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Front Pages

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Athens Institute is an Athens-based World Association of Academics and Researchers based in Athens. Athens Institute is an independent and non-profit Association with a Mission to become a forum where Academics and Researchers from all over the world can meet in Athens, exchange ideas on their research and discuss future developments in their disciplines, as well as engage with professionals from other fields. Athens was chosen because of its long history of academic gatherings, which go back thousands of years to Plato's Academy and Aristotle's Lyceum. Both these historic places are within walking distance from Athens Institute's downtown offices. Since antiquity, Athens was an open city. In the words of Pericles, Athens"…is open to the world, we never expel a foreigner from learning or seeing". ("Pericles' Funeral Oration", in Thucydides, The History of the Peloponnesian War). It is Athens Institute's mission to revive the glory of Ancient Athens by inviting the World Academic Community to the city, to learn from each other in an environment of freedom and respect for other people's opinions and beliefs. After all, the free expression of one's opinion formed the basis for the development of democracy, and Athens was its cradle. As it turned out, the Golden Age of Athens was in fact, the Golden Age of the Western Civilization. Education and (Re)searching for the 'truth' are the pillars of any free (democratic) society. This is the reason why Education and Research are the two core words in Athens Institute's name.

The *Athens Journal of Tourism* (AJT) is an Open Access quarterly double-blind peer reviewed journal and considers papers from all areas of tourism and related disciplines such as culture, leisure, recreation, geography, urban planning, heritage, sports, historical cities, landscape, architecture etc. The AJT considers theoretical and empirical papers as well as case studies and policy papers. The journal's aim is to be useful to both academics of tourism research and the practitioners of the tourism industry. Many of the papers published in this journal have been presented at the various conferences sponsored by the Tourism, Leisure & Recreation Unit of the Athens Institute. All papers are subject to Athens Institute's Publication Ethical Policy and Statement. A journal publication might take from a minimum of six months up to one year to appear. All papers are subject to Athens Institute's Publication Ethical Policy and Statement.

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Editorial and Reviewers' Board

President's Message

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The current issue is the third of the twelfth volume of the *Athens Journal of Tourism (AJT),* published by the Tourism, Leisure & Recreation Unit of Athens Institute.

Gregory T. Papanikos
President
Athens Institute

Athens Institute for Education and Research

A World Association of Academics and Researchers

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30-31 March & 1-2 April 2026, Athens, Greece

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- **Dr. Yannis Stivachtis**, Director, Center for European & Mediterranean Affairs and Associate Professor, Jean Monnet Chair & Director of International Studies Program, Virginia Tech – Virginia Polytechnic Institute & State University, USA.

Important Dates

- Abstract Submission: **16 September 2025**
- Submission of Paper: **2 March 2026**

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Important Dates

- Abstract Submission: **4 November 2025**
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- Submission of Paper: **11 May 2026**

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- **Dr. Peter Jones**, Co-Editor, Athens Journal of Tourism & Professor of Management, University of Gloucestershire, UK.

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How Resilient is the Hotel Industry to Climate Change Impacts in Coastal Areas?

By Karen Irene Thal[*] & Ronald Christian[±]

This conceptual study proposes a model of natural disaster resilience for hotel properties by addressing the Anticipation phase in Organizational Resilience (OR) frameworks. Building on prior studies, the model integrates a multi- capital framework to evaluate natural disaster preparedness (NDP), along with insights from Regulatory Focus Theory (RFT). RFT highlights the pivotal role of hotel General Managers' (GMs') motivational orientation (promotion vs. prevention focus) in shaping preparedness. A GM's prior knowledge is also included as a potential moderator of the relationship between RFT and NDP. Recognizing that hotels are embedded in broader systems, and that a property's resilience is closely tied to surrounding infrastructure and support networks, the model further incorporates destination-level preparedness within the multi-capital framework. The conceptual model is designed to yield a composite Hotel Resilience Index (HRI), enabling meaningful comparisons between individual properties and destinations while highlighting the critical roles of leadership, agency, and collaboration in building resilience to natural disasters.

Keywords: *Natural disaster preparedness; Organizational Resilience, Regulatory Focus Theory, climate change, hotel industry*

Introduction

Intensifying climate-related risks and infrastructure vulnerability, especially given the prevalence of tourism in coastal areas globally, underscore the importance of addressing resilience within the hotel sector (Adger et al.

2007, Northrop 2020). Threats in coastal areas are numerous and include rising sea levels, coastal erosion, increased storm surges, and more extreme and frequent weather events (Ridha et al. 2022). A 2023 IPCC report further noted that, in addition to the significant atmospheric, biospheric, and oceanic changes that have already occurred, these threats will only intensify in the coming decades (Lee et al. 2023).

The concept of resilience has begun to attract significant academic interest across multiple disciplines (Jones and Comfort 2020). Resilience can be broadly understood as the capacity of an entity (such as a system, organization, or community) to cope with disturbances or changes, and often involves planning, adapting, recovering, or transforming in response to unexpected events (Basurto-Cedeño and Pennington-Gray 2018, Gabler et al. 2017, Wang et al. 2022). Developing the capacity to anticipate threats as well as implement measures to mitigate impacts are integral to OR, enabling organizations to respond more effectively and recover more efficiently from adverse or unanticipated events (Duchek 2020, Jiang et al. 2021, Melián-Alzola et al. 2020).

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Research within the hotel sector suggests that a predominantly reactive rather than proactive stance, however, is typical (Brown et al. 2017). The consequences of such under-preparedness may be particularly severe for the hotel sector, given its continuous operations and the responsibility of hosting guests who are themselves unprepared to respond to local and natural events (Brown et al. 2017). Barriers to proactive planning include insufficient resources or lack of investment in preparedness activities due to their perceived high costs, as well as difficulty demonstrating adequate return on investment (Brown et al. 2017, Filimonau and De Coteau 2020, Ivkov et al. 2019, Jiang et al. 2021, Sydnor-Bousso et al. 2011). In addition, time constraints due to operational demands often translate into inadequate staff training and involvement in the preparedness process, even when written plans exist (Brown et al. 2017, Hall et al. 2023, Jiang et al. 2021, Sydnor-Bousso et al. 2011). Thus, despite growing risks in vulnerable coastal areas, and the recognized importance of proper planning notwithstanding, many hotels fail to engage in natural disaster preparedness (Brown et al. 2017).

Given the increasing intensity of climate-related threats in coastal regions, and the hotel sector's tendency to rely on reactive rather than proactive measures, this study proposes a conceptual model to assess the Anticipation phase of natural disaster preparedness as a precursor to natural disaster resilience. The conceptual paper includes the introduction to the resilience concept as applied to the hotel industry, a pertinent literature review, a description of the conceptual model with variables and methodology supporting the proposed framework, a brief discussion, and finally, a conclusion.

Literature Review

Natural disasters are defined as catastrophic events such as hurricanes, earthquakes, or other geophysical or meteorological phenomena that often strike with little warning, resulting in social and economic disruption (Gabler et al. 2017, Ivkov et al. 2019, Mileti 1999). Resilience models that take the natural world into account include evolutionary resilience which describes the capacity of both human and natural systems to adapt in a continuously changing world (Basurto-Cedeño and Pennington-Gray 2018). Ecological resilience considers the ability of natural systems to absorb disturbances and remain in functional equilibrium, while socio-ecological resilience focuses on the dynamic interactions between human and natural systems, as well as their shared capacity to change and adapt (Fabry and Zeghni, 2019).

While resilience for the hotel industry can likewise be conceptualized in various ways, at least two prior studies have applied a multi-capital framework (Brown et al., 2019; Ivkov et al., 2019), arguing that it captures the diverse internal resources and capacities hotels must leverage to prepare for, withstand, and recover from natural disasters. In this context, capital refers to the internal resources and capabilities hotels draw upon both to mitigate the negative impacts of a disaster and to support recovery (Brown et al., 2017). A multi-capital framework aligns with a socio- ecological perspective but is broader in scope, encompassing economic, social, human, physical, natural, and even cultural predictors of disaster resilience (Ivkov et al., 2019). By

contrast, a strategic resilience framework, for example, while also emphasizing preparedness and adaptation through the development of tools and processes, does not integrate the broader spectrum of resources that underpin long-term preparation and recovery (Cabaguing et al., 2024). Thus, by including a diverse range of predictors, a capital-based framework enables a more comprehensive assessment of a hotel's capacity to withstand and recover from a natural disaster. Building on this approach, the authors propose a conceptual model that incorporates organizational level capital alongside destination capital components involving the socio-political and natural environment.

Empirical research on natural disaster resilience at the hotel property level remains limited but both Brown et al. (2019) and Ivkov et al. (2019) employed a multi-capital framework to investigate and measure hotel preparedness in their studies. Brown et al. (2019) assessed disaster resilience within the hotel sector in two New Zealand tourist destinations, namely Wellington and Hawke's Bay. The study, an exploratory, quantitative survey of both hotel managers and staff, included predictors of resilience across economic, social, human, physical, natural, and cultural capitals. The study found that hotels demonstrated positive attributes of disaster preparedness across these capital predictors but also indicated areas requiring improvement, such as budgeting for disaster management activities and increasing staff involvement in planning. The work of Brown et al. (2019) suggests future research should conduct larger studies or case studies in diverse locations, especially post-disaster, to validate and refine the disaster resilience measures for the hotel sector. The authors aim to provide a conceptual model to support this type of future research.

Ivkov et al. (2019) likewise utilized a multi capital-based approach in a survey of 63 hotel managers across 12 European countries most affected by natural disasters. Their study found that managerial experiences and the hotel's category and size positively influence perceived hotel resilience but also revealed that disaster management expenses were often not a significant part of hotel budgets (Ivkov et al. 2019). Key takeaways include that natural disaster resilience, at least in a European context, is positively influenced by managers' previous experience and longer managerial tenure, particularly impacting the human and physical capital aspects of resilience. Like Brown et. al (2019), researchers noted that despite strengths in areas such as insurance and teamwork, there was a notable weakness in economic capital, with many hotels failing to allocate significant portions of their budget to disaster management expenses. The research findings therefore emphasize that managers, particularly of smaller and lower category hotels, need to integrate preparedness costs into their long-term strategy.

Natural Disaster Resilience and Destination Resilience

A more robust body of research on natural disaster resilience at the destination level offers additional insights. Destination resilience is understood as the multifaceted ability of a region, including its stakeholders and residents, to prepare for, absorb, recover from, and adapt to adverse events and changes, often by reorganizing to maintain functions or reach a new, potentially better state (Caluza

2024, Traskevich and Fontanari 2025, Jiao et al. 2024, Melián-Alzola et al. 2020, Olalia 2024, Sinha and Ola, 2021, Wang et al. 2022).

These studies have used economic, social, institutional, infrastructure, and community indicators to explore destination resilience in the context of various natural disasters such as forest fires (Hystad and Keller 2008), floods (Tsai et al. 2016, Walters et al. 2015), earthquakes (Bruneau et al. 2003, Yamamura 2016), and hurricanes (Seraphin 2018), in destinations including the Caribbean, New Zealand, and Thailand. Key insights from these studies suggest that resilience is a dynamic process which critically depends on elements like planning, continuous learning, leadership, resource management, and effective collaboration and knowledge sharing among diverse stakeholders (Hall et al. 2023, Jiang et al. 2021, Sharma et al. 2024). Studies furthermore suggest that fostering destination resilience requires proactive, integrative strategies, often involving innovation and cooperative network development to enhance adaptive capacity across economic, social, human, physical, natural, and cultural capitals (Brown et al. 2017, Della Corte et al. 2021, Sharma et al. 2024).

The broader context provided by destination resilience is also directly relevant to the resilience of individual hotel properties. That is, resilience at the hotel and destination levels is inextricably linked. An individual hotel property's resilience means little if basic infrastructure collapses or utilities fail, preventing hotels from receiving guests (Filimonau and De Coteau, 2020). Destination resilience likewise depends on the resilience of the subsystems within it (Filimonau and De Coteau, 2020). The two therefore share a reciprocal relationship in which each reinforces the other's capacity to withstand and recover from natural disasters (Brown et al., 2017; Hall et al., 2022; Hoffman et al., 2023). Accordingly, the proposed conceptual model incorporates measures of destination-level preparedness as crucial resources that enhance hotel resilience.

Organizational Resilience Defined

Organizational Resilience (OR) is defined as, "the ability of an organization to anticipate, prepare for, respond and adapt to incremental change and sudden disruptions in order to survive and prosper" (Denyer 2017). Contemporary literature promotes a process-based, iterative perspective on OR (Melián-Alzola et al. 2020).

From a process perspective, OR is conceived as a dynamic condition that includes actions taken before, during, and after adverse events (Jiang et al. 2021, Sinha and Ola 2021). For instance, Denyer (2017) devised the 4Sight framework that comprises four stages, namely: (1) Foresight (anticipation and preparation), (2) Insight (interpreting and responding to present conditions), (3) Oversight (monitoring and assessing post-event), and (4) Hindsight (learning from past experience).

Likewise, Duchek's (2020) framework describes OR in terms of meta-capabilities comprising three 'action' phases: (1) Anticipation (proactive or before an event), (2) Coping (concurrent or during an event), and (3) Adaptation (reactive or after an event). The first, or Anticipation phase, includes preventive measures relative to potential disturbances and comprises two facets: (1) Observation and Identification, and (2) Preparation. Observation and Identification involve environmental scanning,

while Preparation encompasses concrete steps that may be taken to prepare for unexpected events (Duchek, 2020). In other words, the former entails the ability to detect weak signals in the environment and identify potential threats. As the proposed model addresses a specific and identified threat, namely natural disasters, the Observation facet is not included in the study model. Similarly, Identification, or the ability to recognize potential threats, is excluded as it is a potentially confounding variable with Prior Knowledge as defined in this study. Rather, the study focuses on the latter or Preparation phase which includes an organization's capacity to build resources, foster relationships, and develop the readiness necessary to respond effectively to crises, thereby building long-term resilience (Duchek, 2020).

The Preparation stage is further defined by two contributing factors: the antecedent, Prior Knowledge, and the driver, Resource Availability (Duchek, 2020). Prior Knowledge is described as an antecedent of the Anticipation phase in Duchek's (2020) conceptual framework and comprises three facets, namely: (1) knowledge about the environment, (2) knowledge about former crises and (3) and knowledge about successful actions taken. Prior knowledge is described as a crucial and foundational element within the resilience-building process since organizational knowledge may inform strategic focus including the ability to identify critical developments and potential threats, and consequently, prepare for future events (Cohen and Levinthal 1990, Duchek 2020). The current study's conceptual model seeks to operationalize the Anticipation phase of OR relative to natural disasters, and we hypothesize that Prior Knowledge of natural disasters will increase the likelihood of preparedness as indicated in prior research findings (Tompkins et al. 2012).

Resource Availability refers to an organization's access to critical resources and assets that can be deployed to support crisis response and recovery (Duchek, 2020). It is considered essential for organizational resilience during each phase of OR, as it enables effective anticipation, absorption, and adaptation in the face of adverse events (Duchek, 2020). In practical terms, resources may include temporal, financial, and human capital, as well as business functions such as contingency planning (Duchek, 2020). In the current study, Resource Availability is framed in terms of destination capital, as hotel operations are already accounted for within the proposed, multi-capital framework. Moreover, external factors such as a destination's infrastructure and overall preparedness including characteristics of the community and natural environment, represent the critical local resource s upon which a hotel's recovery depends (Filimonau and De Coteau, 2020).

In short, destination capital reflects those aspects of the local environment that facilitate resilience. Based on prior studies, a resilient destination is characterized by the ability to maintain essential services such as supply chains, transportation, security, healthcare, and guest care for both tourists and residents (Hoffman et al., 2023). Resilient destinations also provide critical infrastructure and cooperative networks that support individual organizations during and after crises (Brown et al., 2017; Hall et al., 2022; Hoffman et al., 2023). Accordingly, in the present study, Destination Preparedness measures are included as a key variable in calculating Hotel Resilience (see Table 1 in the Appendix).

Organizational Resilience in Prior Studies

Previous studies have applied Organizational Resilience (OR) frameworks to explore how hotel managers can best prepare for and respond to disruptive events. For example, Melián-Alzola et al. (2020) developed and validated a framework for measuring organizational resilience within the hotel sector. Their study empirically examined disruptive changes as perceived by hotel managers in the Canary Islands, and involved developing measurement scales for resilience predictors, including strategic and change-related dimensions. Analyzing the effects on hotel performance, findings confirmed that both the strategy (e.g., planning, collaboration, learning from past experiences) and change (e.g., innovation, continuous improvement, learning) dimensions positively influence hotel resilience, which in turn significantly and positively impacted hotel performance (Melián-Alzola et al. 2020). These finding confirm that proactively planning and adapting are key to hotels emerging strengthened from disruptions (Melián-Alzola et al. 2020).

Ho et al. (2023) adapted Duchek's (2020) OR model for the hospitality and tourism industry to propose a holistic resilience framework designed specifically to address environmental uncertainty, such as disruptions caused by the COVID-19 pandemic. Their study included a synthesis of concepts related to organizational resilience and strategic leadership to construct a strategic leadership-enhanced OR framework. That is, their proposed framework integrated strategic leadership as a key driver within resilience processes (anticipation, coping, adaptation) and strategic support factors (like prior knowledge and resources) to provide a more comprehensive understanding of what is required for hospitality and tourism organizations to attain resilience and long-term health in turbulent times. The current conceptual model integrates additional elements impacting resilience in order to advance this line of research. A key component of the proposed model involves the role of General Managers (GMs) in the Anticipation phase of organizational resilience. Specifically, Regulatory Focus and Prior Knowledge are proposed as indicative attributes of GMs whose leadership styles, in turn, are considered integral to the mobilization of capital at the organization level.

Regulatory Focus Theory

Regulatory Focus Theory (RFT) explains how individuals pursue goals through two primary motivational orientations: promotion focus and prevention focus (Higgins 1997). Promotion focus involves striving for growth, achievement, and positive outcomes, while a prevention focus centers on fulfilling responsibilities, avoiding negative outcomes, and maintaining security (Gino and Margolis 2011). As regulatory focus is conceptualized as a chronic motivational orientation that is relatively stable over time (Manczak et al. 2014), we have included it as the independent variable in the current study model.

A GM's leadership style, particularly regulatory focus, influences strategic decision-making and change implementation (Jiang et al., 2020). As indicated in the literature, a primary driver of a manager's attitudes and behaviors, particularly in team-oriented settings, is regulatory focus, which influences strategic goal setting and

organizational performance (Johnson et al., 2015). Leadership style also plays a central role in decision-making across all organizational levels (Lombardi et al., 2021); thus, GMs may be considered the "key driver and pre-eminent factor in the entire resilience procedure" (Ho et al., 2023). As such, and in the current study, we include constructs from RFT (Higgins, 1997) to examine how a GMs motivational orientation towards future events may influence natural disaster preparedness at the organizational level.

Research shows that promotion-focused CEOs tend to emphasize accomplishment, optimistic forecasting, innovation, and risk-taking (Jiang et al., 2020), whereas prevention-focused CEOs are more concerned with preserving assets, minimizing loss, and avoiding failure (Zou and Chan, 2019). Scholars have also examined the role of regulatory focus in judgment (e.g., eager vs. vigilant; Molden and Higgins, 2003) and decision-making strategies (Kirmani and Zhu, 2007), both of which are critical for enhancing resilience. In organizations operating under environmental threats, managers tend to adopt prevention-focused behaviors (Kark and Van Dijk, 2019).

The present study seeks to extend this line of research by examining the role of regulatory focus in natural disaster resilience within the hotel industry. Sustaining operational efficiency in uncertain circumstances can be challenging for hotel managers. It is proposed that under such conditions, managers with a prevention-focused mindset will be more likely to adopt preparedness and resilience initiatives. We therefore hypothesize that a prevention focus will have a significant and positive relationship with Natural Disaster Preparedness (NDP), whereas a promotion focus will have a significant and negative relationship with NDP, as follows:

Proposition 1: Regulatory focus impacts levels of natural disaster preparedness

Proposition 2: Prevention-focus (promotion-focus) managers will rate significantly higher (lower) on natural disaster preparedness

In addition to regulatory focus, a GM's knowledge and past experiences likewise shape strategic decision making and affect organizational outcomes (Weis and Klarner 2022). The authors suggest, however, that a balance is essential when shoring up knowledge needed for favorable resilience outcomes. While the information is vast regarding resiliency, hotel managers are best suited for optimal resiliency when managing information load effectively. Therefore, the following hypotheses are proposed:

Proposition 3: Prior knowledge moderates the effect of regulatory focus on NDP

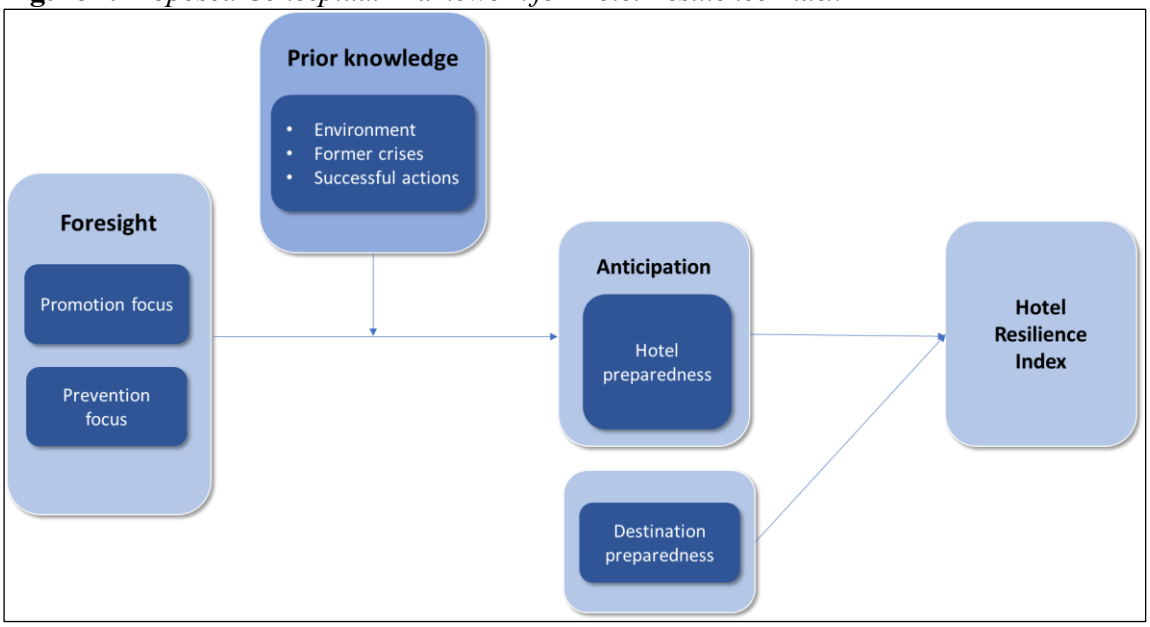
Proposition 4: Prevention-focus (promotion-focus) managers with high information load will rate significantly higher (lower) on NDP

Finally, to integrate both internal and external dimensions of disaster preparedness, the model includes a composite score of overall hotel resilience. This construct combines organizational-level preparedness, measured through readiness actions and protocols, with destination-level preparedness, to reflect broader structural and environmental conditions such as local infrastructure, emergency systems, and disaster

governance. Therefore, the following hypotheses are proposed:

> Proposition 5: Hotel preparedness positively influences hotel resilience. Proposition 6: Destination preparedness positively influences hotel resilience.

Figure 1. *Proposed Conceptual Framework for Hotel Resilience Index*



Methodology

The current study includes a survey instrument designed for the purpose of operationalizing the model. Study measurement scales are included in the Appendix with a brief description of each provided below.

Regulatory Focus

Resilience frameworks typically overlook the role of agency, or in this case the impact of General Managers (GMs) on the OR process. However, rather than a fixed attribute, measurable asset, or objective trait, resilience primarily reflects the ability and willingness of individual actors to take proactive steps in response to anticipated challenges (Posch et al. 2024). Thus, the study model proposes measuring Regulatory Focus through an 11 question, 5-point scale developed and tested by Higgins et al. (2021) (see Appendix).

Prior Knowledge

The study model includes the three aspects of Prior knowledge: (1) knowledge about the environment, (2) knowledge about former crises and (3) and knowledge about successful actions taken, hypothesized as a moderating influence between Regulatory focus and Natural disaster preparedness.

In the current study we limit the first aspect, namely (1) knowledge about the environment to knowledge of the *physical* environment as this is directly relevant to natural disaster preparedness (Daimon et al. 2023). Access to hazard-specific information, such as flood risk mapping, for example, helps individuals to identify and assess particular risks as well as develop appropriate preparedness (Tompkins et al. 2012).

The second facet, knowledge about former crises, has been shown to influence risk perceptions of future hazards (Siegrist and Gutscher 2005). Participants with prior flood experience, for example, interpreted the probability of future floods differently than those without such experience, and in particular displayed a heightened perception of risk, according to one study (Keller et al 2006). However, the severity of a past event is relevant and is accounted for in the model's scale (see Appendix). For example, people tend to disregard disaster information (such as heavy rainfall and evacuation warnings) when they have repeatedly experienced disasters that were relatively minor (Daimon et al. 2023). This reflects the general tendency to use past experiences of disasters as a reference point, potentially leading to an underestimation of future disasters (Daimon et al. 2023).

The third facet, knowledge about successful actions taken, may support natural disaster preparedness. Prior successful actions taken during or after a natural disaster have been shown to inform and significantly improve future disaster preparedness as organizations may learn from past experiences and embed effective responses into routines, policies, and training, thereby enhancing their adaptive capacity and resilience to future events (Linnenluecke et al. 2012).

Moderation Effects

We propose that Prior Knowledge will moderate the relationship between Regulatory Focus and Natural Disaster Preparedness. As fundamental as prior knowledge has proven to be for organizations, research in this area is scant in relation to the hotel industry. Given the vulnerability of hotels to environmental threats, the ability to process information, learn, and absorb relevant knowledge is nonetheless critical to natural disaster resilience.

Extant research has, however, discussed the concept of "information overload" (e.g., receiving too much information) in various management disciplines (Eppler and Mengis, 2004; Grise and Gallupe, 1999/2000; Iselin, 1993; Tushman and Nadler, 1978). One might argue that the information load on hotel managers can be vast, particularly when including the knowledge required to address environmental threats and vulnerabilities.

Prior studies have shown that decision-making and reasoning quality improves with increased information, but only up to a point. Beyond this threshold, additional information leads to a rapid decline in decision quality (Chewning and Harrell, 1990; Eppler and Mengis, 2004). In the context of regulatory focus, scholars have suggested that information processing varies, and we expect the interaction effect to be similarly nuanced (Yoon et al., 2012). Yoon et al. (2012), for example, found that under high information load, promotion-focused individuals tend to rely on positive rather than negative material, while prevention-focused individuals favor negative over positive material. Thus, prevention-focused managers may be more likely to attend to

cautionary signals and related materials, strengthening natural disaster preparedness, whereas promotion-focused managers may compromise preparedness by overlooking warnings or underweighting potential environmental threats.

Hotel Natural Disaster Preparedness

Consistent with previous research, the authors propose a capital-based model to measure Natural Disaster Preparedness at the organizational level. (Brown et al. 2019, Ivkov et al. 2019). This framework identifies a hotel's internal resources and capabilities (capitals) (Brown et al. 2018) to reflect the Anticipation (proactive or before an event) phase of OR, and is conceptualized as a dependent variable of GM attributes measured in terms of RFT, with the relationship moderated by Prior Knowledge (see Figure 1).

Measurement scales were adapted from Brown et al. (2019), who assessed natural disaster resilience among hotel managers in New Zealand measuring six indicators, namely (1) economic, (2) social (3) human, (4) physical, (5) natural, and (6) cultural capital. Brown et al. (2019)'s research acknowledged challenges in quantitatively measuring cultural capital, however, and that measure is not included in the current study. Ivkov et al.'s (2019) applied in a capital-based framework but merged cultural capital with social capital to form organizational capital, for five indicators overall, namely (1) economic, (2) organizational, (3) human, (4) physical, and (5) natural capital, resources.

Following Ivkov et al.'s (2019) lead, the current study model includes (1) economic, (2) human and (3) natural capital, but has replaced cultural and social capital in this case with destination measures (see below). In addition, (4) management capital has been added to reinforce an emphasis on agency as well as the pivotal role of management for strategic planning and leadership.

We also include a measure of (5) corporate capital since ownership structures have been shown to have an impact on natural disaster preparedness in prior studies (Ivkov et al. 2019). Moreover, as major hotel chains have increasingly adhered to an "asset light" strategy, ownership of buildings and real estate is often transferred into the hands of investment firms, while management is outsourced or delegated through franchise agreements (Cloudbeds n.d.). This severing of hotel ownership from hotel management may further hamper natural disaster preparedness as management has no vested interest in the hotel's physical assets but rather is contractually obligated to focus on daily operations and short-term financial performance indicators.

Destination Natural Disaster Preparedness

Hotels are not isolated entities but are an integral part of a destination, both contributing to and benefiting from destination preparedness. To that end, local and government initiatives are recognized as pivotal to preparedness and ultimately resilience for both hotels and destinations (Cabaguing et al., 2024). For example, local, state, or federal government initiatives may include emergency response planning, infrastructure investment, hazard mitigation programs, and public awareness campaigns that support disaster preparedness and recovery efforts.

Local tourism businesses may also support each other within destinations by

forming collaborative networks, providing mutual support, and sharing resources, knowledge, and infrastructure (Fontanari and Traskevich, 2025; Jiao et al., 2024; Melián-Alzola et al., 2020; Olalia, 2024).

Local communities promote destination resilience by actively engaging in planning and development, leveraging their resources, knowledge, identity, and enterprises to build regional self-sufficiency and shape resilient value chains (Fontanari and Traskevich, 2025; Wang et al., 2022). This involves fostering cooperation, building strong social networks and trust among stakeholders, and ensuring the provision of essential services for both residents and guests. Together, these efforts strengthen the destination's ability to adapt to disturbances and enhance collective well-being and prosperity (Melián-Alzola et al., 2020; Olalia, 2024; Wang et al., 2022).

Thus, the current conceptual study includes additional predictors that reflect destination preparedness, namely (6) municipal, (7) government, (8) industry, and (9) community factors in the model, as these are paramount to hotel resilience. As discussed, these markers correspond with Resource Availability in the Anticipation phase of organizational resilience as proposed by Duchek (2020), which fundamentally implies having access to as well as the ability to mobilize critical support systems in preparing for and responding to disruptive events.

Finally, as in prior studies, we include a measure for (10) natural capital in Destination Preparedness which refers to the natural environmental features surrounding a hotel, such as protective barriers like reefs, dunes, or mangroves, and healthy ecosystems. It also encompasses the local climate conditions that reduce the hotel's exposure to natural hazards and disasters. Such natural capital is critically important, as it serves as a first line of defense against environmental threats, significantly lowering the risk of damage and disruption to hotel operations (Brown et al. 2019, Ivkov et al. 2019).

Hotel Resilience Index

Similar to the Tourism Resilience Index developed by the National Oceanic and Atmospheric Administration, averaged scores for each hotel and destination capital predictor will be calculated to produce a composite Hotel Resilience Index (HRI) score (NOAA, n.d.). These composite scores will be categorized as "low," "medium," or "high" to provide a simple reference frame for individual hotel properties (NOAA, n.d.) and enable meaningful comparisons both between individual properties and destinations, as well as across hotels and destinations. Scores may also be disaggregated to isolate and compare the effectiveness of GMs' leadership style in analysis.

Discussion

The study's conceptual model offers several implications for the hotel industry and related stakeholders. The research may help inform both hotel companies and Destination Management Organizations (DMOs), especially those in vulnerable coastal areas prone to natural disasters. A key implication concerns the importance of the General Manager's (GM) characteristics and managerial orientation. The study suggests

that organizations should consider the extent to which a GM's tendency toward risk aversion versus proactive engagement affects the organization's resilience when selecting leadership. While acknowledging that a GM's influence can be constrained by complex ownership structures and management contracts, the study highlights the central role leaders play in organizational decision-making and resilience.

The proposed conceptual model adopts a multilevel approach to resilience by situating hotels within the broader destination systems. An important contribution is the inclusion of disaster preparedness at the destination level. Disaster preparedness is inherently multi-layered. No hotel prepares in a vacuum. Combining organizational readiness with contextual resilience reflects the real- world complexity of disaster response systems. This also aligns with systems thinking, resilience theory, and disaster risk reduction frameworks, which emphasize both internal capacity and external environments.

Conclusion

Proposed findings from the conceptual model will highlight an interplay of factors to provide a more holistic framework for how the hotel industry should conceptualize, prepare for, and ultimately withstand the impact of natural hazards. It emphasizes the influence of leadership styles and organizational preparedness, along with municipal, governmental, industry, and community support as critical factors for natural disaster resilience. The outcome variable, a resilience index may thus be used for descriptive profiling, benchmarking, or case comparisons at both the organizational and destination level.

While aiming to build upon previous scholarly work on resiliency models, there are limitations with this paper that future researchers should consider. First, while regulatory focus has been determined as a critical factor in leadership style and management outcomes, it is worth considering the role of other individual-level variables in resiliency. Second, future research may also examine additional stages of OR models to gain further insight into the multi-faceted processes implicated in building resiliency. Finally, the proposed conceptual model may be validated through data collection and analysis, thereby advancing an understanding of preparedness and overall resiliency within the hotel industry.

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Appendix

Table 1. *Measures for Natural Disaster Preparedness*

	Hotel Predictor	Scale Items*
1.	**Economic capital**	The hotel property has comprehensive multi-hazard insurance coverage Natural disaster relief funds are included in the hotel budget Hotel owners, shareholders or investors have earmarked natural disaster relief funds
2.	**Corporate capital**	Corporate officers are supportive of hotel management's natural disaster preparedness initiatives Corporate headquarters provide natural disaster preparedness resources Corporate level procedures or protocols are in place to respond to natural disasters
3.	**Management capital**	Hotel managers conduct staff training for natural disaster preparedness The management team has documents and procedures in place in the event of a natural disaster Natural disaster response resources are onsite (e.g. emergency water, medical, and food supplies, well- marked evacuation routes, safe zones)
5.	**Human capital**	All employees participate in disaster response exercises Employees would be available to work immediately following a disaster There is cohesion among team members.
	Destination Predictor	Scale Items*
6.	**Community capital**	There are community champions and/or coalitions to raise awareness regarding natural disaster preparedness Local non-profit organizations are effective in organizing resources in the event of a natural disaster Community members support information sharing regarding natural disaster preparedness Community groups are active in natural disaster mitigation efforts
7.	**Municipal capital**	Local building codes for construction standards for disaster resilience are enforced Local land-use regulations for high-risk areas like floodplains are in place Infrastructural measures (e.g. mangrove restoration, construction of sea walls, installation of flood pumps, and beach replenishment programs) have been implemented

8.	**Government capital**	The government has implemented effective monitoring and warning systems The government provides information to promote local preparedness Government grants or loans are available following a natural disaster
9.	**Industry capital**	Tourism reps (e.g. DMOs) coordinate communication regarding natural disaster preparedness (NDP) DMOs facilitate collaboration between hotels on NDP Tourism industry reps are active in local NDP efforts
10.	**Natural capital**	The hotel is not directly exposed to natural hazards There are natural barriers (e.g., coastal reefs, coastal sand dunes or mangroves) in the area The local climate is less prone to natural disasters (low incidence of hurricanes, floods, or extreme heat waves) than others The local environment is characterized by healthy ecosystems

Adapted from Ivkov et al. (2019)

Table 2. *Measures for Regulatory Focus*

This set of questions asks HOW FREQUENTLY specific events actually occur or have occurred in your life. Please indicate your answer to each question by circling the appropriate number below it. (never 1 to often 5)

1. Compared to most people, are you typically unable to get what you want out of life?
1 2 3 4 5
2. Growing up, would you ever "cross the line" by doing things that your parents would not tolerate?
1 2 3 4 5
3. How often have you accomplished things that got you "psyched" to work even harder?
1 2 3 4 5
4. Did you get on your parents' nerves often when you were growing up?
1 2 3 4 5
5. How often did you obey rules and regulations that were established by your parents?
1 2 3 4 5
6. Growing up, did you ever act in ways that your parents thought were objectionable?
1 2 3 4 5
7. Do you often do well at different things that you try?
1 2 3 4 5
8. Not being careful enough has gotten me into trouble at times.
1 2 3 4 5
9. When it comes to achieving things that are important to me, I find that I don't perform as well as I ideally would like to do.
1 2 3 4 5
10. I feel like I have made progress toward being successful in my life.
1 2 3 4 5
Certainly true certainly false

I have found very few hobbies or activities in my life that capture my interest or motivate me to put effort into them.
1 2 3 4 5
Certainly true certainly false

Source: Higgins et al. (2001)

Table 3. *Measures for Prior knowledge*

	Predictor	Scale Items*
1.	**Knowledge about former crises**	*To what extent have you personally experienced the impact of a natural disaster?* 0) I have had no direct experience of a natural disaster 1) I have experienced only minor disruptions due to a natural disaster (e.g., brief power outage, travel delays). 2) I have experienced a natural disaster with limited personal or local impact. 3) I have experienced a moderate natural disaster that affected my home, work, or community. 4) I have had direct experience of a severe natural disaster with significant personal or community consequences. 5) I have had direct experience of at least one catastrophic natural disaster.
2.	**Knowledge about the physical environment**	*How well do you understand the physical environment in your area as it relates to disaster risks (e.g., flood zones, landslide-prone areas, etc.)*? 1) Very Low – I have no knowledge of the physical risks in my area and am unaware of any hazard-specific information or maps. 2) Low – I have heard of certain risks (e.g., floods or earthquakes) but do not know where to find specific information on how it applies to my location. 3) Moderate – I have some knowledge of local disaster risks and have seen hazard-specific materials (e.g., flood maps), but I don't use them actively. 4) High – I know the specific risks to my area and have accessed and understood hazard-specific information (e.g., local flood or earthquake maps). 5) Very High – I have a detailed understanding of my area's environmental risks, frequently use hazard-specific information to inform my preparedness actions, and could explain these risks to others.

2.	**Knowledge about successful actions taken**	*To what extent have you, in your professional capacity, been directly involved in managing a response to a natural disaster?* 0) Not at all involved 1) Slightly involved 2) Somewhat involved 3) Moderately involved 4) Highly involved 5) Fully responsible for managing the response

Source: Adapted from Duchek (2020)

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The Thai Hospitality Industry is taking Steps to Address Potential Future Water Crises

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Water is one of the most important resources for the hospitality industry. Given the ongoing severe global warming situation, efficient resource use is essential for all activities. Addressing sustainability issues in the tourism sector requires effective utilization of resources, particularly water. This study is a preliminary study of water resource management practices in hotels across Thailand, focusing on both the quantity and quality of water resources. It examines the measures hotels have implemented to manage these resources efficiently. This includes setting goals and adjusting equipment and technologies to optimize water use. The findings categorize the hotels' responses to water management into three groups: Group A, which demonstrates an intensive implementation of guest participation, with over 80 percent of respondents indicating that guest involvement is a central focus. Group B: Hotels in this group have implemented most water efficiency and conservation measures, with rankings ranging from 61 percent to 80 percent among respondents. Group C: This group includes hotels that face challenges related to water availability and access to water sources, such as rainwater collection, with rankings below 60percent. The conclusions of this study provide a foundation for further in-depth research. Efficient water uses in hotels, particularly in Thailand, which is in a tropical zone and is experiencing water shortages exacerbated by climate change, will have a positive impact on resource management and service delivery in the Thai tourism sector, especially within the hotel industry.

Keywords: *sustainability indicators, water efficiency, water in hotels, green leaf certification, sustainability tourism*

Introduction

People and countries worldwide are facing increased droughts, higher temperatures, and growing water shortages. Even in Thailand, the land of water, a sufficient water supply cannot be taken for granted everywhere. The hope now is to secure that supply with water conservation and reuse. Thailand is a country where the search for clean water is becoming a growing challenge. Some regions have had acutely dry weather in the last few years, and groundwater levels have plummeted. The causes are not just more drought periods but also soil sealing and higher pollutant levels in the water, which have also become a problem. Thailand requires more water for agriculture and growing crops during the dry season. It is not just climate change

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causing problems with water, but also mass tourism is a major contributor that requires large amounts of water and generates pollution.

The consequences are evident in the wake of climate change: extreme drought and water shortages are putting a strain on the country, where resources are already scarce. Tourism accounts for over a quarter of total water consumption. The problem is that mining harms the environment and the people. The hospitality industry and tourism, in general, present a number of challenges for the management of water supplies (Chen et al. 2010).

The empirical data from the study shows a significant effect for those accommodations concerning the water issue. However, since Thailand is a tropical country. Water scarcity issues are a national priority that must be addressed. Thailand is an agricultural country with agriculture consuming a large amount of water. Sustainable water management for the agricultural sector is urgently needed (Kaewmai et al. 2021).

This paper focuses on how the implemented program for water conservation and water pollution reduction aims to ensure the longer availability of water in Thailand. Because tourism is highly dependent on the availability of fresh water resources (e.g. Orams 1998, Garrod and Wilson 2003).

Recreational activities such as swimming, sailing, kayaking, canoeing, diving, and fishing are often associated with lakes and rivers, which are important components of landscapes that attract tourists. Freshwater is also essential for the operation of tourist infrastructure, including swimming pools, irrigated gardens, bathrooms, and laundry services (Gössling 2001, Gössling 2006). The concept of sustainable tourism has become increasingly prominent in industry today. When applied to the hospitality sector, sustainable tourism can be defined as promoting sustainable consumption and production across all supply chains involved in tourism activities.

Jones mentioned in his review paper that, on the other hand, it is impossible to ignore the demands that all tourism, including nature-positive tourism, makes on the environment and natural resources, as well as the industry's focus on what its critics see as unsustainable consumption (Jones 2024). The paper also mentioned that "Towards Nature Positive Tourism" has a variety of terms, including sustainable tourism, green tourism, and eco-tourism, which have been employed to define such harmonious relationships. In some ways, sustainable tourism is an umbrella term for other terms, some of whose meanings seem to have changed over time (Jones 2024).

Literature Review

Water is one of the essential components of all life on Earth and is crucial for sustaining it. However, the amount of fresh water on Earth is limited, and its quality is under constant threat, particularly in heavily populated and industrialized areas. Clean water is, therefore, one of the most precious resources.

Sustainable Development Goal (SDG) 6, which aims for water and sanitation for all, is alarmingly off track. About two billion people lack access to safe drinking water, while roughly half of the world's population experiences severe water scarcity

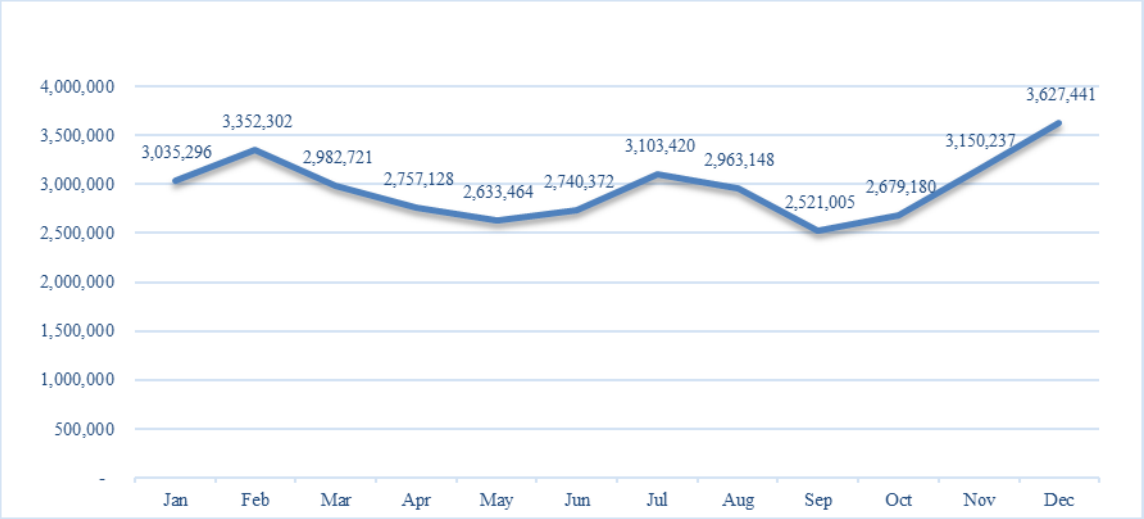
for at least part of the year. Human rights to water, sanitation, and a clean and healthy environment are not being fulfilled. Climate change and population growth are expected to worsen the situation. Data indicates that the health and livelihoods of 4.8 billion people could be at risk by 2030 if water quality and monitoring are not improved (UNEP 2024). Tourism-related water consumption is still little investigated, and there are few detailed studies of water use in different geographical settings, for different forms of tourism, or the many forms of accommodation establishments (Gössling 2006).

The Green Leaf Foundation, a sustainability promotion initiative organization in Thailand, has implemented programs for decades to promote the sustainable hospitality industry in Thailand. The foundation set the sustainability standard for the hospitality industry, particularly for hotels. The Green Leaf Sustainability Standard for Hotels is also designed to help lower operational costs and pass those cost savings on to customers. Indeed, the program also encouraged customers to participate in saving energy and natural resources through various participatory activities (GLF 2025).

Sustainable water management is one of the key areas that relies on water efficiency, water quality, both freshwater supplies, and treated water quality. The sustainable water management of the Green Leaf Foundation also involves engaging all stakeholders, including staff, guests, suppliers, and local communities, in which the hotel is located. Sustainable water management in hotels is also linked to the long-term sustainability of tourism in Thailand. Initially, water efficiency for hotels should be the focal point at the first stage of hospitality and tourism management in Thailand. Since the Thai tourism profile focuses on tourism activities, the government aims to transform the country into a regional hub for tourism and sports, as illustrated in Figure 1. The Sustainable Hospitality Alliance (2021) suggests that as an industry, hospitality also relies heavily on the natural world around us; for materials to build our properties, food and beverages to serve to our guests, and a local environment to entice people to visit. More specifically, natural capital is considered by some authors to comprise a range of natural assets. For example, the World Forum on Natural Capital (2017) defines natural capital as the world stocks of natural assets which include geology, soil, air, water and all living things and argues that natural assets provide a wide range of services, often referred to as ecosystem services, which ultimately underpin human life and economic activity (Wynn and Jones 2023). The paper mentioned in the discussion section highlights more fundamental and complex issues regarding natural capital and its relationship to sustainability and economic growth. While a focus on natural capital is generally seen to be compatible with a transition to a more sustainable economy and society, in the hospitality industry, protection of natural capital is often seen as a way of justifying continuing growth (Wynn and Jones 2023). This also means that water is one of the crucial natural resources for running tourism smoothly.

The problems related to water in tourism have been rising as a crucial issue to be addressed from a sustainable tourism perspective. Water pollution is the changes caused by groundwater, riverbeds, and air pollution in the marine environment that limit the effectiveness of beaches, seawater, coastal appearance, and tourism use on the Syrian Coast (Tachir and Alalı 2022). This problem also occurs in various coastal tourist destinations in Thailand.

Figure 1. *Monthly No. of International Tourists Arrival in Thailand in 2024*



Source: TAT Intelligence 2025.

In 2024, around 35 million international tourists visited Thailand. Figure 1 illustrates the monthly trend of tourist arrivals, demonstrating a seasonal pattern. This suggests that many travelers choose to visit during the winter and summer months to relax and escape the cold weather in their home countries. Thailand experiences its summer season from March to May and the monsoon season from August to September, periods that typically attract fewer tourists compared to other times of the year.

Figure 2. *Number of Hotel Establishments and Number of Room Registration in 2024*

Source: TAT Intelligence 2025.

According to statistics from TAT Intelligence, the accommodation landscape in Thailand can be summarized by the number of hotels and rooms across different regions. The Central region has 1,115 hotels with a total of 117,718 rooms. The Eastern region has 982 hotels, offering a total of 90,744 rooms. In the Northeast

region, there are 1,187 hotels with a total of 55,185 rooms. The Northern region boasts 1,516 hotels and 64,961 rooms. Finally, the Southern region has the highest number, with 2,145 hotels and 121,550 rooms. This information is illustrated in Figure 2: key water users in the tourism sector include hotels, restaurants, and recreational activities. Besides that, water is also indirectly used in the supply chain of goods and services for tourists (e.g., the water used to produce food). Water measurements and implementation of water-saving measures in the tourism sector are important aspects for effective water management. Water footprint and tourism: 3.5 percent - 5.8 percent, representing global water consumption by tourism, according to the World Travel and Tourism Organization (Tervoort and Langergrabe 2024).

Direct water consumption involves water directly consumed by tourists and tourism facilities. Figure 4 shows that globally, approximately only 19 percent of water consumption by tourists is direct (2021 data). In most studies, the direct water consumption consists of water consumed at the accommodation and water used for recreational activities (Gössling et al. 2012). These two aspects are relatively easy to quantify, as they are directly attributable to the tourism sector (Tervoort and Langergrabe 2024).

Most research on water consumption in the tourism sector has been focused on accommodations, in particular hotels (e.g., Gössling 2015, Charara et al. 2011, Tortella and Tirado 2011). It is important to recognize that water consumption varies across different types of accommodations. For instance, hotels and resorts typically offer a wide range of water-intensive facilities, such as swimming pools and spas. In contrast, camping sites may have more limited facilities, and private rental properties may align more closely with local water usage patterns. An additional facet of this discussion involves water use by ships, particularly cruise ships, in harbors, which represents a unique category in the tourism sector. The most straightforward way tourists consume water at accommodations is through the facilities in the hotel rooms itself. Water usage within hotel rooms encompasses essential activities, such as tap water for drinking and washing hands, toilet flushing, showering, and bathing (Tervoort and Langergrabe 2024).

Measuring carbon dioxide emissions from international travel requires cooperation among several parties, including airlines and the governments of both the origin and destination countries. Promoting environmentally friendly tourism can be achieved through various suggestions and analyses. Additionally, it is important not only to manage emissions by measuring carbon levels but also to implement domestic initiatives through national policies.

The precipitation pattern observed in Thailand indicates a declining trend in rainfall over the past century. Consequently, the amount of freshwater available for consumption is expected to decrease because of these precipitation patterns. Meanwhile, data shows that Thailand's population is growing exponentially.

Availability of and Access to Water

Domestic Water Consumption in Thailand

The country reports that the percentage of households with access to clean drinking water increased from 97 percent in 2012 to 99.5 percent in 2019. Government efforts to provide clean water to villages lacking plumbing systems have been successful, reducing the number of such villages from 7,321 to 169.

The quality of available drinking water remains a significant challenge. According to the Ministry of Public Health's Report on Drinking Water Quality from 2009 to 2019, only 40.8 percent of the water supplied to households was suitable for consumption. The report indicated that 43.7 percent of household water required further treatment before it could be safely consumed. In comparison, an additional 15.5 percent was contaminated with chemicals at levels exceeding the recommended limits. Further studies have revealed that 59.2 percent of the water used in households did not meet the necessary quality standards.

According to 2019 data, 89 percent of households in Thailand had access to designated handwashing facilities, while 97.1 percent had access to private toilets. However, the combination of population growth and an increasing number of tourists, along with inadequate drainage systems, has resulted in a decline in the quality of surface water sources. In 2018, only 9 percent of water from these sources met the required quality standards, which dropped to a concerning 82 percent by 2019. Additionally, the percentage of poor-quality water sources doubled from 9 percent in 2018 to 18 percent in 2019. Thailand has also faced droughts three times in the past five years: in 2015, 2019, and 2020.

The country's continued economic and social growth, coupled with the transition towards industrial agriculture, has increased Thailand's water needs. As such, the Thai Government has pursued integrated implementation of SDG6 in four main ways: (1) the Development of the Masterplan on Water Resources Management (2018-2037) as the country's roadmap on this issue; (2) the establishment of the Office of National Water Resources (ONWR) as the focal point for all relevant agencies; (3) the passing of the Water Resources Act (2018) as the main piece of legislation encompassing work in this area; and (4) the promotion of technology, knowledge, and innovation in water resources management in the (VNR 2021).

However, the Water security status of Thailand in each dimension compared with the world (Koontanakulvong 2019). A comparison of water in several issues shows that Thailand has only 1.3 weighting for water sufficiency when compared to the global, Asia, and ASEAN scales, which are 2.7, 2.3, and 2.3 weightings, respectively.

The report also mentions the ranking of the World National Water Security Index by Economy (2003-2007), in which Thailand was ranked at level 23 globally. These rankings were gathered and grouped by country.

One of the largest water consumers not only among the different tourist lodging options, as stated by Hamele and Eckardt (2006), but also within the entire tourism industry (Gossling et al. 2012), is the hotel sector. Despite the different determinants related to the size, star rating, or specific water services, some studies estimate that, on average, water consumption in hotels ranges from 216 litres per guest night to 920,

with an average of 686 litres per guest night, according to a study compiling data from 30 published articles from different geographical contexts (Alhudaithi et al. 2022, Gabarda-Mallorqui et al. 2024).

Water conservation is crucial for hotels, particularly as climate change increases the risk of water scarcity. Although 82.0 percent of hotels actively track their water consumption, only half have action plans to reduce water use. There remains a significant opportunity for the hotel industry to reduce water consumption by making simple changes, such as installing low-flow toilets and high-efficiency showerheads. For example, one in two hotels has yet to adopt high-efficiency showerheads (GreenView 2024).

Water usage in Hotels in Thailand

Water and the Hotel and Tourism Industry

The fundamental issues concerning our use of water. It provides guidance on how to use less water, how to keep it free from contamination during use, and how to ensure responsible treatment of hotel wastewater (Kirk, 2010).Water consumption in the hospitality industry is a crucial aspect that must be carefully managed across all activities and services. There are two primary categories of water usage: hot services and cold services. Figure 3 displays a water steam flow chart that illustrates the water use system in the building for hospitality services.

Figure 3. *Building Water Systems and uses Diagram (Chen et al. 2010)*

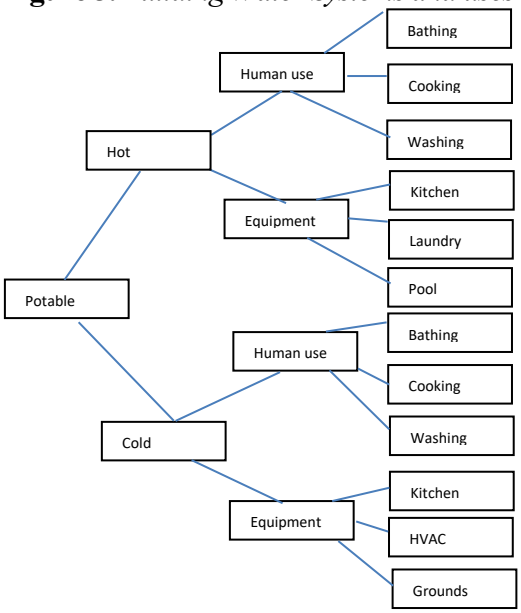


Figure 3 illustrates the water consumption systems in the hotel building, along with their respective activities. There are two primary lines of hotel water consumption: hot water usage and cold-water usage. The estimation of water use of tourism and share of municipal use by country reported by Becken in 2014 found that

tourism use per person per guest night was 716 litres, which could estimate about Tourism's share of municipal water withdrawal 2 percent (Becken 2014).

The statistics on water consumption from the laundry system indicate that the laundry supplier may be able to provide information on the amount of water used. If the total water usage is not available from the supplier, it can be estimated. A common assumption is that 20,000 liters of water are used to wash 1 ton of laundry. If the total tonnage of laundry is unknown, it can be approximated based on the assumption of 0.00512 tons (or 0.0056 imperial tons) of laundry per occupied room (LaundryToday 2024).

Domestic water use in accommodation buildings is a complex issue that varies depending on the type and size of the operation. One area that requires particular attention is laundry services, which can lead to water contamination from cleaning chemicals and the direct discharge of wastewater from laundry outlets. The management of retention ponds or collection systems is also crucial for the proper disposal of laundry water.

Additionally, swimming pools have become a standard facility in hotel services. There is a shift in water treatment methods for swimming pools, moving away from synthetic chlorine towards more environmentally friendly alternatives, such as salt chlorination systems.

The kitchen is a major consumer of high-quality water, but it also generates significant water contamination that needs treatment, particularly from fats, oils, and grease (FOG).

In hotels, another key source of both water consumption and contamination comes from heating and cooling systems. Water cooling systems are particularly common in Thai hotel operations. A significant concern with these systems is the risk of Legionella contamination, especially given that Thailand is in a tropical zone.

Additionally, as shown in Figure 3, water usage for landscaping purposes is another important factor for hotels. Efficient landscape management involves selecting plants that maximize water efficiency. Another consideration in landscape design is the use of chemicals, such as fertilizers and herbicides, which help maintain a clean and vibrant appearance throughout the year.

In Thailand, most domestic water consumption is supplied by waterworks. In the capital and suburban areas, the Metropolitan Water Works provides water, while the Provincial Water Works serves those living outside Bangkok and in surrounding areas. The Thai hospitality industry considers water in its sustainability program. Water management program. Water footprint assessment of the hotels type 1 in Bangkok (volume of the water use of one guest per night) indicated that more than half of water use of hotels was poor according to the benchmark for fresh water use in guest room base on guest is less than 300 litres, Fair is equal 300-350 litres , Poor is greater than 350 litres per guest-night (Sanamthong 2019).

Water Efficiency: Reduce Water Consumption by installing Water-saving Fixtures and Appliances

Thailand's increased water usage indicates regional growth, driven by population and economic expansion. However, the extensive developments in urban areas and the constantly increasing demand for water can lead to water scarcity and pollution problems. As economic development is significantly important for Thailand, the nation may face water scarcity in the near future (Rosa et al., 2020). Our main results regarding determinants of water consumption show that higher water prices cause a drop in water demand. However, the increase in a country's economic growth means a surge in water consumption. Furthermore, when it comes to climate variables, we find that water consumption rises due to higher temperatures, sunshine, and wind speed. In contrast, it falls due to higher precipitation. Finally, analyses of both short-term and long-term effects confirm the results, with all regions except Bangkok showing consistent findings (Tangworachai, Wong, & Lo, 2023).

Track water consumption: Monitor and analyze water use to identify areas for improvement.

The water used by a hotel is extracted from the local water cycle. Water from these external sources can, in principle, be metered or estimated as it enters the hotel's water system. All respondents measured total water withdrawal and use per occupied room with varying methodologies. Other intensity metrics included: water use by: total square footage; number of rooms; built hotel and turnover (Ricaurte & Jagarajan, 2021).

Wastewater Management and reuse: Investing in watershed management strategies for the Central Thailand region could be both beneficial and feasible if funding can be generated through increased water prices. Like the Central region, the East, Southeast, and Southwest regions are also experiencing a rising water demand each year.

Methodology

The Thai hospitality industry considers water management a crucial component of its sustainability program. This study adopted a quantitative research approach, utilizing structured questionnaires distributed to accommodation establishments across five major tourism destinations in Thailand. The research team employed the Voluntary Response Sampling method by sending the online questionnaire to the Thai Hotel Association members in the selected areas. The chosen destinations for distributing the questionnaires included Bangkok, the Central region, the Eastern region, the Northeastern region, the Northern region, and the Southern region, as illustrated in Figure 6.

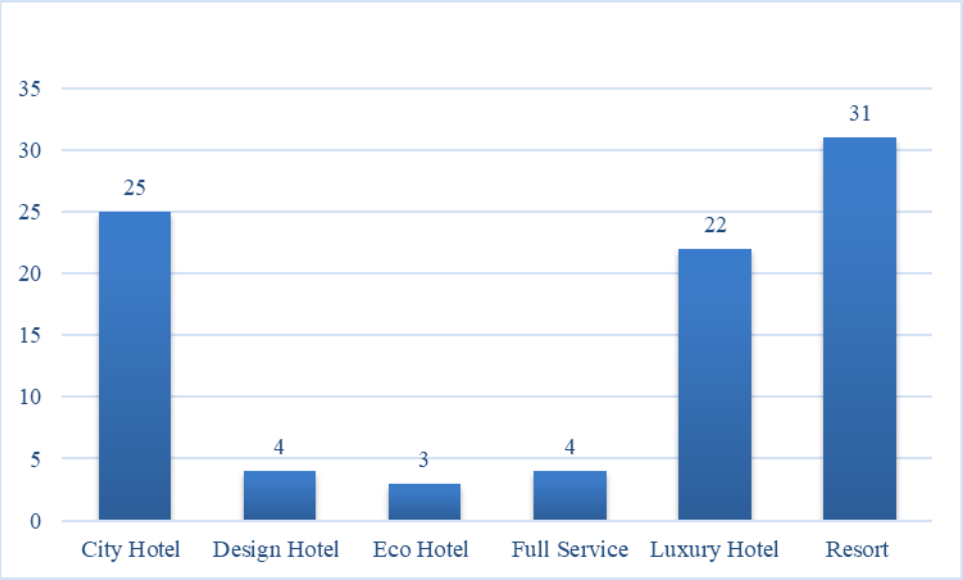
The survey specifically targeted hotel managers, top management, and individuals responsible for sustainability within hotels. The results showed that the highest percentage of respondents, 43.66 percent, identified as General Managers or Representatives. Participants from Human Resources followed this at 16.90 percent, the Engineering Department at 14.08 percent, and those directly responsible for

sustainability at 5.63 percent. Additionally, other roles, including personnel from Housekeeping, Purchasing, Marketing, and Public Relations, accounted for 19.72 percent of the total respondents.

The target group included various accommodation sizes and types. A total of 95 responses were collected from March to May 2025. The data were analyzed using descriptive statistics and thematic categorization of 89 responses.

The data on water usage practices was collected through sustainability initiatives in Thailand, explicitly using the Green Leaf Sustainability Standard. This standard has been recognized both locally and internationally for over two decades. Additionally, to develop a comprehensive water efficiency plan, this study incorporates water management activities from international reports, such as Green View 2024. These comparisons will help assess the study's impact on water management in hotels, ensuring effective operations in the future.

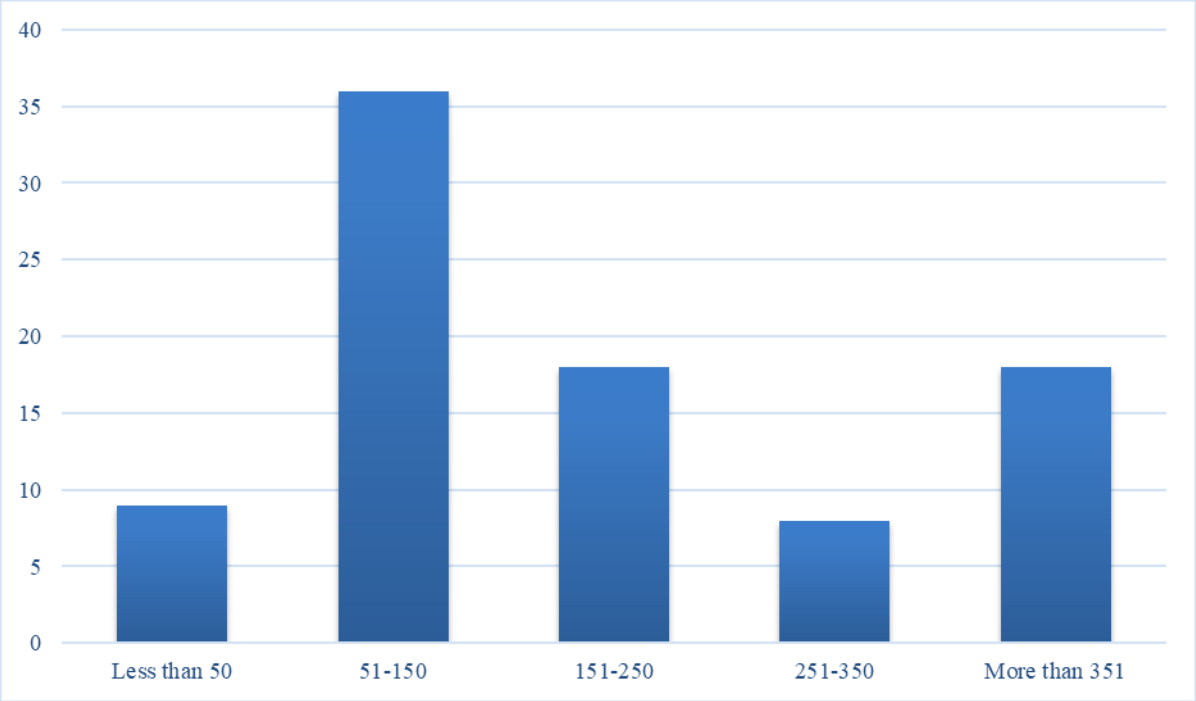
Figure 4. *Number of Accommodation by Type*



Source: Research survey, 2025

Figure 5 illustrates the size of the establishments based on the number of rooms. The data indicates that medium-sized businesses, which represent the largest group of respondents in the survey, typically operate between 51 and 150 rooms. These correspondents are predominantly associated with medium-sized city hotels and resorts, which are likely to have properties within this range. Additionally, there are luxury establishments that also fall into the medium-scale category in Thailand. It is essential to note that properties with more than 300 rooms exhibit significantly higher water consumption, rendering water intensity a crucial factor in their operations.

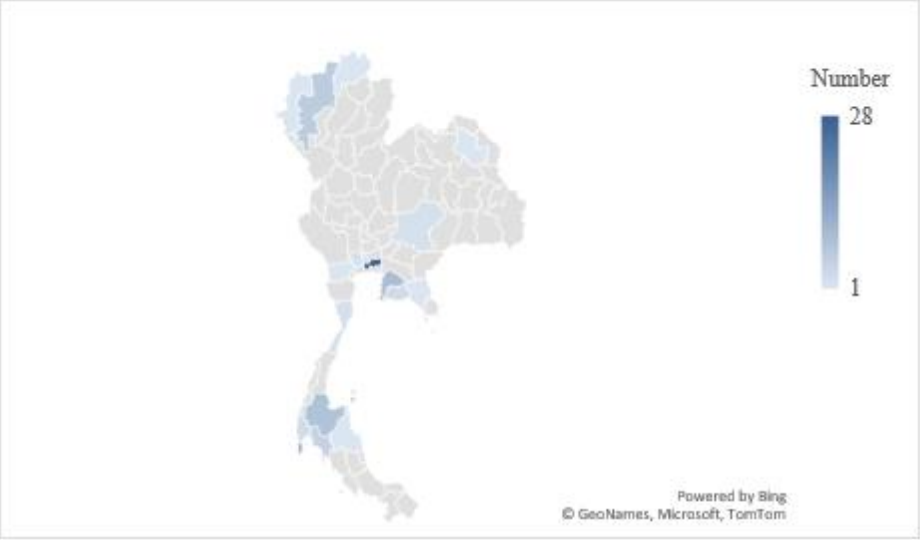
Figure 5. *Size of Esthablisment by Number of Room*



Source: Research survey, 2025

Figure 6 shows the distribution of research across the country. The survey was conducted in five leading tourism destinations, and the most respondents are in four tourist provinces in Thailand: Bangkok, Phuket, Surat Thani, and Chonburi. Analyzing the accommodation locations reveals that all establishments in Bangkok and Chonburi are situated on the mainland. In contrast, most accommodations in Phuket and Surat Thani are located on the islands and operate as resorts or luxury hotels.

Figure 6. *Research Distribution*



Source: Research survey, 2025

Thailand generally experiences three main seasons: summer, rainy, and winter. During the wet season (known as *reudu fon*), the weather is dominated by the southwest monsoon, which brings warm, humid air to the country from the Indian Ocean, resulting in abundant rain throughout these months. Rain tends to fall on most days but comes in short bursts of an hour or two in the afternoon or overnight, with the heaviest rain falling in September and October. While it is not the hottest time of the year, the high humidity caused by the South-West monsoon can make the wet season an uncomfortable time to visit Thailand. It's worth noting that the monsoon also brings consistent onshore winds, which create reliable breaks if you're planning on surfing the Thai coast (Metoffice.gov.uk 2025). However, climate change has led to unusual variations in the monsoon seasons, causing significant challenges. Recently, these changes have led to flash floods and droughts across the country. The most pressing water concern is the quality of water in the pipelines. The issue of water quality is critical as the number of industries increases. Additionally, tourism contributes to water contamination in this country.

The survey results include questions that evaluate the impact of water issues on the hotel's operations. A hotel in Thailand implemented 15 management indicators to enhance water efficiency and conservation based on these results. The findings can be categorized into three main groups.

1. More than 80 percent of implementations will be classified as Group A.

The properties implemented management indicators for water efficiency and conservation by encouraging guest participation in reusing towels, achieving an impressive reuse rate of 98.88 percent. Guests were also asked to reuse their bed linens during stays of more than one night, resulting in a reuse rate of 91.01 percent. Additionally, hotel-organized programs aimed at reducing water contamination, such as the installation of grease traps in washing areas, achieved a compliance rate of 91.01 percent.

The hotel has established a regular water consumption tracking program, which shows a compliance rate of 89.89 percent. Meanwhile, its water management policy operates with an 85.39 percent compliance rate. This demonstrates a solid commitment to water conservation.

2. Between 61percent and 80percent of implementations will be categorized as Group B.

Group B can improve its implementation strategies for the future. The results indicate that the hotel has installed 79.78 percent of the toilets, enabling 76.40 percent of respondents to reduce water consumption by reusing treated water. Additionally, Group B focuses on water conservation by installing water-efficient showerheads, faucets, and toilets.

3. Fewer than 60 percent of implementations will be categorized as group C.

Hotel organizers currently have water-efficient laundry systems implemented in 61-80 percent of their operations, categorizing them in the B group. According to survey results, there is room for improvement, with 42.70 percent of respondents indicating potential areas for enhancement. Although the number of hotels utilizing rainwater collection has increased, this practice has led to a 33.71 percent reduction in water consumption during the dry season.

Table 1. *Presents the Water Management Indicators implemented at the Hotel*

Water Management Indicators	No. of establishments implemented	percent	Group
1. The hotel encourages guests to participate in its towel reuse program.	88	98.88	A
2. The hotel encourages guests to participate in reusing linens, such as bed sheets.	81	91.01	A
3. The hotel organized a program to reduce water contamination, including the installation of grease traps in the washing areas.	81	91.01	A
4. The hotel has a regular program for tracking water consumption.	80	89.89	A
5.The hotel has implemented a water management policy.	76	85.39	A
6.The hotel has installed water-saving toilets and equipment in the guest rooms.	71	79.78	B
7. The hotel has a program for reusing treated water.	68	76.40	B
8.The hotel has implemented a plan to reduce water usage.	67	75.28	B
9. The hotel regularly implemented water efficiency measures for outdoor consumption to reduce leaks and conserve water for all activities.	64	71.91	B
10. Hotel will cultivate local plants in garden areas to minimize water and chemical use.	63	70.79	B
11. The hotel has installed flush tanks that consume less than 6 liters of water per flush.	61	68.54	B
12.The hotel has installed water-saving showers and taps in the guest rooms.	60	67.42	B
13.The hotel invites guests to opt for no room cleaning if staying for more than one night.	55	61.80	B
14. The hotel operates an efficient laundry system that promotes water conservation.	38	42.70	C
15. The hotel has a rainwater collection system that is used during the dry season to reduce water consumption from other sources.	30	33.71	C

Source: Research survey, 2025

Discussion

The survey results indicate that perceptions of water management in hotels in Thailand could be enhanced by categorizing the sustainability activities implemented in these hotels into four categories: 1. Standard Practices, 2. Established Practices, 3. Emerging Practices, and 4. Innovative Practices, as mentioned in Green View 2024

(GreenView 2024). The findings of this survey apply this classification concept to three groups, as illustrated in Table 2.

Table 2. *Shows the Type of Practices for the Water Management Indicators implemented at the Hotel*

Water Management Indicators	Type of practice
1. The hotel encourages guests to participate in its towel reuse program.	Common Practice
2. The hotel encourages guests to participate in reusing linens, such as bed sheets.	Common Practice
3. The hotel organized a program to reduce water contamination, such as installing grease traps in the washing areas.	Common Practice
4. The hotel has implemented a water management policy.	Common Practice
5.The hotel has implemented a water management policy.	Common Practice
6.The hotel has installed water-saving toilets and equipment in the guest rooms.	Established Practice
7. The hotel has a program for reusing treated water.	Common Practice
8. The hotel has implemented a plan to reduce its water usage.	Common Practice
9. The hotel regularly implemented water efficiency measures for outdoor consumption to reduce leaks and conserve water for all activities.	Established Practice
10. The hotel will cultivate local plants in garden areas to minimize water and chemical use.	Established Practice
11. The hotel has installed flush tanks that consume less than 6 liters of water per flush.	Established Practice
12. The hotel has installed water-saving showerheads and faucets in the guest rooms.	Established Practice
13.The hotel invites guests to opt for no room cleaning if staying for more than one night.	Common Practice
14. The hotel operates an efficient laundry system that promotes water conservation.	Innovation Practice
15. The hotel has a rainwater collection system that is used during the dry season to reduce water consumption from other sources	Innovation Practice

Source: Research survey, 2025

Additionally, standard practices in Group B indicate that Thai hotel operations need to improve in several areas related to water issues. These include implementing composting, regularly reusing treated water, and officially establishing a water reduction plan. Another important issue that should be addressed is encouraging guests to participate in the "no-room make-up" option for stays longer than one night, with clear communication of this initiative in all operations.

Based on the analysis of the collected data, the water practices in Thai hotels have introduced a longitudinal perspective to this study. All activities are focused on

understanding how the environmental knowledge base of these firms evolves and the impact this knowledge has on their business performance, as well as global trends.

Thailand is a tropical country rich in water resources and offers various means of access. One potential approach to innovating water resource management is to explore methods for reintroducing rainwater into everyday operations. Hotels are now required to establish integrated circular economy frameworks that guide their business models from the outset and throughout the water life cycle, making the best use of treated water. This is crucial not only for enhancing water efficiency but also for addressing the urgent need to improve water quality nationwide.

Conclusions

The findings presented in this study have some limitations that could inform future research in this area. This research specifically focuses on the Thai hospitality sector, targeting individuals who voluntarily wish to participate in the study. To enhance the generalizability of our results to other service-related industries, similar analyses should be conducted across the entire tourism supply chain, as well as in other sectors with environmental impacts, in different geographical and socio-economic contexts. This approach would provide a more thorough understanding of this critical topic and offer valuable guidance for managing water-related issues in Thailand's tourism sector, ultimately leading to better management indices and performance.

The challenge of further study lies in the lack of basic information, and researchers must contend with the availability of data that sometimes compromises the confidentiality of business operations.

Acknowledgement

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Strategic Application of AI Tools in Enhancing Tourism for SMEs: The Tourist Management in the Seismic Risk Areas

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The aim of this research is to investigate the convergence of digitization, seismic risk, and tourist management, focusing specifically on small and medium-sized firms in the tourism sector. This research examines the strategic application of digital technology to mitigate the adverse effects of earthquakes on the tourism sector and promote the long-term sustainability of these businesses. The research investigates the level of digitalization across 252 accommodation facilities and their geographical distribution in relation to varying degrees of seismic hazard. Furthermore, the research suggests the development of a digital tourism portal designed to provide real-time information in the aftermath of earthquakes. This tool aims to support local small and medium-sized enterprises by integrating artificial intelligence tools, thereby promoting both safety and sustainable economic growth.

Keywords: *Digitalization, Tourism Sector, Seismic Risks, Resilience, AI Tools.*

Introduction

Tourism is an essential component of the global economy that supports economic expansion, creates employment opportunities, and contributes to social advancement (Zhang et al. 2021). Despite its importance, its reliance on infrastructure and natural resources exposes it to risks from natural disasters like earthquakes (Xiao et al. 2022). Seismic risk—a term describing the probability of adverse effects or anticipated losses stemming from seismic events and regional vulnerabilities (Jena et al. 2020)—constitutes a significant challenge for destinations situated in earthquake-prone areas. The repercussions include diminished employment opportunities, fewer tourists, and reputational damage to affected destinations (Akamavi et al. 2023, Mazzocchi and Montini 2001). Moreover, tourists' risk perceptions significantly influence their travel choices, directly affecting the competitiveness of these locations (Akamavi et al. 2023, Scott and Gössling 2015). In this scenario, embracing digital technologies provides substantial opportunities to tackle these issues by enabling the creation of innovative strategies to boost the resilience of tourist destinations. Digital tools, including digital twins that model risk scenarios and digital communication platforms, facilitate efficient information sharing during emergencies, thereby improving the safety of both tourists and locals (Lagap and Ghaffarian 2024, Ye et al. 2022). Concurrently, analytics and Artificial Intelligence (AI) technologies assist small and medium-sized enterprises

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(SMEs) in responding to evolving consumer preferences and boosting tourist engagement and loyalty (Kanwal et al. 2023, Rane et al. 2023). Utilizing social media and integrated digital platforms not only increases the visibility of destinations but also helps in gathering essential feedback for service enhancement (Sharma and Sharma 2024, Di Virgilio 2022).

Based on our knowledge (Web of Science, Google Scholar, and Scopus), present understanding of the intersection between the level of digitalization of SMEs and seismic risk exposure in tourism is limited. While most studies in the field have only focused on the resilience, restoration, redevelopment, and valorization of architectural heritage to protect it from natural disasters and climate change (Mocerino et al. 2024, Aktürk and Hauser 2025, Vegas et al. 2022), and on how digital transformation influences organizational resilience and affects organizational performance and employees' state optimism (He et al. 2023), no previous study has specifically investigated if digitalization contributes to mitigating the effects of seismic risk on tourism and if the level of digitalization among accommodation facilities may be associated with their exposure to seismic risk. Thus, this research explores the following question:

> RQ1: Does digitalization contribute to mitigating the effects of seismic risk on tourism and promoting the resilience of tourist destinations?

The analysis was based on a dataset from Confartigianato and provides comprehensive insights into 252 accommodation facilities located in the Molise region. Molise, based on data from the National Institute of Geophysics and Volcanology, reports a significant seismic risk; this allows for greater emphasis in the analysis. The dataset includes 20 variables, both quantitative and qualitative, divided into six categories. These categories consist of digital contact information, social media presence, and registration on booking platforms. By integrating this dataset with seismic hazard data from the Molise Region—classifying municipalities into three risk zones based on Peak Ground Acceleration (PGA)—this study examines the relationship between the level of digitalization in accommodation facilities and their exposure to seismic risk.

An innovative aspect of this study is the proposal for a digital tourism portal designed to provide real-time updates on post-earthquake conditions while supporting local SMEs in economic development (Sharma and Sharma 2024, Tien et al. 2023). This tool would not only improve communication with tourists by reassuring them during emergencies but also collect useful data through AI tools to identify new trends and develop targeted marketing strategies that ensure sustainable growth for the tourism sector (Rane et al. 2023).

Literature Review

Digitalization of SMEs in the Tourism Sector

Embracing digital technologies is essential for enhancing the competitiveness and ensuring the sustainable development of the tourism sector. Employing new technologies such as AI, virtual reality, and big data enables firms to enhance service quality, optimize business operations, and foster innovation, so ensuring a sustainable competitive advantage in the market (Chen 2024, Mick et al. 2024). The adoption of Information and Communication Technologies (ICT) has transformed market dynamics and management approaches, making it easier and more flexible for tourism SMEs to commercialize their offerings (Lara et al. 2017). Beyond operational enhancements, digitalization bolsters the sector's resilience by lessening the impact of crises—such as those triggered by the COVID-19 pandemic—through increased tourism consumption and fiscal support (Tang 2024). Moreover, the adoption of digital tools is essential for sustaining corporate stability and assuring long-term viability (Surya et al. 2022). Digital transformation encompasses an array of technologies, including artificial intelligence, such as DeepSeek and chatbots; virtual reality; augmented reality; big data; and the Internet of Things (IoT), which enhance efficiency and revolutionize customer experiences through personalization and improved resource management (Kindzule-Millere and Zeverte-Rivza 2022, Jha 2024). The development and implementation of virtual experiences—initially accelerated by the restrictions imposed during the COVID-19 pandemic—underscore their potential not only as a temporary response, but also as a long-term integrative component, especially when supported by the strategic use of AI tools (Amarendra and Das 2022). Mobile applications like DepApp (Kırcı et al. 2023) and web platforms (Verrucci et al. 2016) provide real-time information and practical guidance for earthquake response. Immersive tools, such as virtual reality and serious games (Feng et al. 2020), improve behavioral preparedness, while advanced technologies like Digital Twin (Yu et al. 2023), cloud computing, and IoT (Cheng et al. 2021) facilitate simulation and emergency coordination. Alternative communication systems (Parlar et al. 2024, Centelles et al. 2021), peer-to-peer applications (Han et al. 2016), and machine learning-based solutions (Abdalzaher et al. 2023) are also noteworthy. Key domains, such as social media and mobile booking applications, significantly influence consumer decisions and necessitate organizational adaptation (Paul et al. 2024). The use of video material on social media platforms such as Facebook, Flickr, Instagram, LinkedIn, Pinterest, Twitter, and YouTube is widely recognized as a pivotal strategic asset for the tourism sector. This method enhances and promotes places engagingly, strengthens emotional connections with visitors, and creates new economic opportunities (Di Virgilio and Das 2023a). Social media should not be viewed solely as communication tools; instead, they must be acknowledged as strategic marketing platforms capable of influencing the behavioral decisions of other customers through user interactions (Di Virgilio et al. 2017). A social media campaign may aim to enhance customer loyalty, a goal made more complex by the difficulty of precisely assessing users' emotions and sentiments (Di Virgilio et al. 2024). The amalgamation of social media-driven service innovation and mobile booking

applications augments sustainable development in the tourism and hospitality sector by enhancing service quality, minimizing environmental impact, and promoting sustainable leadership (Zada et al. 2025, Polukhina et al. 2025). Digital booking systems and social media engagement enhance travel experiences by making them more immersive and interconnected while also promoting sustainable tourism through improved accessibility and innovative services (Tandafatu et al. 2024, Zada et al. 2025). The concepts of Tourism 4.0 and smart tourism destinations focus on minimizing tourism's environmental impact and encouraging sustainable practices by utilizing digital technologies to offer highly personalized and engaging experiences for tourists (Pencarelli 2019, Kindzule-Millere and Zeverte-Rivza 2022). Studies indicate that digital tools can significantly boost rural tourism income, especially when tailored to the unique characteristics of natural and cultural landscapes (Zhang et al. 2025, Alonso et al. 2024). The use of digital platforms for booking and information dissemination has improved the efficiency and sustainability of tourism services, reducing environmental impacts and increasing resource availability (Polukhina et al. 2025).

However, SMEs frequently face difficulties in adopting digital solutions due to limited financial resources, a lack of personalized strategies, and insufficient technological skills, preventing them from fully utilizing these advancements (Mick et al. 2024, Zhang et al. 2022a). Nonetheless, SMEs that successfully integrate digital tools can unlock new opportunities and strengthen their competitive position (Kindzule-Millere and Zeverte-Rivza 2022, Jha 2024).

Seismic Risk in Tourism

Seismic risk, which refers to the likelihood of surpassing a certain impact level due to earthquakes, poses a major threat to tourism by causing physical damage, economic losses, and social disruption (Brillinger 1982, Carreño et al. 2007, Carreño et al. 2011, Jena et al. 2020, Akamavi et al. 2023). SMEs, particularly micro-businesses, face difficulties in disaster preparedness due to financial barriers and restricted access to resilience tools (Orchiston 2012, Orchiston 2013). Earthquakes pose major threats to infrastructure, disrupting transportation, food supply networks, and accommodation services, underscoring the importance of robust seismic risk management strategies (Orchiston 2012, Mäntyniemi 2012). A key component of risk mitigation is seismic risk assessment, which evaluates the probability and impact of earthquakes on tourism infrastructure to improve preparedness (Hosseinpour et al. 2021). Effective communication of seismic risks to crisis management teams, particularly in tourists' home countries, ensures that at-risk travel destinations are properly assessed (Mäntyniemi 2012). The role of digitalization in enhancing SMEs' resilience in earthquake-prone areas is vital, especially in developing nations. Research on SMEs in Aceh, Indonesia, demonstrates how digital technologies, such as cloud computing and e-commerce, support risk management by ensuring business continuity and adaptability during seismic events (Chan et al. 2023).

Lessons drawn from past crises, such as the COVID-19 pandemic, emphasize that innovation and adaptability are essential for effectively managing external disruptions, providing important guidance for seismic risk readiness (Rastegar et al.

2023). Moreover, how tourists perceive seismic risk significantly impacts their travel choices, directly affecting the competitiveness of various destinations (Akamavi et al. 2023). Risk perception is a key element of tourist behavior, affecting how travelers evaluate destinations and make travel decisions. When perceived risk is high, it can decrease the impact of positive destination image and motivation on intention to travel (Caber et al. 2020). Despite perceived risks, tourists persist in revisiting and endorsing destinations, especially when environmental concerns are not viewed as major impediments (Setiawan et al. 2024). In earthquake-prone regions, the tourism sector prioritizes digitalization and the rebuilding of trust. The central goal is to deliver a secure, dependable, and high-quality experience to visitors by leveraging advanced technologies and protocols that emphasize personal safety (Di Virgilio and Das 2023b)

Digital technology, particularly remote sensing, has grown significantly, improving capacities for environmental monitoring, agriculture, and urban planning. The combination of AI and machine learning with remote sensing has revolutionized data processing in Earth sciences. AI approaches, particularly deep learning, have been utilized for tasks such as image classification, land cover mapping, and change detection, exhibiting superior effectiveness compared to traditional methods (Chen et al. 2023, Janga et al. 2023). These technologies provide the optimal distribution of emergency resources and the precise identification of disaster sites, hence enhancing the efficacy and efficiency of emergency planning (Zhang et al. 2022b). Artificial Intelligence, when incorporated with cloud-based platforms, enables bidirectional communication, hence aiding in the collecting and analysis of data to formulate effective management strategies for disasters and severe weather events. This enhances the resilience of communities by allowing real-time data transmission and reception (Gupta et al. 2022). The development of intelligent remote sensing satellites presents opportunities for real-time, personalized data services, though issues related to privacy and data sharing need to be addressed (Zhang et al. 2022c).

Mobile platforms are fundamental in improving visitors' readiness by offering real-time information on risks and safety protocols while ensuring privacy (Aliperti and Cruz 2020, Psaroudakis et al. 2021). These instruments are necessary for efficient risk management and emergency response, especially for natural catastrophes and pandemics. Nevertheless, enhancing user awareness and adoption continues to pose a barrier that necessitates focus (Aliperti and Cruz 2020).

Resilience in Supporting SMEs

Resilience is vital for the longevity of tourism SMEs, allowing them to face crises and recover efficiently. Essential resilience factors include supply chain collaboration, strategic HR management, and adaptability (Seow et al. 2024). SMEs that emphasize innovation, product development, and technology integration demonstrate higher crisis adaptability (Sepúlveda and Bustamante-Caballero 2024). Entrepreneurial connections and a proactive approach to risk also contribute to resilience by encouraging adaptation (Dias et al. 2022). Leadership, employee training, and internal management methods are crucial for maintaining business continuity (Núñez-Ríos et al. 2022). Digital transformation, including virtual reality, allows SMEs to maintain

business operations and expand their market reach during crises (Sánchez and Palos-Sánchez 2020, Sepúlveda and Bustamante-Caballero 2023). Additionally, governance, stakeholder engagement, and risk assessments play vital roles in reinforcing resilience and improving tourism performance (Caluza 2024). Strong community ties also support SMEs during crises by providing additional resources and assistance (Dahles and Susilowati 2015, Dias et al. 2022).

Methodology

Study Area

The study focuses on the Molise region, a small and less-studied region located in southern Italy. Molise is characterized by a predominantly rural setting with a developing tourism sector, making it an interesting case for analyzing the digitalization of accommodation facilities located in seismically active zones. Indeed, the region encompasses all three seismic risk categories (low-, medium-, and high-risk zones), which allows for an integrated analysis of how seismic risk may relate to digitalization levels. This diverse risk profile adds a valuable dimension to the study, as it enables exploring potential spatial correlations between seismic vulnerability and digital adoption among local hospitality businesses.

Data Collection and Sample

This study is based on a secondary analysis of data gathered from two principal sources: Confartigianato and the Molise Region. Confartigianato is a leading Italian association that monitors SMEs performance, digital transformation, and regional business risks. The analysis was conducted on accommodation facilities listed in the Confartigianato registry of SMEs, and only those that voluntarily agreed to participate were included in the study.

The assessment of digitalization was based on data provided directly by Confartigianato, which collected information on the online presence and digital tools adopted by each participating facility. While this approach may limit generalizability to the broader population, it ensures data reliability by relying on verified information from a trusted institutional source.

The initial dataset offers comprehensive information on 252 accommodation SMEs in Molise, encompassing 20 variables that reflect both quantitative and qualitative variables.

The quantitative variables were divided into 6 clusters. Digital contact variables (Cluster 1) include the presence of an email, a landline phone number, a mobile number, and a website. Cluster 2 concerns the presence of the structure on social media, considering platforms such as Facebook, Flickr, Instagram, LinkedIn, Pinterest, Twitter, and YouTube. Cluster 3 includes the presence on digital platforms (booking apps), such as TripAdvisor, Booking, Hotels.com, Airbnb, and Trivago. In addition, the dataset contains the geographical coordinates of the structure (Cluster 4), expressed in latitude and longitude, and two qualitative variables: the type of structure

(Cluster 5), which distinguishes between Bed and Breakfast, Farmhouse Stay, Guesthouse, Holiday Home, Hotel, Resort, Scattered Hotel and Tourist Residence, and the municipality of residence, recorded as a textual variable (Cluster 6).

Table 1. *Accommodation Types and Definitions*

Accommodation Type	Definitions
Bed and breakfast	Private residences and small buildings frequently serve as venues for bed and breakfast establishments, offering breakfast services and a distinctive rural ambiance (Lin et al. 2024). These establishments, often available for rent, generate revenue by providing individual rooms and breakfasts made from locally sourced ingredients, thereby contributing to sustainable development and enhancing rural resilience (Fan et al. 2023, Liu et al. 2023, Greene 2022).
Farmhouse Stay	Farmhouse accommodations provide distinctive experiences in rural settings, enabling guests to reconnect with cultural heritage and engage in educational activities related to agriculture (Fanelli and Romagnoli 2020). These establishments contribute to sustainable economic development by incorporating local cultural and historical elements, reducing environmental impact, and bolstering the local economy. Farmhouse stays are a sustainable choice for rural tourism development (Confalonieri 2011).
Guesthouse	Guesthouse refers to different forms of autonomous short-term accommodations, including tourist apartments, tiny residences, and local lodgings, utilized for vacations and temporary visits. Guesthouses may consist of a standalone residence or a single floor within a structure (Ferreira et al. 2020). This category of accommodations generally contains smaller, often family-operated enterprises, providing a more private experience for tourists. Guesthouses offer a more adaptable and personal experience than conventional hotels (Troisi et al. 2023).
Holiday Home	Holiday homes foster family unity and social bonding, promoting a dynamic "family flow" that enhances the holiday experience for both parents and children (Larsen 2013). Holiday homes serve as a "home away from home," fostering a sense of belonging and strengthening familial bonds through shared experiences and carework (Cheong and Sin 2019,; Frochot et al. 2019).
Hotel	A hotel is a type of tourist accommodation that provides lodging, meals, and other services for travelers and tourists; varies in size, function, and cost; and is typically categorized by its level of service, amenities, and location. They often belong to a broader chain or brand, influencing tourists' perceptions and experiences (Papallou et al. 2024, Seo and Shulga 2024, Sharma et al. 2022).
Resort	A resort is a destination that provides an extensive array of amenities and recreational activities, typically situated in picturesque or vacation-oriented locales. The concept of a resort revolves around delivering an all-in-one vacation experience, merging accommodation, culinary services, and leisure activities (Papallou et al. 2024). Resorts are freqiently associated with luxury and comfort, have a major impact on both the development and sustainability of tourism regions (Liu et al. 2021, Shafiee et al. 2020, Makuzva and Ntloko 2021).
Scattered Hotel	The scattered hotel is a horizontally arranged complex with accommodations distributed among multiple edifices in a village, all within pedestrian proximity to a central main building (Fissi et al. 2020, Montis et al. 2015, Confalonieri 2011). This model utilizes a unique business strategy that facilitates value creation by cultivating cultural and emotional ties between entrepreneurs and the local community, consequently providing innovative services designed to improve the guest experience (Fissi et al. 2020, Presenza et al. 2019).
Tourist Residence	Tourist residences are a form of accommodation that offer a more domestic

	environment for travelers, frequently including amenities such as kitchens and living areas. These accommodations are typically utilized for extended stays and may be part of a larger complex or exist as standalone units (Liu et al. 2021). Tourist residences appeal to travelers that search a more autonomous and adaptable lodging option, often combining features of both hotels and vacation rentals (Zasali et al. 2023, Chilufya et al. 2019).

Source: Authors' own work

The variables associated with contacts, social media, and booking applications were converted into a binary format, designating a value of 1 for presence and 0 for absence. A Normalized Digitization Index was developed to evaluate the digitization of accommodation facilities, determined by the ratio of the number of digital characteristics present to the maximum feasible number (16)—based on Cluster 1, Cluster 2, and Cluster 3. This method allows obtaining a value between 0, which indicates the total absence of digitization, and 1, which represents the maximum achievable level.

The second dataset provides information on the regional distribution of peak ground acceleration (PGA), a parameter that quantifies the maximum ground acceleration during a seismic event and a key factor in the formulation of seismic damage scenarios (Mendicelli et al. 2022).

This dataset categorizes communities into three seismic hazard zones: ZONE 1: High hazard, ZONE 2: Medium hazard, and ZONE 3: Low hazard.

The integration of the two datasets involved correlating seismic hazard data with accommodation facilities according to their municipality, facilitating an examination of the correlation between digitization levels and seismic risk across various regions.

Data Analysis

Data analysis was carried out utilizing R, adhering to a stringent methodological approach. The analysis comprised two components. The initial analysis comprised descriptive statistics to encapsulate the primary attributes of the sample, including means, medians, standard deviations, and frequency distributions, alongside significance tests, notably the chi-square test (χ^2) and Cramér's V, to evaluate the existence and intensity of statistically significant correlations among categorical variables. The second part of the analysis includes seismic risk data to assess which accommodation facilities are most vulnerable to seismic risk.

Results

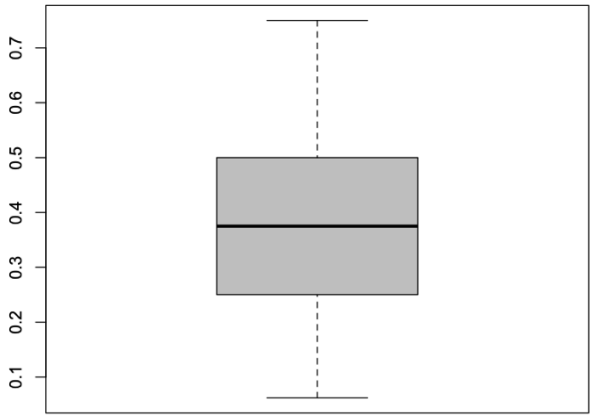
Distribution

There were 252 accommodation facilities; among them, 0.79% were resorts, 1.19% were scattered hotels, 2.78% were farmhouses, 3.97% were tourist residences, 5.95% were holiday homes, 10.32% were hotels, 21.83% were guest houses, and 53.17% were bed and breakfasts.

Measurement Model

Based on the Normalized Digitization Index, digitization classes have been created that include all structures, regardless of type: low, medium, and high. All the accommodation facilities in the dataset have a medium level of digitization, as shown in the box plot (see Figure 1). The distribution can be illustrated using a box plot, which shows no presence of outliers. This absence suggests that there are no data points that are isolated, indicating that the structures demonstrate consistent digitization behavior, with none standing out as notably different.

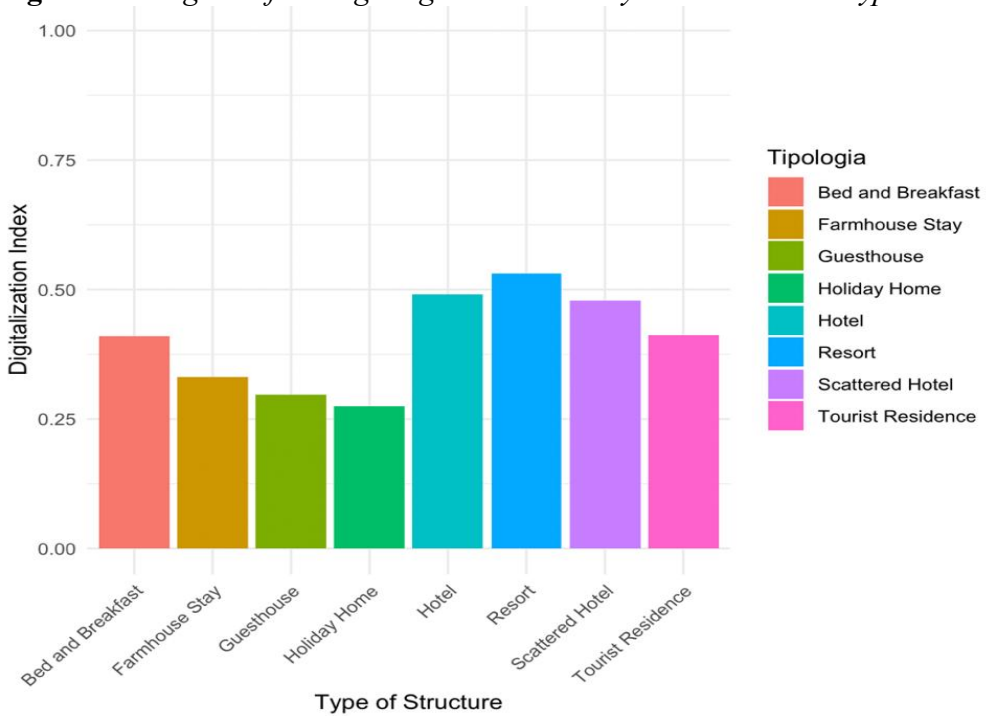
Figure 1. *Box Plot of Digitalization Index*



Source: Authors' own work

The box, which represents the interval from the first quartile (Q1 ≈ 0.25) to the third quartile (Q3 ≈ 0.5), shows that the central 50% of establishments have digitalization levels between 0.25 and 0.5. The digitalization level of the accommodations in the dataset is generally moderate, with a concentration in the 0.25–0.5 range. Analyzing the average digitalization level for each type of establishment was beneficial, as it offered insights into how various accommodation categories have adopted digital tools and technologies (see Figure 2).

Figure 2. *Histogram of Average Digitization Level by Accommodation Type*



Source: Authors' own work

In the results, Table 1, the distribution of the digitalization index across different types of accommodation facilities shows significant variability. In general, bed and breakfasts exhibit a more widespread digital presence, with a concentration in intermediate ranges. Traditional accommodation facilities, including scattered hotels and rural lodgings, typically incorporate digital technologies to a lesser extent. Hotels generally fall in between, showing a stable but moderate uptake of digital tools. Taken together, these insights point to the conclusion that digital transformation in the hospitality sector is determined by a combination of establishment type and managerial approach.

Table 2. *Frequency Distribution of the Digitalization Index by Accommodation Type*

	0.062	0.125	0.188	0.25	0.312	0.375	0.438	0.5	0.562	0.625	0.688	0.75
Bed and Breakfast	1	1	9	18	12	26	18	25	9	12	2	1
Farmhouse Stay	0	0	1	2	1	2	0	0	1	0	0	0
Guest House	10	6	6	5	6	4	7	5	3	1	0	0
Holiday Home	2	2	3	1	3	1	0	1	2	0	0	0
Hotel	0	0	1	0	1	2	5	6	9	2	0	0
Resort	0	0	0	0	0	0	0	1	1	0	0	0
Scattered Hotels	0	0	1	0	0	0	0	1	0	0	0	1
Tourist Residence	0	0	2	0	0	1	3	3	1	0	0	0

Source: Authors' own work

To assess the association between accommodation type and the level of digitalization—Cluster 1: digital contact variables; Cluster 2: presence on social media; and Cluster 3: presence on digital platforms (booking apps)—a chi-squared test was performed.

The results (Table 3) showed a statistically significant relationship between the two variables ($\chi^2 = 157.15$, df = 77, $p < 0.001$). This outcome implies that the extent of digitalization is influenced by the type of accommodation, highlighting possible variations in the implementation of digital technologies across the different categories examined.

Table 3. *Pearson's Chi-squared Test*

Test	χ^2	df	p-value	Significance
Pearson's Chi-squared test	157.15	77	1.97e-07	$p < 0.001$ (***)

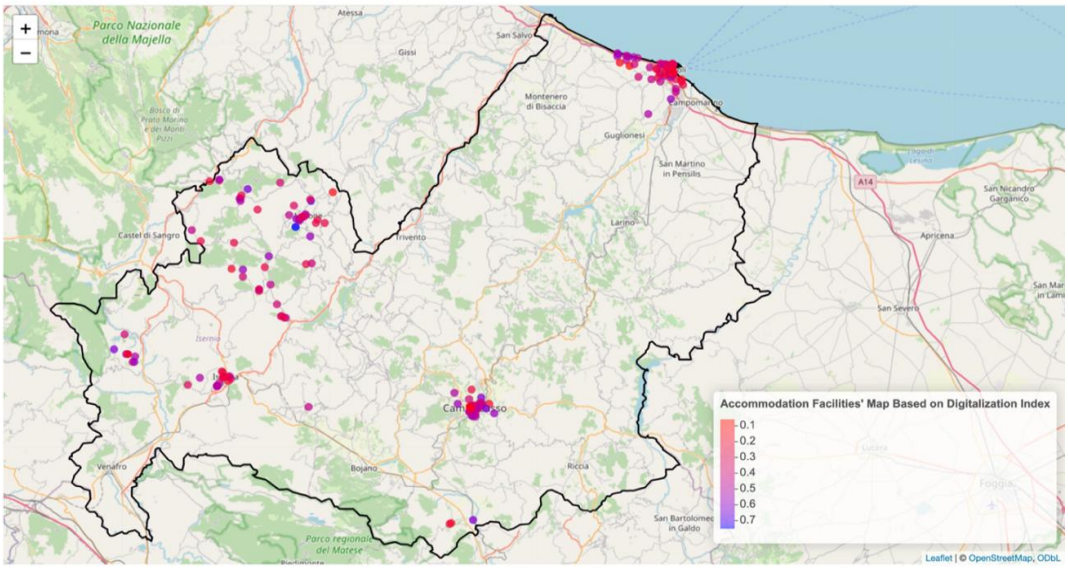
Source: Authors' own work

To measure the strength of the association, we calculated Cramér's V, which ranges from 0 (no association) to 1 (perfect association). We observed a value of 0.298, which is situated within the 0.2 to 0.4 range, signifying a moderate relationship between the type of accommodation and the level of digitalization. This finding implies that there is a correlation between these two factors, with the type of accommodation having an impact on the degree of digitalization.

Seismic Risk

In the subsequent phase of the analysis, we employed the geographical coordinates of the structure, specified in terms of latitude and longitude, to map the structures, including their levels of digitization. Employing R with the `leaflet` command, we developed an interactive map (see Figure 3).

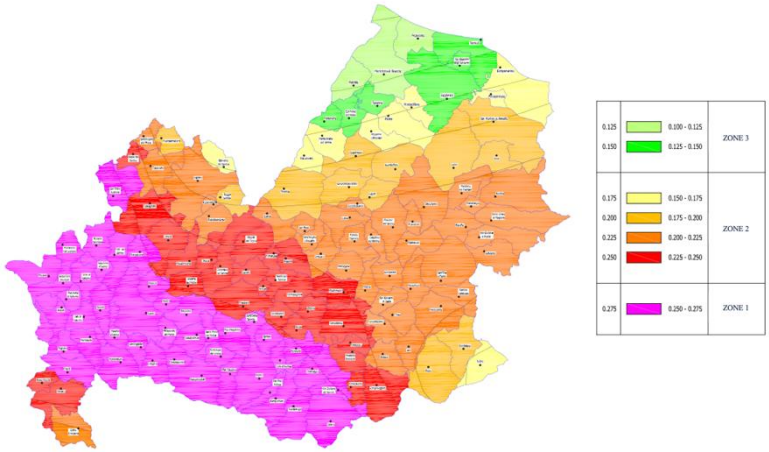
Figure 3. *Location of Accommodation Facilities in the Molise Region*



Source: Authors' own work

The Figure 3 presents a map detailing the locations of accommodation facilities across the Molise region, with each dot indicating a facility and its grade of digital advancement. A significant number of these facilities are clustered along the Adriatic coast, notably in the Termoli vicinity, as well as in inland areas that are popular with tourists, such as the mountainous zones and those close to the Majella National Park. The last step of the analysis is to assess which structures are most vulnerable to seismic risk. For this purpose, the seismic hazard map from the Molise region has been utilized (see Figure 4).

Figure 4. *Seismic Hazard Map of the Regional Territory*



Source: https://www.regione.molise.it/flex/cm/pages/ServeBLOB.php/L/IT/IDPagina/583, in the public domain.

The seismic hazard map for the Molise region delineates the division of the area into specific seismic areas, divided by the peak ground acceleration (PGA) experienced during earthquakes. This map classifies the region into three zones, each representing an escalating level of seismic risk.

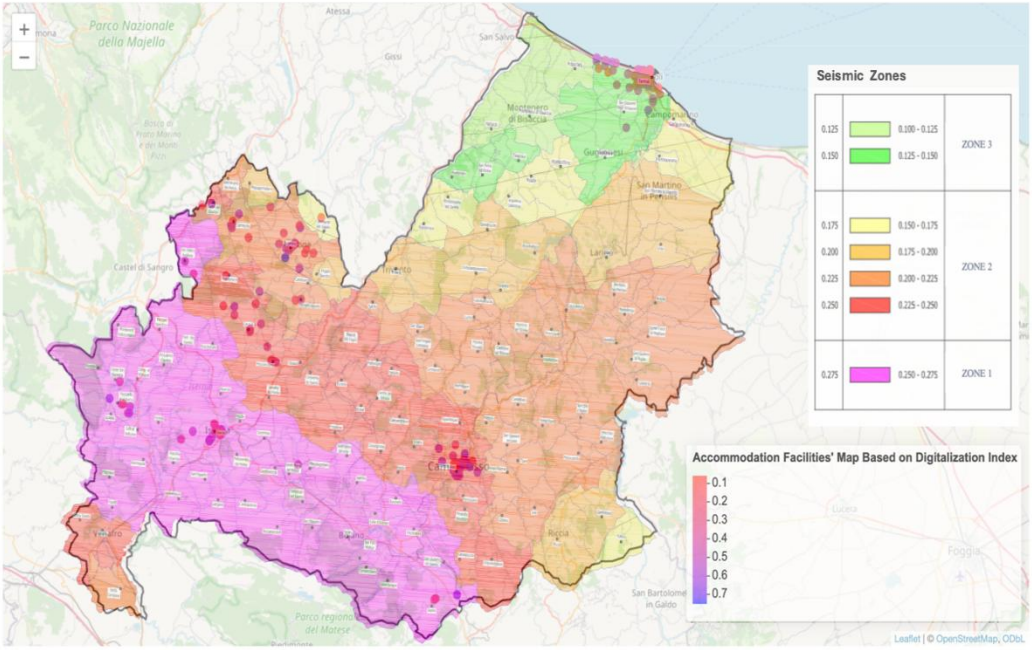
ZONE 3—Low Hazard, predominantly in municipalities in northern Molise.

ZONE 2—Medium Hazard, much of central and eastern Molise, including Campobasso and Isernia (with local variations). This is the zone with the greatest extent.

ZONE 1—High Seismic Hazard, an area with the highest expected acceleration in the event of an earthquake, thus the most prone to high seismic risk, present particularly in the southwestern and southeastern parts of Molise.

The analysis was completed by superimposing the two maps to determine which accommodation facility is most susceptible to seismic risk in the event of an earthquake (see Figure 5).

Figure 5. *Location of Accommodation Facilities according to Seismic Hazard*



Source: Authors' own work

In the southwestern region, characterized by high seismic hazard (zone 1), there is a significant presence of digitized structures, which are also well digitized. Conversely, the northern region of Molise, classified as zone 3 (low hazard), has a high concentration of buildings, some of which are highly digitized, though they are fewer than those in the south-central area. Campobasso, a city in zone 2, is characterized by a significant number of accommodations, many of which are extensively digitized.

Discussion

This study offers valuable insights into the relationship between digitalization and accommodation types in the Molise region, as well as their geographic distribution and exposure to seismic risk. The classification of facilities—ranging from B&Bs and guest houses to hotels, resorts, scattered hotels, and farmhouse stays—reveals a heterogeneous but moderately digitized hospitality sector.

The Normalized Digitalization Index shows a fairly uniform distribution, with all facilities positioned in the medium range and the central 50% of values spanning from 0.25 to 0.5. The lack of outliers indicates a uniform level of digital adoption throughout the region, supporting the notion that digitalization is becoming standard in tourism management, though there are notable variations among different types of accommodations. Bed and breakfasts, which constitute the majority of the sample—53.17%—display a wider range within medium to high digitalization levels. This implies that smaller, often owner-operated establishments are increasingly embracing

digital tools, likely motivated by the need to stay competitive, manage bookings effectively, and engage with customers online.

Guest houses follow a comparable trend. On the other hand, traditional accommodations such as scattered hotels and farmhouse stays often display lower levels of digitalization. This may be attributed to their focus on authenticity and local experiences, which might result in a reduced emphasis on incorporating technology.

Hotels show moderate but consistent digital adoption, likely influenced by established protocols and more structured management systems. The chi-squared test ($\chi^2 = 157.15$, df = 77, $p < 0.001$) confirms a statistically significant link between accommodation type and digitalization level.

A Cramér's V value of 0.298 indicates a moderate correlation, suggesting that the type of accommodation is among several factors impacting digitalization. Other crucial elements include the attitude of management, the availability of infrastructure, and competitive market positioning. Furthermore, spatial mapping enhances the understanding of regional accommodation service trends. High concentrations of accommodations are found along the Adriatic coast and in inland tourist areas, such as those near Majella National Park. These economically active zones tend to host more digitized facilities, indicating a correlation between tourism demand and digital investment. A crucial aspect of this research involved investigating the relationship between digitalization and seismic risk. By integrating the spatial layout of facilities with the seismic hazard map of the Molise region, the study discovered that many well-digitized buildings are located in high-risk areas (Zone 1), particularly in the southwestern part of the region.

Conversely, Zone 3 in the north, although rich in accommodation facilities, has fewer highly digitized establishments. Campobasso, located in Zone 2, shows a concentration of both accommodations and digital adoption, indicating the impact of urbanization and infrastructure. These results underscore the necessity of incorporating digitalization not only for operational efficiency and marketing but also as a part of risk management. In earthquake-prone areas, digital innovations such as early warning systems, real-time notifications, and emergency response platforms can bolster tourism infrastructure and enhance the safety of visitors. The digital transformation of the tourism industry in the Molise region is influenced by a variety of factors, including the types of accommodations, management strategies, geographic location, and exposure to risks, as well as the adoption of digital tools such as social media platforms and AI-based technologies (Di Virgilio and Das 2023a). By implementing policy measures and providing targeted support, particularly to traditional and high-risk businesses, a more balanced digital transformation can be promoted, thereby strengthening the sector's overall resilience.

Theoretical and Practical Implications

This study presents key theoretical insights, especially in terms of digital transformation and the use of large-scale social data. Digital technologies have transformed how supply and demand interact within the tourism industry, significantly affecting the visitor journey and overall experience. Existing theoretical frameworks

highlight the essential role of user-generated content and extensive social data in comprehending and managing the complex dynamics of tourism organizations. These data-driven strategies enable a deeper insight into tourist perceptions and behaviors, facilitating the co-creation of tourist experiences and enhancing the value provided to visitors (Cuomo et al. 2021). The perception of seismic risk among visitors and SMEs, along with the implications of technological progress, could be examined through the lens of risk communication and management. Tourists, who are typically unfamiliar with local hazards, often fail to recognize dangers, accentuating the significance of targeted communication strategies to raise awareness and readiness (Cisternas et al. 2024, Pahrudin et al. 2023).

The resilience of SMEs is increasingly being studied using the perspective of dynamic capabilities. In this context, resilience is viewed as a second-order dynamic capability that emerges when SMEs adjust their business models and use digital technology to deal with crises (Khurana et al. 2022). The concept of entrepreneurial resilience plays a pivotal role in current theoretical discussions on SME robustness. Scholars point to the importance of entrepreneurial initiative and informal business ecosystems in effectively addressing adversity, as opposed to the structured resilience systems commonly found in larger firms (Branicki et al. 2018). The integration of resilience with sustainability holds equal importance, promoting strategies for SMEs that enhance both organizational durability and contribute to societal welfare (DiBella et al. 2022). This approach is intricately connected to sustainable leadership frameworks, which stress the necessity of skill enhancement to ensure continuous resilient development (Suriyankietkaew et al. 2022).

In operational terms, digitalization acts as a driver for improvement in the tourism sector. In particular, AI is profoundly transforming the tourism SME sector, enhancing its innovation, efficiency, and competitiveness. AI promotes improved environmental, social, and governance (ESG) performance through the use of generative AI in digital value chains (Wang and Zhang 2025).

Moreover, AI enables more personalized strategies through big data, machine learning, and natural language (Filieri et al., 2021; Bulchand-Gidumal et al., 2023), while on the operational side it automates repetitive tasks, improves customer service (e.g., with chatbots), and enables the use of immersive technologies such as virtual reality (Samala et al. 2020). In addition, AI offers a competitive advantage to SMEs by enabling more informed decisions and personalized travel experiences (Stroumpoulis et al. 2022). From a policy perspective, the use of AI can also help to improve the moderate correlation between digitalization and the type of accommodation facility, as it enables the development of targeted support programs that encourage the technological advancement of less digitally developed establishments.

Further governments are encouraged to establish specialized programs aimed at bolstering tourist awareness and preparedness, with particular emphasis on international tourists who are less likely to perceive risks accurately. Public institutions and tourism boards could provide also financial incentives, or digital infrastructure improvements to help traditional accommodations, such as scattered hotels and farmhouse stays, enhance their digital presence while maintaining their distinctive characteristics. These efforts might include the dissemination of multilingual information and the installation of clear evacuation routes (Cisternas et al. 2024).

For SMEs, digital solutions provide essential support in managing emergency communication and increasing preparedness. A diverse array of digital instruments facilitates earthquake preparedness by delivering real-time information and improving behavioral readiness. Advanced systems such as Digital Twin (Yu et al. 2023), IoT and cloud computing (Cheng et al. 2021), alternative communication channels (Parlar et al. 2024, Centelles et al. 2021), and machine learning solutions (Abdalzaher et al. 2023) enhance resilience in urban areas with high seismic risk. Utilizing these platforms facilitates stakeholder coordination and contributes to business resilience in the aftermath of seismic events (Pahrudin et al. 2023). Urban development strategies should now prioritize innovative risk management methodologies. The use of digital technologies, including remote sensing, enhances the capacity to assess and mitigate risks, forming a foundation for resilient urban infrastructures (An and Zhang 2022).

The adoption of digital transformation enhances the ability of SMEs to navigate disruptions with agility, safeguarding their market position in increasingly unpredictable economies (Khurana et al. 2022, Awad and Martín-Rojas 2023). Incorporating corporate social responsibility into organizational strategy represents an additional mechanism to foster resilience, promoting long-term sustainability within SME ecosystems (Awad and Martín-Rojas 2023). Finally, resilience is also enhanced through community involvement. SMEs are encouraged to implement approaches that support not only their own operations but also contribute to the wider community's adaptive capacity (DiBella et al. 2022).

While efforts were made to connect the theoretical insights with practical relevance, it is important to note that, to the best of our knowledge, there are currently no real-world case studies or prior research that explicitly examine the relationship between digitalization in the tourism sector and seismic risk classification. This lack of precedent highlights the innovative character of our study and limits the possibility of direct comparison with other regions or industries at this stage. Nevertheless, the framework developed here offers a foundation that can be adapted and applied in other risk-prone contexts. In this sense, it provides practitioners and policymakers with a starting point to explore how digital strategies might interact with environmental vulnerability in tourism planning and management.

In the specific context of Molise, the theoretical frameworks of entrepreneurial resilience and dynamic capabilities gain concrete relevance due to the region’s dual challenges: a structurally fragile tourism ecosystem and a high seismic risk classification. Molise is characterized by a prevalence of micro and small tourism enterprises, often operating in geographically dispersed or rural areas with limited access to digital infrastructure. These SMEs must simultaneously deal with low digital maturity and the uncertainty posed by natural hazards. Within this environment, dynamic capabilities—such as sensing risks, seizing digital opportunities, and reconfiguring business processes—become critical for survival and adaptation. For instance, the ability to adopt digital tools for emergency communication, or to pivot toward online customer engagement during periods of post-seismic recovery, represents a concrete manifestation of these capabilities. Likewise, entrepreneurial resilience in Molise can be observed in informal, community-based networks and local partnerships that help sustain tourism activities despite infrastructural fragility. This illustrates how abstract theoretical constructs materialize in territories with high

environmental vulnerability and limited economic diversification, providing important lessons for similarly exposed regions.

Conclusion and Future Research

This study has explored the multifaceted relationship between digitalization, accommodation typologies, and seismic risk exposure in the Molise region. The findings reveal that while digital adoption is increasingly widespread across the tourism sector, its intensity and scope vary significantly based on structural characteristics, managerial strategies, and geographic location. In particular, areas that are both physically and digitally marginalized—such as mountainous and seismically active zones—face compounded vulnerabilities that can be partially addressed through targeted digital interventions.

Digital technologies, including AI-powered chatbots and mobile applications, play a critical role in enhancing both competitiveness and resilience. Chatbots can improve customer service by offering continuous, personalized assistance, reducing response times, and increasing guest satisfaction and loyalty (Yun and Park 2022, Melián-González et al. 2021, Pereira et al. 2022). Likewise, mobile platforms offer real-time updates on local hazards, emergency procedures, and safety guidelines, thereby strengthening tourists' preparedness while respecting privacy concerns (Lei et al. 2022).

Moreover, digital tools can serve as effective channels for disseminating essential information, especially in regions prone to natural disasters. Providing multilingual safety content, clear evacuation routes, and culturally sensitive communication can enhance seismic awareness among international visitors, a particularly vulnerable group in emergency scenarios (Cisternas et al. 2024).

Ultimately, this study highlights digitalization not merely as a driver of operational efficiency but as a strategic enabler of sustainable and risk-informed tourism development. It offers a foundational basis for public and private stakeholders to formulate digital strategies that are responsive to both internal business models and external environmental threats.

Future research should examine the evolution of digital adoption in the tourism sector over time, considering technological, environmental, and regulatory changes. In particular, longitudinal studies could provide valuable insights into the potential of digital tools to improve resilience and competitiveness, particularly in seismically vulnerable regions. The abilities, constraints, and motivations of accommodation administrators could be revealed through qualitative investigations into their perspectives.

The comprehension of visitors' satisfaction and their sense of safety can be aided by examining interaction and perception with respect to digital safety tools, especially in contexts characterized by high seismic risk. Comparative studies could be conducted in regions with high tourist influx and different risk profiles-such as Italy and other countries subject to increasingly frequent natural events—and could offer scalable models of digital resilience and best practices. Such an approach has the

potential to strengthen the development of tourism ecosystems that are more integrated, adaptable, and capable of responding effectively to crises.

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The Role of Tourism in the National Economy of the Republic of Croatia

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Tourism plays a very important role in the national economy of the Republic of Croatia due to a range of economic benefits including income growth, employment, capital investments, and fostering regional growth and development. One of the main objectives of macroeconomic policy in Croatia, as in other countries, is to maintain a balance of trade. However, Croatia constantly records deficit in foreign trade, and for many years, tourism has successfully mitigated the negative impact of Croatia's trade in goods with foreign countries. This paper aims to examine Croatia's dependence on tourism in its trade balance and propose possible solutions for increasing the competitiveness of other economic sectors. Furthermore, this paper uses empirical research to confirm that dependence on tourism slows down the development of other economic sectors, which poses a threat to the sustainability of the country's economic growth and development in the long run. Given the highly seasonal nature of Croatian tourism, this thesis proposes solutions for development of alternative income sources within the tourism sector, as well as for increasing the competitiveness of other economic sectors.

Keywords: *tourism, economy, foreign trade balance, the Republic of Croatia*

Introduction

The importance of tourism to the national economy of the Republic of Croatia stems from its numerous functions and economic effects. In Croatia, the tourism sector holds significant socio-economic importance and is therefore considered one of the strategic priorities within the nation's economic policy framework. Its growth generates substantial economic benefits for all market participants –private, public, and non-profit sectors - as well as for the local population. An increase in tourism demand, revenue, the standard of living among the local population, attraction and realization of capital investments, and employment enhances the public sector's improved capacity to collect funds necessary for infrastructure upgrades, cultural projects, etc. Another very important economic function of tourism is the encouragement of international exchange. This function manifests in fluctuations in revenues (exports) and expenses (imports) related to goods and services in the current transactions account. Foreign trade balance makes for one of the primary objectives of the economic policy of most countries, including Croatia. One of the most defining traits of tourism is its seasonality, which occurs due to varying weather conditions, the change of seasons, and other unforeseeable circumstances (such as the global economic situation, natural disasters, political instability, change in individual

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preferences). It is therefore necessary to develop a tourism offer beyond the summer season (Ivandić and Šutalo 2018). Accordingly, the development of alternative revenue sources within the tourism industry should focus on the development of special types of tourism. Development of such special types of tourism, such as rural tourism, health tourism, ecotourism, cultural tourism, nautical tourism among others will certainly have a positive impact on the extension of the tourism season.

Tourism organizations, supranational political bodies and national governments saw sustainable tourism economy as the key to recovery after the COVID-19 pandemic (Jones 2022).

The objective of this paper is to analyze the importance of tourism to the foreign trade balance of the Republic of Croatia, with particular emphasis on the effects of tourism on total imports, exports, and the budget of the Republic of Croatia.

Objectives of this paper are as follows:

- to determine the extent to which tourism contributes to the total imports and exports of the Republic of Croatia,
- to identify the challenges arising from the Republic of Croatia's great dependence on tourism with regards to its foreign trade balance (determine the level of dependence, especially in light of a possible sharp drop in revenue due to external shocks),
- to suggest solutions aimed at minimizing the dependence on tourism and increasing the competitiveness of other sectors (consider possible policies that could help minimize dependence on tourism with regards to the foreign trade balance, as well as incite the development of other economic sectors).

Literature Review

Tourism as an Important Revenue Source in the Foreign Trade Balance of the Republic of Croatia

Tourism is one of the most important economic sectors in the modern world and one of its fastest growing economic branches. Tourism is an industry comprised of numerous sectors and can thus be studied from various scientific perspectives. In the past, most tourism-related studies have been focused primarily on its economic contribution; however, nowadays tourism is mostly studied as a whole, i.e. as both an industry and a phenomenon centered around the person - the tourist. This approach is more systemic, meaning it studies all significant parts of tourism, the interdependence of its structures and functions, and the ways in which they influence one another (Čorak et al. 2006). Tourism can be observed from two different perspectives: the economic perspective, where it is important to examine exactly how tourism impacts the development of other economic sectors, and the social perspective, which mainly focuses on improvement of society's cultural level through education about other cultures and maintenance of physical and psychological condition. Tourism cannot exist without tourists. A tourist is defined as a person, i.e. a traveler who spends more than 24 hours but less than a year outside of their country of residence. "The World

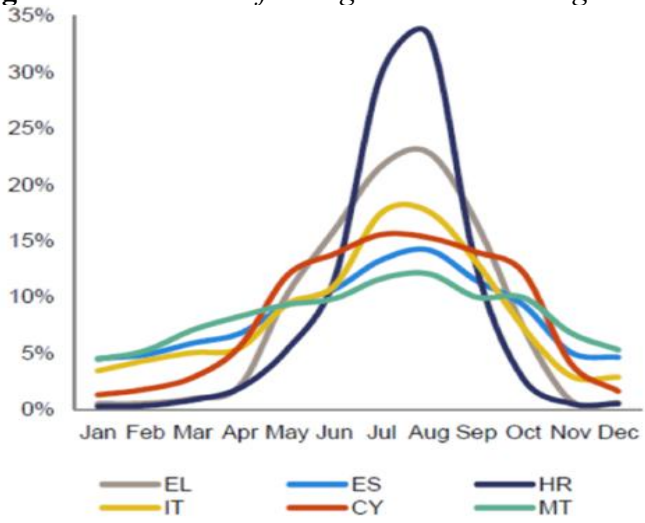
Tourism Organization defines a tourist as a visitor or any other person who travels outside of their domicile for any period under 12 months in order to take a vacation, enjoy some leisure or for business purposes" (UNWTO 2019). Despite the aftermath of the war and the burden created by an inefficient business structure, Croatian tourism managed to survive, mostly due to interest from foreign markets, attractive sights, and its overall resilience. Croatian tourism really started to thrive after the year 2000; moreover, it demonstrated remarkable strength during the world economic crisis of 2008, boasting higher growth rates than competitors from other countries. Its potential was recognized by the European Union, leading to the launch of the "Croatian Tourism Development Strategy until the year 2020". At that time, this document represented the foundation for development and improvement of Croatian tourism, and even though it has since expired, it still remains a valuable framework for further tourism development. "Croatian Tourism Development Strategy until 2020" is a foundational policy document, establishing a strategic framework and providing clear guidance for the future advancement of the tourism sector, i.e., the main activities that will become the cornerstones of future tourism offer. Furthermore, the Strategy also determines organizational, institutional, and human resources necessary to improve competitiveness and generate maximum profits (Gržinić and Bevanda 2021). It enables "a goal-oriented direction of the development and investment process, facilitated access to the European Union funds, a general understanding of key directions for tourism development (which is crucial when it comes to attracting domestic and foreign investors), coordinated actions of policy holders, and systemic coordination of tourism policy measures" (Official Gazette 55/2013-1119). "Croatian Tourism Development Strategy until 2030" should also be mentioned. It was launched in accordance with the "Croatian National Developmental Strategy until 2030" and the basic policies of the European Union and the Republic of Croatia (Official Gazette 2/2023). This Strategy represents a programmed starting point for further development of Croatian tourism, and it points out the development of sustainable, innovative, and resilient tourism as one of its top priorities. Another key document, which should provide more detail with regards to priority areas and concrete measures, is currently in preparation - "The National Plan for Development of Sustainable Tourism from 2021 to 2027". "The Strategy for Development of Sustainable Tourism until 2030" defines the vision for further tourism development, taking into account the sustainability principles, as well as developmental needs and potentials (Ministry of Tourism and Sports of the Republic of Croatia 2022). Furthermore, it outlines a framework for development of a quality and contemporary tourism offer, one that will inevitably increase the competitiveness of Croatian tourism and launch Croatia among the leading tourist destinations in the Mediterranean (Jurić Borić et al. 2018).

The Croatian Tourism Offer

The Republic of Croatia is a country rich in cultural, historical, and natural heritage. Although the sea and the sun are its most important resources, the Croatian coast also boasts numerous islands, coves, clean beaches, and diversity of nature, forests and greenery (Šimleša 2018). Additionally, Croatia has numerous natural sites inscribed on the UNESCO World Heritage list, thus becoming very attractive to

tourists. Nevertheless, there is still a notable lack of tourism offer such as tourist attractions, amusement parks, congress centers with contemporary equipment or a tourist route that encompass multiple sights. Furthermore, the cultural and historical heritage are sorely underutilized, and there is a notable lack of an out-of-season tourism offer. Croatian tourism offer also lacks sporting and recreational amenities (biking trails, scuba diving centers, adventure and adrenalin parks, etc.). One of the main downsides of Croatian tourism offer is its limited seasonality (Figure 1), whereas other Mediterranean countries provide a better tourism offer in that regard. According to statistics, Croatia records most overnight stays during July, August, and September.

Figure 1. *Distribution of Foreign Tourists' Overnight stays by Month*



Source: Eurostat, Tourism in Croatia: Comparison to Other Mediterranean Destinations, available at: https://arhivanalitika.hr/blog/turizam-u-hrvatskoj-usporedba-s-drugim-mediteranskim-destinacijama/ (visited on 06 May 2023)

"The Strategy for the Development of Sustainable Tourism until 2030" outlines the strategic planning of Croatian tourism for the period until 2030, it is aligned with the "Croatian National Development Strategy until 2030" and the key documents and policies of the European Union and the Republic of Croatia. The strategy is aligned with the "Transition Path for Tourism", which is the backbone of the future "European Tourism Plan until 2030", the "Pact for Skills in the Tourism Ecosystem", and the "Sustainable Development Goals of the UN Agenda 2030". The development of the "Strategy" is part of the reform processes envisaged by the "National Recovery and Resilience Plan".

Tourism represents the dominant economic activity of the Republic of Croatia, which has in the previous period significantly determined both economic and social processes. The "Tourism Development Strategy of the Republic of Croatia until 2020" (Official Gazette 55/2013-1119) identified five main goals: increasing international competitiveness, improving the structure and quality of accommodation, new employment, realization of a new investment cycle and increase in tourist consumption. Although a step forward was visible in the previous period, the realization of the goals was largely absent. In the context of increasing the international competitiveness of Croatian tourism, Croatia was planned to enter the top 20 leading tourist destinations

in the world, but Croatia ended in 27th place in 2019. Also, the strategy for the previous period sought to create added value by improving the structure and quality of accommodation as stated in the "Sustainable Tourism Development Strategy until 2030" (Official Gazette 2/2023).

By analyzing development needs and potentials, and with the goal of achieving its vision, four key strategic goals for the development of sustainable tourism in Croatia have been defined in the "Sustainable Tourism Development Strategy until 2030": 1. year-round and more regionally balanced tourism; 2. tourism that preserves the environment, space and climate; 3. competitive and innovative tourism; and, 4. resilient tourism. Strategic goals are interlinked and create a synergistic effect oriented to achieving defined performance indicators, (Official Gazette 2/2023, the "Sustainable Tourism Development Strategy until 2030").

The key element of every tourism offer is its tourism product. The tourism products in the Republic of Croatia can be divided into dominant products and products with a distinct development perspective (Čorak et al., 2011). The dominant products must contribute more than 5% to the overall revenue structure (Official Gazette 55/2013-1119). Some of the dominant products are the sun and the sea, nautical tourism, business tourism, and cultural tourism. Croatia also offers some products with a distinct development perspective, such as: health tourism, cycling, ethno-gastronomic tourism, rural tourism, mountain tourism, adventure and sports tourism, golf tourism, and eco-tourism.

Croatian Product

Croatia's most significant natural attraction is undoubtedly the sea, with its numerous islands and its clean, preserved beaches. Croatia has earned the number one spot in Europe when it comes to the amount of its intangible heritage on the UNESCO list, however, on the global plan, it ranks behind China and Japan (Official Gazette 55/2013-1119). This all serves to attract numerous tourists from all over the world.

Croatian Infrastructure

Traffic and connectivity between destinations are also very important to tourists. The Croatian traffic infrastructure has been significantly upgraded during the past decade, which is mostly reflected in the newly built highway network. However, Croatia still needs to invest into its local and regional roads to keep up with other countries of the European Union. The biggest successful upgrade in the recent Croatian history was the completion of the Pelješac Bridge, which opened to traffic in July 2023, finally connecting the south of Croatia with the rest of the country. Air traffic provides good connectivity with all tourism destinations - notably, 5 out of 7 airports in Croatia are situated in the coastal area. Some challenges still occur, mostly due to a lack of interest from the airlines in establishing non-stop flights. Railroad and ferry traffic rank last when it comes to upgrades and infrastructure optimization, as some significant investments are due so they could reach their full potential (Kos et al. 2020). Communal infrastructure also requires some improvements, mostly for problems such as waste drainage and waste management, which pose a serious

problem to both guests and locals during peak season. When it comes to fresh water, Croatia is characterized by fresh, high-quality drinking water.

Croatian Tourism Demand

Although it cannot compare to countries such as Spain, France, Italy, Greece or Turkey, Croatia has been steadily recording an increase in tourists year after year, thereby landing a spot among the most developed tourism destinations in the Mediterranean. The fact that Croatia has been mentioned and lauded for its cultural and natural sights by many notable global magazines and other media has certainly helped elevate its status. Foreign guests play a crucial role in the structure of Croatian tourism. During the summer season, the majority of overnight stays are generated by the Istria County, followed by the Split-Dalmatia County, Primorje-Gorski Kotar County, Zadar County, Dubrovnik-Neretva County, Šibenik-Knin County, and Lika-Senj County. According to statistics and parallel analyses, the number of foreign guests keeps growing each year, whereas the domestic guest count either remains stagnant or keeps decreasing. Foreign guests mostly book their overnight stays in rooms, apartments and vacation houses, followed by hotels and camps (Rašić 2020, 2022).

Analysis of the Impact of Tourism on the Total Export and Import of the Republic of Croatia

Due to its economic and employment potential, as well as its social and ecological implications, tourism plays an important role in the European Union (Eurostat 2023). Tourism has a significant impact on the total export and import of the Republic of Croatia. While the contributions of export keep growing through tourism services, they also cause an increase in the import of tourism products. Proper tourism sector management is instrumental in achieving a balanced foreign trade in the Republic of Croatia. Although Croatia currently has a trade deficit, the mentioned deficit is significantly decreased by the tourism-generated revenue, thus turning tourism into Croatia's number one export (Stipetić 2012).

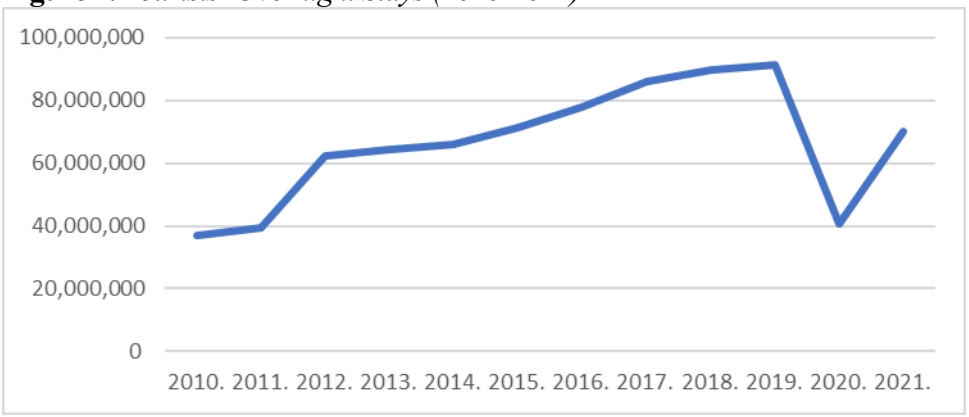
The total export of the Republic of Croatia has been growing. However, the fact that the export rate for high-tech products remains low with a dramatically pronounced contribution of tourism to the total export (which is usually characteristic for low-income countries) is somewhat concerning (Privredni.hr 2019). According to the Croatian Bureau of Statistics exports increased by 13.7% in 2023, amounting to 5.8 billion Euro. Imports also rose by 6.1%, which amounted to 9.8 billion Euro total import. This new data provides a slight correction of the data that was first published by the CBS. According to the initial information, the total for imported goods for 2023 amounted to 3.44 billion Euro, representing a growth of 9.1% compared to the previous year. The initial recorded import growth was 11.1%, amounting to 6.07 billion Euro. The foreign trade deficit reached 2.7 billion Euro during the first two months of 2023, with exports covering 56.1% of imports. Only 15% of Croatian companies export goods and services. However, the companies that do export goods and services employ around 51% of the total workforce, invest 62%, generate around

66% of revenue from their sales, and invest around 73% of their total investments into further development. They also generate a profit of around 76%. Further growth of such healthy and advanced companies strengthens the entire economy of the Republic of Croatia (Izvoz.gov.hr 2023).

Dependence on Tourism in the Foreign Trade Balance of the Republic of Croatia

Tourism has become a vital sector of the Croatian economy with significant impact on the country's foreign trade balance (Bašić et al. 2023). This section analyzes the dependence on tourism in the foreign trade balance and considers key related aspects. Croatian tourism is vulnerable to risks and possible sharp drops due to external expenses. External expenses include unforeseeable events and factors that can significantly impact the tourism industry and contribute to a drop in tourist numbers and the overall revenue. Natural disasters such as earthquakes, floods and fires could have an extremely negative impact on the Croatian tourism industry. For example, the earthquake that hit the Sisak-Moslavina County in December 2020 resulted in loss of human life and material damage. It also harmed the tourism infrastructure such as hotels, restaurants, and attractions, leading to a decrease in tourist visits. Similarly, epidemics or pandemics are another example of external shocks that can cause a sharp decline in the tourism industry. This was particularly visible during the COVID-19 pandemic. The virus initially spread in March 2020, forcing the Croatian government to react by closing the borders and restricting all travel. These measures had devastating effects on tourism. Tourist visits and overnight stays, as well as tourism revenue, recorded a significant drop due to a decrease in demand, cancellations and imposed business restrictions that applied to tourist venues. Figure 2 shows the tourists' overnight stays in the Republic of Croatia between 2010 and 2021, with notable continuous growth over the years.

Figure 2. *Tourists' Overnight Stays (2010-2021)*



Source: Author's work according to Eurostat (2021), *Nights spent at tourist accommodation establishments*, available at: https://ec.europa.eu/eurostat/databrowser/view/TOUROCCNINAT/default/table?lang=en (visited on 12 May 2023)

The coronavirus pandemic ultimately placed great pressure on the tourism industry across European Union member states. According to the global statistic data, 2020 will forever be recorded as the worst year in recent travel history. Estimates

show a drop in tourism by about 60%, whereas the global travel sector recorded losses up to 840 billion Euro. Croatia is the most tourism-dependent European Union member, with tourism making up to 24% of its total GDP. Accordingly, it is unsurprising that the pandemic affected trends on the domestic market. Despite the European Union's quick and efficient policies in response to the pandemic, a deep economic recession was imminent (Benko et al. 2022).

The year 2020 remains recorded as the worst year in recent travel history, mostly due to a staggering drop of 74% in international arrivals. It is believed that this year caused great harm to the Croatian economy. In 2020, Croatia recorded a drop of 55.3% in overnight stays compared to 2019. However, there was a slight positive trend in domestic tourism. Foreign guests usually make up about 90% of total tourist, which amounts to one of the greatest shares in the Mediterranean (alongside Malta and Cyprus). In 2020, domestic tourists generated about 13.3% of total overnight stays amounting to a 23.7% drop, whereas the total overnight stays by foreign tourists plummeted by a shocking 58% (Krešić Lončar et al. 2021).

The previous chart shows a dramatic decline in the number of both foreign and domestic tourists in 2020 (Kordej - De Villam et al. 2023). Compared to 2019, there was a 34.1% drop in domestic arrivals and a 68.0% drop in foreign arrivals in 2020. Furthermore, there was a 64.2% drop in total arrivals (both domestic and foreign) in 2020, directly due to the pandemic. Accordingly, it is possible to conclude that the arrivals kept growing over the years, reaching their peak in 2019, followed by a shocking drop in 2020 due to the coronavirus pandemic. The number of tourists began to grow again in 2021; however, the industry has still not recovered back to its former 2019 glory.

The travel market made a slight recovery in 2021, however, due to numerous travel restrictions the number of international arrivals dropped by 85% for the period between January and May 2021 (compared to the same period in 2019). Furthermore, the percentage dropped by 65% compared to the same period in 2020. Despite the concerns about the success of the tourism season, a favorable epidemiological situation in conjunction with successful government measures resulted in a relatively good 2021 season, especially when compared to 2020, which was dubbed "the worst year for travel in recent history" (Krešić Lončar et al. 2021). As stated earlier, the Croatian economy is largely dependent on the tourism sector. Foreign tourism revenue amounted to 13 billion Euro, accounting for 19% of the country's GDP (Stojić 2023). Tourism activities contribute a staggering 88.3% to the direct gross tourism value in the Croatian economy (Rašić 2020). For comparison, tourism revenue amounted to 18.3% of GDP in 2018 and 21% of GDP in 2019, while the mentioned figures dropped to 8.9% in 2020 and 15.8% in 2021 (due to the pandemic). Despite the decline in tourism revenues, Croatia still recorded the highest tourism revenues in the European Union when expressed as a share of total GDP (Lidermedia.hr 2022).

According to the data from the Croatian Bureau of Statistics ("Tourism by numbers 2021"), the national GDP amounted to 50.224 billion Euro in 2020, and 57.232 billion Euro in 2021. Tourism-generated revenue amounted to 9.121,8 billion Euro in 2020, and 4.813,5 billion Euro in 2021. The share of tourism in the national GDP was 9.6% in 2020 and 15.9% in 2021. Tourism-related activities generated 11.8% of the total GDP in 2019. The gross added value of tourism-related activities

amounted to 10.9 billion Euro that year (24.4% of the total gross added value) (Lidermedia.hr 2022).

According to the Ministry of Tourism and Sports, revenue generated from foreign tourists amounted to 13.1 billion Euro in 2022, which is an increase of 44% compared to 2021; moreover, this also amounts to an increase of 24% compared to the record year of 2019. Looking at the data from 2020 (the pandemic year), it can be concluded that the pandemic caused a sharp decline in revenue – a drop of 89% compared to 2021, to be exact. The aforementioned improvements achieved in 2021 were probably directly linked to the government measures and quality sector preparation, which served to maintain stability in the national tourism industry (Government of the Republic of Croatia 2023).

All of the above clearly demonstrates how external shocks can cause a sudden drop in tourism. It is important that the tourism industry of the Republic of Croatia remains aware of the mentioned risks and implements measures to mitigate their effects. This can include the development of crisis management strategies, diversification of the tourism offer, as well as promotion of lesser-known destinations in order to reduce the dependence on several main tourism centers. Moreover, investments into infrastructure aimed at prevention and mitigation of natural disasters, as well as the development of safety protocols and epidemic suppression measures could be crucial for minimizing of the aforementioned external shocks. External shocks can be unforeseeable and often arise from various sources. It is therefore indispensable to always keep an eye on global trends, analyze risks and implement prompt and flexible crisis-management strategies in the tourism industry (Bašić et al., 2023).

Methodology/Materials and Methods

The research was conducted through a survey questionnaire created and distributed using Google Forms. To ensure confidentially, all participants remained anonymous. The questionnaire was disseminated via email, Viber, WhatsApp, and various Facebook groups to reach a diverse sample.

The collected primary data were analyzed using SPSS Statistics software. Initially, the reliability of the questionnaire was assessed through Cronbach's Alpha, confirming the internal consistency of the survey items. Descriptive statistics were then used to summarize the sample characteristics and to explore initials patterns related to hypotheses H1 and H2.

To test the hypotheses, inferential statistics methods were employed. Both T-tests and ANOVA analyses were conducted to examine differences and relationships relevant to H1 and H2:

> H1: A sharp drop in revenue due to external shocks causes problems in the foreign trade balance. To prevent these problems, more attention should be paid to the tourism offer outside of the summer season.
> H2: High levels of dependence on tourism tend to slow down the development of other economic sectors in the Republic of Croatia, which poses a threat to the sustainability of economic growth and further development of the country in the long run.

These tests helped determine the significance of observed differences and relationships between variables related to seasonality effects and economic sector dependencies in Croatian tourism.

Results

Research results are primary data obtained through the survey questionnaire and used to conduct the analysis. The survey consisted of of 26 closed-ended questions and was available from May 1 to May 17, 2023. The survey was completed by 204 respondents. The first section of the survey referred to the socio-demographic status of the respondents, the second section evaluated their satisfaction with the Croatian tourism offer, its contents and its prices. The remaining questions were presented using a Likert scale, whereby the respondents evaluated predetermined claims on a scale from 1 to 5. Number 1 on the scale corresponded to "Strongly disagree", "Not promoted at all", and "Zero information", whereas number 5 corresponded to "Completely agree", "Very well promoted", and "Excellent" (Benšić and Šuvak, 2013).

The total respondent count was 204 - 66.2% respondents were female and 33.8% were male.

Table 1. *Sample Description (n=204)*

	n	**%**
SEX		
Male	69	33.8%
Female	135	66.2%
SUBJECT AGE		
18-24	5	2.5%
25-34	32	15.7%
35-44	99	48.5%
45-54	44	21.6%
55-64	22	10.8%
Over 65	2	1.0%
LEVEL OF EDUCATION		
Elementary school	4	2.0%
High school	86	42.2%
Bachelor's degree	36	17.6%
Master's degree	73	35.8%
PhD	5	2.5%
EMPLOYMENT STATUS		
Entrepreneur; Artisan	7	3.4%
Employee of the Private sector	86	42.2%
Employee of the Public sector	93	45.6%
Unemployed	5	2.5%
Student	3	1.5%
Retired	10	4.9%

Source: Author's Work

Table 2 shows the reliability coefficient values (Cronbach's Alpha). Generally, Cronbach's Alpha values above 0.7 are considered acceptable, whereas values above 0.8 indicate high reliability. In this case, the Cronbach's Alpha coefficient is 0.668, which is lower than 0.7 and thus indicates a certain variability or inconsistency in responses. The value of the Cronbach's Alpha coefficient based on standardized items is also 0.676, which is very similar to the results obtained based on the original items. This suggests that the standardization didn't have a significant impact on internal consistency. In summary, the results indicate a moderate internal consistency of the measuring instrument. The research was directed at 12 particles that were answered by respondents on a scale from 1 to 5. Given that the reliability coefficient amounted to 0.668, the reliability of the measuring scale can be considered acceptable.

Table 2. *Reliability Coefficient (Cronbach's Alpha)*

Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.668	.676	12

Source: Author's Work

Table 3 shows descriptive statistics results for claims related to H1, which is as follows:

A sharp drop in revenue due to external shocks causes problems in the foreign trade balance. To prevent these problems, more attention should be paid to the tourism offer outside of the summer season. The respondents indicated a certain degree of agreement or disagreement with a certain claim on the Likert scale (from 1 to 5). The mean value shows the arithmetic mean of responses to a certain claim. The highest mean was recorded in response to the claim "External shocks (such as pandemics, natural disasters, and political crises) have a negative impact on the Croatian tourism season" (3.93). The lowest mean was recorded for the claim "Prices of accommodations, foods and beverages in Croatian tourism are acceptable" (2.35).

Table 3. *Descriptive statistics for H1*

Descriptive Statistics						
	N	**Minimum**	**Maximum**	**Mean**	**Std. Deviation**	**Variance**
I am appropriately informed about the local culture, history, and sights of every tourism destination I visit in the Republic of Croatia	204	1	5	3.35	.921	.849
Prices of accommodations, foods and beverages in Croatian tourism are appropriate	204	1	5	2.35	.974	.949

The Croatian tourism offer is diverse and provides high-quality tourism products and services	204	1	5	3.47	.970	.940
Lesser-known tourism destinations in the Republic of Croatia aren't sufficiently promoted	204	1	5	2.68	1.158	1.341
The Croatian tourism offer should be directed at certain interest groups (such as families, adventurers, history enthusiasts, gastro-tourists)	204	1	5	3.87	.906	.821
Dependence on tourism poses a problem to the foreign trade balance of the Republic of Croatia	204	1	5	3.74	.852	.725
External shocks (such as pandemics, natural disasters, and political crises) have a negative impact on the Croatian tourism season	204	1	5	3.93	.982	.965
Valid N (listwise)	204					

Source: Author's Work

Table 4 shows descriptive statistics results for claims related to H2, which is as follows: High levels of dependence on tourism tend to slow down the development of other economic sectors in the Republic of Croatia, posing a threat to the sustainability of economic growth and long-term development. The respondents indicated a certain degree of agreement or disagreement with a certain claim on the Likert scale (from 1 to 5). The mean value shows the arithmetic mean of responses to a certain claim. The highest mean was recorded in response to the claim "Tourism represents an important source of revenue for the Republic of Croatia" (4.34). The lowest mean was recorded for the claim "High levels of dependence on tourism slows down the development of other economic sectors in the Republic of Croatia" (3.63).

Table 4. *Descriptive Statistics for H2*

Descriptive Statistics						
	N	**Minimum**	**Maximum**	**Mean**	**Std. Deviation**	**Variance**
Tourism represents an important source of revenue for the Republic of Croatia	204	1	5	4.34	.842	.709
Tourism provides a significant contribution to the economic development of the Republic of Croatia	204	1	5	4.23	.881	.776
The Republic of Croatia should strengthen its economy via innovations and new technologies	204	1	5	4.29	.814	.662
High levels of dependence on tourism slows down the development of other economic sectors in the Republic of Croatia	204	1	5	3.63	1.016	1.033
It is necessary to invest more funds into development of other economic sectors to decrease Croatia's dependency on tourism	204	1	5	4.22	.855	.732
Valid N (listwise)	204					

Source: Author's Work

To prove the statistically significant correlation between variables and hypothesis H1, it was necessary to conduct a t-test. Based on the t-test results, it is possible to draw a conclusion about the statistical significance of the variables – *information received about sights and amenities offered by the destination, prices in Croatian tourism, diversity and quality of the Croatian tourism offer, promotion of destinations, direction of tourism offer toward interest groups, issues of dependence on tourism as well as negative influences on the tourism season*, as shown in table 5.

Table 5. *T-test – Hypothesis H1 – 95% Significance Level*

One-Sample Statistics				
	N	**Mean**	**Std. Deviation**	**Std. Error Mean**
I am appropriately informed about the local culture, history, and sights of every tourism destination I visit in the Republic of Croatia	204	3.35	.921	.065
Prices of accommodations, foods and beverages in Croatian tourism are appropriate	204	2.35	.974	.068
The Croatian tourism offer is diverse and provides high-quality tourism products and services	204	3.47	.970	.068
Lesser-known tourism destinations in the Republic of Croatia aren't sufficiently promoted	204	2.68	1.158	.081
The Croatian tourism offer should be directed at certain interest groups (such as families, adventurers, history enthusiasts, gastro-tourists)	204	3.87	.906	.063
Dependence on tourism poses a problem to the foreign trade balance of the Republic of Croatia	204	3.74	.852	.060
External shocks (such as pandemics, natural disasters, and political crises) have a negative impact on the Croatian tourism season	204	3.93	.982	.069

Source: Author's Work

Based on the t-test conducted for hypothesis H1, Table 6 indicates that the respondents lacked information on lesser-known destinations in Croatia, and found the prices of accommodations, foods, and beverages in Croatian tourism unacceptable. Therefore, these variables were not statistically significant to the hypothesis, given that the mean of the variables was below 3. According to the results, the remaining five variables are statistically significant to hypothesis H1.

Table 6. *T-test – Hypothesis H1 – 95% Significance Level (test value=0)*

One-Sample Test							
	Test Value = 0						
			Significance			95% Confidence Interval of the Difference	
	t	df	One-Sided p	Two-Sided p	Mean Difference	Lower	Upper
I am appropriately informed about the local culture, history, and sights of every tourism destination I visit in the Republic of Croatia	51.907	203	0.000	0.000	3.348	3.22	3.48
Prices of accommodations, foods and beverages in Croatian tourism are appropriate	34.503	203	0.000	0.000	2.353	2.22	2.49
The Croatian tourism offer is diverse and provides high-quality tourism products and services	51.127	203	0.000	0.000	3.471	3.34	3.60
Lesser-known tourism destinations in the Republic of Croatia aren't sufficiently promoted	33.068	203	0.000	0.000	2.681	2.52	2.84
The Croatian tourism offer should be directed at certain interest groups (such as families, adventurers, history enthusiasts, gastro-tourists)	61.039	203	0.000	0.000	3.873	3.75	4.00
Dependence on tourism poses a problem to the foreign trade balance of the Republic of Croatia	62.728	203	0.000	0.000	3.740	3.62	3.86
External shocks (such as pandemics, natural disasters, and political crises) have a negative impact on the Croatian tourism season	57.089	203	0.000	0.000	3.926	3.79	4.06

Source: Author's Work

To prove a correlation between the statistical significance of the variables and hypothesis H2, it was necessary to conduct a t-test. Based on the t-test results, it is possible to draw a conclusion about the statistical significance of the variables – *tourism as an important source of revenue for the Republic of Croatia, importance of*

tourism to the economic development of Croatia, strengthening of the economy via innovations and new technologies, deceleration of development of other sectors due to the country's great dependence on tourism, and the necessity to invest in other economic sectors, as shown in Table 7.

Table 7. *T-test – Hypothesis H2 – 95% Significance Level*

One-Sample Statistics				
	N	**Mean**	**Std. Deviation**	**Std. Error Mean**
Tourism represents an important source of revenue for the Republic of Croatia	204	4.34	.842	.059
Tourism provides a significant contribution to the economic development of the Republic of Croatia	204	4.23	.881	.062
The Republic of Croatia should strengthen its economy via innovations and new technologies	204	4.29	.814	.057
High levels of dependence on tourism slows down the development of other economic sectors in the Republic of Croatia	204	3.63	1.016	.071
It is necessary to invest more funds into development of other economic sectors to decrease Croatia's dependency on tourism	204	4.22	.855	.060

Source: Author's Work

Based on the t-test conducted for hypothesis H2, Table 8 indicates that the respondents had insufficient knowledge about deceleration of other sectors' development due to tourism dependency. According to the obtained results, and given that the arithmetic mean of all variables exceeded 3, it is possible to conclude that all variables remain statistically significant to hypothesis H2.

Table 8. *T-test – Hypothesis H2 – 95% Significance Level (test value=0)*

One-Sample Test							
	Test Value = 0						
			Significance			95% Confidence Interval of the Difference	
	t	df	One-Sided p	Two-Sided p	Mean Difference	Lower	Upper
Tourism represents an important source of revenue for the Republic of Croatia	73.657	203	0.000	0.000	4.343	4.23	4.46
Tourism provides a significant contribution to the economic development of the Republic of Croatia	68.490	203	0.000	0.000	4.225	4.10	4.35
The Republic of Croatia should strengthen its economy via innovations and new technologies	75.390	203	0.000	0.000	4.294	4.18	4.41
High levels of dependence on tourism slows down the development of other economic sectors in the Republic of Croatia	50.978	203	0.000	0.000	3.627	3.49	3.77
It is necessary to invest more funds into development of other economic sectors to decrease Croatia's dependency on tourism	70.397	203	0.000	0.000	4.216	4.10	4.33

Source: Author's Work

Table 9 shows variance analysis conducted to test hypothesis H1. This analysis was used to determine whether there were significant differences in respondents' thoughts, opinions and answers.

- *Prices of accommodations, foods, and beverages in Croatian tourism are appropriate*

There is a very slight variation between groups (Sum of Squares = 0.189), with a low mean square (Mean Square = 0.047).

F-value (F = 0.049) is statistically insignificant (Sig. = 0.995).

Analysis shows there are no statistically significant differences when it comes to the perception of prices between groups.

- *The Croatian tourism offer is diverse and provides high-quality tourism products and services*

There is moderate variation between groups (Sum of Squares = 2.365) with an average mean (Mean Square = 0.591).

F-value (F = 0.624) is statistically insignificant (Sig. = 0.646).

Analysis shows there are no statistically significant differences when it comes to the perception of the diversity of the tourism offer and the quality of goods and services between groups.

- *Lesser-known tourism destinations in the Republic of Croatia aren't sufficiently promoted*

There is high variation between groups (Sum of Squares = 11.390) with a high mean square (Mean Square = 2.847).

F-value (F = 2.172) has an approximate statistical significance (Sig. = 0.074).

Analysis shows there is a difference in perception of promotion of lesser-known destinations, however, its statistical significance is marginal.

- *The Croatian tourism offer should be directed at certain interest groups*

There is high variation between groups (Sum of Squares = 19.610) with a high mean square (Mean Square = 4.903).

F-value (F = 6.633) has high statistical significance (Sig. < 0.001).

Analysis shows there are statistically significant differences in perception of the necessity to direct the tourism offer toward certain interest groups.

- *Dependence on tourism poses a problem to the foreign trade balance of the Republic of Croatia*

There is high variation between groups (Sum of Squares = 14.633) with a high mean square (Mean Square = 3.658).

F-value (F = 5.490) has high statistical significance (Sig. < 0.001).

Analysis shows there are statistically significant differences in perception of the problem that tourism dependency poses to the foreign trade balance.

- *I am appropriately informed about the local culture, history, and sights of every tourism destination I visit in the Republic of Croatia*

There is moderate variation between groups (Sum of Squares = 8.179) with a mean square (Mean Square = 2.045).

F-value (F = 2.480) has statistical significance on level $p < 0.05$ (Sig. = 0.045).

Analysis shows there are statistically significant differences in perception of knowledge about culture, history, and sights of the destination between groups.

Table 9. *ANOVA test for Hypothesis H1 – 95% Significance Level*

ANOVA						
		Sum of Squares	**df**	**Mean Square**	**F**	**Sig.**
Prices of accommodations, foods and beverages in Croatian tourism are appropriate	Between Groups	.189	4	.047	.049	.995
	Within Groups	192.399	199	.967		
	Total	192.588	203			
The Croatian tourism offer is diverse and provides high-quality tourism products and services	Between Groups	2.365	4	.591	.624	.646
	Within Groups	188.459	199	.947		
	Total	190.824	203			
Lesser-known tourism destinations in the Republic of Croatia aren't sufficiently promoted	Between Groups	11.390	4	2.847	2.172	.074
	Within Groups	260.899	199	1.311		
	Total	272.289	203			
The Croatian tourism offer should be directed at certain interest groups (such as families, adventurers, history enthusiasts, gastro-tourists)	Between Groups	19.610	4	4.903	6.633	.000
	Within Groups	147.076	199	.739		
	Total	166.686	203			
Dependence on tourism poses a problem to the foreign trade balance of the Republic of Croatia	Between Groups	14.633	4	3.658	5.490	.000
	Within Groups	132.597	199	.666		
	Total	147.230	203			
I am appropriately informed about the local culture, history, and sights of every tourism destination I visit in the Republic of Croatia	Between Groups	8.179	4	2.045	2.480	.045
	Within Groups	164.110	199	.825		
	Total	172.289	203			

Source: Author's Work

Table 10 variance analysis was conducted to test hypothesis H1. This analysis was used to determine whether there were significant differences in respondents' thoughts, opinions and answers.

- *Tourism represents an important source of revenue for the Republic of Croatia*

There is moderate variation between groups (Sum of Squares = 4.167) with a mean square (Mean Square = 1.042).

F-value (F = 1.483) has no statistical significance on level $p < 0.05$ (Sig. = 0.209).

Analysis shows there are no statistically significant differences in the perception of the importance of tourism as a revenue source between groups.

- *Tourism provides a significant contribution to the economic development of the Republic of Croatia*

There is a very slight variation between groups (Sum of Squares = 0.596), with a low mean square (Mean Square = 0.149).

F-value (F = 0.189) has no statistical significance on level $p < 0.05$ (Sig. = 0.944). Analysis shows there are no statistically significant differences in the perception of contribution of tourism to economic growth between groups.

- *The Republic of Croatia should strengthen its economy via innovations and new technologies*

There is moderate variation between groups (Sum of Squares = 7.937) with a mean square (Mean Square = 1.984).

F-value (F = 3.124) has statistical significance on level $p < 0.05$ (Sig. = 0.016).

Analysis shows there are statistically significant differences in perception of the need to strengthen the economy via innovations and new technologies between groups.

- *It is necessary to invest more funds into development of other economic sectors to decrease Croatia's dependency on tourism*

There is a significant variation between groups (Sum of Squares = 25.047) with a high mean square (Mean Square = 6.262).

F-value (F = 10.093) has high statistical significane (Sig. < 0.001).

Analysis shows there are statistically significant differences in perception of the need to invest into other sectors to decrease Croatia's dependency on tourism between groups.

Table 10. *ANOVA Test for Hypothesis H2 – 95% Significance Level*

ANOVA						
		Sum of Squares	**df**	**Mean Square**	**F**	**Sig.**
Tourism represents an important source of revenue for the Republic of Croatia	Between Groups	4.167	4	1.042	1.483	.209
	Within Groups	139.814	199	.703		
	Total	143.980	203			
Tourism provides a significant contribution to the economic development of the Republic of Croatia	Between Groups	.596	4	.149	.189	.944
	Within Groups	157.031	199	.789		
	Total	157.627	203			
The Republic of Croatia should strengthen its economy via innovations and new technologies	Between Groups	7.937	4	1.984	3.124	.016
	Within Groups	126.416	199	.635		
	Total	134.353	203			
It is necessary to invest more funds into development of other economic sectors to decrease Croatia's dependency on tourism	Between Groups	25.047	4	6.262	10.093	.000
	Within Groups	123.463	199	.620		
	Total	148.510	203			

Source: Author's Work

Discussion

According to the obtained data, it can be concluded that more women (66.2%) than men (33.8%) took part in this research. The majority of respondents were in the 35-44 age bracket (48.5%), whereas only 1% of respondents belonged to the "over 65" age bracket. Furthermore, 42.2% of respondents were employed in the private sector, 45.6% of respondents were employed in the public sector, and only 1.5% of respondents belonged to the student population. The majority of respondents were high school graduates (42.2%). A mere 2.5% of respondents only completed elementary education. Research results suggest that the respondents usually used Croatian tourism services two or three times per year, preferring a beach vacation that lasted anywhere from one week to ten days. The majority of respondents stated that their engagement in tourism activities in Croatia usually cost between 500 and 1000 Euro per year, or between 1000 and 2000 Euro per year, and they mostly took part in the activities offered by the local tourist board. Most respondents were well-informed about the culture, history, and sights of the destination they were visiting; however, 36.3% of respondents found the prices of accommodations, foods, and beverages unacceptable.

Furthermore, 43.1% of respondents found the Croatian tourism offer diverse and thought it was characterized by high-quality products and services. Approximately half of the respondents agreed that tourism is an important source of revenue for the Republic of Croatia. Moreover, nearly half of the respondents agreed that tourism significantly contributed to the economic development of the country. Respondents found ecological standards and sustainability of the tourism offer very important: however, they were only partially satisfied with the current tourism offer and services. 67.2% of the respondents were partially familiar with other industries that could contribute to economic growth in Croatia. The majority of respondents agreed that Croatia should strengthen its economy via innovations and new technologies. Furthermore, the majority of respondents stated they mostly visited lesser-known Croatian destinations and agreed that these destinations do not get enough promotion. Regarding the tourism offer, respondents found activities such as hiking, cycling, and water sports only partially important. Most respondents believed the tourism offer should be directed at certain interest groups. According to this research, respondents found that tourism dependency poses a problem to the foreign trade balance of the Republic of Croatia and that external shocks have a negative impact on the tourism season. They also found that great levels of tourism dependency decelerate the development of other economic sectors; moreover, they agreed it was necessary to invest more funds into other economic sectors to decrease this tourism dependency. Further research employed descriptive statistics in order to confirm or reject the following hypotheses:

> *H1: A sharp drop in revenue due to external shocks causes problems in the foreign trade balance. To prevent these problems, more attention should be paid to the tourism offer outside of the summer season.*

According to the obtained data, it can be concluded that the respondents agreed with most variables and that there is a positive correlation between variables that are statistically significant to hypothesis H1. Hypothesis H1 has therefore been confirmed.

> *H2: High levels of dependence on tourism tend to slow down the development of other economic sectors in the Republic of Croatia, which poses a threat to the sustainability of economic growth and further development of the country long-term.*

According to the obtained data, it can be concluded that the respondents agreed with all variables and that there is a positive correlation between variables that are statistically significant to hypothesis H2. Hypothesis H2 has therefore been confirmed.

Future research should choose a representative sample that includes respondents from all over Croatia. It would be useful to include certain tourism management institutions that monitor sustainability indicators for tourism (such as agencies, bureaus, institutes, etc.). It could also be useful to compare the conducted analysis with other Mediterranean countries that provide examples of good practice.

There are certain limitations to this research. The survey questionnaire was sent out via email, Viber, WhatsApp, and various Facebook groups, and was subsequently filled out by 204 respondents. This represents one of the fundamental research limitations, as it was not filled out by respondents from all regions of the Republic of

Croatia. The fact that the survey questionnaire was filled out by 66.2% of women and only 33.8% of men represents another limitation. Given that the questionnaire was filled out by only 2.5% of respondents from the 18-24 age bracket and only 1% of retirees, it is impossible to draw conclusions about the opinions of this particular age group. The same applies to unemployed persons, given that only 2.5% of them took part in this research. Another limitation is a small number of postgraduates (2.5%), students (1.5%) and persons who only completed elementary education (2.0%) who took part in this research.

Conclusion

Tourism is one of the most important economic branches in Croatia. The Republic of Croatia is becoming a very attractive tourist destination, and it is therefore imperative to increase the competitiveness of its tourism in the future. Croatia is a country with an abundance of tradition, history, and natural beauty. However, Croatian tourism is characterized by its seasonality, which is why it is necessary to develop specific forms of tourism to expand the season. Apart from beach vacations, tourists are are increasingly seeeking experiences that align with their needs. It is therefore necessary to adapt the tourism offer to the current market demands. It is very important to develop alternative sources, such as rural tourism, health tourism, wellness tourism, sustainable tourism, cultural tourism, etc. Moreover, it is necessary to digitalize the tourism industry to achieve sustainability and competitiveness. Croatia is one of the most tourism-dependent European Union member states, which is why it is crucial to appropriately manage the tourism sector and achieve foreign trade balance. One of the biggest problems arises from the decades-old foreign trade deficit on the Croatian books, which has significantly affected the economic stability of the country. Tourism is vulnerable to unforeseeable events and factors that could have a negative impact on the tourism industry, so it is imperative to continuously analyze risks and promptly implement crisis management strategies. The COVID-19 pandemic has shown how external shocks can have a negative impact on tourism back in 2020, when a dramatic decrease in the number of foreign and domestic tourists caused a great drop in revenue and subsequently GDP.

Great dependency on tourism leads to deceleration of development of other sectors (such as industry, agriculture, and information technology). It is crucial to diversify export by expansion of current markets. Croatia has ample potential due to its numerous natural resources, which means it could open new export possibilities if it made some investments into modernization of agricultural production or provided some support to local producers. Significant investments into other sectors apart from tourism, as well as funding for development of innovations and technologies, could improve the overall competitiveness and create new workplaces.

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