator of the maturation of SDG-related research in tourism.

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Discussion

Intra- and Inter-Disciplinary Practices

A discipline defines its boundaries through practices of intra-disciplinary and inter-disciplinary engagement that informs its scientific structure and defines the ‘world’ it wants to describe,

understand, explain, and participate in. In the words of Tarafdar and Davison (2018), “disciplines engage internally within themselves and externally with one another, to internally and mutually, discursively and iteratively, produce disciplinary knowledge and disciplinary boundaries” (p. 527). In their book, ‘*Re-thinking Science*’, Nowotny, Scott, and Gibbons (2001) advocate for an open and dynamic framework that reconceptualizes science and its relationship to society. As part of this framework, Nowotny et al. (2001) argue that the production of knowledge transcends discipline boundaries to become more meaningful and practically relevant. Nowotny et al.’s (2001) philosophy is highly relevant to a concept such as sustainable development and, therefore, sustainable tourism, that embeds intricate relationships between the economy, society, and the natural environment. Impactful sustainable tourism research therefore requires interdisciplinary perspectives (Bramwell et al., 2017). Interdisciplinary research “involves different disciplines coming together to enable mutual development on the scopes and approaches to the research problem” (Lam et al., 2014, p. 159).

Sustainable tourism research in the *JoST* is constructed through both intradisciplinary and interdisciplinary practices. The journal draws its knowledge from nine distinct disciplines other than tourism, reflecting the disciplinary foundation of mainstream tourism research (Belhassen & Caton, 2009; Tribe, 2018; Tribe & Liburd, 2016). The journal’s interdisciplinarity, however, should be understood and interpreted with some caution as it appears to be restricted in scope. Its knowledge structure is defined by tourism research mostly, and to some extent by the ecology and business management disciplines. Disciplines such as anthropology, sociology, economics, general science, and information technology have a trivial influence on the intellectual development of sustainable tourism research. The journal, however, has become more

interdisciplinary during the recent years, an observation also made by other scholars (Bramwell et al., 2017; Bramwell & Lane, 2015; Moyle et al., 2020).

The heavy reliance of the *JoST* on the tourism literature mirrors the trends observed for other journals such as *Annals of Tourism Research*, *Tourism Management*, and *Journal of Travel Research* (Sharma et al., 2021; Kim, Savage, Howey, & Van Hoof, 2009). While intradisciplinary knowledge sharing practices indicate the maturity of the tourism field (Kim et al., 2009; Wardle & Buckley, 2014), interdisciplinary approaches enable researchers to conceptualize sustainable tourism as a joint worldviews concept necessary to retain its universal appeal as a practical strategy for policymaking and action (Van Opstal & Hugé, 2013). From an ontological perspective, the structure of a discipline is in a state of constant flux, changing with the evolution of science and society. Some of these are evolutionary changes because of the nature of scientific progress in a society (Simonton, 2004).

Business Philosophy

The growing influence of the business discipline on the *JoST's* scientific structure reflects such an evolution. This orientation stems partly from generational changes in the tourism academy, characterized by the retirement of pioneering scholars trained in the founding disciplines of tourism such as geography and psychology, accompanied by a rise in the number of tourism scholars with a background in business management (Ren, Pritchard, & Morgan, 2010; Schweinsberg, Wearing, & McManus, 2013). According to Mulkay (1974), a transition of researchers from one specialty to the other provides opportunities for intellectual development, such as the displacement of concepts and ideas. This evolution reflects Mullins' (1974) theory of scientific development, suggesting that changes in the social structure of a discipline influences its

intellectual and theoretical developments. From this perspective, sustainable tourism research is socially constructed.

The business philosophy in sustainable tourism research also stems from the recognition of the role of corporate actors in advancing sustainable development. Businesses, while being the main consumers of environmental resources, also generate significant economic capital beneficial to the economy and society (Barkemeyer, Holt, Preuss, & Tsang, 2014; Schaltegger, Lüdeke-Freund, & Hansen, 2012). They play an important role in delivering intra- and inter-generational equity and have considerable influence in framing rules that facilitate a transition to a more sustainable future (Barkemeyer et al., 2014; Moon, 2007). International organizations such as the World Business Council on Sustainable Development (WBCSD) has provided further impetus for corporate entities to drive sustainable development agendas, calling on them to reject a ‘business as usual’ mindset and acknowledge that they can achieve transformation by considering themselves as part of a larger whole (WBCSD, 2010). The scientific community has responded appropriately to such calls by pursuing research on business-relevant topics such as CSR and sustainable business models.

Likewise, the recent emphasis on studies that explicitly address the SDGs reflects societal expectations from scholars and higher education institutions to contribute to broader development agendas through their research initiatives (Owens, 2017). These studies address the long-standing criticisms of mainstream sustainable tourism research for failing to address broader societal, environmental and economic concerns (Font et al., 2019; Sharpley, 2020). In these cases, intellectual reconfiguration of sustainable tourism research occurs as researchers engage with politically important topics (Abbott, 2001; Tarafdar & Davison, 2018). At the same time, as

JoST's research demonstrates more relevance to practice and reflects broader societal sustainability challenges that go beyond tourism, its scholarly influence on disciplines such as business, ecology, geography, and information technology has also increased over the years, indicating the growing maturity of the journal (Wardle & Buckley, 2014).

A business management approach to sustainable tourism research certainly has its value, however, it should neither be considered as a 'superior way of knowing' about sustainable tourism nor become the dominant philosophy as this may lead to what Habermas (1987) termed a hegemonic system world driven by economically- and technically-oriented imperatives and knowledge. Such a knowledge system is usually informed by scientific-positivistic imperatives and therefore fails to address issues of critical importance to sustainable tourism such as power, inequality, diversity, oppression, and equity, while reinforcing business interests and economic growth (Mair & Reid, 2007; Ren et al., 2010; Sharma et al., 2021). In this case, 'economic growth' is mistakenly treated as essentially synonymous with 'development', making sustainable tourism an inviable strategy to contribute to broader development agendas (Sharpley, 2020). Eden (1994), for example, discusses how the use of sustainable development by the International Chamber of Commerce ignored international equity and reinforced inequalities, exacerbating the North-South differences. A neoliberalism influence on the tourism scholarship also hinders critical thinking that supports emancipatory approaches required to advance the SDGs (Boluk et al., 2019). Hegemony of neo-positivist modern worldviews, accompanied by the marginalization of alternative disciplinary worldviews, may therefore have detrimental effects on sustainable tourism as a universal and inclusive concept. Knowledge generated solely through such imperatives is de-contextualized, fragmented, privileged, ideological, and outside lived experiences (Van Opstal, & Hugé, 2013).

Future Research on Sustainable Tourism

To address ongoing societal and environmental problems, tourism development paths must be reconfigured, and knowledge must demonstrate more relevance to practice. Sustainable tourism research should be transformative and solution-oriented so that it can contribute to broader development agendas such as those outlined in the SDGs. The SDGs represent a powerful and shared aspiration that should guide future research on sustainable tourism. While it is not possible to discuss exhaustively the future of sustainable tourism research, we suggest some areas of interventions for impactful research. By impactful, we not only imply scholarly impact, but also research having an explicit link to the society, environment, and economy – what is generally referred to as societal impact of research (Hill, 2016).

While many SDG-relevant topics such as gender equality, poverty, mobility, and climate action have been part of academic discourses in the journal recently, it is important that future research does not treat the goals as mutually exclusive because they are interrelated. SDG 5, concerned with gender equality and women empowerment for example, is essential for advancing all the 17 SDGs (Boluk et al., 2019). The interconnectedness between SDG 5 (gender equality), SDG 6 (clean water and sanitation), and SDG 8 (sustainable economic growth and decent work) has also been documented (Alarcón & Cole, 2019). Therefore, for sustainable tourism research to be impactful and relevant, researchers should view the SDGs as a network which links multiple goals (Figure, 9; Le Blanc, 2015; Nunes et al., 2016). In this way, the network of SDGs reflects the outcome of inter-governmental negotiations that took place, and therefore, can be thought of as a ‘political mapping’ of sustainable development, in contrast to a mapping based on natural and

social science perspectives about how the human-environmental system works (Le Blanc, 2015). In the latter case, this may lead to a fragmentation of sustainable tourism research with little theoretical and practical value.

A network approach to the SDGs has implications for the research design of and the ways in which sustainable tourism is conceptualized in individual studies. While it is not a problem per se for a tourism study to address one specific SDG, it should nevertheless consider and explicitly state targets relevant to other goals in an overarching theoretical framework, accompanied with a supporting narrative. For example, while mobility and well-being research in the sustainable tourism literature has so far ignored gender considerations, these concepts are linked both in practice in the SDG network (see Figure 9; Le Blanc, 2015) and at the theoretical level (see e.g., Hanson, 2010; Xu & Wang, 2021). Tourism research on climate change (SDG 13) can also benefit from gender considerations (SDG 5) which influence people's experience of, and resilience to, climate change (Diarra et al., 2021; Lau, Kleiber, Lawless, & Cohen, 2021). SDGs such as no poverty (SDG 1), gender equality (SDG 5), and clean-water and sanitation (SDG 16) provide opportunities for integration with sustainable tourism research as innovative approaches for informing sustainability (see e.g., Alarcón and Cole, 2019; Saleth, Samad, Molden, & Hussain, 2003). Studies on protected area management or addressing the decline of fauna and flora (SDG 15) resulting from tourism development should also consider their implications for SDGs such as nutrition and hunger (Goal 2), good health and well-being (Goal 3), climate action (Goal 13), and life on land (Goal 15, see e.g., Krause & Tilker, 2021). In this way, currently under-researched SDGs in the tourism scholarship such as SDGs 2, 7, and 9 can also become at the forefront of sustainable tourism discourses.

Conceptualizing the SDGs as a network of targets is likely to facilitate the integration of sustainable tourism outcomes with broader development goals and ensure policy coherence and cross fertilization of knowledge between tourism and other sectors. Thus, our research will be of relevance not only to the tourism sector, but also to institutions and civil societies concerned with, for example, poverty reduction, gender equality, and resource preservation. Studies that approach the SDGs in ways that emphasize their interdependence will address the long-standing critique that sustainable tourism research is “tourism-centric”, with little relevance to sustainable development (Bramwell & Lane, 2015; Moyle et al., 2020, p. 4; Sharpley, 2020). At the same time, we caution against sustainable tourism studies that provide only a lip-service to the SDGs without a deep theoretical and methodological engagement, as we have witnessed with concepts such as ‘theory’ and ‘sustainable development’.

The interdisciplinary nature of the SDGs (Game et al., 2018; Nakamura, Pendlebury, Schnell, & Szomszor, 2019; Nunes et al., 2016) requires our own research to be interdisciplinary. While we are not against a business-oriented sustainability research agenda per se, sustainable tourism research will benefit from a wider range of disciplines, drawing on established science and new endeavors. At a time when scientists have been calling for interdisciplinary approaches to sustainability problems, discussions have centered around the role of social sciences and the humanities in the study of global environmental problems (Ban et al., 2018; Castree, 2014; Krauss, 2015; O’Brien, 2013;). Disciplines such as anthropology and the humanities have yet to be fully integrated in sustainable tourism research. They have much to offer to our research on climate change and the Anthropocene, for example. Much of the literature on environmental problems has been criticized for marginalizing the instrumental role of the social sciences and humanities in providing sustainability solutions. These disciplines can facilitate “spaces to engage discussions

about social inequalities and cultural hierarchies” (Joseph, 2012, p. 254). Science has informed the political agenda in the forms of planetary threshold, tipping points, and planetary boundaries, while critical issues such as power relations and socio-cultural values, norms and practices that drive environmental problems have been overlooked (Krauss, 2015; O’Brien, 2013).

If sustainable tourism narratives mirror such practices, then our research runs the risk of depoliticizing the SDGs which are themselves politically negotiated and constructed and as a result, it will have little ability to effect change. The UK’s Research Excellence Framework (REF), for example, found that research addressing societal and environmental problems was based on knowledge drawn from various disciplines (Hill, 2016). For sustainable tourism to advance the SDGs, therefore, we cannot approach our research from a narrow disciplinary lens. The ‘indiscipline’ status of tourism (Tribe, 1997) puts us at a distinct advantage over established disciplines such as the natural sciences where disciplinary identity and structures are harder to permeate. Unlike many other disciplines, the tourism academy benefits from a diversity of scholars trained in geography, anthropology, business management, information technology, economics, psychology, and sociology, which if appropriately leveraged, will break away sustainable tourism research from narrow disciplinary academic structures and knowledge hierarchies.

In light of contemporary societal and environmental challenges, it is imperative that we redefine and affirm our core aims and develop a sense of common purpose to ensure that sustainable tourism research becomes more relevant and impactful. At the same time, we should avoid producing research that draws only on the fringes of other disciplines without a deep engagement with their respective paradigms, theoretical concepts, and methodological approaches – what is referred to

as disciplinary parochialism that characterizes much research on sustainable tourism (Bramwell & Lane, 2015; Moyle et al., 2020). While it is outside the scope of this article to discuss the research design implications of interdisciplinary studies in sustainable tourism, we encourage our readers to consult the literature on the conceptual and empirical considerations in, and the challenges of, interdisciplinary studies (e.g., Huutoniemi, Klein, Bruun, & Hukkinen, 2010).

Conclusion

Sustainable tourism is a rich, potent, challenging, and sometimes contested concept that is engaged with by scholars. It has therefore prompted various academic initiatives in the form of numerous research projects and publications in academic journals. While progress achieved by sustainable tourism research has been optimistically assessed by some scholars (Hall, 2011), others lament that sustainable tourism has often been asserted rather than demonstrated, lacking relevance and impact (Bramwell, 2015) - a critique also leveled against its parental concept, sustainable development (Lam et al., 2014). This article has set out to explore the structure of sustainable tourism research published in the *JoST* by examining the disciplinary foundations of studies and the research trends.

We find some evidence of interdisciplinarity, however, research is constructed mainly through knowledge drawn from the tourism field and, to some extent, from the business and ecology disciplines. Other social sciences and the humanities have yet to fully integrate sustainable tourism discourses. The disciplinary foundation of research in the journal not only influences how sustainable tourism is approached and conceptualized, but also research areas – new topics have emerged while others have reached their conceptual limits or have become politically less attractive and viable. In the contemporary society, we argue, the SDGs present an opportunity and

an appropriate structure for unifying sustainable tourism research so that it impacts on the policy narratives. This requires that we redefine our understanding of the SDGs as a network of targets that requires interdisciplinary research investigations. Disciplinary parochialism and imperialism are damaging to sustainable tourism research.

Our arguments and recommendations must be interpreted considering the following research limitations. First, the unit of analysis of this study is the *JoST*. We analyzed the disciplinary foundations of the journal and not those of individual articles. Some research articles may well be more interdisciplinary than others or grounded in disciplines such as anthropology that, overall, has a negligible influence on the journal's knowledge structure. Second, our disciplinary classification is based on references which are subject to some element of bias. They are often socially constructed and politicized, reflecting alliances and allegiances of researchers. Researchers may, therefore, have cited works not because of their intellectual content, but because of who wrote them (Nunkoo, Hall, Rughoobur-Seetah, & Teerovengadam, 2019). Third, we acknowledge that other researchers may use a different disciplinary classification to group the sources of knowledge. Although we believe that our findings will not change substantially, it is important we alert our readers to this possibility. Finally, the analysis is restricted to articles published in the *JoST*. Although the journal is authoritative in the field of sustainable tourism, several other tourism journals publish articles on similar topics. Studies that are more comprehensive in scope and engage in fine-grained analyses of interdisciplinarity are therefore required. We invite scholars to assess the conceptual, theoretical, and methodological interdisciplinarity (Huutoniemi et al., 2010) of sustainable tourism research using a wider range of journals so that more accurate inferences about the state of research are drawn.

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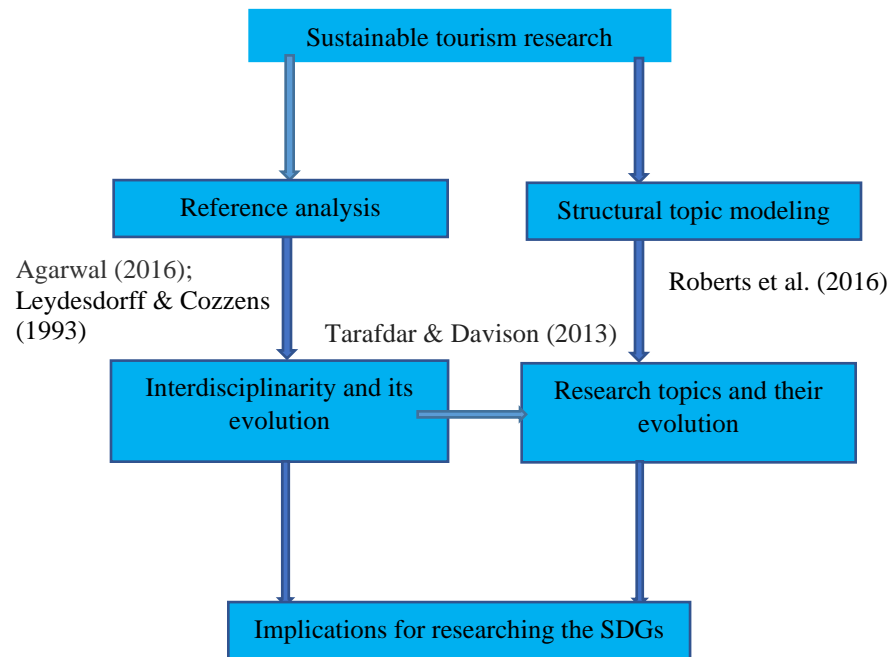


Figure 1. The conceptual framework

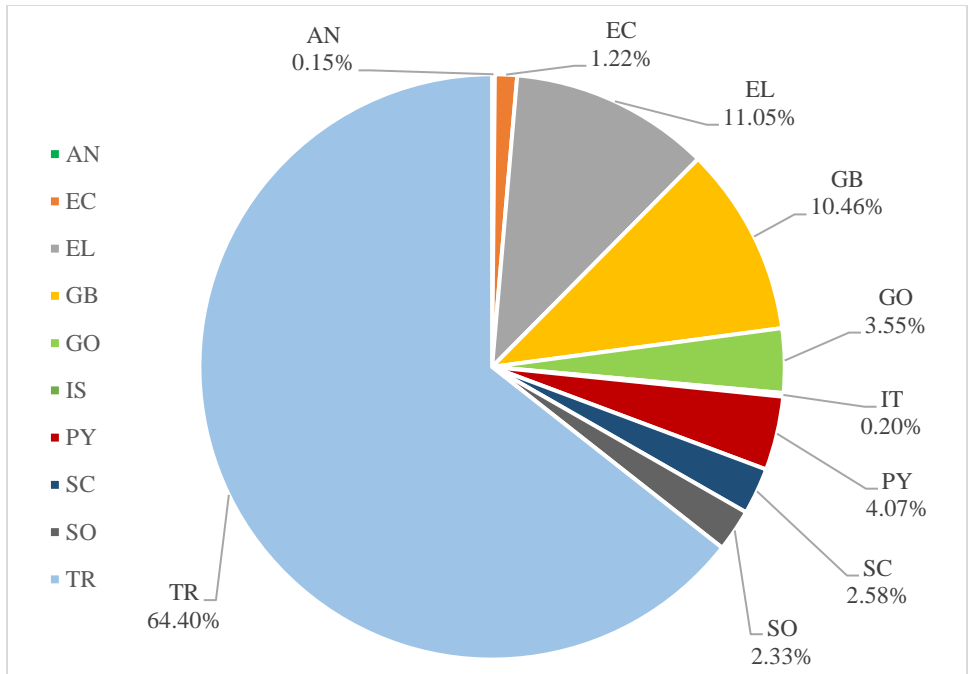


Figure 2a. Knowledge inflows from 10 disciplines to *JOST* (1993-2020). [AN: Anthropology, EC: Economics, EL: Ecology, GB: General Business, GO: Geography, IT: Information technology, PY: Psychology, SC: General Science, SO: Sociology, TR: Tourism]

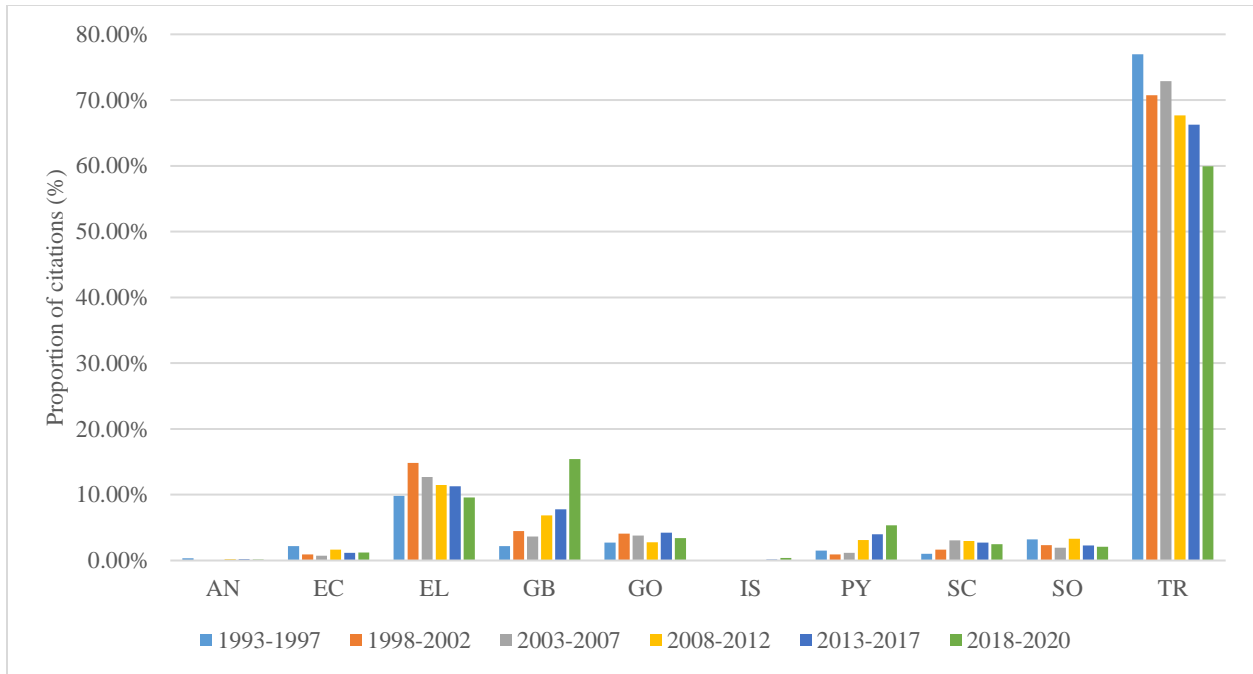


Figure 2b. Cross-period variations in knowledge inflows to *JOST* (1993-2020). [AN: Anthropology, EC: Economics, EL: Ecology, GB: General Business, GO: Geography, IT: Information technology, PY: Psychology, SC: General Science, SO: Sociology, TR: Tourism]

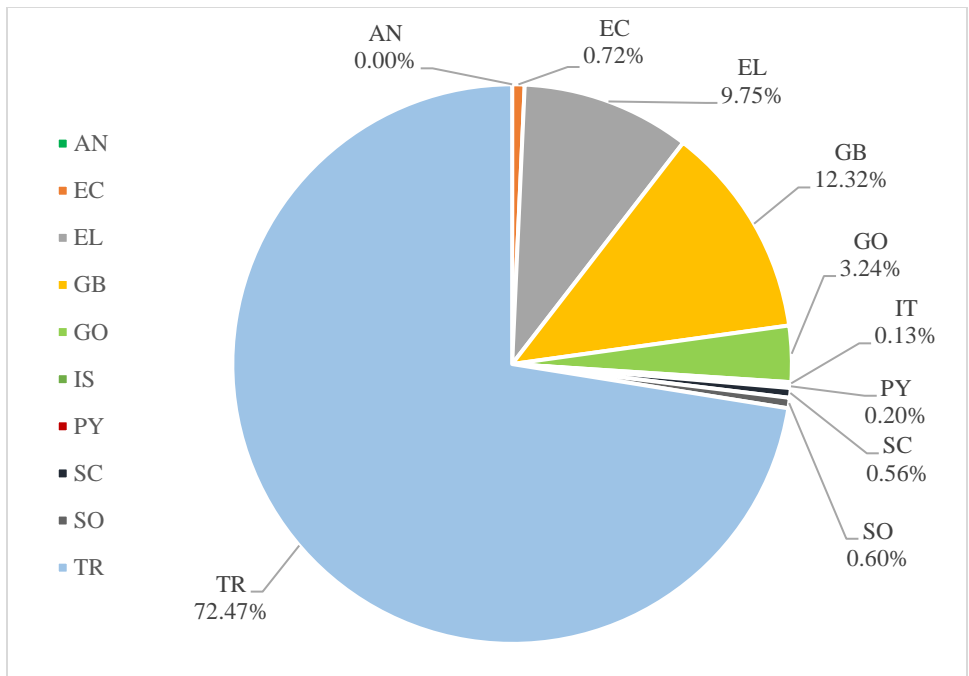


Figure 3a. Knowledge outflows from JOST to 10 disciplines (1993-2020) [AN: Anthropology, EC: Economics, EL: Ecology, GB: General Business, GO: Geography, IT: Information technology, PY: Psychology, SC: General Science, SO: Sociology, TR: Tourism]

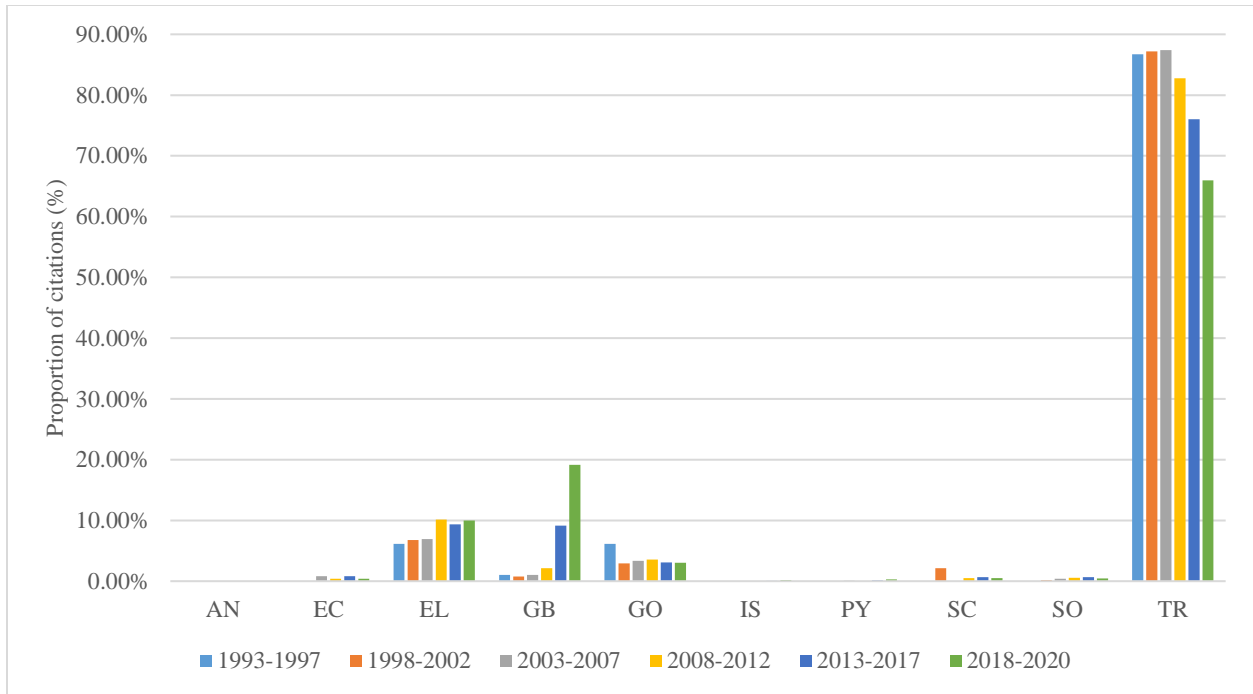


Figure 3b. Cross-period variations in knowledge outflows from JOST [AN: Anthropology, EC: Economics, EL: Ecology, GB: General Business, GO: Geography, IS: Information technology, PY: Psychology, SC: General Science, SO: Sociology, TR: Tourism]

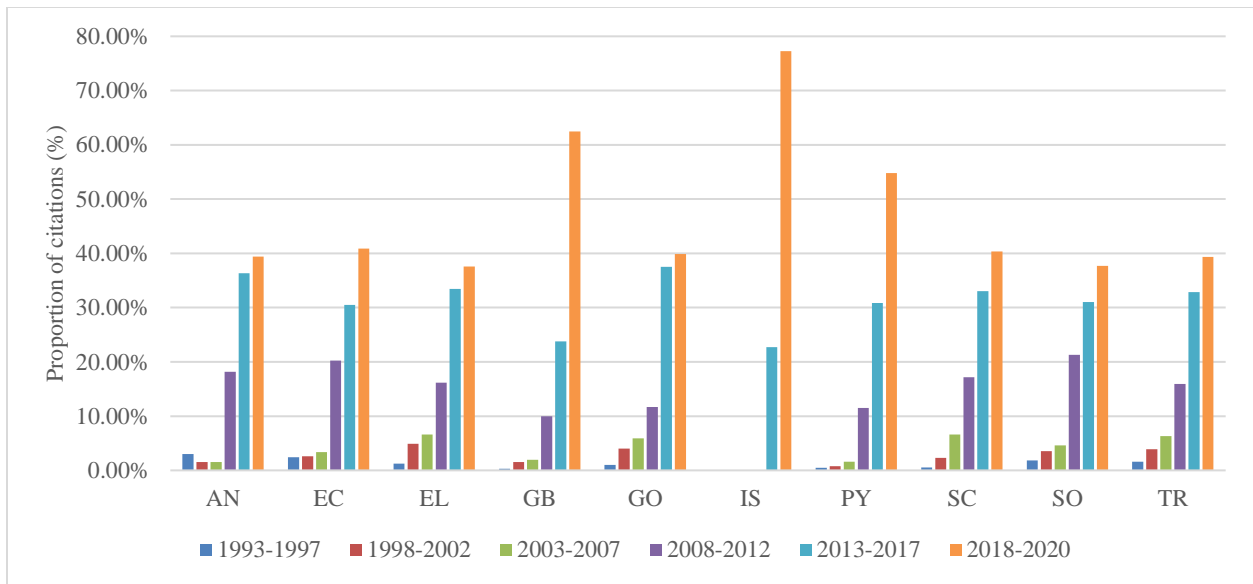


Figure 4a. Relative change in knowledge inflows within discipline over time (1993-2020) [AN: Anthropology, EC: Economics, EL: Ecology, GB: General Business, GO: Geography, IS: Information technology, PY: Psychology, SC: General Science, SO: Sociology, TR: Tourism]

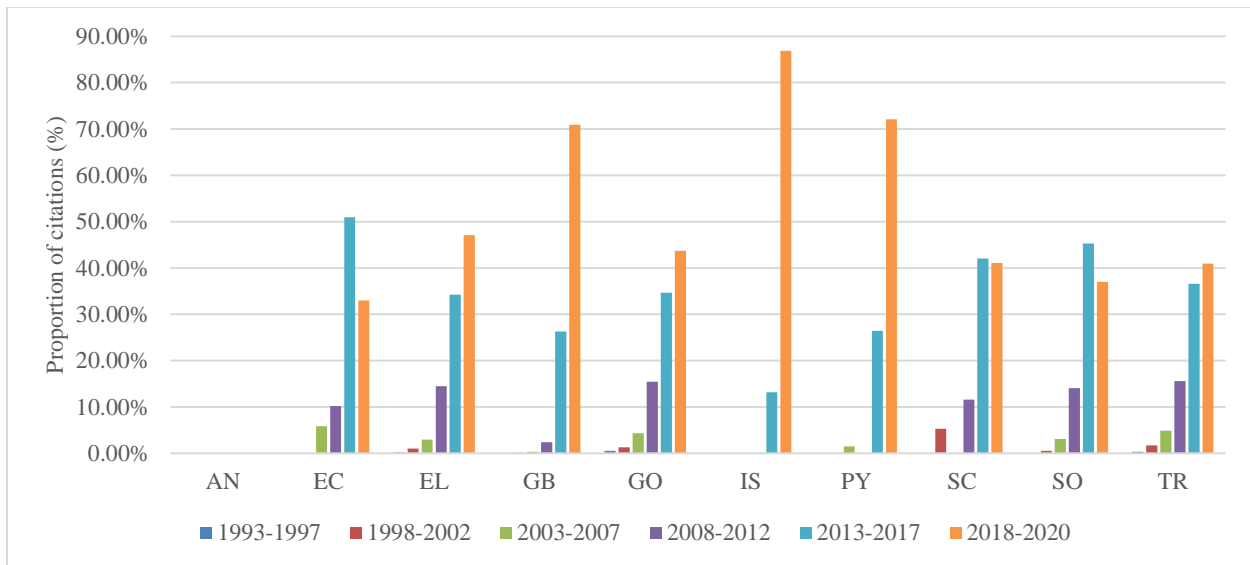


Figure 4b. Relative change in knowledge outflows within the discipline over time (1993-2020) [AN: Anthropology, EC: Economics, EL: Ecology, GB: General Business, GO: Geography, IS: Information technology, PY: Psychology, SC: General Science, SO: Sociology, TR: Tourism]

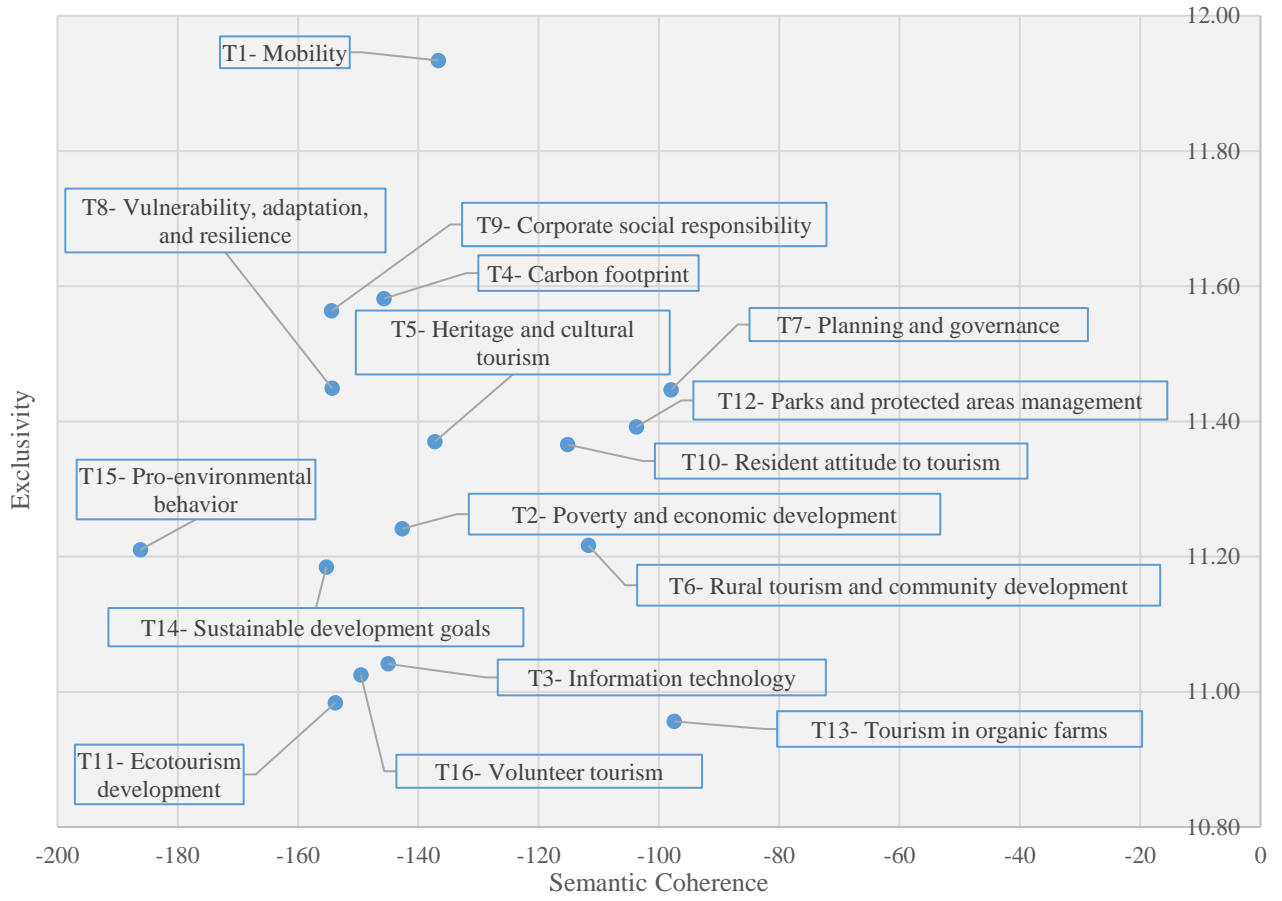


Figure 5. Average semantic coherence and exclusivity scores of topics

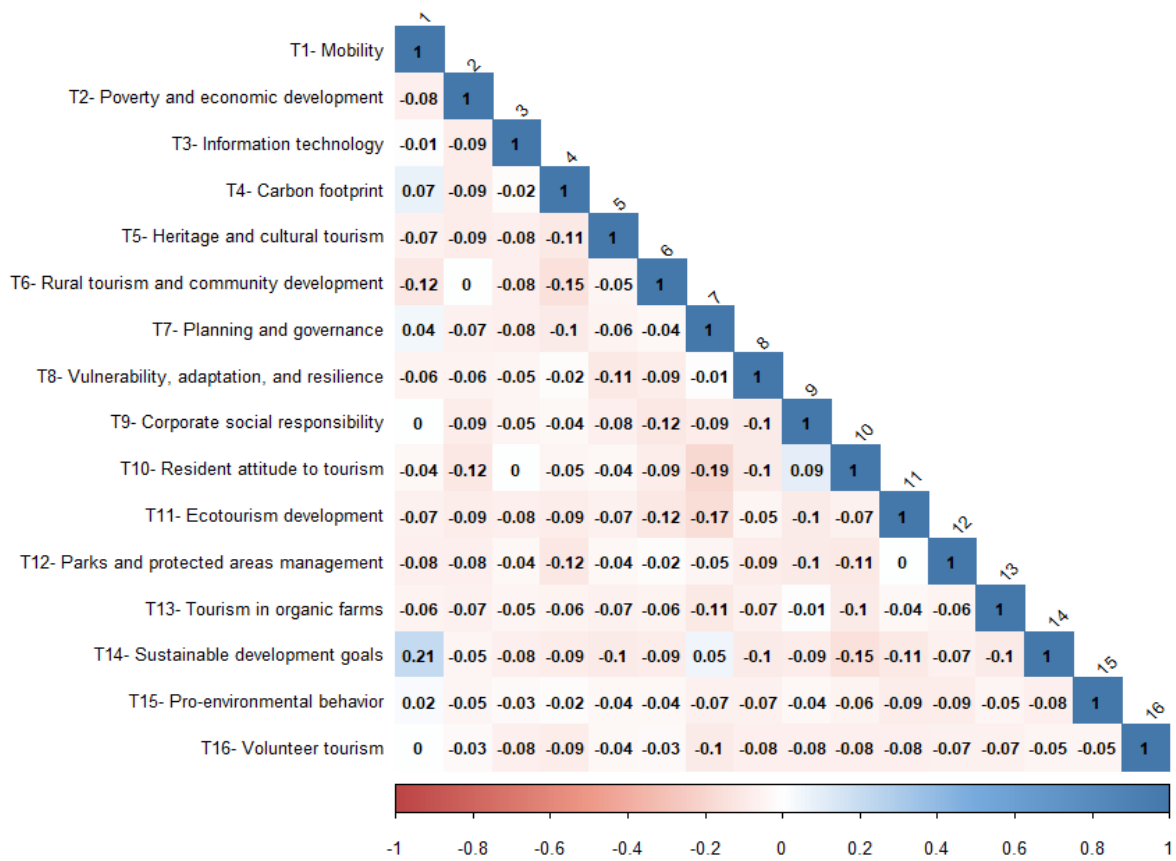


Figure 6. Correlations among the extracted topics

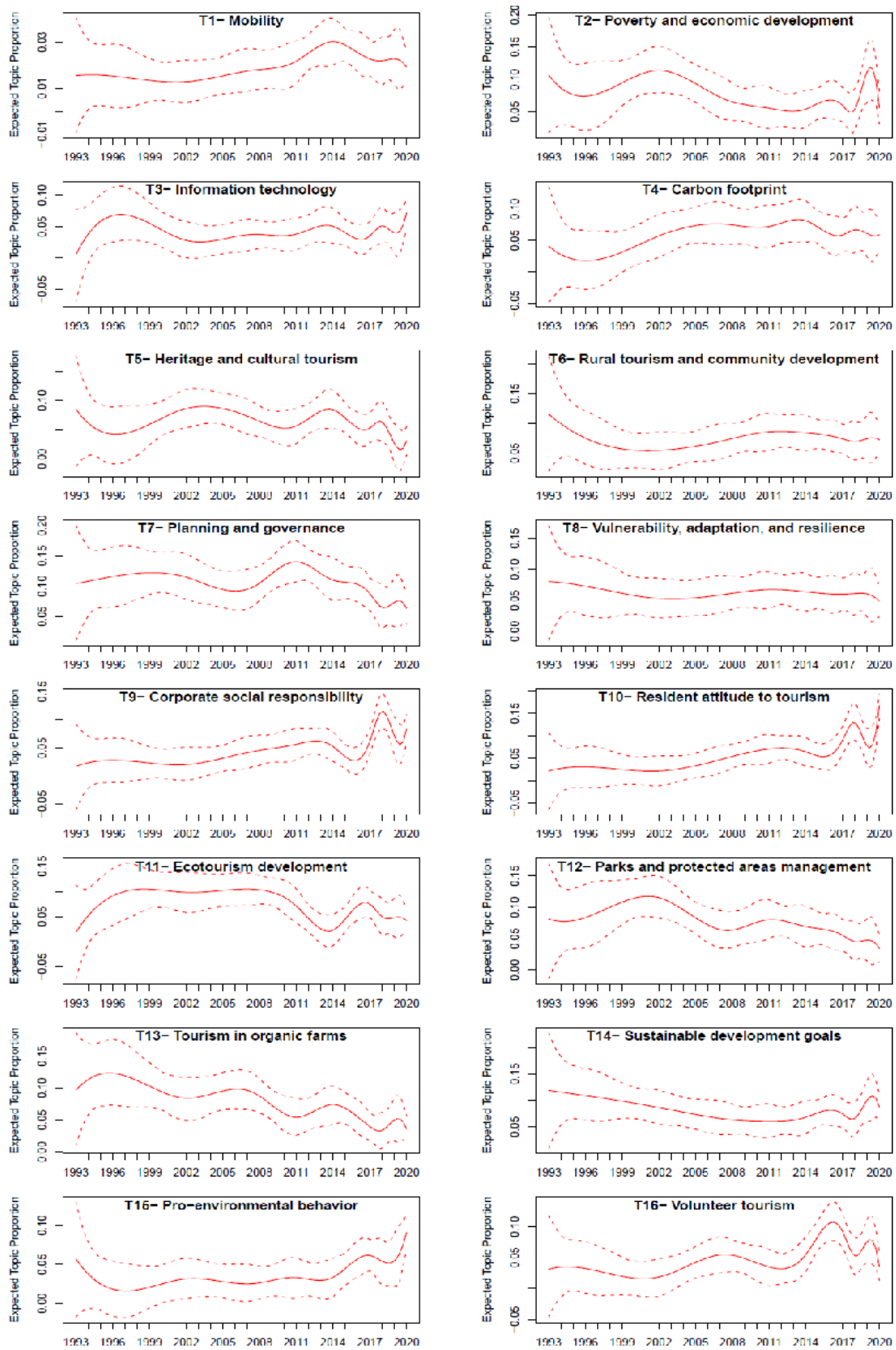


Figure 7. Estimation of the topic prevalence from 1993 to 2020

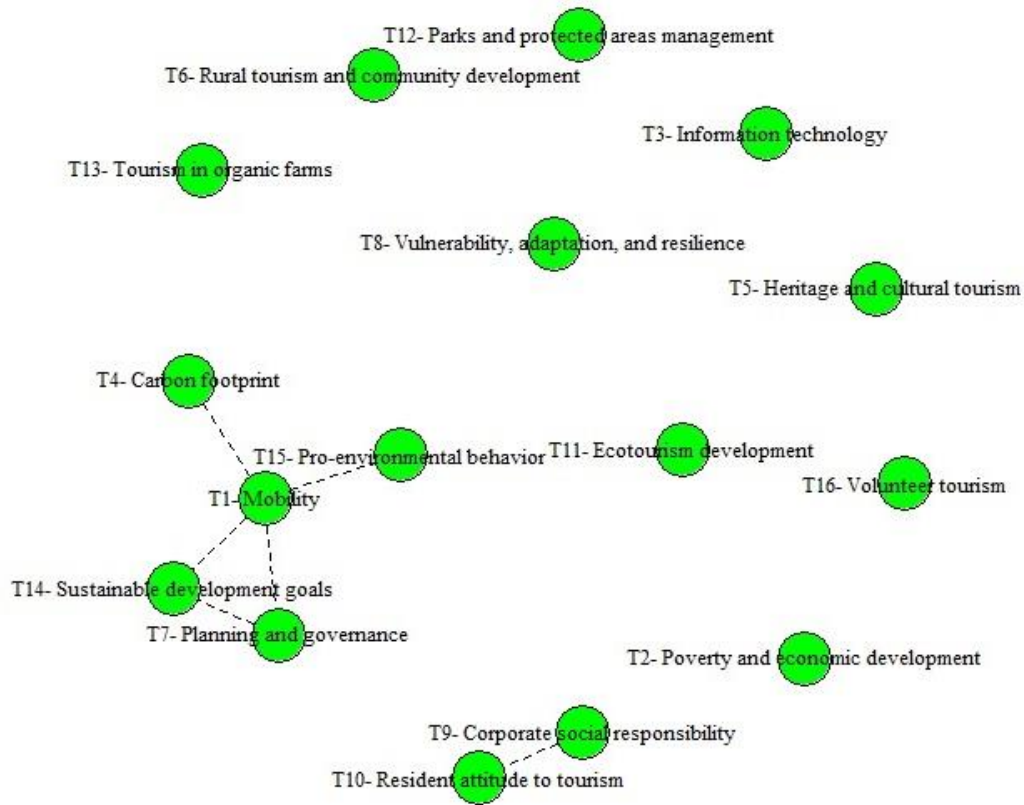
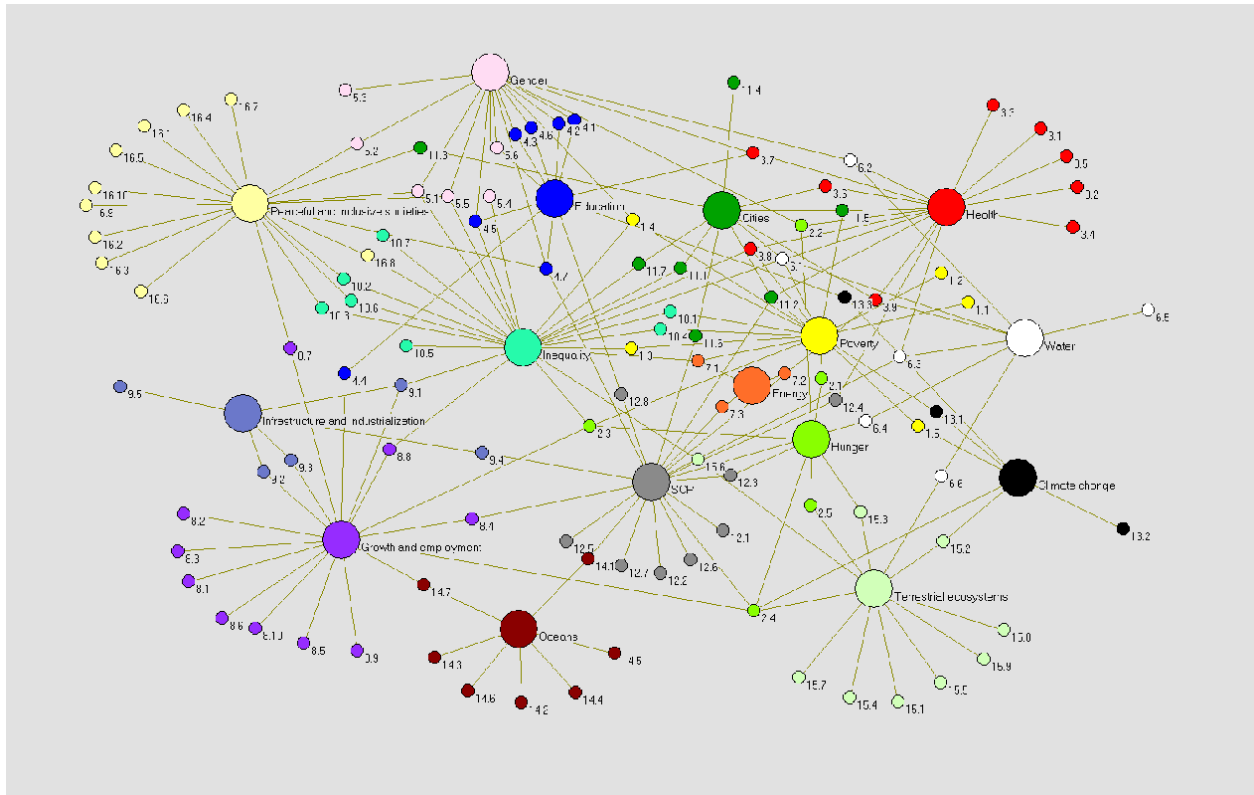


Figure 8. Network of topic correlation



Notes: SDG 17 Partnerships for the Goals is left out as it touches all the SDGs by definition; The targets labels (e.g., 1.1, 1.2, etc.) for each SDG refer to those used in the report of the Open Working Group on SDGs, available from: <https://sustainabledevelopment.un.org/content/documents/1579SDGs%20Proposal.pdf>

Figure 9. SDGs as a network of targets from Le Blanc (2015)

Table 1. Dominant topics in sustainable tourism research

No.	Topic labels	keywords	Proportion	Semantic Coherence	Exclusivity
1	Mobility	Sustainable, Mobility, Behavior, Sustainable Tourism, Change, Critical, Social Marketing, Market, Framework, Behavioral	0.021	-136.65	11.93
2	Poverty and economic development	Tourism, Poverty, Economic, Development, Growth, Tourism Development, Gender, Ecotourism, Social, Countries	0.071	-142.67	11.24
3	Information technology	Tourist, Big-Data, GIS, Urban Transport, Visitor, Data, Time, Tourism, Social media, Public	0.040	-145.05	11.04
4	Carbon footprint	Tourism, Carbon Footprint, Environment, Carbon, Climate change, Emissions, Transport, Energy, Water, Air	0.062	-145.74	11.58
5	Heritage and cultural tourism	Heritage, Tourism, Cultural, World Heritage Sites, Cultural Heritage, Tourist, Visitors, Culture, Interpretation, Perception	0.056	-137.25	11.37
6	Rural tourism and community development	Rural Tourism, Community, Development, Local, Rural, Tourism, Community Involvement, Study, Participation, Tourism development	0.080	-111.71	11.22
7	Planning and governance	Planning, Management, Governance, Destination, Sustainability, Tourism, Stakeholder, Policy, Approach, System	0.105	-98.00	11.45
8	Vulnerability, adaptation, and resilience	Vulnerability, Risk, Adaptation, Resilience, Tourism, Climate change, Destination, Industry, Sustainability, Coastal	0.058	-154.33	11.45
9	Corporate social responsibility	Corporate Social Responsibility, Responsible Tourism, Green Hotels, Environment, Performance, Green Practices, Hospitality, Industry, Practices, employees	0.054	-154.42	11.56
10	Resident attitude to tourism	Resident, Perception, Attitude, Tourism, Study, Tourists, Environment, Destination, Effect, Social	0.082	-115.15	11.37
11	Ecotourism development	Ecotourism, Wildlife, Conservation, Management, Visitors, Tourists, Environment, Marine, Tourist, Reef	0.066	-153.80	10.98
12	Parks and protected areas management	National Parks, Protected Areas, Management, forest, Tourism, Conservation, Protected, Visitor, recreation, Environment	0.067	-103.72	11.39
13	Tourism in organic farms	Organic Farms, Environment, Tour, Operators, Sustainability, Business, Product, Tourist, Guides, Environment Impact	0.065	-97.46	10.96
14	Sustainable development goals	Sustainable Development Goals, Sustainable Tourism, Policy, Theory, Research, Practice, Sustainability, Development, Academic, Approaches	0.080	-155.30	11.18
15	Pro-environmental behaviors	Food Waste, Sustainability, Social, Tourism, Slow, Local, Sustainable, Wellbeing	0.046	-186.21	11.21
16	Volunteer tourism	Volunteer, Tourism, Cultural, Learning, Communities, Indigenous, Research, Ecotourism, Host, Environment	0.047	-149.57	11.03

Table 2. Articles on the SDGs

SDGs	Number of articles	Percentage of articles
SDGs in general	13	31.7
SDG 1	4	9.8
SDG 2	0	0
SDG 3	3	7.3
SDG 4	3	7.3
SDG 5	9	22.0
SDG 6	1	2.4
SDG 7	0	0
SDG 8	6	14.6
SDG 9	0	0
SDG 10	1	2.4
SDG 11	1	2.4
SDG 12	3	7.3
SDG 13	1	2.4
SDG 14	2	4.9
SDG 15	3	7.3
SDG16	4	9.8
SDG 17	10	24.4

Note: Total does not add up to 41 articles or 100% as some articles referred to more than one SDG

Table 3. Number of SDGs referred to in articles

Number of SDGs	Number of articles	Percentage of articles
SDGs in general	13	31.7
1 SDG	17	41.5
2 SDGs	6	14.6
3 SDGs	3	7.3
4 SDGs	0	0
5 SDGs	0	0
6 SDGs	1	2.4
7 SDGs	1	2.4
8 or more SDGs	0	0
Total	41	100