

MAPPING WEAKNESSES AND THREATS FOR SUSTAINABLE HOMESTAY OPERATIONS WITH FUZZY AHP AS A STRATEGIC RISK ASSESSMENT TOOL

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ABSTRACT

Homestays are largely prevalent among contemporary explorers, as evident from the growth and popularity of the homestay business in the rural areas of Darjeeling and Kalimpong districts of West Bengal. However, homestays face several issues and challenges that have hindered their valuable contribution not only towards the sustainable development of the region but also towards their sustainability. In this context, this study undertakes a strategic risk assessment considering the weaknesses and threats, along with an investigation of their magnitude to determine which weaknesses and threats require immediate attention and solution. The fuzzy analytic hierarchy process is used to evaluate different alternatives under operational weaknesses and external threats as identified from the literature. The findings indicate “Marketing Strategy/Low visibility to homestay-hunting customers” and “Entry of outsiders to reap internal economic benefits” as the riskiest operational weakness and external threat to homestays’ sustainability, respectively. With other policy recommendations, it rationally suggests the need for strategic symbiosis between stakeholders to preserve homestays, which are an integral part of rural tourism.

KEYWORDS: Homestays, Rural Tourism, Fuzzy Analytic Hierarchy Process, Sustainability, Darjeeling, Kalimpong.

I. INTRODUCTION

BACKGROUND OF THE STUDY

Homestay refers to an accommodation where visitors pay to stay within the premises of the resident and have the opportunity to interact informally with the resident's family members during their stay. The visitors consume the meal cooked by the family members, and in certain cases, both family members and guests enjoy their meal together. Homestays have gained popularity due to their ability to create a “*relaxing experience*” and a “*homelike environment*”, and have allowed the visitors to witness and experience the culture of the residents (Yasami et al., 2017). Furthermore, through an open conversation between visitors and residents (Kontogeorgopoulos et al., 2015), visitors gain a brief understanding of the traditions, beliefs, and livelihood patterns of the host institution and the region. These home stays have the ability for economic upliftment of rural communities, i.e., economic prosperity (Long et al., 2018; Pasanchay & Schott, 2021), and promoting ecotourism i.e., environmental stewardship (Bhakuni & Kumar, 2020; Bhalla et al., 2016) while creating a cross-cultural interaction zone, i.e., socio-cultural preservation (Anand et al., 2012, 2012; Leh & Hamzah, 2012). So, it is evident that the business practices of homestays, if assessed within the sustainability framework, can serve the achievement of Sustainable Development Goals (SDGs). Home stays as a driver of SDGs is also established by Bhakuni and Kumar (2020). In more specific terms, their sustainable business practices cater to, both directly and indirectly, SDGs such as SDG1: No Poverty, SDG2: Zero Hunger, SDG4: Quality Education, SDG8: Decent Work and Economic Growth, SDG10: Reduced Inequalities, SDG11: Sustainable Cities and Communities, SDG12: Responsible Consumption and Production and SDG15: Life on Land. Considering such capacity in the sustainable business practices of home stays, their perpetual existence is of utmost importance; as such, they must be placed under continuous evaluation to safeguard them from threats and vulnerabilities and support them in their weaknesses. Considering the need for continuous evaluation, the necessity of a strategic risk assessment is sensed, especially in undertaking risk assessments of operational weaknesses and external threats to home stays’ sustainability.

II. THE RESEARCH PROBLEM

Homestays are now being considered as “customer-to-customer based tourist accommodations”, and it is largely prevalent among contemporary explorers

(Bakker & Twining-Ward, 2018). This is evident from the growth and popularity of the home stay business in the rural areas of Darjeeling and Kalimpong districts of West Bengal, which offers a majestic view of Kanchenjunga with a serene and comforting rural environment (Banerjee, 2022; PIB, 2021; Rai, 2023). As per the Department of Tourism, Government of West Bengal, the total number of registered homestays in Darjeeling and Kalimpong districts is more than 1000 as of 2023 (https://www.wbtourism.gov.in/home/dist_list_homestay). It is the highest among all the other districts in West Bengal. However, there are several issues and challenges faced by the homestays (Bhutia et al., 2022) which have hindered their valuable contribution not only towards the sustainable development of the region but also towards the home stays' sustainability. Although homestays have community support and can be stated as a core element of community-based tourism (CBT), the benefits derived from such CBT may not fulfil its purpose if the challenges, vulnerabilities and threats are extensive (Pusiran & Xiao, 2013). Focusing only on the driving factors behind the success of home stays may not provide a full representation of their operations. Rather, equal importance should be given towards the identification of potential threats and weaknesses so that immediate solutions can be executed through policy enactment and managerial implications. In this context, a study that undertakes a strategic risk assessment considering the weaknesses and threats, along with an investigation of their magnitude to determine which weaknesses and threats require immediate attention and solution is necessary. So, the identification of such weaknesses and threats, considering the Darjeeling and Kalimpong districts of West Bengal, sets the research motive behind the study. In support of this motive, the literature is surveyed, and the discussion is presented in the second section.

This study is divided into seven sections. The first section, as discussed above, has presented the background of the study. The second section presents a review of previous literature bifurcated into a thematic review of '*weaknesses and threats during homestay operations*' and '*fuzzy AHP for strategic risk assessment*', followed by a research gap. The third section discloses the objectives and research questions of the study, and the research methodology is discussed in the fourth section. The fifth section presents the Fuzzy AHP for a strategic risk assessment. The sixth section presents the discussion of the strategic risk assessment along with the validation of the results through test-retest and external validation. Ultimately, the concluding remarks are provided in the seventh section.

III. LITERATURE REVIEW

This study is motivated to examine the operational weaknesses and external threats during home stay operations that require pressing attention. To support such examination, an attempt is made to use the Fuzzy Analytic Hierarchy Process or Fuzzy AHP as a strategic risk assessment tool. In this regard, the literature is reviewed thematically into two sub-sections, followed by a research gap.

WEAKNESSES AND THREATS DURING HOMESTAY OPERATIONS

Several studies have attempted to study the vulnerabilities, weaknesses, internal and external challenges to homestay business operations. Likewise, in studying ecotourism and its benefits to rural communities, Gurung and Seeland (2008) discuss the risk and threat posed by the entry of a third party into rural tourism, as they not only reap the economic benefits but can also hamper the image of the tourist destination and destroy the opportunity of rural community upliftment through rural and ecotourism. Stating that the decrease and withdrawal of homestay operators from the business is linked to over-commercialisation, as it shifts the focus from community interest to self-interest, Nor and Kayat (2010) disclose that unbalanced demography due to a lack of youngsters is a vulnerable factor during the homestay operation. In an attempt to reveal the challenges and issues encompassing the homestay operators, Pusiran and Xiao (2013) disclose several internal and external deficiencies that affect homestays' sustainability. Some of the deficiencies include a lack of knowledge, experience and understanding of the tourism and hospitality industry during the homestay operation, third-party exploitations, and a lack of knowledge about marketing and advertising of homestays.

Identifying rural tourism infrastructure as a component of the environmental construct, Chin et al.(2014) identify the importance of tourism infrastructure in tempting tourists to visit and revisit, so that the sustainability of rural tourism destinations can be maintained. Exploring the challenges experienced by the community homestay programme, Kunjuraman and Hussin (2017) found poor marketing strategies, human resource shortages, absence of infrastructure growth, issues related to security and safety, lack of hospitality experiences and faulty local leadership that lead to unsustainable operation of homestays. While assessing the challenges faced by operators in sustaining homestay businesses, Nor and Awang (2017) find that over-dependency on a third party or external party, such as travel

agents and private players, negatively affects the sustainability of the homestay business.

Focusing on the importance of creating a seamless experience in the highly competitive homestay tourism market, Kusuma (2020) identifies the role of 'sensory marketing' in providing such a seamless experience to the homestay visitors and recognises its ability to stimulate the choice of opting for homestays. However, sensory marketing has become a challenge and a weakness for many homestay operators. By integrating the co-creation experience with the theory of planned behaviour, Meng and Cui (2020) assessed their impact on the tourists' revisit intentions in home-based accommodations. Inducing revisit intention is largely a challenge on the part of homestay operators; if unsuccessful, it can turn into their operational weaknesses. In a systematic literature review conducted by Janjua et al. (2021) on rural homestays and sustainability in tourism, they found that homestay operators' training and development on issues such as branding, entrepreneurship, information and communication technology pose a great threat to their sustainability. Stating that homestays have become an integral part of sustainable tourism in Karnataka, India, Joshi and Dhaigude (2021) presented an integrated technique of allocating capacity in peak and off-season to improve homestays' revenue. This form of revenue management is still a challenge and weakness for many homestays operating in India.

Aiming at personalised marketing research for homestays, Zu et al. (2022) focused on the marketing capabilities and marketing strategies of the homestays. Evaluating the consumption of homestay services, they found marketing strategy and marketing capability as problems faced during the operation process. The study of Xu et al. (2022) states that the lack of sustainable behaviours and the lack of pro-environmental attitude from tourists largely impact the operational aspects of tourism units. As such, it poses a threat to the sustainability of tourism units. Implying 'guest revisit intention' as one of the challenges and weaknesses in the homestay operation, Ly et al. (2022) states that entity theorists and incremental theorists will have 'revisit intentions' due to positive previous experience and learning opportunities, while poor prior experience and privacy concern could be a limiting factor before 'guest revisit intention'.

FUZZY AHP FOR STRATEGIC RISK ASSESSMENT

Several authors have formulated risk assessment and evaluation techniques, and some of such techniques include the fuzzy analytic hierarchy process (FAHP) or

Fuzzy AHP (Rodríguez et al., 2016). The FAHP is the integration of fuzzy logic with the analytic hierarchy process (AHP).

The fuzzy logic is extremely helpful to process subjective issues, as it implements a mathematical perspective to analyse the situation of uncertainty and imprecise situations (Wong & Lai, 2011). It is found suitable for risk assessment and evaluation studies (for example Lin et al., 2012; Liu et al., 2012). Also, AHP, i.e., one of the techniques of multi-criteria decision making (Saaty, 2008), is widely used for decision making, evaluation and risk assessment studies (Dey, 2010; Subramanian & Ramanathan, 2012).

Now, the FAHP, which is the integration of fuzzy logic with AHP, derives the intrinsic benefits from both techniques (Ishizaka, 2014). It has been used as a risk evaluation tool and for ranking alternatives in several studies (Mangla et al., 2015; Nezarat et al., 2015; Rodríguez et al., 2016; Tüysüz & Kahraman, 2006).

In the study of Nikkhaha and Makuib (2011), use of the FAHP method can be witnessed to create and rank tourism scenarios by designing a fuzzy expert system. To inspect the relative importance of drivers of the tourism industry, Do and Chen (2013) exemplified the use of the FAHP method. Lin Yang (2011) also used the FAHP method to develop an evaluation model to study the sustainable development of tourism eco-compensation. Through the identification of suitable evaluation criteria and sub-criteria to determine recreational potential, Samira Molaei et al. (2018) aimed to identify and select areas suitable for ecotourism using FAHP. Using internal factors, i.e., strengths and weaknesses and external factors, i.e., threats and opportunities of eco-tourism, Sahani (2021) used the FAHP to recognise the hierarchical top priority strategy for its development.

THE RESEARCH GAP

The existing literature has provided substantial effort to identify the weaknesses and threats that may affect the operation of home stays. Further, several studies also have evidence of the use of FAHP in the area of tourism and eco-tourism. However, limited focus towards the strategic risk assessment during home stay operation is found in the literature; as such, those risks and vulnerabilities can have a direct impact on homestays' sustainability. Limited studies have considered the issue related to weaknesses and challenges to homestays' operations and sustainability. In more specific terms, literature has not presented the hierarchy of both weaknesses and threats, so that an alternative across such weaknesses and threats could be

identified that demands immediate action for problem solving. Lastly, studies that consider the understanding of weaknesses and challenges to home stays' operations and sustainability in the districts of Darjeeling and Kalimpong, West Bengal, are extremely limited.

IV. OBJECTIVES OF THE STUDY

Based on the research gap as discussed in the previous section, the objectives of this study are:

- i. To identify the major operational weaknesses and external threats to home stays' sustainability operating in the districts of Darjeeling and Kalimpong, West Bengal.
- ii. To find out the operational weakness and external threat requires an immediate and effective solution for the home stays' sustainability operating in the districts of Darjeeling and Kalimpong, West Bengal.
- iii. To provide necessary remedial solutions and recommendations that controls the adverse effects of operational weaknesses and external threats on homestays' sustainability.

To attain such research objectives, a necessary and relevant research methodology is essential. The next section presents the research methodology adopted for this purpose.

V. RESEARCH METHODOLOGY

VARIABLES USED IN THE STUDY

The study requires a critical understanding and examination of operational aspects from the perspective of home stay operators and/or managers. From the review of the literature, several problems could be identified. Such problems can be bifurcated into operational weaknesses, i.e., the internal problems and external threats, i.e., the external problems, which have a significant negative impact on homestays' sustainability (Pusiran & Xiao, 2013). TABLE 1 discloses the list of operational weaknesses and external threats as sourced from the literature relevant to the operation of a homestay and its sustainability.

TABLE 1: OPERATIONAL WEAKNESSES AND EXTERNAL THREATS EXPERIENCED BY THE HOMESTAY OPERATORS

A. Operational Weaknesses Experienced By The Homestay Operators		
Variables	Description of the Variables	Source(s)
OW ₁	Sensory Marketing: to portray itself as appealing to the customer's senses (smell, sight, touch, sound, and taste) as it helps in positioning the product.	Kusuma (2020)
OW ₂	Marketing Strategy/Low visibility to homestay-hunting customers.	Kunjuraman and Hussin (2017); Zu et al. (2022)
OW ₃	Product knowledge, i.e., lack of knowledge/experience and understanding of homestay and hospitality services.	Kunjuraman and Hussin (2017); Pusiran and Xiao (2013)
OW ₄	Revenue Management and pricing policies during peak and slack season.	Joshi and Dhaigude (2021)
OW ₅	Revisit Intentions of the tourists.	Ly et al. (2022); Meng and Cui (2020)
B. External Threats Experienced By The Homestay Operators		
Variables	Description of the Variables	Source(s)
ET ₁	Unbalanced Demography (Lack of youngsters to run/operate and support the homestay business, affecting vulnerability and sustainability).	Kunjuraman and Hussin (2017); Nor and Kayat (2010)
ET ₂	Lack of sustainable behaviours/attitude from tourists.	Xu et al. (2022)
ET ₃	Less support from the Government/Local Bodies for the training and development of homestay operators for the sustainability of homestays.	Janjua et al. (2021)

ET ₄	Entry of outsiders to reap internal economic benefits.	Gurung and Seeland (2008)
ET ₅	Tourism Infrastructure.	Chin et al. (2014); Kunjuraman and Hussin (2017)

Source: Author(s).

These variables are embedded into a structured questionnaire for data collection from the homestay operators and/or managers responsible for operating the homestays. However, the design of the questionnaire depends on the use of a data analysis tool in the study.

DATA

As of early 2023, 1282 homestays are operating in the districts of Darjeeling and Kalimpong, which are registered under the “*West Bengal Homestay Tourism Policy*” of the Department of Tourism, Government of West Bengal (https://www.wbtourism.gov.in/home/dist_list_homestay). However, the exact count of unregistered homestays is unknown. So, this study only considers the registered homestays as the eligible sampling units because they have more experience (in years) of operating a homestay, know the registration process, governmental norms, tourism policy and have also utilised a grant of Rs. 1 lac received after registration with the “*West Bengal Homestay Tourism Policy*”. This indicates that they are well-informed about the problems, challenges and vulnerabilities during their daily operations. Therefore, the list of 1282 registered homestays represents the sampling frame for this study. Simple random sampling technique is used to reach and collect data from such registered homestays. Finally, a total of 138 registered homestays participated in this survey, which represents 10.764% of the sampling frame included in this study.

METHOD

As the objectives necessitate the ranking of operational weaknesses and external threats that require an immediate and effective solution for the homestays’ sustainability, this study uses one of the recognised methods under multi-criteria decision making (MCDM)- the Fuzzy Analytic Hierarchy Process or FAHP. The rationale behind using this method is that it integrates the analytic hierarchy process

with the fuzzy set theory, which can control any ambiguity in the decision-making process (Kaya et al., 2019). Thus, it produces more concrete results.

The FAHP uses the pair-wise comparison matrix and criteria weights (W_i) from the analytic hierarchy process or AHP to validate the consistency, as depicted through a consistency ratio (C.R.) which should be within the threshold of 10% (Golden & Wang, 1989; Saaty & Vargas, 2012). After validating the consistency of the matrix, the fuzzified pair-wise comparison matrix (M) is constructed through fuzzification based on the triangular membership function or TMF (Chen & Lee, 2011). The responses of the homestay owners and/or operators are used to construct such fuzzified pair-wise comparison matrix (M), which takes the following form-

$$M = \begin{matrix} & m_{11} & \dots & m_{1n} \\ \begin{matrix} m_{21} \\ m_{31} \\ \dots \\ m_{n1} \end{matrix} & & \dots & \begin{matrix} m_{2n} \\ m_{3n} \\ \dots \\ m_{nn} \end{matrix} \end{matrix} \quad \text{where } M \text{ is the fuzzified pair-wise comparison matrix;} \\ a, b = 1, 2, \dots, n; \\ m_{ij} \text{ is a fuzzy number with } TMF = (x, y, z); \text{ and } m_{ij} = 1 \text{ for, } a=b;$$

In TMF, x, y, z represents lower, middle and upper value, respectively. For two sets of fuzzy numbers, say $M_1 = (x_1, y_1, z_1)$ and $M_2 = (x_2, y_2, z_2)$, few operative laws are:

$$M_1 + M_2 = (x_1 + x_2, y_1 + y_2, z_1 + z_2) \dots \dots \dots (1)$$

$$M_1 \times M_2 = (x_1 \times x_2, y_1 \times y_2, z_1 \times z_2) \dots \dots \dots (2)$$

$$M_1^{-1} = \left(\frac{1}{z_1}, \frac{1}{y_1}, \frac{1}{x_1}\right) \dots \dots \dots (3)$$

Then, the fuzzy geometric mean ($\hat{G}_i$) and fuzzy weights of the criteria (f_i) suggested by Buckley (1985) is estimated as:

$$\hat{G}_i = (m_{i1} \times m_{i2} \times \dots \times m_{in})^{1/n} \dots \dots \dots (4)$$

$$f_i = \hat{G}_i (\hat{g}_1 + \hat{g}_2 + \hat{g}_3 + \dots + \hat{g}_n)^{-1} \dots \dots \dots (5)$$

Next, the fuzzy weights of the criteria (f_i) enter a defuzzification process using a Centre of Area (COA) method as:

$$COA_i = \frac{x+y+z}{3} \dots \dots \dots (6)$$

This defuzzification using COA is necessary to estimate the normalised weights ($\hat{N}_i$), which indicate the criteria weights of the alternatives. In terms of the research

objectives of this study, such normalised weights ($\check{N}_i$) will disclose the ranking of operational weaknesses and external threats.

Regarding the research instrument, a structured questionnaire is used to collect the responses from the homestay owners and/or operators. The questionnaire is designed as per the requirements under FAHP. It consists of operational weaknesses and external problems as highlighted in TABLE 1.

VI. THE RESULTS

FUZZY ANALYTIC HIERARCHY PROCESS

Using the responses on the structured questionnaire from the homestay owners and/or operators, on two different issues- (i) operational weaknesses and (ii) external problems, their respective pair-wise comparison matrix is constructed and the FAHP is conducted. The process and results are discussed in this section.

Firstly, the FAHP is conducted for operational weaknesses. TABLE 2 presents the pair-wise comparison matrix for five different alternatives, each of which represents the operational weaknesses experienced by the homestays.

TABLE 2: PAIR-WISE COMPARISON MATRIX OF OPERATIONAL WEAKNESSES

	OW ₁	OW ₂	OW ₃	OW ₄	OW ₅
OW ₁	1	1/3	7	3	5
OW ₂	3	1	8	8	9
OW ₃	1/7	1/8	1	1/3	2
OW ₄	1/3	1/8	3	1	6
OW ₅	1/5	1/9	1/2	1/6	1

Source: Author(s) calculation.

The pair-wise comparison matrix is normalised to estimate the derive the Criteria Weights (W_i) based on AHP, necessary for the estimation of the consistency ratio. TABLE 3 shows the normalisation of the pair-wise comparison matrix.

TABLE 3: NORMALISED PAIR-WISE COMPARISON MATRIX OF OPERATIONAL WEAKNESSES

	OW ₁	OW ₂	OW ₃	OW ₄	OW ₅	Criteria Weights (W _i)
OW ₁	0.214	0.197	0.359	0.240	0.217	0.245
OW ₂	0.642	0.590	0.410	0.640	0.391	0.535
OW ₃	0.031	0.074	0.051	0.027	0.087	0.054
OW ₄	0.071	0.074	0.154	0.080	0.261	0.128
OW ₅	0.043	0.066	0.026	0.013	0.043	0.038

Source: Author(s) calculation.

With the Criteria Weights (W_i), TABLE 4 shows the estimation of the consistency ratio or C.R., where λ_{max} indicates the maximum eigenvalue based on the average of the λ, and C.I. represents the consistency index calculated as $C.I. = \frac{\lambda_{max} - n}{n - 1}$. The random index, or R.I., by Golden and Wang (1989) for five alternatives (n=5) is 1.120 as given in the random consistency index for a randomly generated matrix (see APPENDIX A). Using both C.I. and R.I., the consistency ratio is estimated as $C.R. = \frac{C.I.}{R.I.}$, and the C.R. is found to be 7.9%, absolutely below the threshold limit of 10% (Saaty & Vargas, 2012).

TABLE 4: ESTIMATION OF CONSISTENCY RATIO (C.R.) OF OPERATIONAL WEAKNESSES

						Weighted Sum Value (I)	W _i (II)	λ(I/II)
	OW ₁	OW ₂	OW ₃	OW ₄	OW ₅			
OW ₁	0.245	0.178	0.377	0.384	0.191	1.375	0.245	5.604
OW ₂	0.736	0.535	0.431	1.024	0.343	3.069	0.535	5.739
OW ₃	0.035	0.067	0.054	0.043	0.076	0.275	0.054	5.102
OW ₄	0.082	0.067	0.162	0.128	0.229	0.667	0.128	5.213
OW ₅	0.049	0.059	0.027	0.021	0.038	0.195	0.038	5.107
							λ _{max}	5.353
							C.I.	0.088
							R.I. (n=5)	1.120
							C.R.	0.079

Source: Author(s) calculation.

With a validated consistency for the decision matrix of operational weaknesses, the next step is to integrate the fuzzy set theory, as shown in TABLE 5. Here, the crisp numeric value from the original decision matrix, as shown in TABLE 2, is converted into fuzzy numbers with reference to the scale of relative importance by Saaty (1977) and Chen and Lee (2011) (see APPENDIX B). Using such fuzzified pair-wise comparison matrix, the fuzzy geometric mean ($\hat{G}_i$) is estimated, which is used for the estimation of fuzzy weights (f_i) in the next step.

TABLE 5: FUZZIFIED PAIR-WISE COMPARISON MATRIX OF OPERATIONAL WEAKNESSES

	OW ₁	OW ₂	OW ₃	OW ₄	OW ₅	Fuzzy Geometric Mean ($\hat{G}_i$)
O W ₁	1,1,1	1/4;1/3; 1/2	6,7,8	2,3,4	4,5,6	1.643;2.036;2.491
O W ₂	2,3,4	1,1,1	7,8,9	7,8,9	9,9,9	3.882;4.441;4.931
O W ₃	1/8;1/7; 1/6	1/9;1/8; 1/7	1,1,1	1/4;1/3; 1/2	1,2,3	0.322;0.412;0.514
O W ₄	1/4;1/3; 1/2	1/9;1/8; 1/7	2,3,4	1,1,1	5,6,7	0.774;0.944;1.149
O W ₅	1/6;1/5; 1/4	1/9;1/9; 1/9	1/3;1/2 ;1	1/7;1/6; 1/5	1,1,1	0.245;0.284;0.354
Adding Fuzzy Numbers (Sum of Column) ($\hat{g}_1+\hat{g}_2+\hat{g}_3$)						6.867;8.117;9.439
Reciprocal of the Sum of ($\hat{G}_i$)						0.106;0.123;0.146

Source: Author(s) calculation.

The fuzzy weights (f_i) are calculated and presented in TABLE 6. It also shows the de-fuzzification based on the COA, from which the normalised weights ($\check{N}_i$) are estimated.

TABLE 6: ESTIMATION OF CRITERIA WEIGHTS USING FUZZY WEIGHTS OF OPERATIONAL WEAKNESSES

	Fuzzy Weights (f_i)	De-fuzzification Based on the Centre of Area	Normalised Weights(N_i)	Criteria Weights (%)	Ranks
OW ₁	0.174;0.250;0.364	0.263	0.254	25.387	II
OW ₂	0.411;0.546;0.720	0.559	0.540	54.027	I
OW ₃	0.034;0.051;0.075	0.053	0.052	05.155	IV
OW ₄	0.082;0.116;0.168	0.122	0.118	11.791	III
OW ₅	0.026;0.035;0.052	0.038	0.036	03.640	V

Source: Author(s) calculation.

Such normalised weights represent the eigenvector or criteria weights that determine the rank of the alternatives as shown in TABLE 6. Thus, the ranks indicate that the homestays face OW₂, i.e., “Marketing Strategy/Low visibility to homestay-hunting customers” as the riskiest operational weakness that can have a severe negative impact on homestays’ sustainability.

Secondly, the FAHP is conducted for external threats in similar steps as above. TABLE 7 shows the pair-wise comparison matrix of five different alternatives for the external threats.

TABLE 7: PAIR-WISE COMPARISON MATRIX OF EXTERNAL THREATS

	ET ₁	ET ₂	ET ₃	ET ₄	ET ₅
ET ₁	1	7	6	1/3	4
ET ₂	1/7	1	1/2	1/9	1/5
ET ₃	1/6	2	1	1/7	1/2
ET ₄	3	9	7	1	8
ET ₅	1/4	5	2	1/8	1

Source: Author(s) calculation.

The pair-wise comparison matrix is normalised and the criteria weights (W_i) are assessed as shown in TABLE 8. These criteria weights are used for estimating the consistency ratio in the next step.

**TABLE 8: NORMALISED PAIR-WISE COMPARISON MATRIX
OF EXTERNAL THREATS**

	ET ₁	ET ₂	ET ₃	ET ₄	ET ₅	Criteria Weights (W_i)
ET ₁	0.219	0.292	0.364	0.195	0.292	0.272
ET ₂	0.031	0.042	0.030	0.065	0.015	0.037
ET ₃	0.037	0.083	0.061	0.084	0.036	0.060
ET ₄	0.658	0.375	0.424	0.584	0.584	0.525
ET ₅	0.055	0.208	0.121	0.073	0.073	0.106

Source: Author(s) calculation.

Using the criteria weights (W_i), the weighted sum value is assessed, which is then used to estimate the eigenvalue or λ as shown in TABLE 9. Next, the value of λ_{max} is calculated for C.I. or consistency index. Then, using the R.I. value of 1.120 for $n=5$, the consistency ratio is estimated to be 6.0%, above the threshold limit by Saaty and Vargas (2012).

**TABLE 9: ESTIMATION OF CONSISTENCY RATIO (C.R.)
OF EXTERNAL THREATS**

						Weighted Sum Value (I)	W_i (II)	λ (I/II)
	ET ₁	ET ₂	ET ₃	ET ₄	ET ₅			
ET ₁	0.272	0.256	0.361	0.175	0.424	1.488	0.272	5.466
ET ₂	0.039	0.037	0.030	0.058	0.021	0.185	0.037	5.062
ET ₃	0.045	0.073	0.060	0.075	0.053	0.307	0.060	5.103
ET ₄	0.817	0.329	0.421	0.525	0.849	2.940	0.525	5.600
ET ₅	0.068	0.183	0.120	0.066	0.106	0.543	0.106	5.117
							λ_{max}	5.270
							C.I.	0.067
							R.I. ($n=5$)	1.120
							C.R.	0.060

Source: Author(s) calculation.

After validating the pair-wise comparison matrix with the help of C.R., the fuzzified pair-wise comparison matrix is constructed from which the fuzzy geometric mean ($\hat{G}_i$) is assessed as shown in TABLE 10. The reciprocal of this fuzzy geometric mean ($\hat{G}_i$) is a necessary element in estimating the fuzzy weight (f_i) in the next step.

TABLE 10: FUZZIFIED PAIR-WISE COMPARISON MATRIX OF EXTERNAL THREATS

	ET ₁	ET ₂	ET ₃	ET ₄	ET ₅	Fuzzy Geometric Mean ($\hat{G}_i$)
ET ₁	1,1,1	6,7,8	5,6,7	1/4;1/3;1/2	3,4,5	1.864;2.236;2.687
ET ₂	1/8;1/7;1/6	1,1,1	1/3;1/2;1	1/9;1/9;1/9	1/6;1/5;1/4	0.238;0.276;0.341
ET ₃	1/7;1/6;1/5	1,2,3	1,1,1	1/8;1/7;1/6	1/3;1/2;1	0.359;0.474;0.631
ET ₄	2,3,4	9,9,9	6,7,8	1,1,1	7,8,9	3.764;4.324;4.816
ET ₅	1/5;1/4;1/3	4,5,6	1,2,3	1/9;1/8;1/7	1,1,1	0.616;0.792;0.970
Adding Fuzzy Numbers (Sum of Column) ($\hat{g}_1+\hat{g}_2+\hat{g}_3$)						6.841;8.102;9.445
Reciprocal of the Sum of $\hat{G}_i$						0.106;0.123;0.146

Source: Author(s) calculation.

With the help of the reciprocal of fuzzy geometric mean ($\hat{G}_i$), the fuzzy weights(f_i) are estimated as shown in TABLE 11. However, before calculating the criteria weights, the fuzzy weights should go through a defuzzification process based on the COA method as shown in the same table.

TABLE 11: ESTIMATION OF CRITERIA WEIGHTS USING FUZZY WEIGHTS OF EXTERNAL THREATS

	Fuzzy Weights (f_i)	De-fuzzification Based on the Centre of Area	Normalised Weights($\check{N}_i$)	Criteria Weights (%)	Ranks
ET ₁	0.198;0.275;0.392	0.2883	0.280	27.957	II
ET ₂	0.025;0.034;0.045	0.0347	0.034	3.361	V
ET ₃	0.038;0.058;0.092	0.0627	0.061	6.076	IV

ET ₄	0.399;0.532;0.703	0.5447	0.528	52.812	I
ET ₅	0.065;0.097;0.141	0.1010	0.098	9.793	III

Source: Author(s) calculation.

Finally, the normalised weights ($\check{N}_i$) are estimated, which represent the eigenvector or criteria weights that determine the rank of the alternatives. In this case, it represents the rank of the external threats to homestays' sustainability. ET₄, i.e., "*Entry of outsiders to reap internal economic benefits*", is marked as the riskiest external threat to homestays' sustainability.

TABLE 12: SUMMARY OF FINDINGS

Operational Weaknesses

Variables	Descriptions	Criteria Weights	Ranks
OW ₁	Sensory Marketing- to portray itself as appealing to the customer's senses (smell, sight, touch, sound, and taste) as it helps in positioning the product.	25.387	II
OW ₂	Marketing Strategy/Low visibility to homestay-hunting customers.	54.027	I
OW ₃	Product knowledge, i.e., lack of knowledge/experience and understanding of homestay and hospitality services.	05.155	IV
OW ₄	Revenue Management and pricing policies during peak and slack season.	11.791	III
OW ₅	Revisit Intentions of the tourists.	03.640	V

External Threats

Variables	Descriptions	Criteria Weights	Ranks
ET ₁	Unbalanced Demography (Lack of youngsters to run/operate and support the	27.957	II

	homestay business, affecting vulnerability and sustainability).		
ET₂	Lack of sustainable behaviours/attitude from tourists.	3.361	V
ET₃	Less support from the Government/Local Bodies for the training and development of homestay operators for the sustainability of homestays.	6.076	IV
ET₄	Entry of outsiders to reap internal economic benefits.	52.812	I
ET₅	Tourism Infrastructure.	9.793	III

Source: Author(s) calculation.

The findings from the FAHP are summarised and presented in TABLE 12. This strategic risk mapping, particularly from the operational weaknesses and external threats, presents a profound understanding of the prevailing situations in the homestay tourism and business. These risks, if left uncontrolled, have such a magnitude that they can severely impair the viability and sustainability of homestays within a decade. These findings add a novel understanding of risks associated with operating a homestay and will provide an avenue to discuss and implement policy measures and remedial actions to tackle such operational risks.

TEST RE-TEST RELIABILITY

Understanding the importance of the findings, this study presents the test-retest reliability to enhance the robustness and reliability of these findings. This will further enhance the universal applicability of the objectives, methodology and findings. This test is performed by assessing the correlation coefficient of the measured values at two different periods on a homogeneous group. A correlation coefficient of a higher magnitude between the values of the two test occasions will specify greater test-retest reliability (Nguyen et al., 2018, p. 68). In this case, the normalised weights ($\check{N}_i$) for both operational weaknesses and external threats are again estimated from the responses of twenty homestay operators of the same region collected at another time interval. Then, the correlation coefficient between the existing and new normalised weights ($\check{N}_i$) is assessed as shown in TABLE 13. The

results show high test-retest reliability scores (correlation > 0.70), which are statistically significant for both operational weaknesses and external threats.

TABLE 13: TEST RE-TEST RELIABILITY

Operational Weaknesses (OW)			
		Original_OW	New_OW
Original_OW	Pearson Correlation	1	.940*
	Sig. (2-tailed)		.018
	N	5	5
New_OW	Pearson Correlation	.940*	1
	Sig. (2-tailed)	.018	
	N	5	5

External Threats (ET)			
		Original_ET	New_ET
Original_ET	Pearson Correlation	1	.979**
	Sig. (2-tailed)		.004
	N	5	5
New_ET	Pearson Correlation	.979**	1
	Sig. (2-tailed)	.004	
	N	5	5

*Correlation is significant at the 0.05 level (2-tailed).

**Correlation is significant at the 0.01 level (2-tailed).

Source: Author(s) calculation.

VII. DISCUSSIONS

With regard to the operational weaknesses, the findings highlighted OW₂, i.e., “Marketing Strategy/Low visibility to homestay-hunting customers” as the riskiest operational weakness. This finding aligns with Rao (2016) where they highlight the importance of marketing strategy to reach the potential homestay customers, as an

important factor towards homestays' sustainability. Further, the aspects of low visibility to homestay-hunting customers have also been discussed in the study of Joshi and Dhaigude (2021). This is a very crucial issue that needs immediate addressal. The problem arises at the very starting period because homestay owners have little or no experience with marketing hospitality services; as such, the only source of linkage with the visitors is the booking agents, who can directly control the pricing strategy. So, the role of the Government and Local Bodies at this stage is to enhance the marketing capabilities of such homestays by taking up the following initiatives:

- i. Organise a short-term online marketing course that includes hands-on training to market their hospitality services to potential visitors.
- ii. Create and disseminate a webpage that acts as a link between sellers and buyers of homestay services without any third-party involvement in their marketing channel.
- iii. Homestays can also be listed in popular hotel booking platforms such as booking.com, OYO, MakeMyTrip, etc., but due to higher commission charges, technical jargon and restricted knowledge base, their marketing attempt worsens. So, a simplified web application at ease, designed for the convenience of both homestay customers and owners, would be of great purpose, considering the rural community and their lower marketing capabilities.

Considering external threats to homestays' sustainability, ET₄, i.e., "*Entry of outsiders to reap internal economic benefits*", is marked as the riskiest threat. This problem arises largely due to the insufficiency of homestay regulations (Bhan & Singh, 2014; Kunjuraman & Hussin, 2017). For this situation, the "*West Bengal Homestay Tourism Policy, 2022*" clearly indicates that a homestay is a place where the owner or promoter of the homestay should be "*the owner of homestay*" and his/her family members physically reside in the same establishment by letting out part of such establishment. The entry of outsiders to reap internal economic benefits is largely due to leasing of properties to non-residents. Such leased properties follow a lower selling price to attract visitors with compromised hospitality services, directly affecting the goodwill, not only of that property but also of the entire region. They simply reap the economic benefits and will exit from the business once it reaches a saturation point. This problem intensifies due to the absence of a permissible authority that verifies the operation of a homestay following the tourism policy. However, if the legal compliances are made mandatory with strict adherence,

it will directly have a negative impact on the rural community, as the homestay business has supported many rural households. Thus, to control the entry of outsiders, the regional homestay association, along with the local bodies, i.e., the Gram Panchayat and Municipality, this issue can be controlled. Firstly, the regional homestay association already have a network of stakeholders and can identify those non-residents who are operating a homestay under lease agreement and destroying the goodwill of the region. Such an association can act as a barrier between the homestay and local body by not allowing a clearance certificate with regard to adherence to the “*West Bengal Homestay Tourism Policy*”. Such clearance should be sought by the local body before issuing a yearly ‘*trade license*’, without which the entity might face legal consequences. Thus, to challenge this external threat to homestays’ sustainability, the symbiosis between regional homestay associations and local bodies is of utmost importance.

VIII. CONCLUSIONS

Homestays are an integral part of rural tourism, which has largely supported rural tourism and rural communities. Although its operational size is that of a micro-enterprise, it has a massive contribution towards the economic, social and environmental well-being of the rural community. Thus, a continuous evaluation is required to identify risk and vulnerabilities affecting its sustainability, and will be of great support towards community upliftment and safeguarding the rural economy.

This study, at the very outset, understood the necessity of an evaluation to identify vulnerabilities against homestays’ sustainability and undertook this research. With limited but suggestive outcomes, it attempted to strategically map such vulnerabilities and suggested presumptive recommendations with rational justification. Concluding the study, it suggests the need for strategic symbiosis between stakeholders to preserve homestays, which are an integral part of rural tourism.

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APPENDICES

APPENDIX A: RANDOM INDEX (R.I.) FOR RANDOM MATRICES

n	3	4	5	6	7	8	9	10	11	12	13	14	15
R.	0.5	0.8	1.1	1.2	1.3	1.34	1.4	1.4	1.5	1.5	1.5	1.5	1.5
I.	8	9	2	4	3	0	5	9	1	4	6	7	8

Source: Golden and Wang (1989).

APPENDIX B: SCALE OF RELATIVE IMPORTANCE

Saaty's Scale of Crisp Numbers* Fuzzy Scale of Relative Importance**

Relative Importance	Definition	Triangular Fuzzy Number
0		
1	Equal Importance	(1,1,1)
2	Weak Importance	(1,2,3)
3	Moderate Importance	(2,3,4)
4	Moderate Plus	(3,4,5)
5	Strong Importance	(4,5,6)
6	Strong Plus	(5,6,7)
7	Very Strong Importance	(6,7,8)
8	Very, Very Strong	(7,8,9)
9	Absolute Importance	(9,9,9)

In the fuzzy scale of relative importance, similar to Saaty's scale of crisp numbers, if pair 1 (activity a) has above non-zero numbers assigned against pair 2 (activity b), then b has the reciprocal value when compared with i.

Source: Compiled by author(s) from Chen and Lee (2011)** and Saaty (1977)*.