

Indicators of sustainable tourism and their application to Pakistan

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Doctoral Thesis Summary

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Indicators of sustainable tourism and their application to Pakistan

Ukazatele udržitelného cestovního ruchu a jejich aplikace v Pákistánu

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ABSTRACT

Tourism as a globally important sector and the world's fastest-growing industry is a source of job creation for millions of people and contributes to global GDP significantly. The role of tourism in the contemporary era is enormous and will be even more vital in the coming years. However, there are some downsides related to tourism, which demands serious attention for future sustainability to reap long-term benefits. Therefore, the researchers and policymakers focused on sustainable tourism to get around and minimize the underlying negative impacts of tourism. However, previous studies contain research gaps regarding sustainability indicators:

- a) Careful assessment of the indicators is needed for higher validity and reliability and that has been overlooked.
- b) Traditional dimensions of sustainable tourism are unable to achieve a higher level of total variance explained; therefore, the new dimensions related to infrastructural sustainability and technological sustainability are important to consider for developing sustainable tourism.
- c) The development of a multidimensional sustainable tourism index with new dimensions and the use of an index for cross-location comparisons is undeveloped yet.

Thus, this thesis aims to fill these research gaps. Mainly, this research examines the traditional dimensions as well as introduce the two new dimensions (infrastructural and technological dimensions), and develop a comprehensive set of indicators and index to monitor parameters of sustainable tourism. Using the Delphi method, the initial list of indicators has been reduced, and a survey method is used to collect data from selected cities of Pakistan (Lahore, Islamabad, and Faisalabad). The validity and reliability have been assessed by using different methods including Confirmatory Factor Analysis (CFA) and Structural Equation Modelling (SEM). Furthermore, the Multidimensional Sustainable Tourism Index (MSTI) has been developed by including two new sustainable dimensions to conduct comparisons among three destinations. The thesis provides theoretical contributions as follows:

- a) By introducing two new dimensions of tourism sustainability (infrastructural and technological dimensions) to give a broad and thorough view of sustainable tourism.
- b) By considering the three traditional and two new dimensions, the development of multidimensional sustainable tourism index (MSTI) to do cross-location comparisons.

Besides, the doctoral thesis gives benefits for practice, by helping the stakeholders of the tourism industry to choose robust indicators. The developed MSTI will provide sustainability status in the selected cities of Pakistan and will come up with practical suggestions to achieve sustainability.

ABSTRAKT

Cestovní ruch jako důležité odvětví a jedno z nejrychleji rostoucí odvětví na světě je zdrojem vytváření pracovních míst pro miliony lidí, čímž významně přispívá k tvorbě celosvětového HDP. V současné době je role cestovního ruchu ve společenském kontextu významná a jak uvádějí odhady, bude v nadcházejících letech ještě sílit. Existují však i rizika související s tímto odvětvím, která vyžadují jistou pozornost. Je tedy nutné zachovat budoucí udržitelnost tohoto odvětví, proto aby bylo možné čerpat jeho výhody i v budoucnu. I z tohoto důvodu se vědci o tuto udržitelnost zajímají a jejich cílem je mimo jiné minimalizovat negativní účinky tohoto působení. Předchozí dostupné studie však obsahují mezery ve výzkumu týkající se např. i aplikace ukazatelů udržitelnosti jako např.:

a) Je nutné, tyto ukazatele pečlivě posoudit z pohledu významnější spolehlivosti a dlouhodobé použitelnosti. Tyto skutečnosti jsou v dostupných studiích zatím přehlíženy. b) Tradiční principy udržitelného cestovního ruchu nejsou schopny dosáhnout vyšší úrovně celkového využití, a proto je nutné vzít v úvahu nové dimenze a to udržitelnost infrastruktury a technologickou udržitelnost. c) Rozvoj vícerozměrného indexu udržitelného cestovního ruchu s novými dimenzemi (udržitelnost infrastruktury a technologická udržitelnost) včetně použití indexu pro srovnání napříč různými lokalitami, není doposud rozpracováno.

Tato práce si klade za cíl zaplnit tyto mezery výzkumu. Cílem tohoto výzkumu je prozkoumat zejména tradiční dimenze, zavést dvě nové dimenze a vyvinou komplexní soubor ukazatelů a indexů k měření udržitelného cestovního ruchu. Použitím Delphi metody se zredukoval původní seznam ukazatelů. Pomocí metody sběru dat byly shromážděny data z vybraných měst Pákistánu (Lahore, Pakistan a Faisalabad). Platnost a spolehlivost dat bude ověřena pomocí různých metod včetně konfirmační faktorová analýza (CFA) a modelování pomocí strukturálních rovnic (SEM). Kromě toho bude charakterizován index vícerozměrného udržitelného cestovního ruchu (MSTI), který zahrnuje dvě nové dimenze udržitelnosti tak, aby bylo možné porovnávat jednotlivé destinace. Práce přispívá svými teoretickými poznatky následovně:

a) zavedením dvou nových dimenzí využití principů udržitelnosti cestovního ruchu s cílem poskytnout široký a přesný pohled na udržitelný cestovní ruch;
b) posouzením tří tradičních i dvou nových rozměrů pomocí vícerozměrného indexu udržitelného cestovního ruchu (MSTI) bude možné srovnávat jednotlivé destinace cestovního ruchu.

Studie navíc obohatí praxi tím, že pomůže zúčastněným stranám v odvětví cestovního ruchu při výběru mezi velkým množstvím ukazatelů a jejich aplikaci. Aplikace vícerozměrného indexu udržitelného cestovního ruchu MSTI poskytne významnou informovanost o využití principů udržitelnosti ve vybraných městech Pákistánu a pomůže s praktickými návrhy, které povedou k významnému zvýšení aplikace těchto principů v dané lokalitě.

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1. INTRODUCTION

1.1 Background and Motivation for the study

Tourism is a globally and dynamically growing industry. The majority of the people consider tourism as a journey for relaxation and a source of fun due to their enjoyable time of holidays or retirement life. Many travel for short-term and temporary jobs or business (Robinson, Luck, & Smith, 2013). Every year, hundreds of millions of people with billions of tourism trips lead to the use of natural resources and environment, local facilities such as transportation, accommodation, and restaurants. Such tourism activities cause significant environmental impacts and put pressure on natural resources (Robertson & Barling, 2017; Rhead, Elliot, & Upham, 2015).

Although the concept of sustainability and sustainability development of tourism lacks a mutually acceptable definition (Murray et al., 2003) and Mundt (2011) regards sustainability and sustainable tourism as a vague concept, yet there is a way forward (Fletcher et al., 2017). A recognition that the resources are limited and vulnerable, and a sense of responsibility that all stakeholders should use resources rationally from the government to planners, and tourism firms to tourists. Hence, to ensure sustainability all the stakeholders should be involved with active participation and cooperation in a sustainable strategy (Fletcher et al., 2017; Tučková & Jurigová, 2014).

In the past, several attempts have been carried out to create a sense of responsibility towards sustainability and greening of the tourism industry (Mycoo, 2006; Hobson & Essex, 2001; Welford, Ytterhus & Eligh, 1999; Font, 2002; Fletcher et al., 2017). Such attempts involve sensitization campaigns along with certification schemes. However, such attempts could not be successful due to the realization at the organizations and companies' level that such certifications involve additional money and less awareness of the sustainable tools. Therefore, this doctoral thesis attempts to provide a comprehensive list of indicators to be followed for sustainable development of tourism covering traditional as well as some new dimensions, for which other authors have not worked explicitly.

Sustainability context for tourism development clearly indicates the importance and need of economic dimension, environmental dimension, socio-cultural dimension of sustainable tourism for better management of destinations, growth and competitiveness as well as long-term sustainability and to cater the needs of all stakeholders (Garrigós-Simón et al., 2015; Fletcher et al., 2017; World Tourism Organization, 2005). Consequently, the adoption of sustainable practices in the tourism industry by adopting better environmental management practices, training of the personnel as knowledge agents, and making tourists aware of achieving the common goal of sustainability (Martínez-Martínez et al., 2019; Fletcher et al., 2017). Also, such involvement of employees is beneficial for employee wellbeing and sustainability (Hussain et al, 2020).

Apart from the aforementioned traditional dimensions of sustainable tourism, some studies implicitly highlighted the importance of improved infrastructure and

better technological accessibility (Johnston & Tyrrell, 2005; Casagrandi & Rinaldi, 2002; Panasiuk, 2007; Rantala et al., 2018; Jun, 2018). Consequently, this research incorporates infrastructural and technological sustainability as two new dimensions of sustainable tourism. Therefore, in the process of assessing and validating a comprehensive set of indicators, this research considers not only traditional dimensions but also two novel dimensions (infrastructural and technological sustainability). Besides, to carry out cross-location and cross-temporal comparisons this research also developed the Multidimensional Sustainable Tourism Index (MSTI) to help the policymakers, researchers, destinations managers, and local administrators to keep an eye on the changing situation and peep into the matter deeply.

1.2 Profile of Pakistan and Tourism in the Country

Pakistan is a South Asian country and the world's fifth-most populous country with more than 200 million inhabitants. By area, Pakistan is the 33rd largest country with an area of 881,913 square kilometers. Pakistan is a strategically important country due to its geographical and regional location. The coastline of Pakistan is 1046 kilometers, mostly on the south-side with the Arabian Sea and the Gulf of Oman. The diversity of cultures, friendly people, and beautiful landscape of Pakistan has a great potential for attracting domestic and international tourists. There was a time when a large number of foreigners including British, Americans, Canadians, Germans, Chinese and tourists from other countries use to visit Pakistan due to its natural beauty, cultural heritage and impressive history. However, tourism potential in Pakistan is matchless due to its scenic places, beautiful lakes, history, heritage, and tallest mountains. British Backpacker Society has ranked Pakistan the world's top travel destination for 2018 while competing for 20 countries including Russia, India, China and Kyrgyzstan, which explicated Pakistan as a paradise for tourists and "one of the friendliest countries on earth, with beyond imagination mountain scenery (British Backpacker Society, 2017).

In Pakistan, International tourist arrivals have boosted by 300 percent since the past few years and this growth is quite impressive (Pakistan Tourism Development Corporation, 2018), and hence Pakistan attracted more than 6.6 million foreign tourists in the year 2018 (Dawn, 2019). The economic impact report 2018 published on Pakistan reveals interesting facts regarding tourism in Pakistan. According to the World Travel & Tourism Council (WTTC, 2018) statistics, the direct impact of travel and tourism contributing 3 percent of GDP in 2017 and is projected to rise by 5.9 percent in 2018 whereas the total contribution to GDP is 7.4 percent.

This widespread traveling also caused some problems regarding environmental damage, socio-cultural issues and economic impacts. So, future sustainability and competitiveness is much considerable issue of debate for the past two decades. Some of the impacts of tourism are positive such as enhancing understanding across cultures however, the pollution because of tourism and harm to the environment due to the irresponsible behavior of tourists is enormous and

alarming (Patterson, 2016). That's why the concept of sustainable tourism is got considerable attention from researchers and policymakers. This concept of sustainable tourism emerged in the 1980s that refers to the low impact on the environment and local culture while helping to generate future employment for local people.

2. LITERATURE REVIEW

2.1 Tourism and Sustainability

Much of the literature discusses the issue of tourism as well as its sustainability along with related concerns. In this vein, Blancas et al. (2015) presented analytical tools to address the two key issues, which the European Commission considers to provide a better base of socio-economic knowledge and improved image as quality sustainable tourism destinations of European areas. They defined a system of sustainable tourism indicators and obtained a composite indicator having weights as well as sustainable tourism country brand ranking. While Ziaabadi et al. (2017) determined the sustainability and indicators of sustainable tourism by using a composite indicator and a linear programming model and explored that situation for sustainable tourism is not appropriate.

WTO (1996) played its leadership role in the field of sustainable tourism, by establishing a task force and 11 core indicators have been identified by the WTO process for sustainable tourism management which includes site protection, stress, use intensity, social impact, development control, waste management, planning process, critical ecosystems, consumer satisfaction, local satisfaction and tourism contribution to the local economy. However, these WTO indicators are 'demand-driven' and are helpful for managers to make decisions of practical nature.

In the same way, Lee and Hsieh (2016) identified indicators of sustainable tourism. They explored key dimensions and indicators by using the fuzzy Delphi method and examined weights by using the analytic hierarchy process. The process revealed 141 indicators for sustainable tourism. Based on stakeholder theory and environmental impact theory for incorporating stakeholder's roles in the assessment of sustainable tourism, they examined indicators and came with the need to foster stakeholder involvement as well as better planning for sustainable tourism.

Although tourism is a source of revenue and growth yet adverse impacts are a much concerning issue for its sustainability, the same issue addressed by Paramati et al. (2017) and they investigated the impact of tourism on economic growth and emission of carbon dioxide in eastern and western EU countries. One country-focused study of Brendehaug et al. (2017) is good to analyze policy shift of Norwegian government and he examined how sustainability can be integrated with tourism planning due to the shift of Norwegian government from sector approach to integration approach.

Furthermore, small and medium-sized tourism enterprises can play their role in sustainability, a study focusing on this conducted by Coles et al. (2017), analyzed environmental resources and costs in the business model of small and medium-sized tourism enterprises (SMTEs). They reported that economic and environmental

performance in the case of sustainable tourism discourse is overlooked. They stressed with strong evidence that in environmental management by SMTE's contemporary approaches should consider the current and changing conditions to form business models.

The above-mentioned literature indicates the status and importance of sustainable tourism as the three aspects of sustainable tourism must be in a good balance for future growth and sustainability of tourism. A better understanding of sustainable tourism, determination of sustainability, different factors and indicators and better practices in this regard can play a vital role in the future sustainability of tourism and competitiveness (Javed & Tučková, 2019a).

2.2 Indicators of Sustainable Tourism

The concept of sustainable tourism needs good and clear indicators for measurability and assessing the impacts of tourism. In tourism planning, policies and management sustainable development is a prevailing paradigm (Bianchi, 2004; Bramwell & Lane, 1993). The sustainability of tourism is more than just the physical environment and covers different aspects (Bramwell & Lane, 2008; Holden, 2003). At the same time, Sustainable tourism is a controversial concept (Liu, 2003; Sharpley, 2009; Wheeler, 1993) but indicators are important to measure and monitor the impacts of tourism (Butler, 1993; Wheeler, 1993). Therefore, the formulation of indicators is necessary for practices and research on sustainable tourism.

The focus on the use of indicators is increasing to assess the level of sustainability since the United Nations Earth Summit of 1992 and as a result, international organizations suggested different indicators from time to time (Vera & Ivars, 2003). The main purpose of all such efforts is to keep the growth of tourism in limits (Holden, 2007; Hunter, 1995). The literature refers to indicators as a necessary tool to measure sustainability by monitoring development in the tourism sector (Castellani & Sala, 2010; Gahin, Veleva, & Hart, 2003; Valentin & Spangenberg, 2000).

The first work on tourism in terms of sustainability and indicators development is of the International Federation of Tour Operators under the project of the European Community Models of Sustainable Tourism in the year 1994 (Hughes, 1994). Then, the guidelines of indicators provided by the World Tourism Organization in 1995 as well as an updated version in 2005 which is being regarded as a very helpful guidebook for researchers and the relevant stakeholders (WTO, 1996; WTO, 2004).

Despite these developments, still, there is less consensus on the issue of sustainability, its exact meaning and components (Bell & Morse, 2012; Tsaur & Wang, 2007; Weaver & Lawton, 1999, Dimoska & Petrevska, 2012, Javed & Tučková, 2018) so logical assessment methodologies are much needed for higher validity and reliability to build and increase confidence on the results for decision making due to the dynamic and unpredictable nature of the tourism industry (Asmelash & Kumar, 2019). Sustainability of tourism does not refer to a single form

but all the aspects related to the tourism industry should be sustainable (Sedai, 2006) and tools developed to assess the impacts are not adequate as well (Asmelash & Kumar, 2019) which hinders the practical assessment of sustainability (Choi & Sirakaya, 2005; Ko, 2001, 2005). Besides, the assessment of tourism sustainability with real cases is also not well-developed (Ko, 2001, 2005; Cernat & Gourdon, 2012, Choi & Sirakaya, 2005) and despite having a lot of indicators in the literature, a very few have been practically implicated and evaluated (Reihanian et al., 2015; Blancas et al., 2010; Rebollo & Baidal, 2003; Lee & Hsieh, 2016). Although Ko (2005) developed a comprehensive methodology for the assessment of sustainable tourism yet a very few scholars followed this model.

Most past studies focused on the traditional dimensions of sustainable tourism, i.e., economic, socio-cultural, and environmental (Dubois, 2005; Schianetz & Kavanagh, 2008) or some added also institutional sustainability. Despite this existing literature on tourism and sustainability with considerable work on the level of organization and academia, their use has been hampered by technical and conceptual difficulties (Torres-Delgado & Saarinen, 2014; Ceron & Dubois, 2003; Vilà et al., 2010). Similarly, a single set of indicators cannot be used for every destination, as there is no consensus among scholars (Cernat & Gourdon, 2012; Fernández & Rivero, 2009). Therefore, careful assessment is also needed for higher validity and reliability to ensure robustness and this assessment has been overlooked in the majority of previous studies (Reihanian et al., 2015), while some authors such as Choi & Sirakaya (2005), and Ap & Crompton (1998) considered these issues and recommended the application of Structural Equation Modeling (SEM). This doctoral thesis will consider such aspects for higher robustness by using SEM. Furthermore, Asmelash & Kumar (2019) departed from the traditional three dimensions of sustainable tourism and also considered institutional sustainability. However, the total variance explained is of moderate level (49.008%), and hence Asmelash & Kumar (2019) suggested including some additional dimensions of sustainability, such as infrastructural sustainability and technological sustainability along with respective indicators.

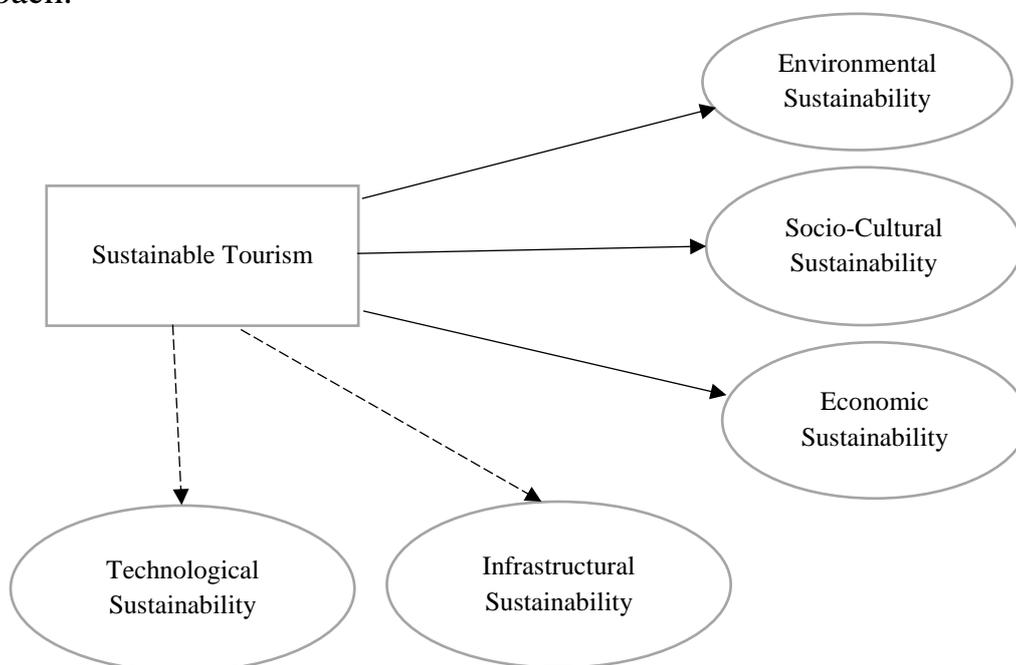
The literature quite obviously indicates the importance of infrastructures. Infrastructures are the central nervous system of the entire unit, society and destination. In light of this, better infrastructure, wide roads, good transportation is also necessary for tourism sustainability. Johnston & Tyrrell (2005) also stressed that infrastructure should also be considered for sustainability and they presented a dynamic model of sustainable tourism by describing the role of infrastructure. In addition, Gössling et al. (2002) also acknowledged the need for necessary infrastructure for tourism sustainability, which consequently enhances the tourist satisfaction and motivates them to revisit (Javed, Tučková, & Jibril, 2020a, Javed, Tučková, & Jibril, 2020b).

Similarly, the technological aspect of sustainability is also of worthwhile importance and often overlooked by researchers. Technological sustainability is very important for tourism in the modern era because the role of technology in

tourism has increased much. Hence, the resulting impact is significant on societal qualities, human well-being, economic growth and sustainable development (Shrivastava et al., 2016). The adoption and utilization of technologies also help to combat the adverse impacts of changing climate (Scherr et al., 2012; Long et al., 2016).

Furthermore, the role of information and communications technology (ICT) is also at the forefront in the tourism industry to provide reliable information before travel and during travel (Kumar, 2014; Barile et al., 2017). Such as ICT and social media also impacted the behavior of tourists (Javed et al., 2020c) and such consideration is important for tourism sustainability and long-term growth at the destination and regional level. Gretzel et al., (2015) discussed the foundations and developments in smart tourism and raised the importance of issues like the availability of free tourist guide through smartphones' app, support services, availability of data, and numbers/web links for a medical emergency. In light of this, it is right to claim that technological sustainability is quite essential for the competitiveness and long-term sustainability of tourism businesses.

The identified research gap related to infrastructural and technological dimension of sustainable tourism to improve the total variance explained (Asmelash & Kumar, 2019) that there have been no studies concentrating on this gap so far (Javed & Tučková, 2019b). Therefore, this doctoral thesis will fulfill the said research gaps by introducing two new dimensions of sustainable tourism along with respective indicators in an attempt to improve and moving towards an exhaustive approach.



Note: Continuous lines indicate traditional dimensions, dashed lines indicate new dimensions
 (Source: Author's own elaboration)

Figure 1: Traditional Versus Suggested New Dimensions of Sustainable Tourism

3. RESEARCH PROBLEM, QUESTIONS, AND OBJECTIVES

This doctoral thesis focuses to develop indicators for assessing and measuring tourism sustainability for the selected destinations in particular cities of Pakistan. As discussed above, tourism has some downsides along with benefits so the need to keep an eye on over-tourism status and impacts to maintain balance among environmental, economic and socio-cultural aspects. In the coming years, it is expected that tourism will show impressive growth as international tourists increased by 300 percent in a previous couple of years by reaching around two million (Pakistan Tourism Development Corporation, 2018). However, the tourism business is not following the contemporary way of action in providing quality services and very little dissemination of information among tourism stakeholders for achieving sustainability. Further, the indicators developed and suggested by other researchers and international organizations cannot be followed blindly in Pakistan due to different types of destinations, for example, suggested by World Tourism Organization (WTO) and European Commission (2016) ETIS toolkit and to develop good indicators it is strongly recommended to include the relevant stakeholders as much as possible (WTO, 2004; Organization for Economic Cooperation and Development, 1994; Miller, 2001; Choi and Sirakaya, 2005; Ap & Crompton, 1998) and this doctoral thesis involves key stakeholders in the development of the indicator. The total variance explained should be 60% or more but in the study of Asmelash & Kumar (2019), it is 49% which invites some more dimensions to be included to improve this value so, this doctoral thesis includes some more dimensions for the sustainability of tourism.

The new important dimensions are infrastructural sustainability and technological sustainability, recommended by Asmelash & Kumar (2019) along with running different tests including Principal Component Analysis (PCA) and Structural Equation Modeling (SEM) for assessing reliability and validating the indicators. Furthermore, to assess the change of tourism status and to have cross-location comparisons and different temporal units the use of an index is better (Mayer, 2008; Torres-Delgado & Saarinen, 2014), therefore this doctoral thesis develops an index, based on the methodology used by Alfaro Navarro, Martinez & Jimenez (2020), along with the introduction of two new dimensions (infrastructural and technological aspects) of sustainable tourism (Figure 1).

Thus, previous works have some research gaps related to

- *two new dimensions, such as infrastructural sustainability and technological sustainability, suggested by Asmelash & Kumar (2019), which are important for developing sustainable tourism but published papers have not focused on so far,*
- *development of multidimensional sustainable tourism index with new dimensions and the use of this index for cross-location comparisons that prior papers have undeveloped.*

3.1 Research Problem

Based on the above arguments, the research problem of this work is to develop a comprehensive set of indicators and index to monitor the sustainable tourism parameters in Pakistan including practical implications.

3.2 Research Questions

Based on the research problem and research gaps, this thesis provides the following main research questions:

RQ1: What are the validated indicators of sustainable tourism for developing the tourism industry?

RQ2: How to develop the multidimensional sustainable tourism index (MSTI) to monitor sustainable tourism?

RQ3: How to apply MSTI to compare sustainable development of tourism among locations?

RQ4: What are the practical implications for local authorities aimed at developing sustainability for the tourism industry?

3.3 Research Objectives

The main research purpose of this work is to develop a tool that provides meaningful decisions to local authorities to advance sustainable tourism and improve the image of destinations. Thus, this research achieves the following objectives concerning sustainability indicators and tourism to fulfill the aforementioned research gaps:

- To develop and validate sustainability indicators based on traditional dimensions (economic, social, and environmental aspects) and two new dimensions (infrastructural and technological aspects).
- To develop the multidimensional sustainable tourism index.
- To compare the multidimensional sustainable tourism index among selected cities in Pakistan.
- To provide some practical suggestions for local authorities to improve the destination's image and sustainability in such cities in Pakistan.

In light of the aforementioned research questions, problem and objectives, this doctoral thesis attempts to fulfill some research gaps for overviewing sustainable tourism comprehensively. As mentioned earlier, specific research gaps are related to two new dimensions of infrastructural and technological sustainability along with the sustainable tourism index to monitor sustainable tourism.

4. RESEARCH METHODOLOGY

4.1 Research Design

A good research design is defined as the overall strategy adopted to carry out research, address the research problem and achieve the objectives of the study. This doctoral thesis used a mix-methods approach (see Table 1) to fulfill the research gaps and achieve the objectives of the research. A mix-methods approach is considered more suitable and preferable over qualitative or quantitative due to the

provided avenues for better understanding of complex issues and addresses the research problem comprehensively (Creswell & Creswell, 2017).

To do qualitative analysis, this doctoral thesis employed the Delphi method, which is a pragmatic approach based on the philosophical assumptions (Kirk & Reid, 2002). The thesis also employed a survey method for quantitative analysis to collect data, as recommended by Creswell (2003). The arguments of Creswell (2003) also clarifies that the quantitative approach is associated with the paradigm of positivism, and methodologically is a deductive approach (Saunders et al., 2003).

Table 1: Summary of Research Methodology

Research Approach	Mixed-Methods	
Research Design	Qualitative (Inductive)	Quantitative (Deductive)
Research Paradigm	Pragmatism	Positivism
Research Method (strategies)	Delphi Method	Survey
Data Collection Technique	Consensus through expert opinion	Questionnaire
Sampling Techniques	Experts Selection	Quota Sampling
Study Context	Pakistan	Pakistan
Data Analysis techniques	Initially, a list of indicators was sent to experts to get the consensus-based indicators based on the Delphi method. The thesis carried out two rounds of the Delphi method to obtained consensus-based indicators	Structural equation modeling (using confirmatory factor analysis)

4.2 Indicators Development Procedure

The previous studies related to the development of indicators for sustainable tourism are worthwhile, however, these indicators are not exhaustive and this doctoral thesis follows the compatible approach, for including additional indicators (Ap & Crompton, 1998; Choi & Sirakaya, 2005; Miller, 2001). This doctoral thesis makes sure of the participation of key stakeholders including residents, tourists, and experts from the selected areas by quota sampling.

In this doctoral thesis, a mixed-method approach is used for the development and validation of sustainability indicators. The indicator collection process ended up with 192 indicators to be applied for the selected cities of Pakistan (Lahore, Islamabad, and Faisalabad). As WTO (2004) argues that 12 to 24 indicators are sufficient for any destination but on the other side if indicators are more than 100, it's impractical too. Another author suggested that 20 to 50 indicators are very reasonable (Sors, 2001). Therefore, this thesis uses the Delphi method to reduce the number of indicators and this method is also compatible with the past studies (Amiryan, 2013; Miller, 2001; Ap & Crompton, 1998; Choi & Sirakaya, 2005).

The Delphi method firstly developed and introduced by Rand Cooperation in the 1950s and this method serves as a tool to reduce the number and range of responses to achieve consensus (Dalkey, 1969; Giannarou & Zervas, 2014). The Delphi method is particularly preferred when the exact knowledge is lacking and the goal is to obtain the most reliable opinion from a group of experts (Kittell-Limerick, 2005; Adler & Ziglio, 1996; Kreitner & Kinicki, 1992). However, there is no consensus concerning the common practice of statistical analysis of Delphi results (Landeta, 2006). Therefore, a group of experts and scholars have been selected, having expertise in the relevant field. So, these experts included faculty members from the selected universities, personals from local government, and some from tourism organizations.

The thesis uses the two-round Delphi method for reaching the final list of indicators by exploiting a five-point Likert scale, as also recommended by Green, Hunter, and Moore (1990) and Choi and Sirakaya (2005). In the first round of Delphi, 22 respondents were invited by sending a questionnaire for the evaluation process. However, only 15 participants returned the questionnaire, so the response rate was 68.18 percent (see Table 2). Internationally accepted criteria of sustainability indicators selection will also be provided to reduce subjectivity, the criteria include: relevance of the indicator to tourism issues in the region (European Commission, 2009; Miller, 2001; WTO, 2004), credibility of the information and reliability for users of the data (WTO, 2004), feasibility of obtaining and analyzing the information required (European Commission, 2009; WTO, 2004), clarity and ease of understanding amongst users (WTO, 2004; European Commission, 2009), limited in number, broad coverage of each indicator (European Commission, 2009), comparability over time and across regions (WTO, 2004; Tanguay et al., 2013). Along with this, respondents also requested to suggest any important and relevant indicators missed on the list.

In the second round of the Delphi method, the number of respondents was less (18 respondents) to reduce the subjectivity (Choi & Sirakaya, 2005). Out of 18 participants, only 13 participants returned the questionnaire with a response rate of 72.22 percent.

4.3 Purification of the indicator development

The relevant feedback can be obtained about the clarity, validity, and other key issues by conducting a pilot study (Cohen, Manion, and Morrison, 2002). Any ambiguity related to the research instrument can also be reduced in this way (Choi & Sirakaya, 2005).

The sample size for the pilot study should also be based on the eminent scholars' recommendations. Isaac and Michael (1995) suggested the sample size between 10 to 30 is suitable due to certain advantages such as easy calculation, simplicity, and the ability to test hypotheses. Johanson and Brooks (2010) also of the view that 30 representative participants are a reasonable number, whilst a little higher number is better.

Keeping in view the aforementioned guidelines, the questionnaire is distributed to 50 respondents including residents, tourists and tourism experts, by the way of convenient sampling method with the request to rate the indicators of the Likert scale (anchored at 1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, and 5 = strongly agree). However, only 37 questionnaires (74%) were valid and useable.

The corrected item-total correlations (CITC) is analyzed for reliability, as higher correlations are better instruments (Choi & Sirakaya, 2005). Several authors have used item-total correlation for the initial assessment and purification of indicators. Francis & White (2002) recommended that items with an item-total correlation coefficient of 0.5 or more should be retained. Wolfenbarger & Gilly (2003) also suggested a cut-off point of 0.5 or more is better for the coefficient of item-total correlation as a purification criterion of items. Churchill Jr (1979) suggested that reliability and internal consistency can be ensured by carrying out a purification process. Hence, the items with CITC with a coefficient below 0.5 can be deleted for purification and enhancing the overall reliability (Krishnaveni, 2008; Asmelash & Kumar, 2019).

Table 2: Development of Indicators and Validation Phases

Indicators Development and Validation Steps	Number of Indicators Evaluated and Retained	Number of Participants
First Round Delphi Method	Initially, 192 total indicators were sent to the experts. First Round to Delphi method ended with consensus on 40 indicators	22 participants took part in the Delphi method First Round and 15 participants returned the completed questionnaire
Second Round Delphi Method	152 indicators were sent to the experts. The Second Round of the Delphi method ended with consensus on 28 indicators	18 participants took part in the Delphi method Second Round and 12 participants returned the completed questionnaire
Purification Phase	A pilot study was carried out based on 68 indicators. Based on the results, 61 indicators were retained, whilst 7 were excluded	50 participants (residents, tourists, and tourism experts) took part in the pilot study Only 37 questionnaires were valid and usable
Validation Phase	Out of 61 indicators, 5 indicators were dropped and 56 indicators were retained.	Questionnaires were distributed to the respondents at three selected destinations, with resulting 450 usable questionnaires

4.4 The Research Context and Sample Selection

The thesis purposefully selected the case of Pakistan due to the improved law and order situation, and consequently increasing number of tourists such as international tourist arrivals showed growth of 300 percent in the previous years (Pakistan Tourism Development Corporation, 2018). The studies often overlooked the issues related to tourism and sustainability in the context of Pakistan. The

contemporary scenario makes it much desirable to address the issues related to sustainable tourism and to develop its indicators on a contextual basis by having the participation of relevant stakeholders. Therefore, by taking the context of Pakistan and its selected cities, the thesis attempts to develop sustainable tourism indicators along with its application to Pakistan.

The cities of Pakistan have also been purposefully selected, precisely are Islamabad, Pakistan, and Faisalabad due to certain reasons. Firstly, these cities are the most peaceful cities of Pakistan with well-maintained law and order situation. Secondly, the responsible tourism development offices are opened in these cities with efforts to facilitate tourists especially coming from foreign countries. Thirdly, these cities are also away from seasonal impacts by receiving tourists around the year.

The sample has been selected from the aforementioned three destinations. In this vein, five attractions have been selected from each destination with a sample size of 150 respondents. The selected attractions of the aforementioned destinations are depicted by Figure 2. The overall sample size from three destinations is 450 respondents including residents, domestic tourists, and foreign tourists.

The selected sample size is sufficient enough to apply Factor Analysis and Structural Equation Modeling (SEM). Different authors also recommended that the sample size should be at least 200 for most Structural Equation Modeling or other statistical tests (Kline, 2013; Byrne, 2016; Iacobucci, 2010). So, the sample size used in this thesis meets this condition well to fulfill this requirement.

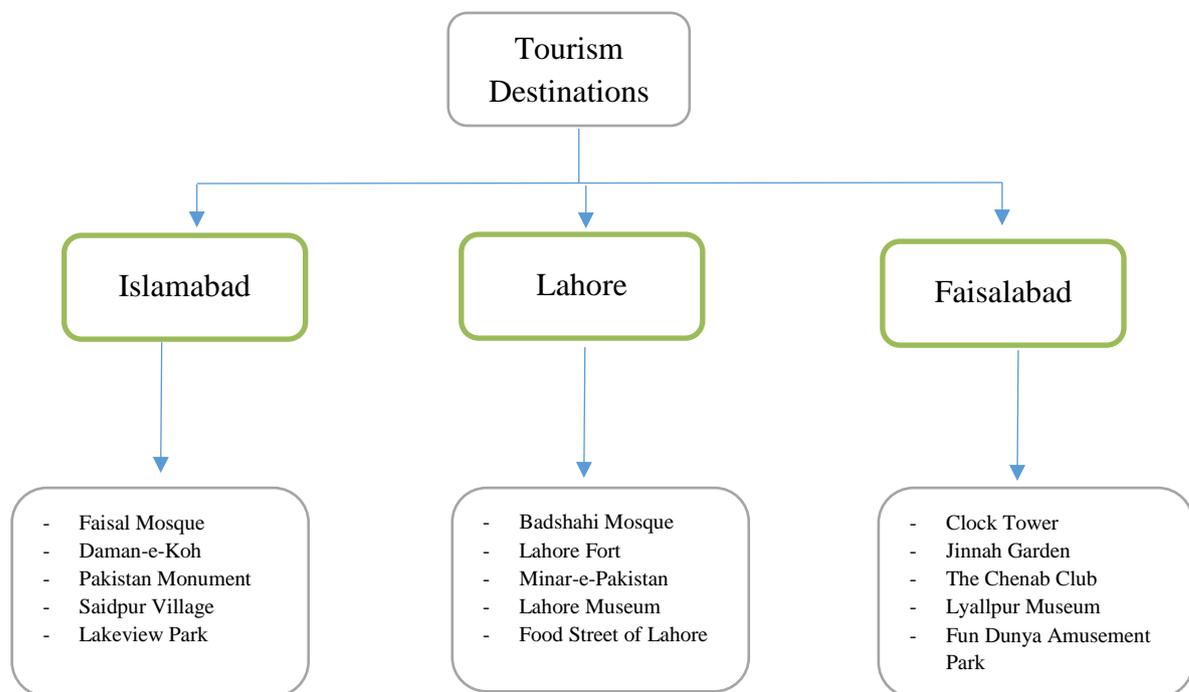


Figure 2: Selected Tourism Destinations and Attractions

4.5 The development of Multidimensional Sustainable Tourism Index (MSTI)

Many studies suggested indicators and indexes for monitoring sustainability; however, this doctoral thesis presents indexes for each of the dimensions as well as an overall index. This also helps how positive and negative performances balance out in the overall index (Alfaro Navarro, Martinez, and Jimenez, 2020).

A novel aspect of this thesis is that this thesis is going to introduce two new dimensions of sustainability to grasp an exhaustive view of sustainability. The two new dimensions are infrastructural sustainability, and technological sustainability has also been suggested by Asmelash and Kumar (2019).

Mendola and Volo (2017) and OECD (2008) suggested guidelines to be followed for the construction of the index. These guidelines reveal that the aggregation of indicators using weights is important to consider as well as normalization of the values due to the different nature of indicators.

Keeping in view the aforementioned guidelines, a weighted aggregation has been used as all the indicators do not have the same importance. So, instead of subjective weights assigned by experts, objective weights have been used by the application of Principal Component Analysis (PCA). Furthermore, the geometric mean has been used for aggregation, which is better for indicators in relative terms (Böhringer & Jochem, 2007).

In calculating the index, the first step is to transform indicators into the same number of principal components by PCA.

$$PCi = \sum_{i=1}^k uixi$$

U_i = characteristic vector of each principal component

X_i = indicators used for each dimension

The indicator is constructed by geometric mean and the weights assigned according to the variance retained;

$$C = \sqrt{\sum_{i=1}^h w_i \prod_{i=1}^k PCw_i}$$

W_i = the percentage of variance retained by each component

Using the objective weights assigned by PCA, the index for each of the dimensions would be;

$$Ecl = \sqrt{\sum_{i=1}^h \alpha_i \prod_{i=1}^h PCE\alpha_i}$$

$$SI = \sqrt{\sum_1^t \beta_i \prod_{i=1}^t PCS\beta_i}$$

$$EI = \sqrt{\sum_1^s \delta_i \prod_{i=1}^s PCE\delta_i}$$

$$II = \sqrt{\sum_1^j \theta_i \prod_{i=1}^j PCI\theta_i}$$

$$TI = \sqrt{\sum_1^k \lambda_i \prod_{i=1}^k PCT\lambda_i}$$

Where,

EcI = sustainability index for Economic dimension

SI = sustainability index for Social dimension

EI = sustainability index for Environmental dimension

II = sustainability index for Infrastructure dimension

TI = sustainability index for Technological dimension

Lastly, the aggregation process can construct an overall index; denoting the Multidimensional Sustainable Tourism Index (MSTI), expressed as:

$$MSTI = \sqrt{\sum_1^{\alpha+\beta+\delta+\theta+\lambda} EcI^\alpha \cdot SI^\beta \cdot EI^\delta \cdot II^\theta \cdot TI^\lambda}$$

This index has a very useful application in the measurement and monitoring of sustainability, and comparison among destinations as well as comparison among different years, depending upon the availability of data. The ranking provided by this index highlights relatively more sustainable and competitive destinations that provide opportunities for improvement and pave the way to achieve better results.

In addition, each dimensional index helps to identify the respective weaknesses and strengths of each city/destination which will improve weaker areas and of issues of considerable attention. In this regard, the proposed index provides an addition to the already available index suggested by Alfaro Navarro, Martinez and Jimenez (2020), which just considers the traditional dimensional of sustainable tourism however this thesis proposed a multidimensional sustainable tourism index (MSTI) by including two new dimensions of sustainable tourism (infrastructure, and technological dimension) to have an exhaustive look and peep into the matter deeply, as suggested by Asmelash and Kumar (2019).

5. DATA ANALYSIS AND MAIN RESULTS

The thesis carried out data analysis through the use of software IBM SPSS 25.0, IBM AMOS 25.0, and NumXL.

5.1 Delphi Method and Indicators Selection through Experts' Consensus

Initially, the questionnaire prepared for the Delphi method was sent to the experts consisted of 192 total indicators based on traditional sustainability dimensions as well as two new proposed dimensions related to infrastructural sustainability and technological sustainability. During the first round of the Delphi method, questionnaires were sent to 22 participants while only 15 participants (68.18%) returned the questionnaire. The participants were requested to rate the indicators on the 5-point Likert Scale. To reach consensus, two criteria were followed that at least 51 percent of experts should respond close to agree and strongly agree (Hackett et al., 2006) and the interquartile range should be at most 1 (Raskin, 1994; Rayens & Hahn, 2000). Hence, in light of this, all the indicators reached consensus followed the aforementioned criteria. It is also worthwhile to mention here that the questionnaire developed for the Delphi method used only the positive statements for sustainable tourism.

The first round results of the Delphi method obtained 40 consensus-based indicators for dimensions of economic sustainability, environment sustainability, socio-cultural sustainability, infrastructural sustainability, and technological sustainability. Proceeding ahead, for the second round of the Delphi method, the questionnaires were sent to 18 participants and only 12 returned (66.67%). Similarly, the second round of the Delphi method ended up with 28 consensus-based indicators by using the criteria of mean, median, and interquartile range values.

5.2 Pilot Study for Purification of Indicators

A pilot study is carried out as an important part of research activity and purification of indicators. Just like mentioned in the previous section about research methodology, a corrected-item-total-score correlation has been calculated through the statistical software IBM SPSS 25.0 and all the indicators below the value of 0.5 are deleted to enhance the reliability. Hence, this stage retained 61 indicators whilst seven indicators were excluded from further analysis.

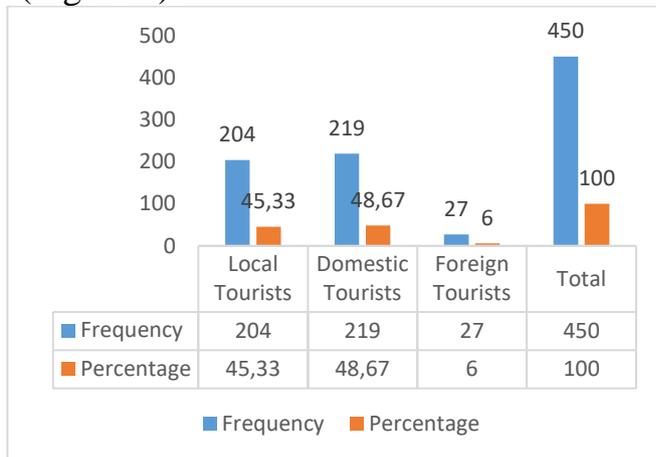
Further steps involved in the analysis of data are as follows:

5.3 Demographic and Descriptive characteristics of respondents

Descriptive statistics are very important to reveal to the characteristics of the research sample to have a clear view and better understand the situation at hand by looking at the corresponding values of central tendency, dispersion, and variability as well as the information related to the demographic features. For example, the statistics about respondents from the selected cities of Pakistan, precisely Islamabad, Lahore, and Faisalabad based on the categories such as domestic tourists, local residents and foreign tourists, males and females, single, married, and divorced,

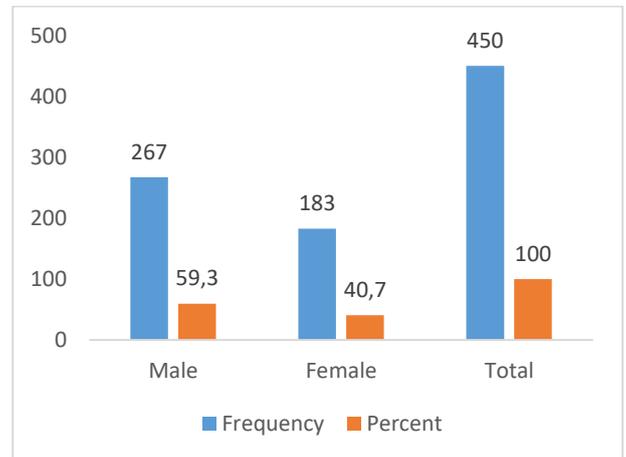
respondents falling in different categories, respondent's status in terms of profession, respondent's level of education.

The analysis based on the survey data depicts that the percentage of domestic tourists and local tourists is almost the same (48.67% and 45.33% respectively), followed by foreign tourists (6%) (Figure 3). Concerning the gender of the respondents, males are in majority (59.3%) while the rest are females (40.7%) (Figure 4).



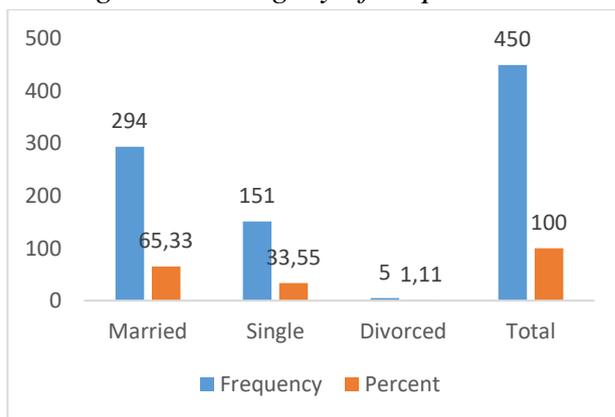
Source: Author's own calculations, based on survey data

Figure 3: Category of respondents



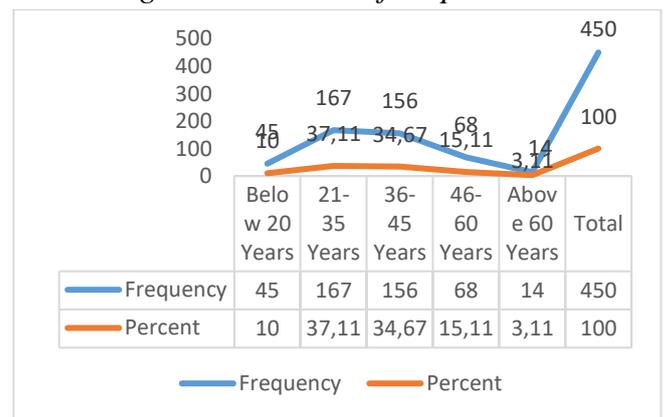
Source: Author's own calculations, based on survey data

Figure 4: Gender of respondents



Source: Author's own calculations, based on survey data

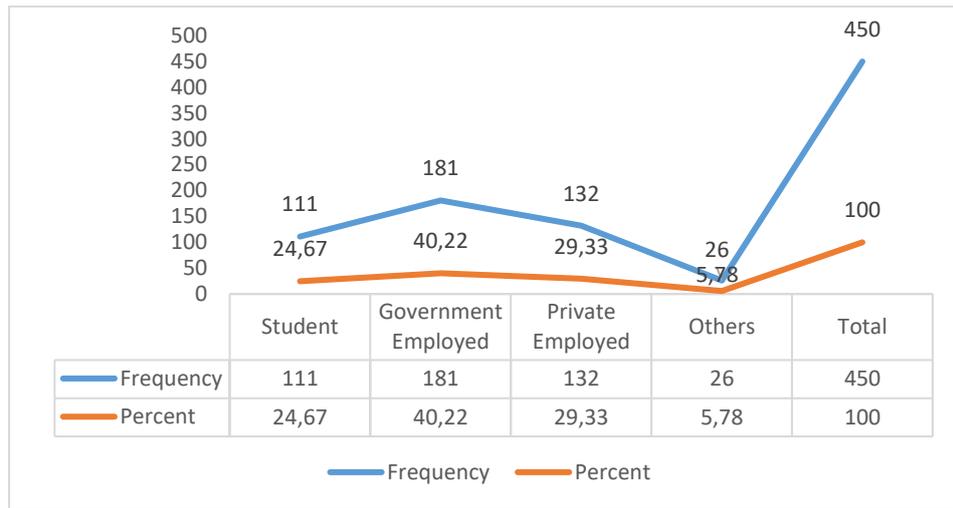
Figure 5: Marital Status of respondents



Source: Author's own calculations, based on survey data

Figure 6: Age of respondents

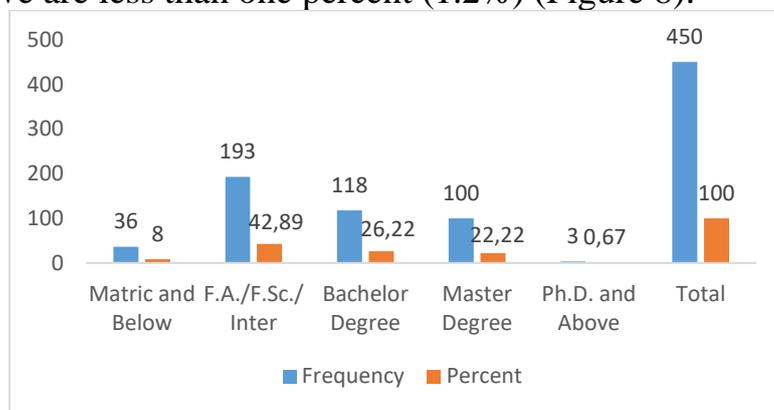
Regarding marital status, most of the respondents are married (65.33%), whilst unmarried respondents are about 34% and 1.11% are divorced (Figure 5). It is also of sufficient interest for readers and researchers to know the age groups of the respondents. In this regards, descriptive analysis depicts that the majority of the respondents are young falling in the age category 21-35 (37.11%), followed by the age group 36-45 years (34.67%), the age group 46-60 (15.11%), whilst teenagers below 20 years are less (10%), and above 60 years of age are the least in percentage (3%) (Figure 6).



Source: Author's own calculations, based on survey data

Figure 7: Occupation of respondents

Besides this, out of the 450 respondents, most respondents are government employed (40.22%), followed by private employees (29.33%), while students are almost one-fourth of the total respondents (24.67%), and the remaining (5.78%) are falling in the other categories of the profession (Figure 7). Also, regarding the educational level of respondents, the data shows that most educated travel more, a majority of the respondents are having F.A./F.Sc. a certificate with 12 years of education (42.89%), while almost one-fourth have having bachelor degree (26.22%). Interestingly, a good percentage of respondents are having a master degree (22.22%), and the rest are the respondents having matric certificate or below (8%), and PhDs and above are less than one percent (1.2%) (Figure 8).



Source: Author's own calculations, based on survey data

Figure 8: Education level of respondents

5.4 Verification of the indicator development:

A principal component analysis (PCA) has been conducted on the selected 61 indicators related to economic sustainability, environmental sustainability, socio-cultural sustainability, infrastructural sustainability, and technological sustainability to determine the dimensionality of indicators. The total variance explained (TVE) of this data is 68.842% which is quite good for studies related to behavioral and social sciences with only 31.158% of the loss of information. This total variance

explained is much better than Asmelash & Kumar (2019) where data only explained 49% of the variability. The overall value of Cronbach's alpha is 0.806, which is higher than the benchmark value of 0.6 (Nunnally & Bernstein, 1994). Furthermore, Kaiser-Meyer-Olkin (KMO) is considered a good estimate of sample adequacy. According to Field (2009) and Hair et al., (2005), the KMO sample adequacy ratio can be classified into three categories; such as mediocre adequacy (0.5-0.7), good adequacy (0.7-0.8), great adequacy (0.8-0.9), and superb (above 0.9). For this research thesis, the KMO sample adequacy ratio is 0.79, which falls in the range of good adequacy ratio and on the edge of adequacy ratio classified as great.

Proceeding ahead, another test Bartlett test of Sphericity widely used by researchers to test the original correlation matrix. In this vein, a significant value of Chi-Square shows that the correlation matrix is not an identity matrix (Field, 2009). Therefore, if Bartlett's test of Sphericity is significant, it suggests that the correlation between the indicators is sufficient to apply PCA (Hair et al., 2005). For this research thesis, the value of Chi-Square for Bartlett's test of Sphericity (Chi-Square = 3421.618) is significant and therefore suggests that factor analysis is quite suitable and appropriate. Hence, this stage led to the exclusion of seven indicators with the reduction of indicators from 61 indicators to 54 indicators.

5.5 Assessment of multivariate normality and multicollinearity

The normality of the data distribution has been tested in SPSS, using Q-Q plot and observed values fall approximately on the straight line which is sufficient evidence to claim about the normally distributed dataset. The values of kurtosis and skewness are also not exceeding +2 and -2. To check the issue of normality, the value of Determinant for this thesis is 9.464E-04 (0.0009464), and this value is greater than the necessary value of 0.00001 so, refers that there is no issue of multicollinearity.

5.6 Validation of the indicator development:

Assessing reliability and validity

In statistics and psychometrics, the reliability of a research study or questionnaire is referred to as the overall consistency of a measuring test (Trochim & Donnelly, 2001) and a research instrument consistently measures the construct (Field, 2009). The assessment of the reliability of the measurement model should satisfy the internal reliability, composite reliability (CR) which refers to the reliability and internal consistency of a latent construct, and average variance extracted. Table 3 below shows that the threshold levels have been met in this study related to Cronbach's Alpha, composite reliability, and the average variance explained (AVE).

Confirmatory factor analysis (CFA) is used to examine the validity of the dimensions, including convergent validity, discriminant validity, and content validity based on the threshold values suggested in the literature. Importantly, composite variables have been formulated based on their sub-dimensions to assess the reliability and validity following the suggestions of Asmelash & Kumar (2019). Several authors also recommended and explained the procedure of using composite

variables depending upon the situation at hand and convenience (Hair et al., 2005; Walkey, 1997; Styliadis, Biran, Sit, & Szivas, 2014). In this research thesis, CFA was carried out to investigate the validity of the relevant dimensions (See Figure 9). The concept of CFA indicated the degree or level of a scale or set of indicators accurately measures the relevant concept of interest (Hair et al., 2005; Field, 2009).

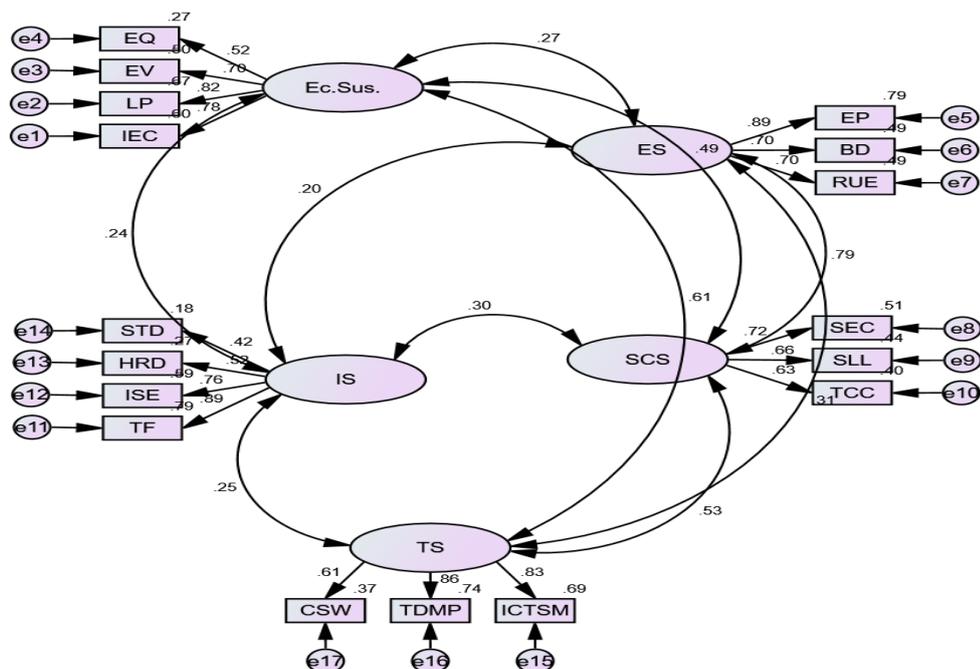
According to the recommended criteria, the estimated value of the average variance explained (AVE) should be 0.5 or more to achieve convergent validity. Moreover, the value of composite reliability (CR) and standardized regression weight (SRW) should be 0.7 or greater (Hair et al., 2005). The values of AVE, CR, and SRW are indicated in Table 3. According to the suggested criteria (Fornell & Larcker, 1981; Hair et al., 2005), the thesis achieved convergent validity for the economic dimension, environmental dimension, and technological dimension (Table 4). However, the values for the socio-cultural dimension and infrastructural dimension are close to the threshold and hence this validity is almost achieved. A bit lower value of average variance explained (AVE) for socio-cultural dimension and infrastructural dimension might be associated with the used composite variables for appropriate representation of the constructs (Hair et al., 2005; Styliadis et al., 2014).

Table 3: Construct Reliability

Construct/Indicator	Standardized Regression Weight (SRW)	Cronbach's Alpha	Composite Reliability	Average Variance Explained (AVE)	Remarks
Economic Sustainability		0.793	0.802613	0.510373	Achieved
1. Employment Quality	0.524				
2. Economic Viability	0.704				
3. Local Prosperity	0.818				
4. Investment and Economic Competitiveness	0.776				
Environmental Sustainability		0.799	0.808988	0.588709	Achieved
1. Environmental Pressure	0.889				
2. Biological Diversity	0.698				
3. Resource Utilization and Efficiency	0.699				
Socio-Cultural Sustainability		0.706	0.710084	0.450165	Almost Achieved
1. Social Equity and Crimes	0.717				

2. Social Living of Locals	0.662				
3. Traditional Culture Conservation	0.631				
Infrastructural Sustainability		0.728	0.75619	0.456369	Almost Achieved
1. Small Towns Development	0.420				
2. Hotels and Restaurants Development	0.523				
3. Information, Signposts and Electricity	0.765				
4. Transport Facility	0.889				
Technological Sustainability		0.790	0.813991	0.598451	Achieved
1. Cellular Services and Wi-Fi	0.607				
2. Technology in Design, Management and Protection	0.861				
3. ICT and Social Media	0.828				

Source: Author's extraction from Amos output



Source: Author's extraction from Amos output

Figure 9: Confirmatory Factor Analysis for validity examination

Table 4: Convergent Validity

Convergent Validity	Economic Sustainability	Environmental Sustainability	Socio-Cultural Sustainability	Infrastructural Sustainability	Technological Sustainability
Average Variance Extracted (AVE) AVE ^a = $\sum K^2/n$ (AVE>0.5)	0.510	0.589	0.450	0.456	0.598
Composite Reliability (CR) CR ^b = $(\sum K)^2 / ((\sum K)^2 + (\sum e))$ (CR>0.7)	0.803	0.809	0.710	0.756	0.814
Standardized Regression Weight (SRW) (SRW>0.7)	0.706	0.762	0.670	0.649	0.765
Convergent Validity	Achieved	Achieved	Almost Achieved	Almost Achieved	Achieved

^aK = refers to factor loading of every item, and n = represents number of items

^bK = refers to factor loading of every item, and n = represents number of items

Source: Author's extraction from Amos output

The other measure of validity is discriminant validity refers that a measure of a construct is uniquely represents the phenomena of interest more than other measures do not capture (Hair et al., 2005). According to Henseler, Ringle, & Sarstedt (2015), the AVEs of each construct should be greater than the squared correlations of other constructs included in the model. Table 5 shows that the discriminant validity is achieved for all the constructs except for one combination.

Table 5: Discriminant Validity

Discriminant Validity	Factor Correlation (r)	Squared factor correlation (r²)	AVE1 and AVE2 Criterion: AVEs > r²	Discriminant Validity
EcS <--> ES	0.270	0.0729	0.510, 0.589	Achieved
EcS <-->SCS	0.486	0.236	0.510, 0.450	Achieved
EcS <-->IS	0.237	0.056	0.510, 0.456	Achieved
EcS <-->TS	0.607	0.368	0.510, 0.598	Achieved
ES <-->SCS	0.788	0.621	0.589, 0.450	Close to Achieve
ES <-->IS	0.197	0.039	0.589, 0.456	Achieved

ES <-->TS	0.311	0.097	0.589, 0.598	Achieved
SCS <-->IS	0.298	0.089	0.450, 0.456	Achieved
SCS <-->TS	0.529	0.279	0.450, 0.598	Achieved
IS <-->TS	0.252	0.064	0.456, 0.598	Achieved

Source: Author's extraction from Amos output

5.7 Assessment of Sustainability, Cross-location Comparisons and Multidimensional Sustainable Tourism Index (MSTI)

As discussed in the research methodology section, the thesis also developed the multidimensional sustainable tourism index (MSTI). The developed multidimensional sustainable tourism index is used to analyze the sustainability in the two cities, based on the overall sustainable tourism index as well as individual dimension sustainable tourism indexes. These cross-location comparisons identify the relative competitiveness of the said locations. The identified weaknesses and suggested implications help the stakeholders especially local administration to improve the image of the destination to enhance sustainability and competitiveness.

In this vein, Table 6 shows the calculated indexes for each dimension of sustainable tourism as well as multidimensional sustainable tourism index for the dimensions related to economic, socio-cultural, environmental, infrastructural, and technological sustainability based on the data collected from the three selected cities of Pakistan, precisely Islamabad, Lahore, and Faisalabad. The index is constructed based on the geometric mean of the principal components and weighting them according to their retained percentage variance.

Table 6: Estimated STI and MSTI for the selected cities of Pakistan

Indexes/Selected Destinations	Islamabad	Lahore	Faisalabad
Sustainability Index for Economic Dimension (EcI)	3.38568	3.87153	3.51771
Sustainability Index for Environmental Dimension (EI)	3.87667	2.93918	3.04206
Sustainability Index for Socio-Cultural Dimension (SI)	3.89676	4.08149	3.56037
Sustainability Index for Infrastructural Dimension (II)	4.13017	3.48620	3.19013

Sustainability Index for Technological Dimension (TI)	4.01019	3.58825	3.14994
Multidimensional Sustainable Tourism Index (MSTI)	3.85071	3.57118	3.28687

Source: Author's calculation on NumXL

According to the estimated sustainability index for the economic dimension (EcI), Lahore is having higher economic sustainability with an index value of 3.87153, whilst Faisalabad is having a value of 3.51771 and Islamabad observed the least economic sustainability with the index value of 3.38568 (see Table 6). Although Islamabad is considered a better tourist destination, yet economically opportunities have been exploited in a better way for the city of Lahore and then for the city of Faisalabad. The environmental dimension of sustainable tourism includes indicators related to ecology, environmental protection, and resource utilization. The estimated values of a sustainability index for the socio-cultural dimension (EI) indicates that environmental sustainability for the Islamabad city is better with the sustainability index value of 3.87667, then city Faisalabad with the index value of 3.04206 which is relatively less explored city, and Lahore is having the least environmental sustainability.

Proceeding ahead, the sustainability index for the socio-cultural dimension includes indicators related to the social norms, quality of life, socio-cultural attributes, and site protocol. According to the socio-cultural sustainability index, the estimated index values indicate that Lahore is socio-culturally more sustainable as compared to Lahore and Faisalabad, and Faisalabad is least sustainable in terms of socio-cultural sustainability. The role of infrastructure and availability of better facilities is having vital importance for the sustainability and development of tourism. In this research thesis, the sustainability index for the infrastructural dimension included indicators related to infrastructures such as the development of the rural and small-town due to improved infrastructure, the construction of long and wide roads, hotels and restaurants development and transportation facilities. Regarding the infrastructural sustainability, the estimated index indicates that the city of Islamabad leads in the better infrastructure with an index value of 4.13017 followed by Lahore with an index value of 3.4862 and Faisalabad with an index value of 3.19013.

Similarly, the importance of technological sustainability has increased much due to the rapid rise in the use of technology in providing tourism services to enhance their level of sustainability and competitiveness. The estimated values of the index indicate that Islamabad is having a higher level of technological sustainability with an index value of 4.01019, followed by Lahore with the index value of 3.58825 and then Faisalabad with the index value of 3.14994.

The important aspect of the development of sustainable index is the formulation of the multidimensional sustainable tourism index through the aggregation of each dimensional index by geometric mean. Hence, the estimated values for the MSTI indicate that overall the city of Islamabad is having better sustainability for tourism, with the estimated value of MSTI 3.85071, then Lahore with an index value of 3.57118 and Faisalabad with the index value of 3.28681. Therefore, the developed MSTI indicates how the higher and lower values of individual dimensions balance out in the MSTI.

6. DISCUSSION AND CONCLUSION

The massive growth of international tourist arrivals and easiness of traveling played a crucial role at the global, regional, and domestic levels with certain favorable and unfavorable impacts. The literature indicates many altruistic and well-meaning reasons in favor of tourism development, such as foreign exchange earnings, income, and employment generation are some related economic benefits. In this vein, the purchase of accommodation, food and beverages, transport, communication, entertainment services, and goods bought from retail outlets are examples of related positive economic impacts by tourist spending. However, the leakages of expenditure from the local economy, displacement and opportunity cost, the loss of a productive unit of labor are some adverse impacts. Similarly, the role of the environment is fundamental in providing any tourism service or product. Besides, the linked issues of socio-cultural impacts and some additional dimensions included in the thesis and discussed in detail in the review of the literature suggest a healthy balance of tourism development and resource utilization for the long-term sustainability of tourism.

In light of this, this doctoral thesis attempted to assess the development of sustainable tourism indicators and their validation. Such a robust set of indicators would help to monitor the activities related to tourism along with their impacts. The development of such sustainability indicators for tourism and their validation is also strongly recommended in the literature (Ko, 2005; Cernat & Gourdon, 2012) and yet overlooked in the real sense. As WTO (2004), Choi & Sirakaya (2005), and Miller (2001) also stressed the use of DPSIR framework, related to the broad-based participation of the stakeholders in the development of indicators and systematically transparent approach during their application. In reality, such issues in their early stages of development. Therefore, this thesis attempted to fill this lacuna by following a participatory approach for indicators development and their validation.

Hence, keeping in view such a prevailing state of affairs, this research worked on the comprehensive list of indicators obtained from the literature and expert opinions. The thesis followed the two-round Delphi method to get the consensus-based indicators following the approach used by other researchers (AP & Crompton, 1998; Choi & Sirakaya, 2005; Miller, 2001). The two-round of Delphi method ended with 68 consensus-based indicators from 192 indicators related to economic sustainability, environmental sustainability, socio-cultural sustainability,

infrastructural, and technological sustainability. The purification process based on the data collected from the pilot study also reduced the indicators from 68 to 61.

Although the process adopted to develop and validate such sustainability indicators is lengthy and cumbersome, such as the availability and willingness of experts to be available and participate in the Delphi method, and the time and money needed to collect data from selected tourist destinations and attractions yet such process is inevitable. Therefore, the resulting set of indicators is useful, relevant, reliable and robust having higher reliability and validity (see Table 3, Table 4, Table 5, & Figure 9). Such indicators can be used to monitor tourism in terms of sustainability and changing scenarios based on contemporary facts and figures.

This thesis applied the sustainability indicators on the three selected destinations of Pakistan, precisely Islamabad, Lahore, and Faisalabad. The respondents included in the sample are domestic tourists, local residents, and international tourists to have broad-based participation and diverse opinion. The indicators of economic sustainability, environmental sustainability, socio-cultural sustainability, as well as the two novel dimensions infrastructural and technological sustainability have similarities with other studies. In this vein, the studies of Shen & Cottrell (2008), Deng & Bender (2008), Choi & Sirakaya (2005), Blancas et al. (2010), Twining-Ward (2003), Nicholas & Thapa (2010), Byrd et al. (2009), Ramdas & Mohamed (2014) as well as WTO (2004) are worthwhile to mention.

As an important aspect of the thesis, the developed indexes related to economic sustainability, environmental sustainability, socio-cultural sustainability, infrastructural and technological sustainability are important to monitor the level of sustainability for the relevant dimension of sustainability. Such results show that the level of sustainability is mixed for the three cities in terms of different dimensions. However, the city of Islamabad is better due to the higher level of the index value. Therefore, the developed indexes can be used conveniently to have cross-location comparisons. In light of this, it can be concluded that from the selected cities of Pakistan, although the city Islamabad is better in terms of sustainability based on the overall measurement yet the performance is of moderate level. Whilst other cities Lahore is better in some individual sustainable dimensions. However, there is great room for the improvement of sustainability by monitoring indicators of sustainable tourism and improving the respective dimensions to improve performance at the dimensional level as well as overall measurement performance.

7. CONTRIBUTION, LIMITATIONS, AND FUTURE RESEARCH DIRECTIONS

This thesis proves a way forward and platform for future work to assess the level of tourism sustainability, different factors of tourism and the determination of sustainable tourism with novelty and contribution.

7.1 Theoretical Contributions

This thesis has some important theoretical contributions. Firstly, the involvement and broad-based participation of different stakeholders such as the

experts from the selected higher educational institutions, domestic and international tourists as well as local residents are overlooked aspect in the development of sustainability indicators for tourism (OECD, 1994; Ap & Crompton, 1998; Miller, 2001; Choi & Sirakaya, 2005).

Secondly, during the process of indicators development for sustainable tourism, this thesis incorporated the framework of DPSIR (Driving forces-Pressure-State-Impact-Response) recommended by the European Commission (2009) and it is uncommon to consider the DPSIR framework (European Environmental Agency, 1998).

Thirdly, this thesis departed from the prevailing state of literature related to traditional dimensions of sustainable tourism and included two new dimensions of sustainable tourism (infrastructural sustainability and technological sustainability) which contribute to the theory by providing a broad and thorough view about sustainable tourism. The included two new dimensions in the assessment of sustainable tourism have also improved the total variance explained (TVE) significantly (68.84%) which was only 49% in the study of Asmelash & Kumar (2019).

Fourthly, the development of the multidimensional sustainable tourism index (MSTI) by considering the three traditional as well as two new dimensions (infrastructural and technological dimensions) is another theoretical contribution to capture the broader picture of sustainable tourism. This proposed index measures and monitors sustainability separately for each sustainability dimension (economic, environmental, socio-cultural, infrastructural, and technological dimension) as well as overall sustainability by including all sustainability dimensions simultaneously.

7.2 Practical Contributions

The thesis has very important contributions to practice. Firstly, the suggested system of verification and validation of sustainability indicators will help the stakeholders of the tourism industry to choose robust indicators and will draw the attention of other researchers to keep in mind the statistically robust criteria for the development of the indicators.

Secondly, on a practical basis, it is often hard and cumbersome to identify key areas where actual action is needed. Mostly, practitioners have to rely on conventional indicators such as GDP, Human Development Index (HDI), number of tourist arrivals, and their spendings (Bell & Morse, 2012). Whilst the robust and validated indicators can help the destination managers to take the required decisions and actions needed to avoid the wastage and miss-utilization of resources, and this is the case in this research.

Thirdly, the developed multidimensional sustainable tourism index (MSTI) will help to have some cross-location comparisons as well as temporal comparisons to improve the image of destinations and enhance competitiveness. The practical suggestions for local authorities will also help to achieve sustainability in the tourism industry and will also provide a way to achieve sustainable development.

7.3 Limitations and Future Research Directions

Despite significant contributions, this doctoral thesis has some limitations and provides avenues for future researchers to carry out further studies.

Firstly, the selected cities for this thesis are only from one province of Pakistan. Therefore, the developed indicators are more appropriate for the destinations of similar characteristics. However, these indicators should be applied cautiously for the destinations in the northern part of the country because a few indicators such as overcrowding might not be the issue for the destinations over there. Moreover, these developed indicators are quite beneficial for other destinations with similar features and attributes. Hence, other such destinations of South-Asian countries such as India, Bangladesh, and Nepal can get benefit from these indicators.

Although most of the indicators could apply to the destinations of other regions such as countries of Europe and America yet cautiously as a few indicators being applicable in the developing country context might not be suitable in the context of developed countries. Such as the availability of cellular services with good signal strength, a free facility of Wi-Fi, uninterrupted availability of electricity, online facility to buy ticket and option to use credit/debit cards are a few examples in this vein. The facility of Wi-Fi is almost every tourist destination in developed countries such as European or American countries but in developing countries, it is not the case, similarly, the continuous availability of electricity in the developing countries need to be addressed for the growth and sustainability of tourism. However, it would be interesting for enthusiastic researchers to adopt the proposed way of developing and validating the indicators, as well as measurement and monitoring process is quite helpful to replicate for obtaining consensus-based indicators for other popular destinations of Europe with different cultural values and settings.

Secondly, the selected indicators are only subjective in nature. Similarly, the developed multidimensional sustainable tourism index (MSTI) is based on the indicators ranked on the five-point Likert Scale. The five-point Likert Scale creates difficulty to monitor sustainability and do comparisons across destinations because the resulting index is based on a five-point scale. Therefore, it is strongly recommended to include a 10-point Likert Scale to monitor sustainability and especially for comparability across destinations to capture a clearer difference.

Thirdly, the subjective indicators which can vary from one destination to other are the limitation of such indicators. Similarly, the developed sustainability index based on sustainability indicators can give measurement and monitoring of sustainability based on subjective assessment. Therefore, it is strongly recommended to include objective indicators for future studies in the measurement of sustainability through sustainable tourism index (STI).

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1. **Javed, M., & Tučková, Z.** (2020). The role of government in tourism competitiveness and tourism area life cycle model. *Asia Pacific Journal of Tourism Research*, 25(9), 997-1011. [**SSCI, Impact Factor: 2.02**]
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6. **Javed, M., Tučková, Z., & Abbas, Z.** (2020). Towards Understanding the Challenges of COVID-19 and Tourism Industry. In *14th International Conference INPROFORUM 2020, 5th–6th November, 2020*, Faculty of Economics, University of South Bohemia in České Budějovice, Czech

- Republic. [Conference Proceedings Citation Index-Web of Science, Clarivate Analytics]
7. Abbas, Z., Zámečník, R., **Javed, M.**, Gulzar, S., Hussain, K., Shoaib, M., Yousaf, M. (2020). A systematic quantitative literature review of GHRM under AMO theoretical perspective. In *14th International Conference INPROFORUM 2020, 5th–6th November, 2020*, Faculty of Economics, University of South Bohemia in České Budějovice, Czech Republic. [Conference Proceedings Citation Index-Web of Science, Clarivate Analytics]
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 14. Ussenova, D., & **Javed, M.** (2018). Comparative analysis of the development of hotel sector in the republic of Kazakhstan and Czech Republic. International Scientific Conference: Economics, Management, Finance (EMF 2018), Bratislava, Slovakia.

LIST OF ARTICLES: ROLE AS A REVIEWER

1. Article reviewed in 2020, Title, ‘Local support for tourism development and its determinants: An empirical study of Kashmir region”, Asia Pacific Journal of Tourism Research. Routledge Taylor & Francis Group. [SSCI, Impact Factor: 2.02]
2. Article reviewed in 2020, Title, ‘Solidifying tourists’ post-travel memories through souvenir’ “GeoJournal of Tourism and Geosites”, University of Oradea, Romania. [Scopus, Cite Score: 2.0]
3. Article reviewed in 2018, Title, ‘Impact of Foreign Remittances on Household Welfare in Sylhet Region of Bangladesh’ Reviewed for “International Journal of Finance and Economics”. Wiley Publisher. [SSCI, Impact Factor: 0.94]

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- **2009-2011:** M.Phil. (Economics) degree from University of Sargodha, Sargodha, Pakistan.
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He published 14 research papers in peer reviewed Journals and international conferences, and made further submissions for forthcoming journal publications.

Mohsin Javed, Ph.D.

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