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Effect of Sustainable Infrastructure and Service Delivery on Sustainable Tourism: Application of Kruskal Wallis Test (Non-parametric)

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Abstract

This study examined the effect of sustainable infrastructure and service delivery on sustainable tourism in Kashmir Valley through the five main destinations by covering essential stakeholders. At present, tourism potential nations face destination sustainability issues in various junctures of the tourism sector. Therefore, international agencies and nations focus on sustainable tourism through sustainable transport infrastructure, other factors and improved service delivery. Few studies underlined the role of sustainable infrastructure in service quality and their collective impact on sustainability without empirical evidence at the destination level. At this juncture, the current study presents the summaries of empirical investigation of the effect of sustainable transport infrastructure and services delivery on sustainable tourism in Kashmir Valley. For analysis, the Kruskal-Wallis test (non-parametric) is applied to assess the variation in sustainable tourism based upon the performance of sustainable infrastructure and service delivery at destinations. The application of the Kruskal-Wallis independent samples tests duly confirmed the significant results. Sustainable tourism differs by transport infrastructure performance, other elements and service quality of the destinations. Therefore, it is to be stated that poor functioning of transport infrastructure and other basic structures adversely affects service delivery and raises sustainability issues at destinations. It asserts that the comprehensive sustainable transport infrastructure, water supply and drainage, health and sanitation, solid and liquid waste management are highly required to combat environmental issues and ensure sustainability at destinations. The findings of the study have significant policy implications to promote green infrastructure, quality services and development of sustainable tourism at destinations.

Keywords

Kashmir Valley; Transportation infrastructure; Basic facilities; Service delivery; Sustainable tourism.

1 Introduction

Tourism is proliferating than other service industries of the economy and the international agencies confirmed by predictions [1]. It may assure economic benefits to the nations, but at the same time, it requires corrective measures to ensure sustainability. Since sustainability of tourism resources and environment plays a vital role to attract tourists. Therefore, it requires adopting sustainable tourism as a strategy. It opens the opportunities to curtail negative impacts, reap economic benefits, protect the social-cultural heritage, and sustain tourism resources and the environment [1].

India considered the tourism industry at the beginning of the 1980s and announced its first tourism policy in 1982. It shifted the outlook of the Tourism sector from 'tourism attraction' into 'tourism destination'. Outcomes of the Tourism Action Plan - 1992 channelized tourism growth through private stakeholders' participation. Following that, Tourism Policy - 2002 considered tourism as an engine of growth and include sustainable tourism as one of the objectives of the policy framework [2].

In order to curb visitors' dissatisfaction and initiate sustainable tourism practices, the Government of India implanted various programs during the 12th plan period. For comprehensive understanding and implementation, the Government of India launched 'Sustainable Tourism for India: Criteria and Indicators (STCI) - 2014'. It opens way for sustainable tourism initiatives through Sustainable Transport Infrastructure, Market Development Assistance Scheme, Training for Tourism Service Providers and Tool and Techniques for Tourism Human Resource Development.

Sustainable Tourism Criteria comprises carrying capacity, community participation, environmental guidelines, bio-toilets, water harvesting, lessons from experiences, institutional certification, and polluter pays principle. It says that the implementation of sustainable tourism is possible by the provision of suitable infrastructure including sustainable modes of railways, roads, and water transport. Criteria recommended using products, traditional skills, materials available local are for infrastructure development and service delivery. This strategy is

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helpful to achieve sustainability in tourism resources, environment, culture and heritage of the destinations [3].

At this juncture, potential destinations face unprecedented sustainability challenges in road and transportation issues, solid waste and wastewater management, biodiversity loss, and other problems. Deficient sustainable transport structures and solid waste have created numerous issues and therefore imperative actions will be pleasing to deal with grave concerns of deficiency in Himalayan Tourism States [4]. The hasty escalation in the use of outdated vehicles causes greenhouse gasses particularly in urban destinations.

In such destinations, mismanagement of private transport structures greatly damages the local environment [5]. Consequently, green transportation facilities are highly essential to protect the resources of economies through the protective measures [6]. A study conducted by [7] suggested the use of traditional transportation methods to address the severe pollution of heritage tourism sights and to reduce the negative externalities imposed by transport emissions.

Tourism products of Kashmir Valley are susceptible and necessitate sustainable tourism initiatives. It attracted visitors by four different seasons and offered immense economic benefits mid of perennial unrest. However, most potential destinations face sustainability issues regarding transportation pollution, plastic menace, wastewater treatment, pollution and cleanness, and other issues. Specifically, Srinagar and other famous destinations lack sustainable transport mechanism, waste management and other problems. Dearth of waste carrying transport and dumping waste in open yards is a common practice except who accessed door to door waste collection facilities. Of the total waste generated (per day), only 69 per cent collected, and the remaining are dumped in open forests and on the banks of freshwaters due to the dearth of waste carrying transport vehicles [8].

The performance of various types of transport and other services is highly dependent on sustainable infrastructure setup. Deficiency of sustainable transport infrastructure and other basic essentials widely affects the service delivery and quality assurance and aggravates sustainability issues at destinations. Studies available briefly explicated the impact of infrastructure and service delivery on sustainability of economies and however, did not provide empirical verification with scientific methods at tourism destinations.

With this background, the researchers raised the question that "How does the dearth of sustainable transport infrastructure, related structures and services delivered affect the sustainable tourism at the destinations of Kashmir Valley?"

2 Literature Review

2.1 Studies of sustainable tourism

Discourse of sustainability in tourism activities happened in 1990s due to emergence of the sustainable development [9-11]. Earlier, sustainable tourism was treated as an initiative to conserve the environment, community, and culture [12]. Studies of UNWTO gradually designed the concept and dimensions to understand sustainable tourism [13-14]. It opened the opportunities to conduct empirical enquiries on sustainable tourism. As an output, studies offered inputs to strengthen the concept, dimensions, and expanded scope of the analyses [15-16].

The corollary between the concepts of sustainability in tourism and its development is analyzed and confirmed positively [16]. But favorable changes in the institutional dimension significantly improve the tourism development than others [17]. However, the contribution of dimensions of sustainable tourism varied by community participation and nature of destination [18-19].

Similarly, issues and challenges of sustainable tourism differed among the regions, and it needs to select indicators of dimensions subject to the regional character. It helped to establish sustainable tourism practices with a suitable monitoring system [20]. Few studies established the dimensions and methodology fit to assess the rural tourism's sustainability related impression and implications at the macro-level [21]. On the other hand, studies analyzed the role of local products and resources in sustainable tourism initiatives. It revealed that the benefits obtained from local products motivate the agents to adopt sustainable practices [22-23]. Enhancement of the livelihood of the dependents at tourism destination is essential and highly connected with sustainable tourism. As a result, studies analyzed the impact of the host-guest relationship and influence on the livelihood of the various dependents of tourism at destinations. Results confirmed a relationship and offered suitable suggestions and policy guidelines [24-25].

Interaction between tourism development and environmental consequences are studied. It infers that the stakeholders focus on maximizing economic benefits and paid less attention to the conservation of

the environment. It is highly prevalent in developing nations [1]. This phenomenon downscaled the carrying capacity of the destination through pollution, waste generation and, degrading the resource quality. It worsened the functions of the environment and affect the sustainability of tourism products and destinations [4,26]. Accordingly, studies verified sustainable tourism initiatives and practices with geographical features of destinations. It revealed the need for strategies for initiatives and practices.

Studies offered methodology and indicators to measure sustainable tourism at a macro level with secondary data. However, the influence of infrastructure and service quality on sustainable tourism at destinations unearthed yet with empirical analysis.

2.1.1 Studies on transport infrastructure, service quality, and sustainable tourism

Sustainability issues of the tourism destinations are visible in their transport facilities and services, environmental quality, cleanliness, hygienic condition, and impact on tourism resources. The dearth of sustainable transport infrastructure, other facilities and poor services generate sustainability issues. Therefore, sustainable infrastructure, service quality and sustainable tourism have deep association. Studies conducted at developing nations of the Asia addressed these issues and acknowledged by the reports of the international agencies [16, 26-29].

Present studies on infrastructure mainly focused on transport and their role in functioning of destinations [30-32]. Development of transport infrastructure paves a way for development of destinations and soft infrastructure contributes more significantly [32]. Following the role of transport infrastructure in tourism development, [33] explained the implications of sustainable infrastructure on sustainability and inferred that its development reduces the environmental negatives and gives positive externalities to the stakeholders. Primarily, it is beneficial to the host community, who are the prime target of tourism negatives.

The performance of transportation infrastructure, other facilities and quality of tourism services are closely related to the sustainability issues and capable of differentiating sustainable tourism at destinations [13]. The prime goal of the provision of sustainable transport infrastructure and other structure is to promote sustainability at destinations through the better quality of services. It helps to improve the service delivery and reduces the cost [12]. The transport infrastructure supports the progress of the tourism industry and plays a significant role in service delivery. It favors the stakeholders and sustainability of destinations [25-26].

Tourist influx and willingness to revisit ensures the sustainability of destinations in near future. It depends on visitor satisfaction and experiences, and destinations achieve it through the provision of better infrastructure and quality of services. It includes infrastructure-led environmental services like green transport, sewerage management, solid waste disposal and sanitation services [34]. In this context, to achieve sustainable benefits from tourism and ensure tourists satisfaction, green infrastructure and services are mandatory at destinations [35-36]. The studies explored the association between sustainable infrastructure, services, and sustainable tourism, and they did not provide empirical evidence at the destination level. Further, the studies did not analyze the role of transport infrastructure, other facilities, and services in sustainable tourism of tourism spots. It is expected that the performance of infrastructure and services might have a vital role to distinguish sustainability at destinations.

The literature review and research gap strongly recommend analyzing the effect of sustainable transport infrastructure, other facilities, and performance of services on sustainable tourism of destinations. Further, the infrastructure-led development theory advocates that sustainable transport infrastructure is most suitable to curtail tourism negatives by ensuring green infrastructure and sustainable services. The establishment of appropriate transport infrastructure with proven quality could reduce the externalities by their functions in various areas of the tourism sector. Sustainable Transport Infrastructure and other facilities will help the tourism services to improve the quality. Efficient functioning of transport infrastructure and service quality having efforts to improve the sustainability of the destinations.

With this background, hypothesis framed as “Sustainable tourism varies according to sustainable infrastructure performance and service delivery of the destinations.” At this juncture, empirical investigation is required to prove the corollary between sustainable infrastructure, service delivery and sustainable tourism. It will help to obtain robust inferences to understand the effects of sustainable infrastructure and services on sustainable tourism in Kashmir valley. It will help the policymakers for destination-specific planning and policy proposals.

3 Materials and Methods

3.1 Sampling design

This study covers important main destinations of Kashmir Valley namely Srinagar, Pahalgam, Gulmarg, Kokernag, and Yusmarg based on the valid reasons. Among the selected main destinations, Srinagar (38) has the highest number of famous tourist spots, followed by Gulmarg (20), Pahalgam (18), Kokernag(8), and Yusmarg (7). The destinations contain numerous places to visit and offer multiple tourism products. For sample selection, the study covers all the stakeholders of the tourism industry such as tourists, service providers and the host community. It surveyed 450 samples, comprising 90 samples from each destination. And from each sample group 30 samples are interviewed by pre-tested structured interview schedule during the normal period of 2019-20. The details of sample size are given in Table 1 below:

Table 1 Particulars of sample group

SI. No.	Destinations	Sample Group			All (N=450)
		Tourists (n=150)	Residents (n=150)	Service Providers (n=150)	
1	Srinagar	30	30	30	90
2	Pahalgam	30	30	30	90
3	Kokernag	30	30	30	90
4	Gulmarg	30	30	30	90
5	Yousmarg	30	30	30	90
	Total	**150**	**150**	**150**	**450**

Note:
1. Tourist comprises both domestic and international.
2. Service providers include both government and private.

3.1.1 Categorization of perceptions

Further, for the data collection, the study selected representative samples from each stratification. In the case of tourists, the study has chosen the persons who visited multiple tourist spots of the respective destination. Among the public and private sector service providers, it selected the persons familiar with the majority of the tourism destinations. On the other hand, the host communities are the residents of the destinations; however, persons actively involved in tourism activities and familiar with tourism spots had selected for the survey.

Based on the understanding and experiences, the respondents were requested to rank the infrastructure performance and service quality of the destination's respective cluster of tourism spots as 'below average', 'average' and 'above average'. Further, according to the respondents' perception, each main destination cluster of tourist spots is categorized based on infrastructure performance and service quality. For example, tourism spots of Srinagar had classified as 'Srinagar below average', 'Srinagar average', and 'Srinagar above average' in both infrastructure performance and service quality and a similar classification had applied to all the main destinations.

For the empirical validity and verification, the tourism infrastructure performance index and service quality index were referred.

3.1.2 Application and need of Kruskal Wallis test

The hypothesis is framed based on issues identified and studies related to sustainable infrastructure, service delivery and sustainable tourism. [33] analyzed the implications of infrastructure in sustainable tourism from theoretical perspectives. [37] states that the sustainable infrastructure needs up-gradation, and new initiatives are required to enhance the delivery of tourism services. Studies done by [38-40] discussed role of infrastructure in sustainable tourism and influence of services quality in sustainability. Establishment and effective functioning of transport infrastructure and its influence on service quality reduce tourism negatives. It contributes to sustainability of the destinations. Nevertheless, it needs empirical investigation to explore the association between sustainable infrastructure, service delivery and sustainable tourism at destinations. With this background, the hypothesis framed as "Sustainable tourism varies according to the status of sustainable infrastructure and service delivery of the destinations."

To analyze variation in sustainable tourism at destinations due to infrastructure performance and service quality, Univariate Kruskal-Wallis test (non-parametric) is suitable according to the need. The survey was conducted on three heterogeneous sample groups namely tourists, residents and service providers and therefore did not satisfy the condition of homogeneity of variances. The perceptions of three

groups of surveyed respondents significantly varied due to their differentiating experiences and observations. Therefore, the analysis was done by applying a non-parametric test. Accordingly, the Kruskal-Wallis test (non-parametric) is applied to assess the variation in sustainable tourism. It is one of the non-parametric tests and is a generalized form of the Mann-Whitney U test. It compares three or more groups on a dependent variable based upon the ordinal data. Microsoft Excel and SPSS (version 2019) are used for data interpretation and testing of results.

4 Results and Discussions

4.1 Variation in sustainable tourism due to infrastructure performance

For analysis of variation of sustainable tourism due to performance of infrastructure the perceptions of surveyed respondents are categorized into three magnitudes. These include below average, average, and above average performances. Three groups are formed, and comparison is done among the paired groups to verify the results. Results of Kruskal-Wallis test confirmed the significant difference. The results of each destination are depicted below:

a) Srinagar

Test summary of independent-samples Kruskal-Wallis test confirmed the significant variation in sustainable tourism due to level of infrastructure performance at the destination (Table 2). Test statistics and asymptotic 2-sided test is significant at 5 per cent level.

Table 2 Independent-samples Kruskal-Wallis test summary of Srinagar

Independent-Samples Kruskal-Wallis Test Summary	
Total N	90
Test Statistic	13.037[a]
Degree Of Freedom	2
Asymptotic Sig.	.001

[a]The test statistic is adjusted for ties.

Table 3 presents the pairwise comparisons of infrastructure performance of a cluster of tourism spots of Srinagar. It conveyed that there is no difference in sustainable tourism between below average and average. However, a significant difference was found in-between 'below average - above average' and 'average - above average' clusters. The primary reason is the quantum of infrastructure available at the tourism spots. In the case of the above-average group, the location is very close to the city, and it opens the way to get required infrastructure facilities. Though certain tourism spots are famous and close to the urban center, due to the high tourist influx and lack of maintenance, infrastructure cannot perform and affect the destination's sustainability. Below average spots contain deficient facilities and therefore doesn't perform well. Their underperformed operations degrade the functioning, and it is totally different in case of spots containing better structures.

Table 3 Pairwise comparisons of infrastructure performance of Srinagar

Pairwise Comparisons of Srinagar - Classification of Infrastructure Performance					
Sample 1-Sample 2	Test Statistic	Std. Error	Std. Test Statistic	Sig.	Adj. Sig.
Srinagar Below Average-Srinagar Average	-2.976	9.103	-.327	.744	1.000
Srinagar Below Average-Srinagar Above Average	-22.841	9.385	-2.434	.015	.045
Srinagar Average-Srinagar Above Average	-19.865	5.901	-3.367	<.001	.002

b) Pahalgam

Kruskal-Wallis test summary for independent samples of Pahalgam and Table 4 presents the details. It revealed the presence of significant variation in sustainable tourism among the clusters due to infrastructure performance. The test statistics of the asymptotic 2-sided test is found significant at a 5 per cent level.

Table 4 Independent-samples Kruskal-Wallis test summary of Pahalgam

Independent-Samples Kruskal-Wallis Test Summary	
Total N	90
Test Statistic	27.785[a]
Degree Of Freedom	2
Asymptotic Sig.	<.001

[a]The test statistic is adjusted for ties.

In the case of Pahalgam, sustainable tourism differs among the three groups of tourism spots, and Table 5 presents the details. It underlined the strong association between infrastructure performance and sustainable tourism and the prevalence of the dearth of infrastructure facilities in the tourism spots of the Pahalgam. Further, it confirms the results of the tourism infrastructure index, which explained the infrastructure stock of the Pahalgam. With a limited quantum of infrastructure stock, Pahalgam need to serve the increasing tourist influx, and it deteriorated the infrastructure performance and sustainable tourism of Pahalgam Pairwise comparison depicts that the difference in sustainable tourism is high between the 'below average - above average' than others. The prime reason is that spots good in infrastructure are able to perform tourism activities efficiently and therefore, contribute positively to reduce negatives of tourism in Pahalgam. It suggested the establishment of a sufficient quantum of infrastructure subject to the need of the destination.

Table 5 Pairwise comparisons of infrastructure performance of Pahalgam

Pairwise Comparisons of Pahalgam - Classification of Infrastructure Performance					
Sample 1-Sample 2	Test Statistic	Std. Error	Std. Test Statistic	Sig.	Adj. Sig.
Pahalgam Below Average-Pahalgam Average	-22.419	9.453	-2.372	.018	.053
Pahalgam Below Average-Pahalgam Above Average	-46.260	9.885	-4.680	<.001	.000
Pahalgam Average-Pahalgam Above Average	-23.841	5.968	-3.995	<.001	.000

c) Kokernag

The Kruskal-Wallis test for independent samples describes statistically significant variation in sustainable tourism, and Table 6 presents the details. It explains differences in sustainable tourism among the clusters of tourism spots of Kokernag by the level of infrastructure performance.

Table 6 Independent-Samples Kruskal-Wallis test summary of Kokernag

Independent-Samples Kruskal-Wallis Test Summary	
Total N	90
Test Statistic	21.274[a]
Degree Of Freedom	2
Asymptotic Sig.	<.001

[a]The test statistic is adjusted for ties.

Results of the Kokernag and Srinagar are more or less similar, and Table 7 gives details of pairwise comparison. Variation in sustainable tourism is not significantly differed between the 'below average' and 'average' categories. The case for no variation is the amount of infrastructure and similarity in both groups. The tourist influx is also identical in nature. Surveyed respondents offered similar perceptions in the case of 'below average- average' infrastructure performance spots and therefore inferred insignificant results. On the other hand, the difference between 'below average - above average' and 'average - above average' groups are statistically significant. The intensity of variation is high in-between 'average - above average'. It shows that the clusters of tourism spots average in infrastructure performance are severe infrastructure scarcity and lack of maintenance. It required policy and management interventions in terms of additional infrastructure facilities, periodic supervision and maintenance.

Table 7 Pairwise comparisons of infrastructure performance of Kokernag

Pairwise Comparisons of Kokernag - Classification of Infrastructure Performance					
Sample 1-Sample 2	Test Statistic	Std. Error	Std. Test Statistic	Sig.	Adj. Sig.
Kokernag Below Average-Kokernag Average	-10.240	11.290	-.907	.364	1.000
Kokernag Below Average-Kokernag Above Average	-34.472	11.497	-2.998	.003	.008
Kokernag Average-Kokernag Above Average	-24.233	5.749	-4.215	<.001	.000

d) Gulmarg

Table 8 presents the details of independent-Samples Kruskill-Wallis test summary of Gulmarg. Inferences of the test summary underlined the statistically significant variation in sustainable tourism among the clusters of tourism spots by the infrastructure performance.

Table 8 Independent-samples Kruskal-Wallis test summary of Gulmarg

Independent-Samples Kruskal-Wallis Test Summary	
Total N	90
Test Statistic	27.699[a]
Degree Of Freedom	2
Asymptotic Sig.	<.001

[a]The test statistic is adjusted for ties.

Table 9 presents the details of pairwise comparison and test statistics of Gulmarg. It confirms variation in sustainable tourism due to the variation in infrastructure performance among the stratified groups of the Gulmarg. It conveyed the widespread dearth of tourism infrastructure and their performance among the stratified groups. The extent of variation is noticeably high between 'below average - above average'. In Gulmarg, the below average infrastructure performance spots are unable to perform tourism activities effectively and which differs in the case of above average spots. Consequently, the magnitude of sustainability practices also differs. This result duly acknowledges the inferences of the tourism infrastructure index. According to the tourism infrastructure index based on the quantity of infrastructure stock, Gulmarg is second most deprived destination in infrastructure stock in the study area. Gulmarg depends on nature-based tourism products. However, infrastructure is essential to downsize the negative and motive the sustainability practice.

Table 9 Pairwise comparisons of infrastructure performance of Gulmarg

Pairwise Comparisons of Gulmarg - Classification of Infrastructure Performance					
Sample 1-Sample 2	Test Statistic	Std. Error	Std. Test Statistic	Sig.	Adj. Sig.
Gulmarg Below Average-Gulmarg Average	-17.703	7.813	-2.266	.023	.070
Gulmarg Below Average-Gulmarg Above Average	-45.012	9.006	-4.998	<.001	.000
Gulmarg Average-Gulmarg Above Average	-27.309	6.695	-4.079	<.001	.000

e) Yusmarg

Independent-samples Kruskal-Wallis test summary of Yusmarg presented in Table 10. The statistical significance of the test discloses fluctuations in sustainable tourism due to the level of infrastructure performance among the clusters of tourism spots in Yusmarg.

Table 10 Independent-samples Kruskal-Wallis test summary of Yusmarg

Independent-Samples Kruskal-Wallis Test Summary	
Total N	90
Test Statistic	12.033[a]
Degree Of Freedom	2
Asymptotic Sig.	.002

[a]The test statistic is adjusted for ties.

The infrastructure stock of the Yusmarg is meagre among the surveyed destinations, and the analyses of the tourism infrastructure index confirm the same. Consequently, it reflects in the different clusters of tourism spots of Yusmarg (Table 11). In Yusmarg, between 'below average - average' no variation in sustainability due to infrastructure. The influence of infrastructure performance creates significantvariation between 'below average - above average' and 'average - above average. Environmental sensitive tourism products and the location disadvantages severely affect the quantity of infrastructure and leads to poor infrastructure performance. Therefore, the provision of sufficient infrastructure facilities and maintenance is necessary to improve the destination's sustainability.

Table 11 Pairwise comparisons of infrastructure performance of Gulmarg

Pairwise Comparisons of Yusmarg - Classification of Infrastructure Performance					
Sample 1-Sample 2	Test Statistic	Std. Error	Std. Test Statistic	Sig.	Adj. Sig.
Yusmarg Below Average-Yusmarg Average	-9.040	9.408	-.961	.337	1.000
Yusmarg Below Average-Yusmarg Above Average	-27.532	9.999	-2.753	.006	.018
Yusmarg Average-Yusmarg Above Average	-18.492	6.096	-3.033	.002	.007

4.1.1 Variation in sustainable tourism due to service quality

a) Srinagar

Table 12 details the test summary of independent samples Kruskal-Wallis test of Srinagar. The result of the test confirmed the influence of the service quality of the destination on sustainable tourism. Test statistics and asymptotic 2-sided test significant at 5 per cent level.

Table 12 Independent-samples Kruskal-Wallis test summary of Srinagar

Independent-Samples Kruskal-Wallis Test Summary	
Total N	90
Test Statistic	13.149[a]
Degree Of Freedom	2
Asymptotic Sig.	.001

[a]The test statistic is adjusted for ties.

Table 13 presents the particulars of pairwise comparison of variation in sustainable tourism based on service quality. According to the service quality index, the service quality of Srinagar is appreciable as compared to other destinations. However, the level of service quality differed among the tourism spots of Srinagar, and it differentiated the sustainability among the spots. The majority of the tourism spots of Srinagar are located within and very close to the city limit. It enables them to provide quality services. Therefore, not much variation between clusters compared in the first row. Nevertheless, levels of service quality influence sustainable tourism between 'below average - above average' and 'average - above average' and details of pairwise comparison provide with test statistics. Size of the service units and tourist arrivals affects the service quality and leads to fluctuation in sustainable tourism.

Table 13 Pairwise comparisons of service quality of Srinagar

Pairwise Comparisons of Srinagar - Classification of Service Quality					
Sample 1-Sample 2	Test Statistic	Std. Error	Std. Test Statistic	Sig.	Adj. Sig.
Srinagar Below Average-Srinagar Average	-18.771	10.856	-1.729	.084	.251
Srinagar Below Average-Srinagar Above Average	-33.126	10.528	-3.146	.002	.005
Srinagar Average-Srinagar Above Average	-14.355	5.851	-2.453	.014	.042

b) Pahalgam

Table 14 gives an account of independent samples Kruskal-Wallis test summary of Pahalgam. Test statistics and asymptotic 2-sided test significant at 5 per cent level. Outcomes of the test show the statistically significant difference in sustainable tourism between the tourism clusters of Pahalgam.

Table 14 Independent-samples Kruskal-Wallis test summary of Pahalgam

Independent-Samples Kruskal-Wallis Test Summary	
Total N	90
Test Statistic	11.532[a]
Degree Of Freedom	2
Asymptotic Sig. (2-sided test)	.003

[a]The test statistic is adjusted for ties.

A pairwise comparison of variation in sustainable tourism according to the level of service quality of the tourism spots had presented in Table 15. Similar to Srinagar, no variation in sustainable tourism between 'below average - average' due to service quality prevails in the respective clusters. On the other hand, a statistically significant variation is visible between 'below average - above average' and 'average - above average' service quality clusters of Pahalgam. Even though the service quality index of the Pahalgam is close to the study area average, service quality has differed among the tourism places. Most of the tourist spots are located distant from the Pahalgam town, and service providers of the distant tourism spots are unable to match the quality equal to the urban due to infrastructure constraints and other reasons.

Table 15 Pairwise comparisons of service quality of Pahalgam

Pairwise Comparisons of Pahalgam - Classification of Service Quality					
Sample 1-Sample 2	Test Statistic	Std. Error	Std. Test Statistic	Sig.	Adj. Sig.
Pahlgam Below Average-Pahalgam Average	-4.750	6.817	-.697	.486	1.000
Pahlgam Below Average-Pahalgam Above Average	-23.848	7.706	-3.095	.002	.006
Pahalgam Average-Pahalgam Above Average	-19.098	6.625	-2.883	.004	.012

c) Kokernag

Table 16 gives an account of a summary of the Kruskal-Wallis independent samples test. It confirmed the variation in sustainable tourism due to the service quality of the tourism clusters stratified in the materials and methods. Test statistics and asymptotic 2-sided test significant at 5 per cent level.

Table 16 Independent-samples Kruskal-Wallis test summary of Kokernag

Independent-Samples Kruskal-Wallis Test Summary	
Total N	90
Test Statistic	20.622[a]
Degree Of Freedom	2
Asymptotic Sig.	<.001

[a]The test statistic is adjusted for ties.

Table 17 presents the variation in sustainable tourism among the clusters of tourist spots subject to their service quality. Overall service quality of the Kokernag is very close to the study area average. However, tourist spots have differed in service quality. Between the 'below average - average' no difference in sustainable tourism based on the service quality. In the below average and average service quality tourist spots, infrastructure stock and services do not vary much. It is reflected in the sustainability issues also. Therefore, there is no variation between them. However, a significant difference has been noticed between 'below average-above average' and 'average - above average', which is intensive between 'below average - above average. It signifies that the tourist spots with below average service quality need suitable interventions and policy initiatives.

Table 17 Pairwise comparisons of service quality of Kokernag

Pairwise Comparisons of Kokernag - Classification of Service Quality					
Sample 1-Sample 2	Test Statistic	Std. Error	Std. Test Statistic	Sig.	Adj. Sig.
Kokernag Below Average-Kokernag Average	-24.310	10.522	-2.310	.021	.063
Kokernag Below Average-Kokernag Above Average	-43.621	10.850	-4.020	<.001	.000
Kokernag Average-Kokernag Above Average	-19.311	5.848	-3.302	<.001	.003

d) Gulmarg

Independent samples Kruskal-Wallis test summary of Gulmarg presented the below-given Table 18. It showed the difference in sustainable tourism among the groups of the tourism spots based on their service quality. Test statistics and asymptotic 2-sided test significant at 5 per cent level.

Table 18 Independent-samples Kruskal-Wallis test summary of Gulmarg

Independent-Samples Kruskal-Wallis Test Summary	
Total N	90
Test Statistic	23.307[a]
Degree Of Freedom	2
Asymptotic Sig.	<.001

[a]The test statistic is adjusted for ties.

Table 19 presents the pairwise comparison of sustainable tourism of the groups of tourism spots. In the case of Gulmarg, sustainable tourism has differed among all the clusters of tourism spots. Though the service quality of Gulmarg is equal to Srinagar and above the study area average, service quality differed between the tourist spots and affected the sustainability of the destination. Results of the tourism infrastructure index conveyed the infrastructure dearth of the Gulmarg. At this juncture, insufficient quantity of infrastructure unable to improve the services equal to increasing tourist influx and negatively affecting the service quality. The variation is highly prevalent in tourism spots with poor infrastructure and few service providers to serve visitors.

Table 19 Pairwise comparisons of service quality of Gulmarg

Pairwise Comparisons of Gulmarg - Classification of Service Quality					
Sample 1-Sample 2	Test Statistic	Std. Error	Std. Test Statistic	Sig.	Adj. Sig.
Gulmarg Below Average-Gulmarg Average	-21.581	8.764	-2.462	.014	.041
Gulmarg Below Average-Gulmarg Above Average	-38.807	8.500	-4.565	<.001	.000
Gulmarg Average-Gulmarg Above Average	-17.226	5.960	-2.890	.004	.012

e) Yusmarg

Table 20 provides the details of the summary of the Kruskal-Wallis independent samples test. It showed the difference in sustainable tourism among the groups of the tourism spots based on their service quality. Test statistics and asymptotic 2-sided test significant at 5 per cent level.

Table 20 Independent-samples Kruskal-Wallis test summary of Gulmarg

Independent-Samples Kruskal-Wallis Test Summary	
Total N	90
Test Statistic	22.338[a]
Degree Of Freedom	2
Asymptotic Sig.	<.001

[a]The test statistic is adjusted for ties.

Table 21 gives the pairwise comparison of sustainable tourism of the clusters of the tourist spots according to their service quality. Sustainable tourism has differed between all the clusters of tourist spots of Yusmarg. Especially, variation is high between 'below average - average and below average - above average' category tourist spots. It reflects the analysis of service quality index and tourism infrastructure index. The score of the tourism infrastructure index of the Yusmarg is distinctively poor than other destinations of the study. Both the analyses explain that the insufficient infrastructure stock of the destination cannot expand the service delivery and quality of service. We can conclude that poor infrastructure affects service delivery capability, erodes service quality, and adversely influences sustainable tourism.

Table 21 Pairwise comparisons of service quality of Yusmarg

Pairwise Comparisons of Yusmarg - Classification of Service Quality					
Sample 1-Sample 2	Test Statistic	Std. Error	Std. Test Statistic	Sig.	Adj. Sig.
Yusmarg Below Average-Yusmarg Average	-21.199	8.614	-2.461	.014	.042
Yusmarg Below Average-Yusmarg Above Average	-38.609	8.614	-4.482	<.001	.000
Yusmarg Average-Yusmarg Above Average	-17.410	5.909	-2.946	.003	.010

4.1.2 Major findings

i. In the case of Srinagar, tourism sustainability differed between the tourism spots with below-average and average categories and between average and above-average categories of infrastructure performance. A similar picture is visible in the level of service quality and sustainable tourism.

ii. In Pahalgam, there is wide variation between the three levels of infrastructure performance and a slight difference in service quality. It is the opposite in the case of Kokernag and Yusmarg.

iii. In Gulmarg, a comparison of infrastructure performance and service quality revealed the prevalence of significant variation in sustainable tourism at all levels.

5 Conclusion

Results of Kruskal-Wallis independent samples tests duly confirmed the variation in sustainable tourism due to the status of sustainable infrastructure and service quality of the surveyed destinations. Transport Infrastructure performance, other elements and service quality highly depend on infrastructure stock at tourist spots. For the empirical validity and verification, the tourism infrastructure performance index and service quality index were referred to and compared with the Kruskal-Wallis independent samples test inferences. It strongly endorsed the inter-linkages between infrastructure, services and sustainable tourism at the destination level.

Sustainability issues of the tourism spots accounted through environmental problems, service delivery, sanitation and hygienic conditions of the destinations. According to 'The Economics of the Coming Spaceship Earth', a tourism destination is considered spaceship earth, with limited capacity to absorb the negatives. The continuous growth of negative externalities of tourism is capable of eroding attractiveness of the tourism products. Therefore, to downsize the tourism negatives, theories of 'Sustainable Tourism and Infrastructure-led Development' argued for adopting a weak sustainability approach. Sustainable infrastructure facilities can reduce the negatives of tourism activities.

The establishment of comprehensive sustainability-led infrastructure is essential to run and strengthen the service delivery of the destinations. It allows to downscale road and transport problems, water supply and drainage, health and sanitation, solid waste, and environmental issues. Further, different types of tourism services solely or partially depend on infrastructure for their functioning. The effective coordination of infrastructure and service quality enables to curtail the sustainability issues of the destinations.

Kruskal-Wallis independent samples tests strongly proved it. Tourism spots with deficient sustainable infrastructure are unable to function equal to the growing tourist influx. It leads overburden to the existing infrastructure, and improper maintenance affects its functional capacity. The decline in functioning of sustainable infrastructure adversely affects the service delivery and raises the sustainability issues at destinations. Therefore, sustainable tourism differs by sustainable infrastructure performance and service delivery of the destinations. Inferences of the results and discussion agreed with the theoretical propositions of sustainable tourism and infrastructure-led development.

A limitation of this study is, first, the impact of Kashmir issues did not consider for analyses. Secondly, the study selected only five essential destinations rich in tourism potential. Third, due to the unavailability of quantitative data, the study utilized ordinal data for analyses.

A further study could assess the sustainability of tourism infrastructure and its impact on sustainable tourism gives the platform for a new study in tourism economics. Moreover, infrastructure establishments, service quality and environmental impact, offer a place to conduct a new study to explore the corollary between infrastructure, services and environmental impact. Inter-linkages between sustainable infrastructure, regional development and sustainable tourism also open for a new study.

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References

[1] Neto, "A New Approach to Sustainable Tourism Development: Moving Beyond Environmental Protection," Discussion Paper of the United Nations Department of Economic and Social Affairs: pp. 8-13, 2003.

[2] P. Chaudhary, "Tourism Policy and Planning. Adeline Book: New Delhi," 2009.

[3] Chhabra, A. Chowdhury, & C. Jasleen, "Examining sustainability of heritage on wheels: the case of

autorickshaws in Delhi (India)," *J. Herit. Tour.*, vol. 16, no. 3, pp. 349-362, 2021.

[4] NITI Aayog, "NITI Aayog launches five Thematic Reports on Sustainable Development in Indian Himalayan Region," Press Information Bureau Government of India, 2018.

[5] S. Fazal, "Addressing congestion and transport-related air pollution in Saharanpur, India", *Environ. Urban.*, vol. 18, no. 1, pp. 141-154, 2006.

[6] D. Pojani, and D. Stead, "Sustainable Urban Transport in the Developing World: Beyond Megacities," *Sustainability* 2015, vol. 7, pp. 7784-7805, 2015.

[7] Ministry of Tourism-Government of India, "Sustainable Tourism for India: Criteria and Indicators Applicable to Accommodation Sector and Tour Operators," Retrieved 06 Jan 2019 from http://www.tourism.gov.in, 2014.

[8] S. Bashir & S. Goswami, "Tourism induced Challenges in Municipal Solid Waste Management in Hill Towns: Case of Pahalgam" *Procedia Environ. Sci.*, vol. 35, pp. 77 – 89, 2016.

[9] Swarbrooke, J. (1999). The History of the Concept of Sustainable Development. Sustainable Tourism Management, CABI Publishing (Ed: 1st): Wallingford UK, 3-12, 1999.

[10] UNESCO, "Sustainable Tourism Development in UNESCO Designated Sites in South-Eastern Europe. UNESCO Regional Bureau for Science and Culture in Europe (BRESCE) AND United Nations Environment Programme, Ecological Tourism in Europe – ETE Koblenzer Str. 6553173 Bonn, Germany," pp. 1-43, 2009.

[11] Y. Guo, J. Jiang, & L. Shengchao, " A Sustainable Tourism Policy Research Review," *Sustainability*, vol. 11, no. 11, pp. 1-16, 2019.

[12] P. D. Bac, "The Emergence of Sustainable Tourism: A Literature Review," QUAESTUS *J. Multidiscip.* Res, PP. 131-40, 2012.

[13] UNDP & UNWTO, "Tourism and the Sustainable Development Goals- Journey to 2030," Retrieved 8 Dec 2018 from https://www.e-unwto.org/doi/book/10.18111/9789284419401, 2018.

[14] UNEP & UNWTO, "Making Tourism More Sustainable: A Guide for Policy Makers. United Nations Environment Programme Division of Technology, Industry and Economics 39-43 Quai André Citroën 75739 Paris CEDEX 15, France and World Tourism Organization Capitán Haya 4228020 Madrid, Spain," 2005.

[15] Hussain, & F. Ali, "Sustainable Tourism and resulting Residents Satisfaction at Jammu and Kashmir, India," *Worldw. Hosp. Tour. Themes*, vol. 7, no. 5, pp. 486-99, 2015.

[16] W. Luo, "Evaluating Tourist Destination Performance: Expanding the Sustainability Concept," *Sustainability*, vol. 10, no. 516, pp. 1-16, 2018.

[17] P. Siakwah, R. Musavengane, & L. Liewlenn, "Tourism Governance and Attainment of the Sustainable Development Goals in Africa," *Tour. Plan. Dev*, vol. 17, no. 4, pp. 355-83, 2019.

[18] European Parliament, "Research For Tran-Committee - From Responsible Best Practices to Sustainable tourism Development. Structural and Cohesion Policies transport And Tourism", Piero Soave Policy Department for Structural and Cohesion Policies European Parliament B-1047 Brussels, pp. 1-118, 2016.

[19] Goel, & I. Garg, "Construction of Health Infrastructure Index in Haryana: An Econometric Approach," J. *Technol. Manag. Grow.*, vol. 9, no. 1, pp. 103-123, 2018.

[20] X. Font, J. Higham, G. Miller, & P. Shahab, "Research Engagement, Impact and Sustainable Tourism", *J. Sustain. Tour.*, vol. 27, no. 1, pp. 1-11, 2019.

[21] Eusebio, E. Kastemholz, & B. Zelia, "Tourism and Sustainable Development of Rural Destinations: A Stakeholders View" *Rev. Port. de Estud. Reg.*, vol. 36, pp. 13-21, 2014.

[22] Kokkranikal, & A. Morrison, "Entrepreneurship and sustainable tourism: The houseboats of Kerala," *Tour. Hosp. Res.*, vol. 4, no. 1, pp. 7-20, 2002.

[23] R. Sims, "Food, Place and Authenticity: Local Food and Sustainable Tourism Experience," *J. Sustain. Tour.*, vol. 17, no. 3, pp. 321-36, 2008.

[24] M. Carneiro, & C. Eusebio, "Host- Tourist Interaction and Impact of Tourism and Residents Quality of Life," *Tour. Manag*, vol. 11, no.1, pp. 25-34, 2015.

[25] S. K. Dahiya, "India- Sustainability and the Tourism Rankings. African Journal of Hospitality," *Tour., leis. glob. change*, vol. 7, no. 13, pp. 1-21, 2018.

[26] R. Nepal, M. Irsyad, & K. Sanjay, "Tourist arrivals, energy consumption and pollutant emissions in developing economy-implications for sustainable tourism," *Tour. Manag.*, vol. 72, no. 2019, pp. 145-154, 2019.

[27] United Nations, "Is the Concept of Sustainable Tourism Sustainable? Developing the Sustainable Tourism Benchmarking Tool. United Nations Conference on Trade and Development, United Nations: New York and Geneva," pp. 1-27, 2007.

[28] N.A. Khalid, & T.P. Stephanie, "Towards Sustainability of Thailand Tourism Industry: Between Action Plans and Implementation," Proceedings of Regional Conference on Tourism Research, the State of the Art and its Sustainability Universiti Sains Malaysia, Penang 13-14 December 2010, pp. 16-25, 2010.

[29] R. Genc, "Environmental Sustainability and the Future of the Cruise Tourism: A Suggested Model. Çukurova," Üniversitesi İİBF Dergisi, vol. 22, no. 1, pp. 107-114, 2018.

[30] V. Navickas, & A. Malakauskaite, "The Possibilities for the Identification and Evaluation of Tourism Sector Competitiveness Factors," *Eng. Econ.*, vol. 1, no. 61, pp. 37-44, 2009.

[31] J. Sonja, & I. Ivana, "Infrastructure as Important Determinant of Tourism Development in the Countries of Southeast Europe," ECOFORUM, vol. 5, no. 8, pp. 288-94, 2016.

[32] B. Seetanah, K. Padachi, V. R. Sannassee, & R. Juwaheer, "Soft Infrastructure in Tourism Development," The International Academic Research Conference in Milan, pp. 342-72, 2016.

[33] Aniah, J. Otu. U. M. Anake, "Sustainable Tourism Development in Cross River State Nigeria. Eco-Tourism and Sustainable Tourism: New Perspectives and Studies," United States of America (1st Edition): Apple Academic Press: pp. 203-11.

[34] Seetanah, D.T. Juwaheer, J. M. Lamport, S. Rojid, V. R. Sannassee, & U. A. Subadar, "Does Infrastructure Matter In Tourism Development," *Univ. Maurit. Res. J.*, vol. 17, pp. 89 – 108, 2011.

[35] R. Samer, L. Yiu, L. & M. Filature, "Tourism Development in Least Developed Countries: Challenges and Opportunities," Handbook of Research and Global Hospitality and Tourism Management, IGI Global Publication Hershey, Penn. 2015, Chapter. 13, pp. 234-61, 2015.

[36] R.T. Hidayat, Y. E. Prasetya, & D. Dinanti, 'Village Development Index and ICT Infrastructure in Tourism Region," *J. Indones. tour. dev. stud.*, vol. 7, no. 3, pp. 166-74, 2019.

[37] WTTC, "Travel and Tourism Economic Impact 2017 India. The Authority on World Travel & Tourism, Harlequin Building, 65 Southwark Street, London SE1 0HR, United Kingdom," Retrieved 20 Feb 2019 from www.wttc.org, 2017.

[38] UNEP, "Enhancing Sustainable Communities with Green Infrastructure. A Guide to Help Communities Better Manage Storm water While Achieving Other Environmental, Public Health, Social, And Economic Benefits. U.S. Environmental Protection Agency's Office of Sustainable Communities," pp. 1-61, 2014.

[39] Asia Pacific Economic Cooperation, "APEC Guidebook on Quality of Infrastructure Development and Investment. Ministry of Economy, Trade and Industry", 1-3-1 Kasumegaseki, Chiyoda- Ku, Tokyo, 100-890, Japan, pp. 1-28, 2014.

[40] Kaul, & S. Gupta, "Sustainable tourism in India," Worldw. Hosp. Tour. Themes, vol. 1, no. 1, pp. 12-18, 2009.