Marine tourism and environmental preservation: Determinants of tourists' ecofriendly behavior and promotion through word-of-mouth

Abstract

This study aims to explore the factors that impact tourists' engagement in environmentally friendly behaviors (BI) and their promotion of a destination through word-of-mouth (WOM) while attending marine tourism. The research uses a stringent methodology, including sufficient/necessary condition analysis and fuzzy-set qualitative comparative analysis (fsQCA), to examine the essential and sufficient conditions for the presence of BI and WOM. It thoroughly investigates the solutions that emerge from the complex interplay of factors influenced by cognitive, emotional, and normative influences. The results obtained from the fsQCA analysis generally correspond to our hypotheses and validate the relationships between the determinants and the desired outcomes. By comparing established theory with the proposed model, this research also identifies a combination of factors, such as the presence of moral norm and the absence of social norm, that influence BI and WOM. This study holds potential for theoretical expansion in future marine tourism studies.

Keywords: Marine tourism, tourist eco-friendly behavior, word-of-mouth, anticipated feeling, social norm, moral norm, image of sustainable behavior

1. Introduction

The concept of the Blue Economy (BE) represents a burgeoning approach aimed at the sustainable management of water resources, with a particular focus on the preservation and responsible utilization of seas and oceans as invaluable natural assets for present and future generations (Balestracci & Sciacca, 2023). The BE framework encompasses a wide spectrum of economic activities, which are all intricately connected with the oceans. These activities span from fishing, shipbuilding, and maritime transport to marine tourism (United Nations, 2014). While the term "Blue Economy" may appear relatively recent, the principles underlying it align with long-standing awareness concerning environmental conservation and the growing recognition of the significance of adopting eco-friendly practices (Kabil et al., 2021).

Recent research has delved into the psychological processes underpinning tourists' intentions and behaviors when it comes to responsible consumption (Chua & Han, 2022; Fakfare et al., 2023). However, a thorough examination of the existing studies on marine tourism shows several notable research gaps. First, despite concerted efforts to heighten tourists' awareness of environmental protection in marine destinations, studies that identify the factors influencing tourists' intentions toward eco-friendly behaviors and their promotion of a destination through word-of-mouth (WOM) remain lacking (Liu et al., 2022). Second, although pro-responsible actions have gained considerable traction as a trend, how tourists' perceptions of ethicality, specifically from a sociopsychological standpoint, play a role in explaining their intentions to support environmental ethics has yet to be understood in the context of tourism (Quan et al., 2022). Crucial cognitive, affective, and normative mechanisms, which are pivotal in shaping intentions, remain undiscovered within the realm

of marine tourism (de Lima Pereira et al., 2021). Exploring determinants of tourists' eco-friendly behaviors and their promotion of a destination through WOM from the perspective of established theories, such as the norm activation model (NAM) and the theory of planned behavior (TPB), provides a promising avenue for future research in this field.

Third, prior studies have made efforts to lay the research groundwork for comprehending and advancing the sustainability of marine tourism (e.g., Ip-Soo-Ching et al., 2022; Lin et al., 2021; Ngah et al., 2021; Zhu et al., 2019). They have used qualitative and quantitative approaches, as seen in Chakraborty et al. (2020), Dimitrovski et al. (2021), and Panwanitdumrong & Chen (2021). However, these studies have fallen short in uncovering the underlying factors that could contribute to the development of a mechanism for achieving sustainable outcomes in marine tourism, including eco-friendly behaviors and WOM intentions. Moreover, mainstream studies that utilize quantitative methods often concentrate on identifying and hypothesizing associations among variables to ascertain the outcome, using sufficiency logic (Dul, 2016; Woodside, 2014). While this approach contributes to the field, it comes with certain limitations. The outcomes obtained through sufficient logic fail to unveil the essential factor(s) required for the occurrence of the desired outcome(s). This letdown poses academic and practical challenges because the failure to identify these necessary conditions makes it challenging to determine the factors that cannot be neglected to achieve the intended outcome(s) (Dul, 2016; Wattanacharoensil et al., 2024). In the context of marine tourism, where promoting eco-friendly behavior and encouraging tourists to spread positive WOM about the destination is a crucial goal, scholars and practitioners must pinpoint the key components that drive this projected result.

Given that responsible consumption intentions and behaviors are crucial outcomes arising from tourists' evaluation of cognitive, affective, and normative mechanisms (Wattanacharoensil et al., 2024) and considering that these intentions/behaviors can promote sustainable activities and responsible consumption at the destination (Han et al., 2020), this research utilizes the logic of necessity and sufficiency to investigate eco-friendly behaviors and WOM activities concerning marine tourism. In contrast to necessary logic, sufficiency logic posits that an individual antecedent is sufficient but not mandatory for determining the outcome. In our research context, while the intention of travelers to adopt sustainable behaviors may decrease in the absence of a specific antecedent, other components that still wield influence and cannot be replaced may exist (Hauff et al., 2021). Hence, the essential conditions or determinants of eco-friendly practices and WOM intentions, including cognitive, affective, and normative factors, assume a crucial role in driving the desired outcomes (Han et al., 2020). In the absence of these essential conditions, attaining the desired outcome becomes an unattainable goal (Meeprom et al., 2023), making endeavors to advocate for and enhance sustainability awareness futile.

Additionally, the use of conventional net-effect analyses, such as regression and/or structural model, has been critiqued for its limitations in explaining the complex nature of antecedents (Woodside, 2014). This criticism emerges from the inadequacy of a symmetric technique in addressing the asymmetric associations present within the data (Wattanacharoensil et al., 2023). In practical terms, the connections among variables related to eco-friendly behaviors and WOM intention at marine destinations can extend across cognitive, affective, and normative factors, influenced by the intricate interaction of various

psychological components. Prior studies have adopted fuzzy-set qualitative comparative analysis (fsQCA) to examine the interplay and combinations of constructs, depicted as causal recipes that identify the most effective combinations of variables and unveil their influence on the outcomes (Manosuthi et al., 2022). Therefore, the current study attempted to identify the determinants of touristss' environmental preservation behaviors at marine and coastal tourism sites by utilizing variable- and case-based analyses. Specifically, this study was designed to (1) assess the impact of affective, cognitive, and norm factors on tourists' intention for eco-friendly behaviors (INT) at marine and coastal tourism sites; (2) assess the impact of affective, cognitive, and norm factors on tourists' WOM intention; (3) build the causal recipes comprising an optimum combination of affective, cognitive, and norm variables on INT; (4) build the causal recipes comprising an optimum combination of affective, cognitive, and norm variables on WOM intention; and (5) identify necessary conditions of tourist eco-friendly behaviors and promotion of a destination through WOM resulting from affective, cognitive, and norm antecedents. Through fsQCA, set-theoretic methods were primarily adopted to test research hypotheses and obtain outcomes.

2. Literature review

2.1 Marine tourism and environmental preservation

Marine tourism and environmental preservation have garnered growing attention from scholars within the wide sphere of environmentally responsible practices in the tourism industry (Dimitrovski et al., 2019). This heightened interest signifies a significant shift toward the embrace of sustainable approaches across the sector (Merli et al., 2019). This transition to sustainability encompasses a diverse array of elements within the tourism industry, including hotels, golf clubs, spas, wellness facilities, resorts, beach amenities, restaurants, cruises, conventions, and an assortment of destination types (e.g., Han, 2015; 2020; Han & Hwang, 2016; Hunt & Harbor, 2019). However, a notable gap exists in the literature regarding marine and coastal destinations (Fakfare & Wattanacharoensil., 2023). This gap underscores the pressing need to improve the understanding of whether environmentally friendly practices exert a discernible influence on tourists' choices and behavioral intentions in the specific context of marine tourism. Research articles published in major tourism journals, such as those authored by Han (2015; 2020), Han et al. (2020), and Kiatkawsin and Han (2017), have consistently highlighted the necessity for conducting more comprehensive investigations into visitor behavior regarding environmentally friendly practices, albeit in diverse research settings.

Despite the wealth of research on tourists' pro-environmental behavior within the tourism industry (Choi et al., 2024; Davari et al., 2024; Han et al., 2019; Stern, 2000; Wattanacharoensil et al., 2024), these studies often yield inconsistent or inconclusive results. Therefore, a deeper exploration of pro-environmental behavior within tourism destinations is imperative. Furthermore, given the paramount importance of marine tourism in the context of environmental preservation (Dimitrovski et al., 2019; Merli et al., 2019), the call for additional research and exploration of sustainable practices specifically tailored to the marine tourism sector has become urgent. Such research will not only provide valuable insights but also serve as guiding principles for the future development of marine tourism while helping safeguard fragile marine ecosystems.

2.2 Cognitive influences toward sustainable behaviors and activities

The concepts of problem awareness (PA) and the perceived image of sustainable behaviors are fundamentally cognitive and are widely recognized as pivotal factors in shaping an individual's pro-environmental intentions and eco-friendly decision-making (de Lima Pereira et al., 2021; Kim & Hwang, 2020; Wong & Lai, 2024). PA refers to an individual's level of awareness regarding the potential negative consequences for their valued possessions or objectives if they do not engage in environmentally friendly actions (Han, 2015). In the NAM, PA is considered a key antecedent or a precursor to the development of personal norms (Schwartz, 1977). In essence, it involves recognizing the potential negative outcomes that may affect things they value, such as their possessions, goals, or even broader environmental issues. According to Stern (2000), the awareness individuals possess about the detrimental environmental effects plays a crucial role in influencing their environmentally friendly decisions and behaviors. For example, in the context of a marine destination, environmentally aware tourists might understand that neglecting to recycle can result in increased waste in landfills, ultimately harming the environment. In this aspect, PA serves as a motivational factor because it highlights the personal and broader consequences of not engaging in eco-friendly behaviors. As Panwanitdumrong and Chen (2021) noted, PA prompts individuals to consider how their actions impact not only themselves but also the environment, particularly the marine ecosystems.

Complementing PA, the cognitive image of sustainable behaviors plays a vital role in shaping tourists' pro-environmental intentions and actions within a marine destination (de Lima Pereira et al., 2021). Tourists with a favorable cognitive image of sustainable behaviors view themselves as conscientious and environmentally mindful visitors (Wattanacharoensil et al., 2024). They comprehend that their conduct is not only noticeable to others but also directly influences the cherished marine environment. This positive self-perception motivates them to align their behavior with their values and ideals. For instance, such tourists may take proactive steps, including using reusable items to reduce single-use plastic waste or actively participating in beach cleanups and marine conservation programs to demonstrate their commitment to preserving the marine ecosystem. Furthermore, they support businesses that embrace sustainability practices, thereby contributing to the overall sustainability efforts of the community. In doing so, they not only fulfill their own desire for a positive self-image but also inspire others to follow suit, fostering a culture of environmental responsibility and sustainable tourism in the marine destination. Within this context, PA and the cognitive image of sustainable behaviors undeniably emerge as significant cognitive catalysts for tourists' eco-friendly behaviors and their support for sustainable initiatives when visiting a marine tourism destination.

2.3 Affective influences toward sustainable behaviors and activities

Affect, including feelings and emotions, has been extensively studied in the fields of marketing, consumer behavior, and hospitality and tourism (Han et al., 2020; Yong et al., 2024). In the context of consumption, affect refers to the emotional response that patrons have based on their perceptions of the qualities that make up a particular product or service

performance (Chen et al., 2022). Scholars generally concur that integrating emotional components into a theoretical model designed to explain customer pro-environmental decisions would significantly enhance the model's ability to predict outcomes (Fakfare et al., 2023; Han et al., 2017a; 2017b).

In the realm of tourist behavior, individuals experience a wide range of emotions and feelings when they engage in specific activities. Additionally, individuals anticipate the emotions and feelings they will experience because of their actions, a phenomenon known as "anticipated feelings" (Han & Hwang, 2017). These anticipated feelings can include positive and negative aspects, referred to as "positive anticipated feelings" and "negative anticipated feelings," respectively (Perugini and Bagozzi, 2001). In the context of pro-environmental behavior, positive anticipated feelings often include emotions, such as pride, a sense of self-worth, and increased confidence, as key components (Han et al., 2020), whereas negative anticipated feelings typically involve emotions, such as guilt and remorse (Panwanitdumrong & Chen, 2021).

In marine tourism, where the natural environment, particularly marine ecosystems, plays a pivotal role, understanding how emotions, such as pride and guilt, impact tourists' decisions and actions is crucial. Marine tourism often involves activities, such as snorkeling, diving, boat tours, and coastal visits, which have the potential to impact fragile aquatic ecosystems (Kabil et al., 2021). Anticipated feelings of pride may arise when tourists engage in responsible and sustainable practices that preserve marine environments, whereas anticipated feelings of guilt may emerge when they perceive themselves as contributing to environmental harm (Han et al., 2020). Therefore, by investigating the role of pride and guilt, this study aims to shed light on the emotional underpinnings of tourists' choices and behaviors, ultimately contributing to the promotion of sustainable practices in this specific niche of tourism. Additionally, understanding how these emotions influence WOM communication can have implications for the dissemination of environmentally friendly practices and the overall sustainability of marine tourism destinations (Dimitrovski et al., 2021).

2.5 Normative influences toward sustainable behaviors and activities

Prior research has extensively investigated the impact of normative factors, including social norm (SN) and moral norm (MN), on tourists' pro-responsible behaviors (Rezvani et al., 2017; Wattanacharoensil et al., 2024). MN, synonymous with personal norm, signifies a person's sense of duty and responsibility in engaging in pro-environmental actions pertaining to a particular subject (Han, 2015). As Staub (1978) argued, prosocial behavior often finds its roots in an individual's moral values, culminating in the formation of an MN influenced by their awareness of these behaviors. This MN represents an individual's judgment regarding the ethical appropriateness or inappropriateness of a specific action (Han, 2015; Rezvani et al., 2017) and is rooted in their feeling of responsibility for actions that might result in harm (Stern et al., 1985). Importantly, the NAM has been exploited to clarify the association between MNs and behavioral intentions. This model has been implemented in research endeavors investigating pro-responsible behavior and assessing the impact of normative factors (Han, 2015; Wattanacharoensil et al., 2024).

SN, which has also gained increasing attention in the realm of pro-environmental behavior, wield a substantial influence on shaping individuals' actions, primarily driven by the behaviors and viewpoints of their peers (Han, 2015; Kim & Hwang, 2021). Embedded within the TPB (Ajzen, 1991), SNs serve as a foundational element guiding behavioral intentions. This category of norm is characterized as perceived social pressures that can either encourage or discourage particular behaviors. Insights garnered from social groups provide information about prevalent behaviors or what is deemed the norm, effectively serving as a tool to promote pro-environmental behavior (Kim & Hwang, 2021). As highlighted by Farrow et al. (2017), individuals tend to conform to SNs to align with their social surroundings, avoid potential social disapproval, and enhance their social self-esteem. Distinguishing between SNs and MNs is critical because they are not consistently followed but are instead contingent on specific circumstances (Han et al., 2019).

In the context of marine tourism, normative influences, including social and MNs, can significantly impact tourist eco-friendly behaviors and their promotion of a destination through WOM (Han et al., 2019). For example, within tourist groups, SNs can foster a culture of responsible behavior, encouraging individuals to engage in eco-friendly practices, such as litter reduction, respecting marine life, and using reef-safe sunscreen. Simultaneously, personal MNs can motivate tourists to participate in conservation activities, such as coral reef restoration or supporting local environmental organizations. These normative influences not only shape on-site behaviors but also extend to WOM recommendations, with tourists sharing their positive eco-friendly experiences and promoting sustainable practices to others (Wattanacharoensil et a.., 2024). Moreover, the influence of social and MNs can extend to interactions with marine tourism operators. Individuals may choose operators who have a reputation for sustainable and responsible practices, aligning with their MN and the SN of supporting environmentally conscious businesses.

2.6. Set-theoretic methods applied to marine tourism and environmental preservation

Qualitative comparative analysis (QCA) provides flexibility by allowing for degrees of membership within sets (Ragin, 2008). For instance, individuals with 100% cognitive, affective, and normative influences are fully within the set, whereas those with zero influences are entirely outside it (Wattanacharoensil et al., 2023). Those with 50%–100% influence are more inside the set, and the opposite applies to those with less than 50% influence. This approach is referred to fsQCA (Castro & Sharma, 2011). By applying these set-theoretic methods, our study offers valuable insights into how cognitive, affective, and normative factors relate to tourists' intentions for eco-friendly behaviors and WOM promotion in the context of marine tourism.

In this study, our focus is on tourists' intentions for eco-friendly behaviors and WOM intention when visiting a marine tourism destination. We consider various influencing conditions, such as cognitive, affective, and normative factors, to determine which combinations lead to high intentions. We analyze six causal conditions: PA, perception of sustainable behaviors, anticipated feelings of pride and guilt, and social and MNs, each explored across cognitive, affective, and normative dimensions. Winning

configurations are those in which majority of tourists with specific combinations of these influences exhibit high intentions.

In this research, set-theoretic approaches are preferred over traditional analysis, such as path analysis, due to their ability to capture the complex interplay of multiple causal conditions (Schneider & Wagemann, 2012). fsQCA's focus on identifying winning configurations of conditions that are sufficient to produce the desired outcome provides a comprehensive viewpoint that aligns with the multifaceted nature of human decision-making (Ragin, 2008; Manosuthi et al., 2024). The method's flexibility allows us to account for degrees of influence within sets, offering a more realistic portrayal of the intricate processes underlying tourists' intentions (Ragin, 2008). Additionally, as Wattanacharoensil et al. (2023) stated, including both configuration and net effects allows for a comprehensive understanding of the complex interplay between various causal conditions and their ultimate impact on tourists' intentions. It enables researchers to identify not only which factors are most conducive to high intentions but also to gauge the overall strength and significance of these combined effects. This holistic approach provides valuable insights into the underlying mechanisms driving tourists' sustainable behavior in marine tourism settings. Drawing on existing literature and the set-theoretic approach, we propose the following hypotheses:

Hypothesis 1: Affective factors have a significant effect on tourist INT at destinations.
Hypothesis 2: Affective factors have a significant effect on tourist WOM intention.
Hypothesis 3: Cognitive factors have a significant effect on tourist INT at destinations.
Hypothesis 4: Cognitive factors have a significant effect on tourist WOM intention.
Hypothesis 5: Norm factors have a significant effect on tourist INT at destinations.
Hypothesis 6: Norm factors have a significant effect on tourist WOM intention.
Hypothesis 7: Affective, cognitive, and norm factors have an optimum combination effect on tourist INT at destinations.
Hypothesis 8: Affective, cognitive, and norm factors have an optimum combination effect on tourist WOM intention.

Insert Figure 1

2.7 Necessary condition analysis

NCA represents an innovative approach that uses necessity logic to identify critical conditions that must be met to achieve a desired outcome. As elaborated by Dul (2022), the presence of these necessary conditions is crucial for the desired outcome to be realized. However, the mere existence of these conditions does not ensure success. In any situation or configuration that leads to the desired outcome(s), all these necessary conditions must be fulfilled simultaneously (Meeprom et al., 2023). These necessary conditions are commonly referred to as "must-have" factors, as articulated by Richter et al. (2020).

By contrast, the conventional approach within the field of marine tourism destinations typically involves using symmetric quantitative methods, such as net-effect or

path analysis, which operate based on sufficient logic. These methods calculate the overall effects of antecedents to explain how independent variables influence the outcome variable. Hauff et al. (2021) labeled these antecedents, which have a significant impact on the outcome variable but are not mandatory, as "nice-to-have" components. To illustrate, consider the case where certain factors, such as anticipated feeling of pride (AP) and anticipated feeling of guilt (AG), may be necessary conditions but not always sufficient conditions for INT in marine tourism destinations. Conversely, the favorable impact of MN on the tourists' WOM may only become evident when tourists acknowledge this specific condition. Moreover, the essence of necessity logic differs significantly from sufficiency logic in that alternative factors cannot replace specific dimensions when they are not met or present. Dul (2016) has elucidated necessity logic through NCA by formulating hypotheses, such as X is a requisite for Y, which can be simplified as Y cannot come into existence if X is absent. Considering these arguments, we propose the following hypotheses within the context of conservation and sustainability activities in marine tourism destinations:

Hypothesis 9: At least one variable of the cognitive, affective, and normative factors is necessary for tourist INT at destinations.

Hypothesis 10: At least one variable of the cognitive, affective, and normative factors is necessary for tourist WOM intention.

3. Research methods

3.1. Measurement development

The eight constructs in this study were assessed using measurement items that were borrowed from prior research in the fields of environmental ethics, pro-environmental behavior, and tourism. These items were drawn from established sources, such as studies conducted by Ajzen (1991), Han (2015), Schwartz (1977), Stern (2000), and Wattanacharoensil et al. (2024). In particular, this study incorporates elements from the NAM and TPB. It includes variables related to PA, anticipated emotional responses, such as feelings of pride or guilt, SN, and MN. The measurement of PA in this study utilized a set of three items, which were adapted from sources, including Fakfare et al. (2023) and Han (2015). The assessment of anticipated feelings of pride and guilt involved four and three items, respectively, which were adapted from the work of Han et al. (2019). Furthermore, the measurement items for certain fundamental constructs of the TPB, including SN, MN, and INT, were sourced from previous studies conducted by Wattanacharoensil et al. (2024). Additionally, the image of sustainable behaviors and WOM intention were assessed using three and two items, respectively, which were taken from the work of Han et al. (2019). To ensure their relevance to the context of marine tourism and environmental preservation, all these measures were adjusted and organized into seven-point Likert scales. All measurement items are shown in the Appendix.

3.2. Data collection process and sample characteristics

This study collected data with help from an online research company, which has 1.7 million panels in Korea. Similar to other research, such as Kim et al. (2023), the use of an online panel provides access to a large and diverse pool of potential respondents. This vast

pool ensures a wide representation of the target population, increasing the generalizability of the findings. The company sent out an email invitation to their panels using convenience sampling technique. While convenience sampling may not guarantee a perfectly representative sample of the population, efforts were made to mitigate biases and ensure the validity of the data collected. The screening question used in this study (i.e., have you experienced a coastal and marine tourism activity within the last 6 months?) was designed to target individuals with relevant experiences, thereby enhancing the relevance and accuracy of the responses obtained. Moreover, by setting clear screening criteria and ensuring respondents' anonymity, steps were taken to reduce response bias and encourage honest participation. During the nine days in 2023, we concluded the data collection with more than 693 responses. However, we detected some responses that were deemed invalid because of several reasons (e.g., the completion of survey in the relatively short timeframe). After screening the data, a total of 420 responses were found suitable for the fsQCA analysis.

The sample composition was characterized by an even distribution of genders, with 49% being male and 51% being female. On average, the participants were around 39 years old. In terms of their educational background, majority of respondents (61%) held a bachelor's degree, whereas 16% had completed high school, 15% had an associate degree, and 8% had achieved a postgraduate degree. Regarding their marital status, 44.3% of the participants were single, whereas 55.7% were married. In relation to the frequency of coastal/marine activities in the past three years, 41% of respondents engaged in these activities 1–3 times, followed by 4–5 times (33%), 10 times or more (17%), and 6–9 times (9%).

4. Analytical processes and results

This study adopted a multimethod approach to examine the proposed hypotheses, utilizing the cSEM and QCA packages within the R programming environment (Dusa in 2019). Initially, the generalized structured component analysis with measurement errors incorporated ($GSCA_M$) was used to derive scores for eight factors, which include AP, AG, PA, image for sustainable behaviors (ISB), SN, MN, INT, and WOM. As Hwang et al. (2017) pointed out, similar to how factor-based SEM deals with measurement errors, the $GSCA_M$ considers the shared and distinct components of the indicators. The preliminary analysis shows that the proposed model fits well with the data ($\chi 2/df = 2.318$, RMSEA = 0.043, GFI = 0.94, CFI = 0.98, and TLI = 0.97).

Our analysis also reveals that the reliability estimates, including Dijkstra–Henselers rho_A, for all constructs consistently exceeded 0.7. This finding strongly supports the internal consistency of our measurement instruments. Additionally, all factor loadings and average variance extracted values surpassed 0.5, providing robust evidence for the convergent validity of our study. To evaluate discriminant validity, we used the advanced heterotrait–monotrait ratio of correlations, and all results from this assessment were below the widely accepted threshold of 0.85. These findings substantiate that our constructs possess discriminant validity. Subsequently, logistic regression was used to compute membership scores, considering threshold values of 0.05 (indicating full exclusion), 0.5 (signifying maximum uncertainty), and 0.95 (representing full inclusion) for dataset

calibration. This refined dataset was then subjected to sufficient condition analysis (SCA) and NCA to evaluate the significance of each factor through variable- and case-based analysis.

4.1 SCA and NCA results (variable-based analysis)

Following the processes for variable-based analysis recommended by Meeprom et al. (2023) and Wattanacharoensil et al. (2024), this study attempted to identify and categorize study variables into four groups: (1) necessary and sufficient, (2) necessary but insufficient, (3) unnecessary but sufficient, and (4) unnecessary and insufficient. The integration of six predictors from the NAM and TPB factors into our SCA and NCA models is illustrated in Tables 1 and 2. Our hypotheses focused on these individual determinants, aiming to ascertain whether they functioned as adequate conditions for fostering environmentally friendly behaviors (BI) and/or WOM intention, which constituted the primary objectives of our study.

Insert Table 1 & 2

In our joint analysis of SCA and NCA, as displayed in Table 3, an intriguing discovery emerged. SN and MN were identified as sufficient and necessary conditions for BI and WOM intentions. These results imply that tourists who are influenced by SN and MN not only exhibit a higher likelihood of expressing intentions for eco-friendly behaviors and engaging in WOM promotions when visiting marine tourism destinations, but these norms are also fundamental factors for the occurrence of such intentions/behaviors. The finding that PA is a sufficient and necessary condition for WOM suggests that when individuals are aware of specific issues or problems about marine tourism, they are not only more inclined to engage in WOM but also that such awareness is a fundamental prerequisite for WOM to occur. In essence, it implies that raising awareness about certain issues in a marine destination is a critical driver for WOM actions related to those problems. By contrast, the analysis also revealed insights into AP and ISB in the context of marine tourism. While AP and ISB were identified as necessary conditions for BI and WOM, they were found to be insufficient on their own to ensure a significant increase in BI and WOM. In simpler terms, having anticipated feelings of pride and maintaining a positive self-image of sustainable behaviors is undeniably important, but these emotions alone are insufficient to guarantee a substantial rise in eco-friendly intentions and WOM actions. Last, the surprising discovery is the role of AG. AG was found to be unnecessary and insufficient for BI and WOM in the context of marine tourism. This finding implies that the anticipated feeling of guilt does not significantly motivate individuals to intend to engage in eco-friendly behaviors or to share their experiences and recommendations with others within the marine tourism context. In general, H9–H10 were partially supported. Detailed discussions are further provided in the implication section.

Insert Table 3

4.2 Multiple NCA results (case-based analysis)

In the case-based analysis, single and multiple necessary conditions were examined to identify their impact for positive and negative outcomes. We established specific threshold values for inclN, RoN, and CovN at 0.9, 0.65, and 0.5, respectively. These evaluations were based on SUIN (sufficient but unnecessary part of a factor that is insufficient but necessary for an outcome) conditions. Next, SCA was conducted to determine the optimal combination of factors that can effectively explain the occurrence of BI and WOM. We analyzed high and low outcomes, represented as BI, ~BI, WOM, and ~WOM, to examine carefully any potential adverse effects of the simultaneous subset relationship. The results from the NCA revealed that PA, SN, and MN are identified as single necessary conditions for achieving the desired outcomes. In other words, the absence of any of these factors ensures the absence of BI and WOM. While the remaining factor was not identified as a single necessary condition on its own, we discovered that combining this single unnecessary condition with others could sufficiently create a necessary condition for BI and WOM. Applying the concept of SUIN condition, we found three possible necessary conditions: AP*MN, PA*MN, and ISB*MN. As a result, we can logically deduce the presence of three single necessary conditions (PA, SN, MN) and three multiple necessary conditions (AP*MN, PA*MN, ISB*MN) essential for attaining the BI and WOM in the context of marine tourism and environmental preservation. These findings are summarized in Table 4.

Insert Table 4

4.3 Hypothesis testing through the set-theoretic approach

To enhance the reliability of our findings, we conducted an evaluation of model fit and research hypotheses. This assessment involved examining the alignment between the empirical solutions derived from fsQCA and the presence or absence of the proposed theory, as well as the occurrence or nonoccurrence of the outcomes. We relied on three critical parameters for this assessment: sufficiency inclusion (inclS), proportional reduction in inconsistency (PRI), and raw coverage (covS).

Table 5 provides a comprehensive overview of the outcomes of Hypotheses 1–8. All sufficiency indices exceeded the minimum threshold values, signifying that all solutions derived from the fsQCA are not only sufficient but also robust across the training and testing datasets. H1 and H2 were closely examined, revealing the disjunction of AP, which accounted for a substantial 90.8% and 89.3% explanation, respectively. Concerning H3 and H4, two distinct combinations surfaced as key ingredients: the disjunction of PA (recipe 1) and ISB (recipe 2). These recipes collectively accounted for 90.6% add 89.2% for the occurrence of BI and WOM, respectively. For H4 and H5, the disjunction of MN was found for the existence of BI and WOM. This distinct recipe sufficiently explains 99.3% with a PRI score of 96.8% for BI and 97% with a PRI score of 88.1% for WOM. Finally, H7 and H8 contain two similar solutions: AP*AG*PA*ISB*MN (recipe 1) and AP*PA*ISB*SN*MN (recipe 2). Collectively, these solutions sufficiently explain 97.6% with a PRI score of 97.1% for the existence of BI and 96.5% with a PRI score of 95.9% for

the existence of WOM. A summary of the important conditions based on the set-theoretic approach is presented in Table 5.

Insert Table 5

To validate our findings and research hypotheses, we conducted a formal set-theoretic evaluation using fsQCA. This rigorous approach uncovers the intersections among the empirical solution, theory, and outcomes, resulting in eight distinct combinations: Model*Theory*INT/WOM (CML), Model*~Theory*INT/WOM (CLL), ~Model*Theory*INT/WOM (UML), ~Model*~Theory*INT/WOM (ULL), Model*Theory*~INT/~WOM (IML), Model*~Theory*~INT/~WOM (ILL), ~Mode*lTheory*~INT/~WOM (CML), and ~Model*~Theory*~INT/~WOM (CLL). Alongside these combinations, we provided their respective percentages in relation to the total number of cases (CT1) and their percentages relative to the total number of conditional cases, whether Y or ~Y (CT2). This comprehensive analysis strengthens the credibility of our results and research hypotheses. The detailed discussion is provided in the implication section.

Insert Table 6

5. Discussion and implications for theory and practice

This study sought to uncover the crucial factors that promote touirsts' BI and WOM when they embark on vacations to marine tourism destinations, using a combination of variable and case-based analyses. Although academics and practitioners have dedicated substantial attention to this matter, the need to foster responsible behavior among business entities and tourists remains imperative. To advance our comprehension of the elements that shape tourists' embrace of eco-friendly behaviors and WOM intention during their trips to marine tourism destinations, this study suggests dividing six elements into three discrete categories: cognitive (PA, ISB), affective (AG, AP), and normative influences (MN, SN). Through the application of sufficiency and necessity logic, the findings offer substantial theoretical implications for researchers in the field of tourism. For example, this study investigates the practical use of NAM and TPB constructs, specifically focusing on elements, such as PA, AP, AG, AN, and MN. By leveraging the insights from these concentrated concepts, as previously established by Han (2015), Han et al. (2019), Stern (2000), and Wattanacharoensil et al. (2024), this research introduces a more comprehensive and robust framework for effectively predicting tourists' pro-responsible intentions in the marine tourism context. Additionally, the NCA approach used in this research extends beyond the mere identification of "important" and/or "should-have" factors (Dul, 2016). Instead, it focuses on pinpointing the "must-have" factors that genuinely contribute to tourists' eco-friendly behaviors and their intention to encourage others to engage in environmentally sustainable activities.

Based on variable-based analysis, through the analysis of SCA and NCA, a comprehensive range of conditions that lead the manifestation and increment of BI and WOM emerges. Among these conditions, AP, ISB, SN, and MN were found to be prerequisites for the occurrence of BI and WOM, either in kind or in degrees. By contrast,

PA only appears to be a precondition for WOM to some extent. The study's findings partly align with the empirical and conceptual literature concerning tourists' perceptions of environmental sustainability (Manosuthi et al., 2022; Wattanacharoensil et al., 2024), although in different research contexts. Particularly, AP, ISB, and MN are necessary in kind for the existence of BI, indicating the importance of giving strong emphasis to these elements; however, the BI of tourists is triggered when the tourists' level of SN reaches the trigger point of 0.33. To facilitate WOM regarding environmentally sustainable activities at marine destinations, SN and MN are indispensable, signifying their significant influence on encouraging others to engage in such activities. In addition, AP, PA, and ISB are essential factors, but they are necessary in degree. WOM from tourists becomes enabled when AP (0.183), PA (0.347), and ISB (0.228) reach these specific trigger points. These fresh perspectives form a solid basis for gaining a deeper understanding of the dynamics of tourists' BI and WOM (Han, 2015; Han et al., 2019). They also carry substantial implications for the advancement of sustainable tourism practices in marine destinations.

By conducting a combined analysis of NCA and SCA (Meeprom et al., 2023), we uncover four comprehensive conditions that shed light on the emergence and enhancement of BI and WOM: necessary and sufficient, necessary but insufficient, unnecessary but sufficient, and unnecessary and insufficient conditions. SN and MN were classified as necessary and sufficient, highlighting their pivotal roles in the realization of BI and WOM. Within the context of marine tourism destinations, the necessary and sufficient condition signifies that for BI and WOM to occur, SN and MN must be present and capable of independently influencing these sustainable behaviors and intentions. This assertion aligns with the findings of Han et al. (2019) and Wattanacharoensil et al. (2024), who emphasize the significance of normative influences in shaping environmentally conscious actions among tourists. Specifically, SN has the power to shape tourists' perceptions by defining what is socially expected and acceptable in terms of sustainable practices. By contrast, MN guides tourists' sustainable behavior by drawing on moral considerations and personal values, which become particularly prominent when they are exploring a marine destination.

Despite their impacts on BI and WOM, AP and ISB are considered insufficient yet necessary conditions. Tourists who expect to feel pride and have a positive self-image regarding sustainable behaviors when attending marine tourism activities, such as diving, fishing, and snorkeling, are more likely to recognize the importance of AP and ISB in their decision-making process. These factors become pivotal influencers in tourists' responsible decisions, shaping their overall perception and commitment to environmentally responsible activities and experiences. These findings offer valuable insights, particularly regarding the essential elements in environmental sustainability, thereby making a significant contribution to the body of sustainable tourism literature (Fakfare & Wattanacharoensil, 2023; Merli et al., 2019). In addition, the contrast effect of PA toward BI and WOM was found. While PA may seem unnecessary and insufficient as a condition for BI, it has been found to be necessary and sufficient for WOM. This finding highlights the multifaceted influence of PA in tourists' decision-making and sustainable actions, thus verifying the dynamic roles of this factor in shaping the marine tourism industry and fostering environmental stewardship.

The results of the case-based analysis, using a combination of fsQCA and NCA, have unveiled single and multiple necessary conditions for the outcome under investigation.

Among the identified conditions, PA, SN, and MN were found to be single necessary conditions, whereas the remaining factors were not determined to be necessary conditions. This finding suggests that a combination of PA, SN, and MN or potentially other unnecessary factors could be simultaneously considered for the outcome to be achieved (Dinh et al., 2023). Furthermore, the study considered the SUIN condition, and it revealed the existence of three possible multiple necessary conditions. These multiple necessary conditions are (1) AP*MN, (2) PA*MN, and (3) ISB*MN. Given the first solution, the combination of AP and MN, which represents a mixed configuration between affective and normative factors, can significantly enhance BI and WOM in the context of environmental preservation at marine tourism sites. This finding implies that the interplay between these two factors, serving as a mandatory necessity, plays a critical role in positively influencing BI and WOM. As Han et al. (2017b) and Wattanacharoensil et al. (2024) asserted, the individual or combined impact of affective and normative influences can be instrumental in fostering positive actions related to environmental preservation. The results of this multiple NCA strengthen the prior research outcomes.

Considering the second multiple necessary condition (PA*MN), which involves the presence of PA and MN facilitating the realization of BI and WOM, emphasizes the importance of recognizing that individuals are more likely to engage in desired behaviors when they are not only aware of the problem at hand but also motivated by a MN. In other words, this condition suggests that tourists are more inclined to act and talk about a particular issue or behavior when they understand the problem and feel a moral obligation or sense of responsibility to address it. This condition underscores the idea that addressing environmentally responsible intentions/behaviors often requires not just awareness but also a strong sense of moral duty, which can drive individuals to act and influence others positively (Han et al., 2019; Kiatkawsin & Han, 2017; Stern, 2000). Regarding the third solution (ISB*MN), the presence of image of sustainable behaviors, coupled with MN, collectively facilitates the existence of BI and WOM. This result underscores that to promote tourists' sustainable behaviors and their communication (WOM), shaping positive perceptions of self-image toward sustainable behaviors must be focused on, and a MN that encourages responsible actions must be fostered. When individuals see sustainable behaviors as attractive and feel a moral obligation to adopt them, their intentions to engage in these behaviors and share their experiences with others are enhanced. Similar to previous research (e.g., Wattanacharoensil et al., 2024), this solution emphasizes the role of cognitive and normative influences in driving sustainability initiatives and spreading awareness about them.

By using a formal set-theoretic approach to investigate alternative pathways for substantiating research hypotheses (Schneider & Wagemann, 2012), this research further enhances knowledge and methodology within the field. The verification of the eight possible solutions as previously mentioned confirms the validity of the fsQCA model. Concerning the hypothesis results, an analysis of H1 and H2 using logical minimization with Boolean logic revealed fascinating discoveries. The results align with our expectations and confirm the relationship (AG*AP) when the proposed model is in accordance with the established theory (Model*Theory*BI/WOM). This discovery offers compelling evidence for the effectiveness of affective influence within the NAM framework for predicting

tourists' BI and WOM in the context of a marine tourism destination. These findings are consistent with the outcomes of Han et al. (2020) and Wattanacharoensil et al. (2024), thereby offering support for H1 and H2. Nonetheless, when identifying solutions based on the "covered least likely" (CLL) cases (Model*~Theory*BI/WOM), we unexpectedly found one solution (~AG*AP) that was not anticipated. This finding implies that instances where the expected relationships between AG, AP, and outcomes (BI/WOM) do not hold true occur. In other words, the absence of guilt anticipation might occur in specific cases, challenging the previously assumed link between affective influence and BI/WOM. This result raises intriguing questions about the affective factors influencing tourists' responsible intentions/behaviors and highlights the complexity of tourist emotions and decision-making processes, although the number of cases in the intersection is not high. Further investigation into the specific conditions and variables leading to this unexpected outcome could provide valuable insights into the nuanced nature of affective influence and its impact on behavior and decision-making. We further investigate the model based on the UML, ULL, IML, ILL, cML and CLL cases. However, the solutions that emerged were associated with very low percentages or in some cases, no instances at the intersection between the established theory and the proposed models (Table 6). Therefore, the results further emphasize the significance of affective factors under the NAM framework in the context of environmental preservation and tourism (Han (2014; Onwezen et al., 2013).

Next, by using a Boolean expression, we derive two solutions comprising the disjunction of PA and ISB in achieving H3 and H4. When the proposed model aligns with the established theory (Model * Theory * BI/WOM), the results substantiate our expectations by confirming the relationship between the combined influence of cognitive factors (PA*ISB) on BI/WOM (Fakfare et al., 2023; Wattanacharoensil et al., 2024). However, when pinpointing solutions based on the CLL cases (Model * ~Theory * BI/WOM). Two unexpected solutions emerged: ~ISB*PA + ISB*~PA. The first solution implies that in some instances where the established theory is not followed, PA is influential, but a positive image of sustainable behaviors is not. The second solution suggests that in other cases where the theory is not followed, a positive ISB plays a role, but PA does not. These unexpected solutions suggest that instances where one of the variables (ISB or PA) is effective on its own occur, even when the established theory is not fully applicable. The combination of these variables is not necessary in these specific cases, which may warrant further investigation to understand when and why these situations occur. The evaluation of other possible solutions under the set-theoretic analysis shows few to no cases, thus validating the significance of cognitive factors (PA*ISB) in combined in influencing BI/WOM in the context of marine tourism destination.

Hypotheses H5 and H6 were further examined in the study, and the results reveal that a single solution (MN*SN) exists when comparing the proposed model with the established theory. This discovery aligns with the research conducted by Han et al. (2019) and Kim and Hwang (2020). The results suggest that the interaction between MN and SN plays a crucial role in influencing how tourists engage in sustainable behaviors and encouraging others to adopt responsible behaviors in this context. Nonetheless, when exploring the solutions based on the CLL cases (Model*~Theory*BI/WOM), one unexpected result was determined (MN*~SN). This outcome implies that the presence of

MN in the absence of concurrent SN in these cases may indicate that marine tourism tourists are motivated to engage in sustainable behaviors primarily due to their personal values and ethical considerations. They may have a strong intention to engage in such behaviors because they genuinely believe in their importance, regardless of what SNs dictate. This intention could result in a high behavioral and WOM intentions for sustainability in marine tourism. Although the number of cases with this unexpected result might be limited, these findings offer valuable insights into the role of personal values and ethics in promoting sustainable behaviors in marine tourism. Further research and exploration are necessary to understand the broader implications and potential conditions that lead to these results. Additionally, we conducted an analysis involving combinations such as ~Model*Theory*BI/WOM and ~Model*~Theory*BI/WOM, using data from UML and ULL cases. However, we observed that very low percentage had overlapping characteristics. As a result, the fsQCA model for assessing normative factors (MN*SN) was confirmed to be valid.

To determine the most effective combinations of cognitive, affective, and normative factors that influence BI and WOM, H7 and H8 were investigated. By applying a Boolean expression, we identified two solutions: AP*AG*PA*ISB*MN + AP*PA*ISB*SN*MN. When we compared our proposed model to the established theory (Model*Theory*BI/WOM), the results confirmed our initial expectations by validating the relationship between these factors. Notably, when we compared the established theory with the UML cases (~Model * Theory), several possible solutions were discovered (in Table 6). These results indicate that multiple valid explanations for the relationship between the established theory and the UML cases exist, although the number of cases is not high. These explanations deviate from our original theoretical expectations. This difference underscores the intricate and multifaceted nature of the factors that influence BI and WOM. Consequently, a more thorough and comprehensive analysis is needed to identify which of these solutions best represents the underlying mechanisms and to enhance our understanding of these complex dynamics. This discovery not only challenges our initial assumptions but also paves the way for new avenues of research and exploration in this field. Other findings of the formal set-theoretic analysis, following the approach by Schneider and Wagemann (2012), did not yield a significant proportion of results. Thus, the solutions identified through the optimal recipes can be considered valid and reliable. Our findings not only specify the specific individual or combined cognitive, affective, and normative variables that are either sufficient or necessary for influencing BI and WOM, but they also offer valuable support for existing theories, such as NAM and TPB (Han, 2015; Han et al., 2019; Kim & Hwang, 2020; Wattanacharoensil et al., 2024). These results emphasize the critical role these factors play in promoting environmentally friendly behaviors among tourists during their visits to marine tourism destinations.

From a practical perspective, destination marketers and policymakers in marine tourism destinations should strategically address each factor influencing tourist eco-friendly behaviors and their promotion of a destination through WOM to maximize the effectiveness of the desired outcomes outlined in our proposed model. The insights obtained from SCA and NCA can help pinpoint not only the elements that boost tourists' intentions to engage in sustainable activities but also identify the "must-have" factors that deserve primary

attention. For instance, to achieve a significant level of BI, destination managers and policymakers should focus on achieving the following percentage improvements in the affective, cognitive, and normative factors: an 18.3% increase in AP, a 22.8% increase in ISB, a 33% increase in SN, and a 25.2% increase in MN. To enhance WOM intention, additional attention must be given to the PA in the development process. Effectively promoting these factors can encourage stronger commitment to BI and WOM, ultimately leading to increased environmental sustainability at marine destinations.

Furthermore, a significant gap exists in our understanding of how cognitive, affective, and normative determinants, individually and in combination, influence tourists' behaviors/intentions regarding environmental sustainability at marine destinations. Notably, our study has identified four variables, i.e., AP*ISB**PA*MN, that consistently appeared in both optimal fsQCA configurations, with AG and SN appearing in at least one configuration. These findings highlight the critical roles these variables play in comprehending and potentially shaping tourists' behaviors. Destination managers should consider these factors when developing strategies to promote environmental sustainability. For example, they can design marine protection campaigns or travel awareness programs that leverage the identified variables, i.e., AP, ISB, PA, and MN, to encourage tourists to adopt eco-conscious practices. Moreover, collaboration with educational institutions and media can help create impactful movements that emphasize these key variables, using compelling narratives and visuals to highlight the benefits of sustainable practices.

6. Limitations and future research

This study has certain limitations to be addressed. First, this research is primarily rooted in the utilization of an online survey methodology. While online surveys have become increasingly popular in recent years, they cannot capture tourists' immediate reactions during their consumption of a product or service at a destination (Kiatkawsin & Han, 2017). To assess their direct and immediate responses better, we suggest considering the use of a field survey methodology for future research. Second, although the findings of case-based analysis (CLL) reveal emerging and unexpected solutions resulting from the comparison of the established theory and the proposed model, inherent limitations in the generalizability of these results may exist, given the specific context and limited number of the cases analyzed. While the insights derived from CLL are unquestionably valuable, they may warrant further scrutiny and replication in diverse settings to validate their broader applicability and their influence on desired outcomes. Finally, determinants for sustainable intentions/behaviors at marine destinations adopted in this research are primarily based on the NAM and TPB theory. Future research is encouraged to examine other relevant constructs, such as perceived benefits and costs, technology and information access, and education and awareness programs that may play a substantial role in shaping sustainable intentions and behaviors at these destinations.

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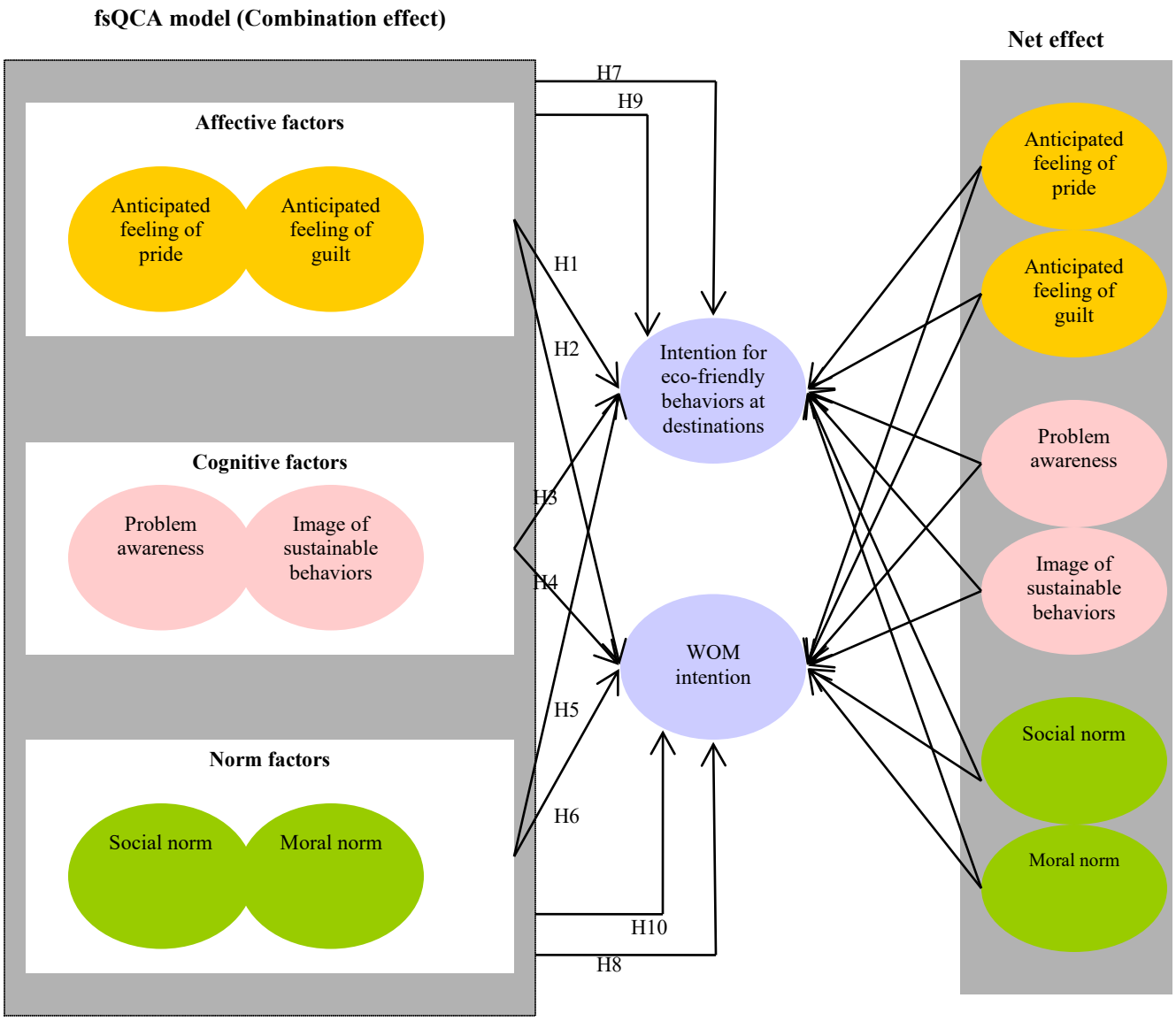

Figure 1. Hypothesized conceptual framework

Figure 1 Alt Text: The hypothesized conceptual framework depicts the relationships among various predictors, including affective, cognitive, and norm factors, as well as outcomes such as intention for eco-friendly behaviors at destinations and word-of-mouth intention. Models for both net-effect and fsQCA analyses have been proposed.

Table 1: Sufficient condition analysis (net-effect)

Outcome	Predictors	Coefficients	p-value	Sufficient?+
BI	AP	0.001	0.979	No
	AG	-0.022	0.138	No
	PA	0.041	0.322	No
	ISB	0.034	0.43	No
	SN	0.105	0.015	**Yes**
	MN	0.660	0.001	**Yes**
WOM	AP	-0.003	0.946	No
	AG	-0.027	0.248	No
	PA	0.102	0.03	**Yes**
	ISB	-0.003	0.944	No
	SN	0.23	0.001	**Yes**
	MN	0.604	0.001	**Yes**

Note: AP = Anticipated feeling of pride, AG = Anticipated feeling of guilt, PA = Problem awareness, ISB = Image of sustainable behaviors, SN = Social norm, MN = Moral norm, BI = Intention for eco-friendly behaviors at destinations, WOM = tourists' word-of-mouth intention, + Sufficient factor can be interpreted as being sufficient but unnecessary for increasing the likelihood or level of the outcome, R-square (BI = 55.2%, WOM = 49.4%)

Table 2: Single necessary condition analysis (variable-based)

BI	**CE-FDH**	**p-value**	**CR-FHD**	**p-value**	**Triggered level**	**Necessary?**
AP	0.10	0.046	0.08	0.038	0.183	In kind
AG	0.00	1.000	0.00	1.000	-	No
PA	0.00	1.000	0.00	1.000	-	No
ISB	0.15	0.025	0.13	0.015	0.228	In kind
SN	0.00	0.303	0.00	0.304	0.330	In degree
MN	0.33	0.000	0.28	0.000	0.252	In kind
WOM	**CE-FDH**	**p-value**	**CR-FHD**	**p-value**	**Triggered level**	**Necessary?**
AP	0.06	0.140	0.04	0.143	0.183	In degree
AG	0.00	1.00	0.00	1.000	-	No
PA	0.01	0.610	0.00	0.649	0.347	In degree
ISB	0.08	0.103	0.06	0.092	0.228	In degree
SN	0.01	0.084	0.00	0.236	0.039	In kind
MN	0.32	0.000	0.32	0.000	0.227	In kind

Note: CE-FDH = Ceiling Envelopment with Free Disposal Hull, CR-FDH = Ceiling Regression with Free Disposal Hull, AP = Anticipated feeling of pride, AG = Anticipated feeling of guilt, PA = Problem awareness, ISB = Image of sustainable behaviors, SN = Social norm, MN = Moral norm, BI = Intention for eco-friendly behaviors at destinations, WOM = tourists' word-of-mouth intention

Table 3: The four exhaustive conditions of the occurrence and increment of outcomes

Condition (BI)	**Sufficient***	**Insufficient**
Necessary	SN, MN	AP, ISB
Unnecessary	-	AG, PA
Condition (WOM)	**Sufficient***	**Insufficient**
Necessary	SN, MN, PA	AP, ISB
Unnecessary	-	AG

Note: AP = Anticipated feeling of pride, AG = Anticipated feeling of guilt, PA = Problem awareness, ISB = Image of sustainable behaviors, SN = Social norm, MN = Moral norm, BI = Intention for eco-friendly behaviors at destinations, WOM = tourists' word-of-mouth intention, *Sufficient factor can be interpreted as being sufficient but unnecessary for increasing the likelihood or level of the outcome, other things being equal

Table 4: Single and multiple necessary condition analysis

Condition	**Necessary Condition Analysis**						
	Outcome = BI			**Outcome = ~BI**			**Necessary?**
	inclN	RoN	covN	inclN	RoN	covN	
AP	0.936	0.545	0.908	0.908	0.114	0.139	No
AG	0.781	0.824	0.924	0.924	0.297	0.161	No
PA	0.928	0.786	0.952	0.952	0.17	0.141	Yes
ISB	0.932	0.568	0.91	0.91	0.121	0.139	No
SN	0.909	0.843	0.961	0.961	0.197	0.141	Yes
MN	0.968	0.773	0.96	0.96	0.136	0.136	Yes
AP*MN	0.913	0.858	0.965	0.142	0.008	0.924	Yes^{SUIN}
PA*MN	0.911	0.879	0.970	0.143	0.008	0.925	Yes^{SUIN}
ISB*MN	0.909	0.866	0.966	0.143	0.008	0.923	Yes^{SUIN}
Condition	**Outcome = WOM**			**Outcome = ~WOM**			**Necessary?**
	inclN	RoN	covN	inclN	RoN	covN	
AP	0.937	0.509	0.893	0.982	0.116	0.155	No
AG	0.783	0.798	0.910	0.915	0.301	0.176	No
PA	0.931	0.744	0.940	0.914	0.172	0.152	Yes
ISB	0.932	0.531	0.895	0.981	0.123	0.156	No
SN	0.917	0.820	0.957	0.887	0.199	0.152	Yes
MN	0.967	0.705	0.943	0.916	0.138	0.148	Yes
AP*MN	0.914	0.807	0.950	0.156	0.019	0.906	Yes^{SUIN}
PA*MN	0.915	0.838	0.958	0.155	0.018	0.898	Yes^{SUIN}
ISB*MN	0.909	0.813	0.950	0.156	0.019	0.906	Yes^{SUIN}

Note: inclN = Inclusion of Necessity, RoN = Relevance of Necessity, covN = Coverage of Necessity, SUIN = Necessary disjunctions of SUIN (Sufficient but Unnecessary part of a factor that is Insufficient but Necessary) conditions, AP = Anticipated feeling of pride, AG = Anticipated feeling of guilt, PA = Problem awareness, ISB = Image of sustainable behaviors, SN = Social norm, MN = Moral norm, BI = Intention for eco-friendly behaviors at destinations, WOM = tourists' word-of-mouth intention

Table 5: The solution of hypotheses

	H1	H2	H3			H4		
Variable	Recipe 1	Recipe 1	Recipe 1	Recipe 2	Full model	Recipe 1	Recipe 2	Full model
AP	●	●						
AG								
PA			●		Recipe 1 + Recipe 2	●		Recipe 1 + Recipe 2
ISB				●			●	
SN								
MN								
Model's Predictive Power								
inclS	0.908	0.893	0.952	0.910	0.906	0.940	0.895	0.892
PRI	0.894	0.878	0.945	0.897	0.893	0.930	0.879	0.876
covS	0.936	0.937	0.928	0.932	0.985	0.931	0.932	0.986

	H5	H6	H7			H8		
Variable	Recipe 1	Recipe 1	Recipe 1	Recipe 2	Full model	Recipe 1	Recipe 2	Full model
AP			●	●	Recipe 1 + Recipe 2	●	●	Recipe 1 + Recipe 2
AG			●			●		
PA			●	●		●	●	
ISB			●	●		●	●	
SN				●			●	
MN	●	●	●	●		●	●	
Model's Predictive Power								
inclS	0.960	0.943	0.976	0.983	0.976	0.965	0.976	0.965
PRI	0.954	0.934	0.983	0.980	0.971	0.958	0.971	0.959
covS	0.968	0.967	0.714	0.792	0.830	0.718	0.800	0.718

inclS = Inclusion of Sufficiency, PRI = Proportional Reduction in Inconsistency, covS = Raw Coverage, ● = Core condition, ○ = Absence, Blank = Don't care

Table 6: A summary of the conditions based on the set-theoretic approach

Outcome		H1	H2	H3	H4
Y	Model	AP	AP	PA + ISB	PA + ISB
	Theory	AG*AP	AG*AP	PA*ISB	PA*ISB
	Model * Theory (CML)	AG*AP	AG*AP	ISB*PA	ISB*PA
	inclS	0.908	0.912	0.960	0.947
	PRI	0.894	0.896	0.953	0.938
	covS	0.936	0.771	0.874	0.878
	CT1	76.43%	75.48%	89.52%	89.05%
	CT2	79.46%	79.45%	93.07%	93.73%
	Model * ~Theory (CLL)	~AG*AP	~AG*AP	~ISB*PA + ISB*~PA	~ISB*PA + ISB*~PA
	inclS	0.973	0.962	0.964	0.945
	PRI	0.963	0.947	0.936	0.902
	covS	0.292	0.293	0.223	0.222
	CT1	17.38%	17.38%	6.43%	5.95%
	CT2	18.07%	18.3%	6.68%	6.27%
	~Model * Theory (UML)	~A*AG*AP + AG*AP*~P	~A*AG*AP + AG*AP*~P	~AB*ISB*PA + ~AI*ISB*PA + ~AS*ISB*PA + ~BP*ISB*PA + ~IP*ISB*PA + ISB*PA*~PS	~AB*ISB*PA + ~AI*ISB*PA + ~AS*ISB*PA + ~BP*ISB*PA + ~IP*ISB*PA + ISB*PA*~PS
	inclS	0.992	0.993	0.991	0.998
	PRI	0.985	0.986	0.965	0.992
	covS	0.099	0.100	0.548	0.056
	CT1	0%	0%	0%	0%
	CT2	0%	0%	0%	0%
	~Model * ~Theory (ULL)	~A*~AG + ~A*~AP + ~AG*~P + ~AP*~P	~A*~AG + ~A*~AP + ~AG*~P + ~AP*~P	~AB*~ISB + ~AB*~PA + ~AI*~ISB + ~AI*~PA + ~AS*~ISB + ~AS*~PA + ~BP*~ISB + ~BP*~PA + ~IP*~ISB + ~IP*~PA + ~ISB*~PS + ~PA*~PS	~AB*~ISB + ~AB*~PA + ~AI*~ISB + ~AI*~PA + ~AS*~ISB + ~AS*~PA + ~BP*~ISB + ~BP*~PA + ~IP*~ISB + ~IP*~PA + ~ISB*~PS + ~PA*~PS
	inclS	0.978	0.974	0.986	0.970
	PRI	0.960	0.954	0.948	0.888
	covS	0.111	0.113	0.057	0.057
	CT1	2.38%	2.14%	0.24%	0%
	CT2	2.48%	2.26%	0.25%	0%
	Result of model fit	**Good fit**	**Good fit**	**Good fit**	**Good fit**
	Model * Theory (IML)	AG*AP	AG*AP	ISB*PA	ISB*PA
	inclS	0.908	0.912	0.960	0.947
	PRI	0.894	0.896	0.953	0.938
	covS	0.936	0.771	0.874	0.878
	CT1	0%	0%	0%	0%
	CT2	0%	0%	0%	0%
	Model * ~Theory (ILL)	~AG*AP	~AG*AP	~ISB*PA + ISB*~PA	~ISB*PA + ISB*~PA
	inclS	0.973	0.962	0.964	0.945
	PRI	0.963	0.947	0.936	0.902

~Y	covS	0.292	0.293	0.223	0.222
	CT1	0.71%	0.71%	1.19%	1.67%
	CT2	18.75%	14.29%	31.25%	33.33%
	~Model * Theory (cML)	~A*AG*AP + AG*AP*~P	~A*AG*AP + AG*AP*~P	~AB*ISB*PA + ~AI*ISB*PA + ~AS*ISB*PA + ~BP*ISB*PA + ~IP*ISB*PA + ISB*PA*~PS	~AB*ISB*PA + ~AI*ISB*PA + ~AS*ISB*PA + ~BP*ISB*PA + ~IP*ISB*PA + ISB*PA*~PS
	inclS	0.992	0.993	0.964	0.998
	PRI	0.985	0.986	0.936	0.992
	covS	0.099	0.100	0.223	0.056
	CT1	0%	0%	0%	0%
	CT2	0%	0%	0%	0%
	~Model * ~Theory (CLL)	~A*~AG + ~A*~AP + ~AG*~P + ~AP*~P	~A*~AG + ~A*~AP + ~AG*~P + ~AP*~P	~AB*~ISB + ~AB*~PA + ~AI*~ISB + ~AI*~PA + ~AS*~ISB + ~AS*~PA + ~BP*~ISB + ~BP*~PA + ~IP*~ISB + ~IP*~PA + ~ISB*~PS + ~PA*~PS	~AB*~ISB + ~AB*~PA + ~AI*~ISB + ~AI*~PA + ~AS*~ISB + ~AS*~PA + ~BP*~ISB + ~BP*~PA + ~IP*~ISB + ~IP*~PA + ~ISB*~PS + ~PA*~PS
	inclS	0.978	0.974	0.986	0.970
	PRI	0.960	0.954	0.948	0.888
	covS	0.111	0.113	0.057	0.057
	CT1	0%	0.24%	0%	0.24%
	CT2	0%	4.76%	0%	4.76%

Outcome		**H5**	**H6**	**H7**	**H8**
Y	Model	MN	MN	AP*AG*PA*ISB*MN + AP*PA*ISB*SN*MN	AP*AG*PA*ISB*MN + AP*PA*ISB*SN*MN
	Theory	MN*SN	MN*SN	AP*AG*PA*ISB*MN *SN	AP*AG*PA*ISB*MN *SN
	Model * Theory (CML)	MN*SN	MN*SN	AG*AP*ISB*MN*PA + AP*ISB*MN*PA*SN	AG*AP*ISB*MN*PA + AP*ISB*MN*PA*SN
	inclS	0.978	0.969	0.976	0.965
	PRI	0.974	0.964	0.971	0.959
	covS	0.894	0.901	0.830	0.835
	CT1	89.76%	88.81%	86.67%	85.95%
	CT2	93.32%	93.48%	90.1%	90.48%
	Model * ~Theory (CLL)	MN*~SN	MN*~SN	-	-
	inclS	0.978	0.955	0.991	0.965
	PRI	0.952	0.9022	0.966	0.959
	covS	0.209	0.207	0.086	0.835
	CT1	4.52%	4.76%	0%	0%
	CT2	4.7%	5.01%	0%	0%
	~Model * Theory (UML)	~M*MN*SN + MN*~N*SN	~M*MN*SN + MN*~N*SN	AG*AP*~ISB + AG*AP*~PA + ~AP*ISB*PA + ~ISB*MN*SN + ISB*~MN*PA + MN*~PA*SN + ~AG*ISB*PA*~SN	AG*AP*~ISB + AG*AP*~PA + ~AP*ISB*PA + ~ISB*MN*SN + ISB*~MN*PA + MN*~PA*SN + ~AG*ISB*PA*~SN
	inclS	0.993	0.970	0.965	0.948
	PRI	0.968	0.881	0.941	0.912
	covS	0.119	0.118	0.280	0.279

	CT1	0%	0%	9.29%	9.05%
	CT2	0%	0%	9.65%	9.52%
	~Model * ~Theory (ULL)	~M*~MN + ~M*~SN + ~MN*~N + ~N*~SN	~M*~MN + ~M*~SN + ~MN*~N + ~N*~SN	~AG*~ISB*~MN + ~AG*~ISB*~SN + ~AG*~MN*~PA + ~AG*~PA*~SN + ~AP*~ISB*~MN + ~AP*~ISB*~SN + ~AP*~MN*~PA + ~AP*~PA*~SN	~AG*~ISB*~MN + ~AG*~ISB*~SN + ~AG*~MN*~PA + ~AG*~PA*~SN + ~AP*~ISB*~MN + ~AP*~ISB*~SN + ~AP*~MN*~PA + ~AP*~PA*~SN
	inclS	0.937	0.901	0.974	0.951
	PRI	0.778	0.696	0.906	0.829
	covS	0.129	0.126	0.092	0.089
	CT1	1.9%	1.43%	0.24%	0%
	CT2	1.98%	1.5%	0.25%	0%
	Result of model fit	**Good Fit**	**Good Fit**	**Good Fit**	**Good Fit**
~Y	**Model * Theory (IML)**	MN*SN	MN*SN	AG*AP*ISB*MN*PA + AP*ISB*MN*PA*SN	AG*AP*ISB*MN*PA + AP*ISB*MN*PA*SN
	inclS	0.978	0.969	0.976	0.965
	PRI	0.974	0.964	0.971	0.959
	covS	0.894	0.901	0.830	0.835
	CT1	0%	0%	0%	0%
	CT2	0%	0%	0%	0%
	Model * ~Theory (ILL)	MN*~SN	MN*~SN	-	-
	inclS	0.978	0.955	0.991	0.965
	PRI	0.952	0.9022	0.966	0.959
	covS	0.209	0.207	0.086	0.835
	CT1	0.95%	0.71%	0%	0%
	CT2	25%	14.29%	0%	0%
	~Model * Theory (cML)	~M*MN*SN + MN*~N*SN	~M*MN*SN + MN*~N*SN	AG*AP*~ISB + AG*AP*~PA + ~AP*ISB*PA + ~ISB*MN*SN + ISB*~MN*PA + MN*~PA*SN + ~AG*ISB*PA*~SN	AG*AP*~ISB + AG*AP*~PA + ~AP*ISB*PA + ~ISB*MN*SN + ISB*~MN*PA + MN*~PA*SN + ~AG*ISB*PA*~SN
	inclS	0.993	0.970	0.965	0.948
	PRI	0.968	0.881	0.941	0.912
	covS	0.119	0.118	0.280	0.279
	CT1	0%	0%	1.43%	1.67%
	CT2	0%	0%	37.5%	33.33%
	~Model * ~Theory (CLL)	~M*~MN + ~M*~SN + ~MN*~N + ~N*~SN	~M*~MN + ~M*~SN + ~MN*~N + ~N*~SN	~AG*~ISB*~MN + ~AG*~ISB*~SN + ~AG*~MN*~PA + ~AG*~PA*~SN + ~AP*~ISB*~MN + ~AP*~ISB*~SN + ~AP*~MN*~PA + ~AP*~PA*~SN	~AG*~ISB*~MN + ~AG*~ISB*~SN + ~AG*~MN*~PA + ~AG*~PA*~SN + ~AP*~ISB*~MN + ~AP*~ISB*~SN + ~AP*~MN*~PA + ~AP*~PA*~SN
	inclS	0.937	0.901	0.974	0.951
	PRI	0.778	0.696	0.906	0.829
	covS	0.129	0.126	0.092	0.089
	CT1	1.9%	2.38%	0.48%	0.71%
	CT2	50%	47.62%	12.5%	14.29%

Note: CML = Covered Most Likely, CLL = Covered Least Likely, UML = Uncovered Most Likely, ULL = Uncovered Least Likely, IML = Inconsistent Most Likely, ILL = Inconsistent Least Likely, cML = Consistent Most Likely, CLL = Consistent Least

Likely ,CT1 = Cases in the intersection divided by Total number of cases, CT2 = Cases in the intersection divided by Total number of cases Y > .5, AP = Anticipated feeling of pride, AG = Anticipated feeling of guilt, PA = Problem awareness, ISB = Image of sustainable behaviors, SN = Social norm, MN = Moral norm, BI = Intention for eco-friendly behaviors at destinations, WOM = tourists' word-of-mouth intention