RESEARCH ARTICLE

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Analyzing COVID-19 Post-Pandemic Recovery Process in Azores Archipelago

ABSTRACT
Objective: The Small Islands Developing States (SIDS) are specific regions that mainly depend on tourism industry and sector. The pandemic of COVID-19 has strongly affected the tourism management in these areas. In this study, we aim to design and test recovery strategies to represent practical solutions based on the concept of risk perception as a significant issue in the intention and attitude of tourists toward behavior.
Methods: In this regard, we use the theory of planned behavior (TPB) to provide an accurate simulation and evaluation to develop a model including four distinct strategies: social distancing, tax reduction policy, travel bubble, and joint strategy.
Results: The outcomes indicate that the most efficient way to alter tourism behavior intention and attitude is the travel bubble strategy.
Conclusions: Remarkable reduction in tourism arrival could be an advantage to use existing opportunities toward sustainable development plans in the Azores Archipelago as the chosen case study in this study.

Keywords: Sustainable Development, Tourism Management, Tourism Recovery Strategy, Small Islands Developing States, System Dynamics, Planned Behavior'.

Azor Takımadalarında COVID-19 Pandemi Sonrası İyileşme Sürecinin Analizi

ÖZET
Amaç: Gelişmekte Olan Küçük Ada Devletleri (SIDS), esas olarak turizm endüstrisine ve sektörüne bağlı olan belirli bölgelerdir. COVID-19 pandemisi bu alanlarda turizm yönetimini güçlü bir şekilde etkilemiştir. Bu çalışmada, turistlerin davranışa yönelik niyet ve tutumlarında önemli bir konu olan risk algısı kavramına dayalı pratik çözümleri temsil edecek kurtarma stratejilerini tasarlamayı ve test etmeyi amaçlıyoruz.
Gereç ve Yöntem: Bu bağlamda, dört farklı stratejiyi içeren bir model geliştirmek için doğru bir simülasyon ve değerlendirme sağlamak için planlı davranış teorisini (TPB) kullandık; sosyal mesafe, vergi indirim politikası, seyahat balonu ve ortak strateji.
Bulgular: Sonuçlar, turizm davranışı niyetini ve tutumunu değiştirmenin en etkili yolunun seyahat balonu stratejisi olduğunu göstermektedir.
Sonuç: Turizm gelişindeki kayda değer azalma, bu çalışmada seçilen örnek olay olarak Azor Takımadaları'ndaki sürdürülebilir kalkınma planlarına yönelik mevcut fırsatları kullanmak için bir avantaj olabilir.

Anahtar Kelimeler: Sürdürülebilir Kalkınma, Turizm Yönetimi, Turizm Kurtarma Stratejisi, Küçük Adalar Gelişmekte Olan Devletler, Sistem Dinamikleri, Planlı Davranış.

INTRODUCTION

Small Island Developing States (SIDS) are a distinct group of 38 UN Member States and 20 Non-UN Members or Associate Members of United Nations regional commissions that face unique socio-economic and environmental vulnerabilities and have specific characteristics. They also face a host of challenges including small scale, remote location, inaccessibility, limited resources, and the risk of confronting global environmental challenges socio-economic issues (1).

The COVID-19 viral pandemic is an unprecedented global phenomenon that is also a highly personal experience with wide-ranging and deep effects (2). In this regard, International travel has not been affected as much in decades as by the COVID-19 pandemic. This results largely from the increasingly strict travel restrictions imposed since January, 2020. Countries around the world started by imposing bans or 14-day self-isolation periods for travelers from certain countries with high COVID-19 infection rates (3).

Later, these bans were extended to other countries like Portugal and Spain. By 28 April, all global destinations had introduced travel restrictions. At the same time, 45% of all travel destinations have completely or partially closed the border, and 30% of destinations have suspended most international flights (3). Consequently, an average of 22% fall in international tourist arrivals has been resulted during the first quarter of 2020 based on the latest data from the United Nation World Tourism Organization (UNWTO) shows. According to the United Nations specialized agency, the crisis has led to an annual decline of between 60% and 80% when compared with 2019 rates. This issue has placed millions of livelihoods at risk and threatens to roll back progress made in advancing the Sustainable Development Goals (SDGs) (4).

As we mentioned, the measures put in place to contain the spread of the pandemic have taken a heavy toll on the tourism sector. The SIDS are especially dependent on the tourism sector according to their fragile economy and specific circumstances. The Azores Archipelago located in the middle of the northern hemisphere of the Atlantic Ocean, tourism contributed an estimated 59% to its GDP in 2019 as well as indirectly and directly hired 69% of the workforce (WTTC 2019). Overall, travel and tourism in SIDS is worth an average of $48 billion per year. According to UNCTAD, a decline in tourism receipts by 25% will result in a $7.4 billion or 7.3% fall in GDP. The drop could be significantly greater in some of the SIDS, reaching almost 9% in the Azores Archipelago (5). As a result, it is essential for these islands to respond quickly to the epidemic catastrophe by considering the tourism trends and dynamics during this unsettled period in order to figure out how to recover from the impact of pandemic toward a better post-pandemic period in the SIDSs based on their specific features (6).

Although numerous studies have been conducted on the impact of crises on tourism and tourist trends, the epidemics have been limited to a specific geographical area, which practically affected a particular geographic area for a limited period. Whereas an epidemic in this scale, affecting tourism markets and tourism destinations significantly, has occurred for the first time. However, nature, the unprecedented circumstances, and the impacts of the COVID-19 demonstrate signs that this crisis is not only different, but it can have profound and long-term structural and transformational changes to tourism as a socio-economic activity (7). The impact of crises can be devastating for the tourism sector in SIDSs due to being highly reliant on tourism receipts. Furthermore, managing the recovery following a tourism crisis is likely to be impaired by the state of fragility associated with these regions (8).

In this regard, risk has been considered as the main priority attention and a key factor in the comprehensive tourism planning to investigate tourist behavior and dynamics in SIDS areas. On this matter, risk perception consists of a set of subjective principles and personal verdicts regarding uncertain circumstances that might lead to risks. In tourism planning, risk efficiently depends on natural disasters, accidents and epidemics that would result in various aspects of risk such as social, economic, demographic, psychological, and healthy risk phenomenon (9).

Destination management defines a process that involves coordinated actions aimed to control the economic, socio-cultural and environmental dimensions of a specific tourism territory. In this way, one of the efficient methods in destination management is simulation approaches. System dynamics (SD) has been considered as a beneficial technique developed on computer-based simulation tool that could be used in analyzing the trends and dynamics of tourism system interactions over a specific period (10).

While COVID-19 is a new pandemic and dynamic characteristics and related interaction all over the world are different from the past pandemics, the past is not a good predictor for the future. As a result, other prediction methods such as time series forecast techniques and neural network models are extremely dependent on historical data and previous dynamics so they will perform poorly when conditions are unstable and the structure of the data could change dramatically and frequently (11,12).

This study aims to use the risk perception based on the theory of planned behavior (TPB) as the main method to investigate the tourism trends and dynamics during the COVID-19 pandemic and post-pandemic period. To attain this purpose, we

introduce a SD simulation model specifically suggested for SIDS areas to understand the impact of pandemic on the destination management to recognize the upcoming post-pandemic period in Azores Archipelago. The achievement of a comprehensive insight in the post-pandemic period, the proposed model in this study consists of five sub-model based on a research that has used it for Maldives as a SIDS (4). These five sub-models represent the social, economic and environmental sectors of the destination management. At the end, four strategies are proposed to support the decision-making system for tourism recovery process in post-pandemic period. The main contribution of this study is to consider Azores Archipelago as a specific case study due to its particular characteristics and features to evaluate the tourism dynamics during the COVID-19 pandemic for precise preparation toward suitable recovery strategies for tourism recovery in post-pandemic period.

As long as the COVID-19 outbreak has a strong impact on tourism management, the investigation of pandemic in specific periods and consideration of tourist rate along with number of active cases and vaccination level is essential in medical and socio-economic issues of any region. While tourism sector forms the main section of GDP and economic aspects in islands, designing and implementing new strategies for reduction of active cases rate and tourism recovery will lead to develop tourist's behavior intention and attitude in travel dynamics. Furthermore, the proposed approaches and strategies could effectively contribute in achieving proper situation of COVID-19 outbreak (13).

In this regard, the main motivation of this study is to propose a framework that will result in a desirable post-pandemic period, specifically in tourism management. This study includes a multi-discipline framework consists of tourism management concepts, system dynamics, medical statistics and solutions, and finally strategic recovery procedure in post-pandemic period in tourism sector. The results derived from this research could be efficiently used in small islands developing states, specifically in the field of tourism planning. Therefore, the main contribution of this study is to develop both tourism and health issues in post-pandemic period of COVID-19.

Risk Perception in Tourism Management: Theory of planned behavior (TPB) suggests that behavior is determined by intentions, attitudes (beliefs about a behavior), and subjective norms (beliefs about others' attitudes toward a specific behavior) (14). It could be used to investigate the tourist tendencies and intentions in decision-making process in the context of destination management. In this regard, attitude toward the behavior, subjective norm and perceived behavior control are the three dimensions that TPB considers during the tourism decision-making process (15).

The relationship between risk perception and TPB for evaluation of tourism management, behavior analysis and proposed strategies has been determined. In this respect, it is simply understood that perceived risk will lead to a remarkable impact on tourism management by affecting tourist's tendency negatively toward a particular destination (16). Furthermore, in an interactive relationship, affective risk perception and subjective norms are respectively influenced by tourist's attitudes and cognitive risk perceptions in a positive way (17).

According to risk perception concept and proposed notions, the TPB with risk perception could be clarified as illustrated in Figure 1.

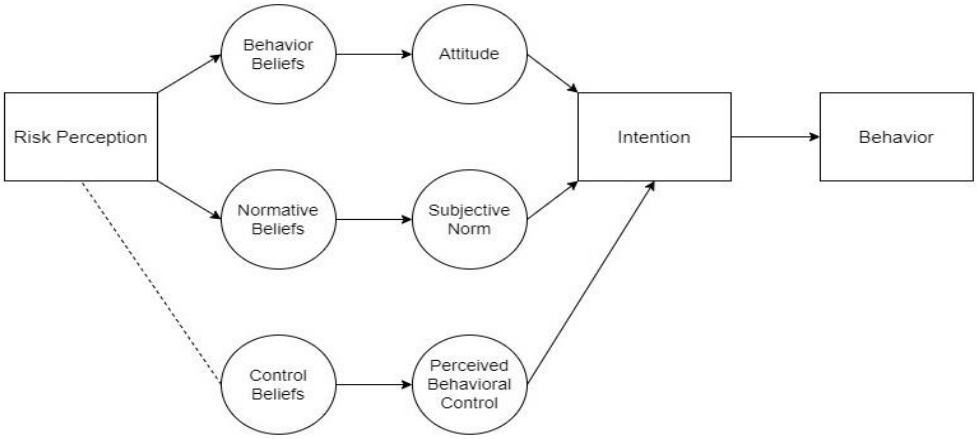

Figure 1. TPB with risk perception (4)

Recent studies show that TPB provides an efficient framework to evaluate the three proposed dimensions along with key factors in tourism management such as tourist attitude and behaviors in a particular region. As we discussed, all three pillars of TPB have a direct and positive impact on tourist intention. In this regard, subjective norm, perceived behavior control, and attitude

competently affect the tourist behavior intention in a descending way (18,19).

Risk perceptions plays a central role in forming health behaviors. Neither theories of heath. In fact, risk perception is principal to most health-specific behavioral analysis including the health belief model, protection motivation theory, and the extended parallel process model (20). In the same way, the self-regulation prototypical strategy consists of numerous hypotheses that are quite significant to risk perception (21). In this regard, many general behavioral theories are frequently applied to health behaviors such as the theory of planned behavior (22), and subjective expected utility theory (23). These general theories suggest that the possibility and extent of potential results including medical purposes and non-health costs and benefits form behavior, but the studies conducting various tests and analysis to these theories evaluate the expected probability and extent of potential health-specific harms such as risk perceptions on the condition that the contributors in experimental studies discuss them (24).

Even if the main stream of experiential studies has noted affirmative relations between risk perceptions and behavioral intentions, as many theories recommend, specific researches report that the different impact dimensions have been found for risk perceptions tend to be substantial but limited (25). In a review of latest studies conducted based on the health belief models, the effect size for the relationship of perceived probability to intention control and severity of health behavioral control due to COVID-19 instructions and guidelines. The range of the effect size points to various groups of health behaviors and research designs (26). Furthermore, most of the studies in this behavioral and intention analysis have used attitude as the outcome variable along with socio-economic factors for the post-pandemic period (27).

The main reason of chosen method could be summarized in this matter that in this context, several lifecycle proceedings have been used to clarify modifications in travel behavior analysis, often as a type of explanatory variable. Such modeling behavior, conversely, is challenging on behalf of behavioral resolutions over the life course, since a life event itself is actually a part of people's decisions and travelling based on pandemic criteria (28).

Travel behavior study necessities the investigation of not only travel behavior itself but also the impacts of travel behavior on based on upcoming situation and represent suitable solution to improve the impacts. In this regard, research on the COVID-19 post-pandemic period has attracted increasing attention in the field of not only medical science but also other disciplines of engineering, management, urban planning and health studies. Collected regular practice of the travel behavior and the occasioning tourism attitude along with effective strategies to improve the current circumstances will carry out substantial impacts on tourism sector (29).

Nevertheless, no study to see the sights of this issue can be found in literature. To fill this research gap, this study has made an opening effort to discover the perspectives of travel behavior and tourism plans in post-pandemic period based on pandemic statistics in Azores Archipelago as a critical case of study.

Sustainable Development in Tourism Management: Tourism management consists of a complex socio-economic ecosystem with various qualitative and quantitative components and aspects affected by a tremendous number of impacts. The interactive relationship between these components and aspects are nonlinear (30). Predicting models such as time series rely on the basis of this assumption that the past including historical data and previous dynamics is a suitable tool as an estimator of the future (31). As opposed to, the simulation tool could efficiently manage the uncertainty in a complex context due to the fact that it concentrates on the interactive relationships among components. As these relationships includes factors and variables that organize the system intention and behavior. In this way, the main task that system has to carry out could be explained based on SD theory (32).

SD has been implemented in various sub-fields of tourism management, such as accommodation (33,34), natural attractions (35,36), and tourism operations (37). In the last decade, this method has been widely applied to destination management (38). This research area includes tourism attractions and pertaining services and issues along with the interests of inhabitant and different aspects that affect stakeholder’s attitude. In this regard, it is essential to understand the way that system's constituent parts interrelate and influence each other in socio-economic issues in tourism management. As a result, the SD could efficiently provide a comprehensive framework to deal with challenges regarding post-pandemic period and explore and represent productive solutions (39,40).

SD approaches provide tourism management and planning with alternative variables and visualization techniques to renew existing strategies for enhancing evaluation and execution process. Moreover, SD could develop several models that directly include a wide range of stakeholders. In this way, SD enriched with strategic scenario planning form a powerful implement for handling unexpected phenomenon in real world such as COVID-19 pandemic. It also has the potential ability to consider uncertainty in tourism planning and destination studies. The outcomes could efficiently contribute in sustainable development

concerns including socio-economic and environmental challenges and issues (41).

In a few words, recent studies show that SD model development could be considered as a practical way to evaluate tourism management. It also has the ability to explain system thinking, determine future dynamic, and enable planners and policy-makers to implement new strategies. As the COVID-19 pandemic period is ending and in order to properly prepare for post-pandemic, by mean of feedback loops used in SD and combined with risk perception, it provides us with a comprehensive understating of tourism intentions and behaviors for suitable supporter and recovery of tourism management that has been negatively influenced in last two years.

Theoretical Literature Review: The possible impacts of devastating happenings on hospitality and tourism have increased in both extent and rate of recurrence due to increasing rate in the hyper-mobility of tourism industry and reciprocally connected situation of the worldwide economy (42). In the context of COVID-19, the increasingly disaster-prone world and specifically, the tourism planners have to design and implement a comprehensive framework for understanding and employing disaster management strategies for a proper post-pandemic period (43).

The world has faced an increasing thoughtfulness and attentiveness for disasters in the tourism industry and sector since the beginning of the 21st century. In this regard, COVID-19 has been considered as the most significant disaster in the century that causes an emergent circumstance including sudden devastating events, both absolutely predictable and avoidable ones, disturbing enterprises, challenging their operative routine, arrangement, and persistence (44).

Many theories derived from different disciplines have been used in the field of disaster management literature. In this regard, the overall literature is mostly centered to the engineer-medical based theories. On the other hand, from the perspective of tourism management, most studies are conducted based on management-oriented theories (45). For instance, an adopted approach has been designed and implemented on the basis of the crisis management theory highlighting the competent diffusion of evidence and statement among several stakeholders (46). Furthermore, a collaborative planning has been applied to investigate tourist’s attitude, significant issues, and existing complications of travel in COVID-19 pandemic and post-pandemic period based on socio-economic theories (47).

Theory of planned behavior provides us with effective opportunities to reach applicable models that represent a wide range of beliefs from psychological to medical impacts on critical planning and policy-making along with considering variety and diversity in socio-economic and demographic issues (48). On this matter, several tourism management contexts including socio-economic, medical, environmental, and cultural aspects have been developed by mean of multifaceted adaptive coordination concepts to predict the tourism industry situation in the post-pandemic period (49). In a similar way, an integrated and comprehensive understanding of emergent disaster management in tourism context has been developed based on the chaos theory. This appreciative approach adopts the previous statistical data to address the complexity and extent of the nature of the existing phenomenon rolling in tourism sector and dynamics (50, 51).

A number of studies in the literature have represented numerous solutions for disaster conditions that deal with them in several phases. With the emphasis on particularities of the tourism and destination industry, a generic framework has been commonly approved to examine and improve tourism disaster management strategies. This framework groups the three main modules in tourism disaster management including parts of disaster procedure, features of disaster management reactions, and key elements of the disaster management strategies (52).

The Azores Archipelago in Brief: The Azores Archipelago is part of the Macaronesia Region - along with the archipelagos of Madeira, Cape Verde, and Canary. The Archipelago, inserted in the North Atlantic, comprises nine islands and a total surface area of around 2,300 km2, corresponding to approximately more than 2.5% of the Portuguese territory (more than 92,000 km2). Their geographical proximity groups the Archipelago Islands in Eastern, Central, and Western (53).

The three biggest islands are São Miguel, Pico, and Terceira - and they represent approximately 68.5% of the total area and about 85% of the Azores population. Population densities per km2 fluctuate between 184 inhabitants on the biggest island and 27 inhabitants on the smallest island. Amongst the 19 municipalities in the Azores, the largest is Ponta Delgada's isle of São Miguel. Contrarily, the smallest is Vila do Corvo on Corvo's island, which registers a variation in population density in 230 inhabitants per km2 (54).

Generally, the landscape of the Azores is marked by a strong orography, where the high altitude is associated with the hardy relief. The different islands' maximum altitude ranges between 405 m in Graciosa and 2,351 m in Pico, the highest point in Portugal. The islands' landscape is usually overwhelmed by the magnificent lagoons that occupy the abatement craters of extinct volcanoes (55).

MATERIAL AND METHODS

Model Development: The proposed model in this study implements Azores Archipelago tourism industry statistics since 2019 before the

COVID-19 pandemic including historical data to understand tourist intentions and behavior trends. Additionally, the impact of pandemic on the tourism management could be evaluated. As a result, tourism behavior intention and tourist arrival are two performance variable in the proposed model. Goods, services tax of tourism sector, generated wastes of tourists and resident's population rate are other variable used in this study for further considerations of socio-economic and environmental circumstances toward better understanding of pandemic impact in the Azores region (56). To sum up, the proposed model in this study consists of five sub-models including tourist arrival and economy, tourism resort scheme, residents and population, waste and pollution, and health care.

Tourists dynamics in Azores Archipelago between 2019 and 2021.

Major Islands	2019	Change (2019-2020)	2020	Change (2019-2020)	2021	Change (2019-2021)	Total
Santa Maria	16456	-60%	6426	25%	8041	-51%	30923
São Miguel	624093	-71%	177557	45%	258430	-58%	1060080
Terceira	143545	-66%	47661	43%	68320	-52%	259526
Graciosa	7946	-59%	3257	59%	5195	-34%	16398
São Jorge	23416	-60%	9428	83%	17246	-26%	50090
Pico	57647	-68%	18374	87%	34439	-40%	110460
Faial	79524	-73%	21062	107%	43694	-45%	144280
Flores	17955	-54%	8228	68%	13858	-23%	40041
Corvo	1212	-26%	899	38%	1240	2%	3351
Total	**971794**	**-70%**	**292892**	**53%**	**450463**	**-53%**	**1715149**

Source: Azores Regional Statistical Service (www.srea.azores.gov.pt)

Gross domestic production (GDP) trends in Azores Archipelago between 2019 and 2021

Year / Quarter	2019 Q1	2019 Q2	2019 Q3	2019 Q4	2020 Q1	2020 Q2	2020 Q3	2020 Q4	2021 Q1	2021 Q2	2021 Q3
GDP per capita	17900	18100	18300	18600	17400	15900	15400	15700	15500	16400	17100
GDP growth rate for preceding quarter (%)	2.3	1.1	1.2	1.1	-6.5	-8.6	-3.1	1.9	-1.2	5.8	4.2
GDP growth rate for corresponding quarter (%)	6.2	3.3	4.5	7.3	-2.8	-12.1	-15.8	-15.6	-10.9	3.1	8.9
Tourism contribution to GDP growth rate (%) for preceding quarter	1.3	0.7	0.8	0.7	-2.8	-3.6	-1.8	-1.1	-0.5	2.3	3.3
Tourism contribution to GDP growth rate (%) for corresponding quarter	10.8	16.4	20.2	9.5	-26.7	-15.1	-11.3	-5.9	-4.1	9.4	11.3
Tourism contribution to GDP (%)	41.3	41.7	42.6	42.9	13.4	4.1	1.8	1.6	5.3	13.7	19.8

Source: Trading Economics – Azores GDP growth rates (https://tradingeconomics.com/portugal/gdp-growth)

Tourist Arrival and Economy: Tourist arrival and tourism economy of Azores Archipelago include the overall tourists visit the area and tourism revenue gained from tourism industry. Consequently, the major contribution and course of tourists are calculated by the number of individuals that travel to the area and remain there for more than two days. As we implement TPB to evaluate tourist behavior and intentions in pandemic, it is essential to consider the numerical tourist arrival in that period due to the vital impact of tourist rates on behavior and intention. But then again, the tourist behavior and intention is efficiently affected by attitude, subjective norm and perceived behavior control that form the risk perception in this study (57).

Resorts proportion, pollution indices, and finally, the risk perception determine the attitude of tourist behavior. Resorts proportion consists of affluence of regional tourism resources. Pollution and waste have been always considered as a significant indicator of tourism environmental impact assessment (58). More than 10% of waste in Azores Archipelago is not cleanly handled and could be one of the main reasons of pollution regarding tourism industry. Number of active cases in tourism management and occupied rate of hospital capacity are two other impacts that seriously affects the risk perception in attitude of tourist behavior (59).

Subjective norm as the other factor in risk perception could be determined by word of mouth (WoM). Based on Azores Archipelago tourist examination, WoM along with social media are two major sources to access tourism information regarding the area. it is also worth to mention that more than 96% of the tourists visited Azores Islands have announced that they would recommend this region to others for travel (60,61). This matter shows that WoM is a considerable and

effective topic in subjective norm measurements. Furthermore, risk perception could affect the subjective norm in a positive way (62).

The perceived behavior control includes three main variables in the proposed SD model: leisure time, consuming rate, and security level index. Travel time is another critical aspect in attitude of tourist behavior. The longer travel time gets; the more complicated attitude of tourism behavior would be due to limitations in leisure time based on quarantine regulation of the COVID-19 for international tourism management. Consuming rate relies on determining the affordability in a particular region. This parameter is usually measured by various economic variable along with demand and supply balance. Furthermore, the affordability in Azores is changing due to the seasons. We could expect more rate of tourists visiting the area in some months that would results in increasing the local to regional prices such as accommodation and transportation. The security level index consists of perception and control of tourists for a safe travel and visit. It efficiently affects the tourism tendencies in a particular area due to behavioral control over travel safety. By mean of tourist arrival measurements, the proposed model could simulate the economic issues such as goods and service tax and expenses from tourism sector to determine the economic benefits (63).

Tourism Resort Scheme: The tourism resort system relies on the advancement in both quantitative and qualitative parameters of bed capacity utilization and availability in a particular tourism region. The rate of available resorts brings more abundancy of regional tourism resources and a remarkable enhancement in attitudes toward an area for visit. Moreover, resort rate could be used in tourism planning such as accommodation and capacity. Increasing rate in resort system leads to higher number in occupancy and more revenue that could be actively used in resort development as well (64).

The actual ratio between required and available accommodation capacity utilization is used in the proposed model and simulation. In general, the resort beds capacity could be taken into account by mean of SD model. According to this assumption, the required beds could be determined based on the average number of visitors in a particular period. In this way, the stated ratio between required and available beds is used to calculate supply and demand balance in tourism resort system and accommodation (65).

Residents and Population: The dynamics in residents and population growth provide us with effective insights deal with better understanding in the tourism impact on regional employment rate and migration trends. The resort regarding the tourism management could result in significant employment opportunities (29). As providing more jobs directly increases rate of immigration, population growth and security level and conversely, reduces indices such as crime rate, thereby, it has a strong positive impact on attitude of a particular area and tourism behavior intention. As a result, it enhances the rate of tourism arrival as an efficient feedback loop (66).

Waste and Pollution: The amount of waste and pollution in Azores Archipelago depends on the dynamics in generation of solid waste and discarding procedure. This index shows the impact of tourism industry on the environment at local to regional scales based on waste and pollution generating rate. Particularly, solid waste and pollution could be considered in two sections including generated by the local residents and the tourists. In agreement with the data regarding the region, the Azores Archipelago generate more than 200,000 tons of solid waste per year, almost 2 kg per person in each day (67). In order to make the measurements simple, the proposed model in this study implements the average waste weight by the of distribution of the population in the region. In Azores, more that 90% of the solid waste is disposed on the garbage disposal place while about 7% of the solid waste is not properly handled (68). The SD model implements pollution index to calculate the environmental degradation emerged by the solid waste. In this way, the waste and pollution impact on the attitude of tourist's behavior and further effects of tourist behavior intention as a feedback loop could be considered.

Health Care: Health care mainly focuses on the active cases of COVID-19 among the tourists visit the region and occupied the hospital beds. This issue aims to evaluate the ability of a particular region to control outbreak of the COVID-19 based on health care system and related facilities. The number of active COVID-19 cases rests on the flow of increasing or decreasing rate and recovery rate in the region. This issue extremely depends on the number of tourist arrival and social distancing policies (69).

An agent-based model recently represented is concerned about the adoption of social distancing regulation could limit the contagious transmission. While the rate of active cases is the best basis to deal with the pandemic situation, the configuration of the mentioned model is suitable method to determine tourist's risk perception of a particular region (70). Furthermore, the average rate of hospitalization and the occupancy rate of hospital bed are other accurate indicators to determine the total number of hospitalization. These two variables directly affect the risk perception of the destination in tourist's attitude and tourism behavior intention as an effective feedback loop (71).

Strategy Design: The proposed model simulates the historical data regarding tourism trends and dynamics in Azores Archipelago from 2019 to 2021. This period includes before pandemic, pandemic and post-pandemic of

COVID-19. In this study, we propose four strategies toward a proper recovery procedure in tourism management in post pandemic period. The first one consists of implementation of particular social distancing rules and guidelines for the resorts that aim to identify and handle active cases of COVID-19 in the study area. according to this strategy, resorts capacity is reduced. In this regard, the proposed strategy considers a remarkable reduction in the rate of available beds per resorts and employees in any resort sector. Second strategy relies on leading price promotion by mean of tax reduction in goods and services from tourism sectors. Price promotion could be considered as one of the impressive impacts in tourism management. Tax reduction policy has been always implemented to attract more tourists to visit destinations. During the pandemic, this policy was widely used to support economy recovery (19). Third strategy focuses on making bilateral travel bubbles and regional agreements that allow inbound tourists from certain countries. This issue demands a COVID-19 test before traveling to shorten self-isolation period. As a result, this will be a significant progress in tourist intention. Travel bubble could be arranged between two specific state or country as a great recovery for tourism industry and economy (72,73). In order to achieve this strategy, it is essential to implement a diminutive quarantine policy. Besides, the perceived security level of a particular area has to be improved. The last strategy deals with a set of combined previous strategies including social distancing strategy, tax reducing policy, and travel bubble arrangement. The main aim of this strategy is to address the possibility of combining various policies to achieve a proper solution regarding post pandemic recovery in tourism management.

RESULTS

Base Scenario: The outcomes derived from the first strategy indicate that there has been an increasing number in tourist's rate visiting Azores until the beginning of 2020. When pandemic of COVID-19 started in January 2020, the number of tourists has been faced a significant reduction and this trend continued until the execution of inclusive travel limitations in the area. Although the rate of tourists visiting Azores has started to increase during the post-pandemic period, it is still a remarkable amount lower that before pandemic. In comparison with 2019 rate, the average number of tourists from 2020 to 2021 has faced a declined rate of 53 %. Furthermore, according to the seasonal circumstances of the region, the proposed model predicts that the rate of tourists will be increased in the fourth quarter of 2021 and specifically, in the first quarter of 2022. The decline in the rate of visitors mainly depends on the dynamics in tourist behavior intention. More specifically, while the risk perception is increasing due to COVID-19 pandemic, travel intention has been reduced consequently. As we discussed, the risk perception is an effective impact in the subjective norms & attitude towards behavior. The notation of existing active cases in a particular region cause positive attitude toward travelling change to a specific tendency of conservative tourism behavior. In a similar way, social pressure has an undeniable impact on travel intentions and plan to fulfill the social norms.

Social Distancing Rules: The outcomes of this strategy could not directly attract visitors. Hence, it could handle the rate of COVID-19 active cases. While we observe a drop in the rate of employees in resorts, job opportunities rate increases. This issues will result in some socio-economic impacts that have a strong effect on destination image and positive attitude of tourists on the security level of the area. In this regard, this policy would lead to a reduced rate compared with the previous strategy.

Tax Reduction Policy: The results of this scenario illustrate that it is reasonably an effective strategy. The implementation of this strategy has led to a remarkable increasing trend in tourist arrival, specifically compared with the base scenario. The dynamics in tourist behavior are caused by the growing positive trend in tourism behavioral intention. Price promotion will result in increasing rate of risk perceived behavior control due to increasing trends in tourism payment capacity. Nevertheless, growing number of tourists follows a cross transmission between inhabitants and international tourists as well. In this way, the rate of active cases among tourist's upsurges based on this strategy. In this case, the risk perception is still at a high rate. As a result, we could not expect that the rate of tourist will reach the level of before pandemic. On the other hand, lower tax strategy will drop the regional income from the tourism sector, although it attracts more tourists to a particular destination. According to this issue, this strategy is not as useful as the others in local to regional economy recovery.

Travel Bubble: This strategy has the ability to improve tourist behavior intention in two distinct phases. At first step, shorter quarantine policy will enhance tourist perceived behavior control because it saves the actual travel time for tourists and convenience them to travel to less limited places with more leisure time. Moreover, achievement of a travel bubble increases the perceived security level of a particular destination. Agreement between countries all over the world is a supportive way to express a mutual trust. In this way, tourist perceived control over the behavior has been improved and tourist attitudes toward the destination have become more efficient. These developments form a remarkable increase in the rate of tourist arrival.

Joint Strategy: Proposed strategy considered all other scenarios would not make a significant difference in development of attracting

visitors to Azores. While tax reduction and tourism bubble strategies can efficiently increase number of visitors, the implementation of social distancing strategy reduces tourism accommodation capacity and availability. As a result, there will be a meaningful balance in the supply and demand function and reduce tourism behavioral intention. Consequently, the proposed combined strategy could not provide a proper support for tourism recovery.

COVID-19 Statistics in Azores Archipelago: In order to achieve accurate outcomes regarding the proposed strategies of implemented approach in this study, we represent the rate of active cases and vaccinated individuals in the Azores Archipelago to be considered as a helpful hand in discussion and conclusion section of this study. To bring a proper recovery plan for post-pandemic period, a large share of the region should be protected against the COVID-19 outbreak. The following diagrams indicate the number active cases and received COVID-19 vaccination that are counted at least as a double doses.

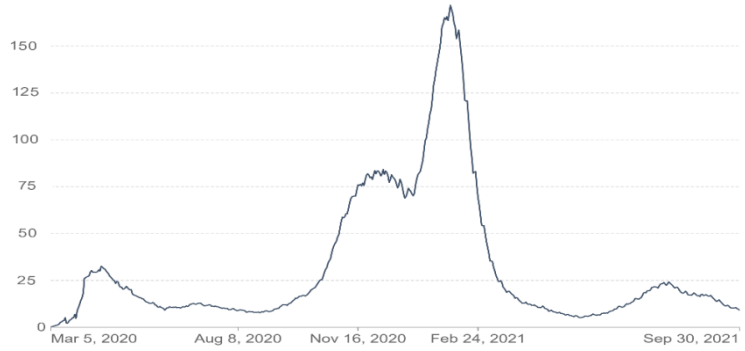

Figure 2. Number of active cases in Azores Archipelago (Source: www.worldometers.info)

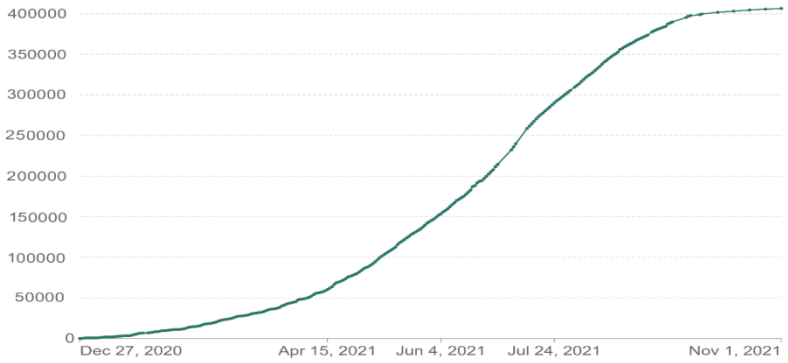

Figure 3: COVID-19 vaccination rate in Azores Archipelago (Source: www.worldometers.info)

COVID-19 Statistics Analysis: The outcomes of this study by comparing proposed recovery strategies and rate of COVID-19 active cases and vaccination show that over 76 per cent of the undertakers of the research are willing to received vaccination. Vaccination intention and hesitancy rates have also been stable over time (74). Early in the vaccination process, vaccination intentions negatively impacted travel intentions, suggesting that individuals who are willing to get the vaccine postponed their travels in the short term, while individuals who do not plan to get the vaccine may not have changed their travel plans as travel restrictions were eased. However, this negative impact disappeared later as the number of vaccinated individuals significantly increased, closing the gap between the two groups. Findings also suggest that sociodemographic factors such as generational age, gender, marital status, education, region, race, religion, occupation influence the COVID-1 vaccination intention and vaccine hesitancy.

Risk perceptions are central to many health behavior theories. However, the relationship between risk perceptions and behavior, muddied by instances of inappropriate assessment and analysis, often looks weak.

DISCUSSION and CONCLUSION

The rate of tourism estimated based on the four proposed strategies indicates that the best way to alter tourist behavior intention is travel bubble strategy. After that, tax reduction has been proved as the most effective one. Whereas, social distancing strategy and joint strategy are not as efficient as the first two. Though the simulation results based on all four scenarios and strategies indicate that the proposed policy of tourism recovery is a long way to be accurately

implemented. Moreover, the dynamics in the intention travel behavior based on four proposed strategies are consistent with tourist arrival rate.

The reduction in the tourist rate opens new opportunities for any region to recover the environmental damages. Since January 2020, tourist rate has faced a sharp drop in Azores Archipelago based on simulation results. After two years and during the post-pandemic period, this rate has not been reached the level before pandemic. This issue could be a positive impact on environmental conservation strategies in the region. Furthermore, recovery process for tourism management could take place in a more sustainable way based on sustainable development plans of the region.

The global and unexpected impacts of the COVID-19 is undeniable. As we discussed, existing prediction models and solutions based on historical data and previous patterns are not capable in being implemented to simulate these impacts and upcoming trends. In this regard, we proposed a model based on SD to evaluate tourism dynamics in the support of recovery process in the Azores Archipelago. This simulation technique could efficiently contribute in tourism management affected by pandemic period, specifically in the rate of tourists and visitors. Furthermore, it provides practical insights and solutions including socio-economic and environmental aspects. In four distinct strategies. The results could be used to provide a comprehensive understanding of tourist intentions and attitudes toward behavior. Considering the risk perception in the TPB proved that proper controlling in pandemic at a local destination will reduce the tourist risk perception, although it may negatively affect tourist intention.

Tourism industry and management have been completely affected by the COVID-19 pandemic and confronting significant challenges and concerns. As the SIDS economy and other social and demographic aspects precisely depends on the tourism markets and tourism destinations, these regions are influenced more than any other area. In this regard, a comprehensive understanding of tourism attitudes and tendencies during the pandemic and post-pandemic period is the first step to represent efficient solutions for this phenomenon. Therefore, risk perception along with extended TPB theories and methods could be considered as a capable tool to study the tourism behavior attitudes. In order to support the regional tourism recovery decision-making system, the assessment of the COVID-19 impact is being done by a SD model proposed in this study. This model provides integrated framework including accurate historical data from a holistic perspective and to support the policy-making procedure in the post-pandemic period toward a proper one.

We have considered the Azores Archipelago as the case study of SIDS and the proposed SD model let us design and test four distinct scenarios for tourism recovery. The outcomes proved that the best way to handle tourism behavior intention dynamics in the area is the travel bubble strategy. Besides, it is worth to mention that the declined observed in tourism arrival could be a remarkable opportunity for any destination, particularly for the Azores region, to rebuild damaged environmental landscapes.

The main limitation that we faced in this research is the inaccessibility and insufficiency of accurate practical data regarding the Azores Archipelago. This issue has been led to some subjective defects. As a result, various variables have not been taken into account in this study to achieve a precise representation and evaluation of the simulation for the destination upgrading and recovery in the post-pandemic. Such parameters and aspects just like the improvement of guest houses on inhabited islands. Although some of these parameters would increase accommodation prices, but on the other hand, they may convey a tremendous amount of income to the regional community. Furthermore, due to insufficient data collection regarding the Azores, we could not take some parameters such as the impact of vaccinated rate on the tourist behavior intention and attitude. This topic could be considered for prospective and upcoming studies to propose new scenarios for a better post-pandemic recovery and preparation.

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