


# RESIDENTS' PERCEPTION ON WASTE SORTING ON THE KVARNER ISLANDS

## Abstract

 **Antonio DEKANIĆ**, PhD student  
University of Rijeka, Faculty of Tourism and  
Hospitality Management  
Primorska 46, 51410 Opatija, Croatia  
E-mail: antonio.dekanic0@gmail.com

 **Marinela KRSTINIĆ NIŽIĆ**, PhD, Full  
Professor (*Corresponding Author*)  
University of Rijeka, Faculty of Tourism and  
Hospitality Management  
Department of Microeconomics and Macroeconomics  
Primorska 46, 51410 Opatija, Croatia  
Phone: ++38551294189  
E-mail: marikn@fthm.hr

*Purpose* – The aim of this paper is to empirically examine residents' perceptions of waste sorting and to research whether residents' behavior regarding waste sorting has an impact on the sustainable development of a tourist destination.

*Design* – A questionnaire with four constructs was designed: attitudes towards waste sorting, perceived behavioral control, waste sorting behavior and sustainable development of a tourist destination. Data were collected from a sample of 579 residents of the Kvarner islands.

*Methodology* – Univariate and multivariate statistical analysis were used for statistical analysis. Hypotheses were tested using PLS-SEM.

*Approach* – The research was conducted on the Kvarner islands (Krk, Cres, Lošinj and Rab) in August and September 2022.

*Findings* – Attitudes of residents towards waste sorting positively influence the behavior of residents of the Kvarner islands towards waste sorting. PBC also positively influences the behavior related to waste sorting. Residents' behavior regarding waste sorting positively influences sustainable development in Kvarner islands.

*Originality of the research* – Research on waste sorting concerning the residents of Kvarner islands is scarce. Therefore, this paper provides a rare insight into the theoretical and practical implications that are useful for destination development planners and destination management.

**Keywords** waste management, sustainable development, perception, local population, island tourist destinations

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## INTRODUCTION

Waste management is one of the biggest global environmental problems (Damjanić, 2014; Zhang et al., 2022). Household waste makes up the majority of municipal solid waste (Fereja & Chemed, 2022). Residents play a key role here (Babaei et al., 2015). Individuals decide whether they will behave in an ecological or non-ecological way. Increasing emphasis is therefore placed on the behavior of individuals and households, as well as researching theories that explain pro-ecological behavior (Ajzen, 1991; Stanić & Buzov, 2009; Stanić et al., 2009).

The transition from linear to circular economy is one of the models that supports the concept of sustainable development, which involves the reuse of materials. Recycling is considerably hampered if waste is not sorted according to material. Waste sorting is a prerequisite for recycling (Fistrić, 2011; Marcuta et al., 2021; Šverko Grdić et al., 2019). Recycling reduces the global environmental problem of waste accumulation, thereby reducing pressure on landfills, creating savings in resources, energy, materials, and ultimately reducing environmental pollution, which is extremely important for sustainable development, especially in tourist destinations (Stanić & Buzov, 2009; Stanić et al., 2009).

Waste is particularly problematic in island tourist destinations. Tourism can become self-destructive if the environment is not protected. Waste management is a major challenge for tourist destinations during the tourist season when there is a significant influx of tourists, which subsequently leads to larger amounts of generated waste (Damjanić, 2014; Fistrić, 2011). Island tourism has a detrimental effect on the environment because it pollutes the sea, air, and land and disrupts the ecosystem in the summer months. The goal of the Kvarner islands is to be recognized as tourist destinations fully focused on sustainable development, and attract tourists aiming to spend their holidays in precisely such an area (Gregorić et al., 2018; Krstinić Nižić & Drpić, 2013). Island destinations are specific by being isolated in winter, while in summer they present attractive holiday areas (Vidučić, 2007).

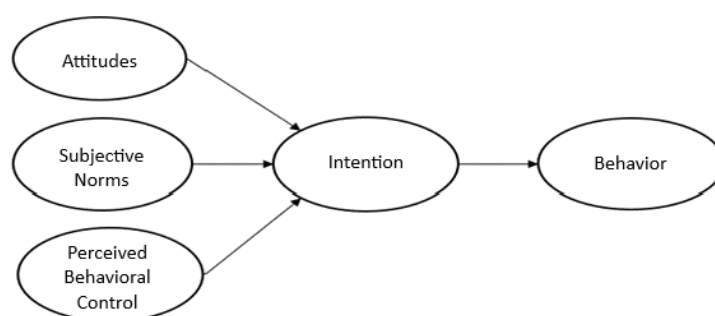
The aim of the research is to examine the perception of the residents of the Kvarner islands about waste sorting, their waste sorting behavior and their participation in achieving the sustainable development.

Following the introduction, the paper provides an overview of previous research on the perception of the population about waste in Europe, on the islands, and then in the Republic of Croatia and after the methodological part, the results of the research are presented, followed by the conclusion.

## 1. THEORETICAL BACKGROUND

Based on previous foreign research and research conducted in the Republic of Croatia, it was noted that, beginning with Ajzen (1991), many authors used the Theory of Planned Behavior (TPB) when studying the influence of attitudes, subjective norms and perceived behavioral control on intention and behavior concerning waste management, and realized their connection (Bezzina & Dimech, 2011; Bortoleto et al., 2012; Corsini et al., 2018; Ilakovac, 2018; Park & Ha, 2014; Tonglet et al., 2004; Wang et al., 2020; Zhang et al., 2017; Zhang et al., 2019). The TPB model was developed as an extension of the Theory of Reasoned Action (TRA), which emphasizes the process of thoughtful decision-making in which individuals carefully consider their attitudes and normative beliefs before making a decision to adopt a certain behavior. The main disadvantage of this theory is that it does not take into account the degree of control over behavior. For this reason the TRA has been expanded by adding the variable of perceived behavioral control (Ajzen, 1991; Ajzen & Fishbein, 1980; Fishbein & Ajzen, 1975). The TPB model is used to explain the behavior of individuals in the field of environment by examining items such as behavior towards energy saving, behavior in green tourism, ecological behavior and waste sorting behavior. Given the effectiveness of the TPB model in explaining pro-environmental behavior, it is appropriate to choose it as the basis for such research (Wang et al., 2020). The TPB model consists of the following constructs: attitudes, subjective norms, perceived behavioral control, intention and behavior (Ajzen, 1991). Figure 1 shows the TPB model.

Figure 1: Theory of Planned Behavior (TPB)



Source: created by the authors according to Ajzen, 1991; Park and Ha, 2014

Ajzen (1991) noted that TPB is an open theory and variables can be added to improve model explanations and to better explain behavior. The TPB model has in some cases been supplemented with the Norm Activation Model (NAM) in order to better explain pro-environmental behavior. NAM was introduced by Schwartz (1973), and the theory encompasses elements of personal norm, awareness of consequences, ascription of responsibility, and behavior (Park & Ha, 2014; Schwartz, 1973). However, TPB is used as a basis in environmental research because it has proven to be a useful conceptual framework in researching attitudes in order to predict consumer behavior, while the integration of this model using Schwartz's model is only partially feasible (Ajzen, 1991; Do Valle et al., 2005; Wang et al., 2020). Table 1 below showcases previous research regarding waste sorting among the local population based on the expanded Theory of Planned Behavior.

Table 1: Previous research regarding waste sorting among the local population based on the expanded Theory of Planned Behavior

Author (year)	Place of research	Aim of research	Conclusions
Tonglet et al. (2004)	UK (Brixworth)	To examine attitudes and behavior towards waste recycling.	Attitudes are the main determinant regarding recycling. TPB has proven to be a useful model for identifying factors that encourage recycling and determining their relationship.
Do Valle et al. (2005)	Portugal	To examine elements of TPB and NAM in explaining waste sorting behavior.	The use of the (modified) TPB model as a basis for representing participation in waste sorting is supported, while its integration with the Schwartz model is partially feasible. PBC has a positive influence on behavior towards waste sorting.
Park and Ha (2014)	USA	To expand the existing knowledge of consumer waste sorting behavior by researching psychological variables.	Elements of TPB and NAM directly or indirectly influence the intention of waste sorting.

Author (year)	Place of research	Aim of research	Conclusions
Zhang et al. (2019)	China (Taishan)	To examine the impacts of TPB and NAM elements on intention regarding waste sorting.	Personal norm is the main factor influencing the intentions regarding waste sorting, while subjective norms and perceived behavioral control are not significantly related to intention to sort waste and there is a gap between intention and waste sorting behavior.
Wang et al. (2020)	China (Hefei)	To understand intentions and behavior of residents towards waste sorting.	Elements of TPB, as well as personal moral norm and knowledge about waste sorting are directly and significantly related to the intention of waste sorting, while knowledge about waste sorting is indirectly related. The gap between intention and behavior towards waste sorting is visible.

Source: created by the authors according to the listed references

Authors Do Valle et al. (2005) and Ramayah et al. (2012) used a modified, abbreviated TPB model to explain waste sorting behavior. In the conceptual models of these papers, the TPB model was modified to observe a direct link between its elements – attitudes towards waste sorting, subjective norms and perceived behavioral control with waste sorting behavior.

Zhang et al. (2017) conducted research in China with the aim of identifying key social psychological variables that affect residents' intentions regarding environmental protection. The results showed that personal norm is the strongest direct determinant of intention. It is followed by perceived behavioral control and attitude, while awareness of consequences affects intention indirectly and significantly.

The study by Barr et al. (2001) showed that behavior regarding waste reduction is significantly different from behavior regarding waste sorting and is likely to be driven by different motivations. They report that waste sorting behavior is likely to be influenced by practicality, knowledge, and approach, and waste minimization is more likely to be driven by environmental concerns. Corsini et al. (2018) conducted research on the local population in Italy regarding the prevention of generating waste. They found that awareness of consequences is a fundamental driver of attitudes towards preventing waste generation. Barr et al. (2001) also suggest that behavior regarding waste reduction should be examined separately from behavior regarding reuse. The results of a study conducted by Bortoleto et al. (2012) on the local population in Brazil in the context of preventing waste generation confirm the benefit of the TPB and Schwartz's model of altruistic behavior (NAM) as a basis for modeling participation in preventing waste generation. The results also prove that personal norms and perceived behavioral control are main predictors and that subjective norms have little impact.

Research on the attitudes and behavior of residents towards waste sorting has been conducted on the islands of Cyprus (Safshekan et al., 2020), Malta (Bezzina & Dimech, 2011), Lesbos and Skyros (Aegean islands – Greece) (Kounani et al., 2020) and Tioman (Malaysia) (Latif & Omar, 2012).

Authors Safshekan et al. (2020) conducted a survey in Famagusta, a tourist destination in Northern Cyprus about residents' environmentally responsible behavior through their community attachment, community involvement and attitudes. They all have a positive impact on environmentally responsible behavior. Residents' attitudes positively influence their engagement in environmentally responsible behavior that leads to achieving sustainability in a tourist destination. Tourism, in addition to contributing to economic growth, affects society and the environment. For the above-mentioned reason, tourism can endanger sustainability of a tourist destination (Woo et al., 2018). It is necessary to focus on the long-term sustainability of a tourist destination and on achieving positive interactions between the local population, tourists and the environment (Safshekan et al., 2020).

Bezzina & Dimech (2011) have done research on the island of Malta among the local population in order to determine which factors are key in recycling participation. Recycling attitudes, norms and skills, satisfaction with service provided, and inconveniences are the factors that influence waste sorting behavior among Maltese residents. Latif & Omar (2012) conducted a study to investigate recycling behavior among Tioman island's residents through recycling attitudes, collectivism and materialism. The findings show a significant relationship between recycling behavior and collectivism, a positive, but weak relationship with recycling attitudes, and a negative relationship with materialism. Authors Kounani et al. (2020) examined the waste management perception of Aegean islands' residents about their environmental awareness, their attitudes towards waste management and recycling. The results of the study have shown that there is little difference between the islands Lesbos and Skyros regarding those respondents' perception towards waste and attitudes that are positive.

Research in the territory of the Republic of Croatia on the perception of the local population in relation to waste management is scarce, so this paper is a contribution to the literature related to waste management in island destinations. The results of the study by Ilakovac (2018) found a significant positive influence between the elements of the TPP in the context of household food waste management.

The research about the tourist offer on Kvarner showed that the local population has a positive attitude towards the development of tourism in the tourist destinations of Kvarner and that the positive attitude has been growing over the years. The conclusion is that the tourist destinations of Kvarner achieve sustainability (Alkier Radnić et al., 2007; Blažević et al., 2012). The results of a piece of research about waste management on the island of Krk conducted by Damjanić (2014) have shown that almost all the inhabitants of the island fully support the existing waste sorting system. They agree that sorting and recycling are the only ecological way of waste disposal. The viewpoints obtained indicate support for the existing integrated waste management system. According to the respondents, tourism has an impact on increased generation of waste, but at the same time waste sorting has a positive effect on the island's quality as a tourist destination. Gregorić et al. (2018) in their research on sustainable development on the island concluded that the island of Krk is going in the right direction and that his tourist destinations are recognized as destinations focused on sustainable development. The merit goes to the inhabitants of the island of Krk (Fistrić, 2011). Sustainable development of a tourist destination cannot be achieved without the involvement of the local population of that particular tourist destination (Birkić, 2016; Vodeb et al., 2021). With their efficiency in waste sorting, the locals participate in achieving sustainable development (Damjanić, 2014; Vidučić, 2007). In research on the role of the local population in the development of destination tourism with the aim to achieve sustainable development of the island tourist destination, the authors conclude that the local population and other stakeholders, are the ones who create tourism and facilitate sustainable tourism development. The goal of the local population is to live in a pleasant environment and earn money from tourism, which enables them to have a better life (Rudan, 2012; Tomljenović et al., 2013; Vidučić, 2007).

Dekanić & Krstinić Nižić (2021) compared tourist indicators with the data on the amount of waste on the Kvarner islands and concluded that even the extreme seasonality of tourism, i.e., a large influx of tourists in the summer months, does not disrupt the waste management model if it is organized in advance and consistently applied.

## 2. RESEARCH METHODOLOGY

In this chapter, the hypotheses and conceptual research model are set, the questionnaire design and study site are described, sample size selection and data collection are defined, and the methods of statistical data analysis are stated.

### 2.1. Research hypothesis and conceptual model

The Theory of Planned Behavior (TPB) is the best-known theory that explains the behavior of individuals in the field of the environment, and many studies use its modified versions in researching and explaining this phenomenon. It is used in creating the conceptual model and hypotheses of this research. Some previous studies on the local population have demonstrated the positive influence of the elements of TPB on waste sorting intention and behavior (Do Valle et al., 2005; Park & Ha, 2014; Tonglet et al., 2004; Wang et al., 2020; Zhang et al., 2019).

The conceptual model of this research draws the following elements from the TPB model: attitudes, perceived behavioral control (PBC), and behavior. Subjective norms and intention were excluded. Based on the research by Ramayah et al. (2012), the Norm Activation Model (NAM) was not combined with the TPB model, as Ajzen (1991) states that the TPB model forms the basis, while Do Valle et al. (2005) concluded that the integration of TPB with NAM can only be partially achieved.

Attitudes refer to the way an individual evaluates a specific behavior that needs to be implemented, e.g., positive or negative evaluation. Subjective norms refer to whether or not an individual perceives social pressure to perform or not perform a specific behavior. Perceived behavioral control (PBC) refers to whether individuals feel they possess the skills and abilities to perform a particular behavior. Intention refers to a subjective probability that an individual will perform a specific behavior. In the context of waste sorting, behavior implies environmentally responsible activities carried out in practice (Ajzen, 1991; Gao et al., 2017; Wang et al., 2020).

Subjective norms were excluded from the research in accordance with Corsini et al. (2018). Bortoleto et al. (2012) concluded that subjective norms do not necessarily reflect objective reality. The results of previous research showed that individuals do not necessarily consider the opinions of family, peers and society important so subjective norms only have an indirect effect on behavior. Authors Everett & Peirce (1993) point out that for positive subjective norms that are to be developed there must exist earlier examples within families and communities because otherwise there is no one to catalyze the development of the norm. Intention was excluded in line with research by Bortoleto et al. (2012), Corsini et al. (2018), Do Valle et al. (2005) and Ramayah et al. (2012). They used a modified limited TPB model to explain behavior towards waste sorting. Authors Zhang et al. (2019) concluded that there is a gap between intention and waste sorting behavior which means that intention does not guarantee a high level of participation in waste sorting. Residents often report that their intentions to sort waste are strong, while their actual waste sorting rate is quite low. Additionally, they proved that subjective norms and perceived behavioral control are not significantly related to the intention to sort waste. Wang et al. (2020) have also found that there is a visible gap between intention and behavior towards waste sorting.

Given all of the above, the first and second hypotheses were formed.

H1: Attitudes of residents towards waste sorting positively influence behavior of residents towards waste sorting in an island tourist destination.

H2: Perceived behavioral control positively influences behavior of residents towards waste sorting in an island tourist destination.

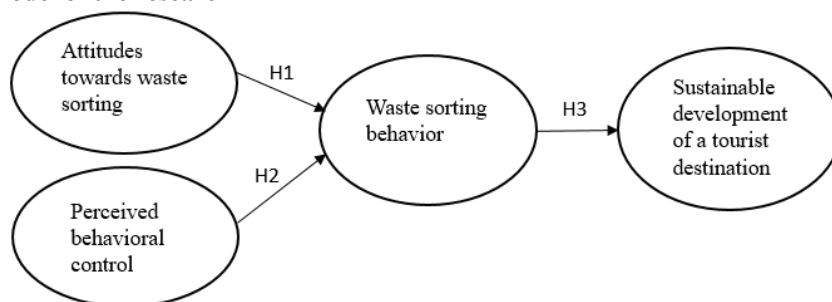
Waste sorting and recycling are important goals in promoting long-term environmental protection (Damjanić, 2014). Sustainable development of a tourist destination involves development that meets the current needs of tourists and the local community, while conserving resources for their future use (Črnjar M. & Črnjar K., 2009). The success and sustainability of tourism largely depend on the local population's enthusiasm and support for sustainable development of tourism. They are the ones who must therefore be included in the tourism development of a destination. Before implementing any development plan in a tourist destination, a key factor is to research how the residents perceive their impact on the sustainable development of tourism. It is important to achieve an increase in environmentally responsible consumer behavior, to raise awareness of the importance of the environment and to promote environmentally responsible behavior (Handriana & Ambara, 2016; Heesup, 2021). Sustainable development is based on understanding its three core components – society, environment, and economy. A balance between all three components and its operationalization ensures long-term development of a human society in a preserved environment. Perception and efficiency of the local population towards waste sorting and sustainable development is also important for achieving further tourism development in a destination. The main goal in tourism development on Croatian islands must be to increase quality of life. The good will of the residents can make tourism development sustainable (Damjanić, 2014; Vidučić, 2007).

The third hypothesis follows from the paragraph above.

H3: The behavior of the residents towards waste sorting in an island tourist destination positively influences the sustainable development of a tourist destination.

According to the set hypotheses, Figure 2 shows the conceptual model of the research.

Figure 2: **Conceptual model of the research**



Source: created by the authors

## 2.2. Questionnaire design

In order to examine the local population's perception of waste sorting on the Kvarner islands, a questionnaire consisting of four constructs was designed. The constructs include attitudes towards waste sorting, perceived behavioral control, waste sorting behavior, and sustainable development of a tourist destination. Each of these constructs consists of three items. Items are taken from authors Wang et al. (2020) and Birkić (2016). All items were rated using a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree).

The questionnaire was designed using the inverted funnel approach, which means that specific questions are asked before general questions. Similarly, socio-demographic characteristics (age, gender, and education) were asked at the end of the questionnaire.

## 2.3. Study site

The Kvarner islands is a group consisting of four inhabited islands (Krk, Cres, Lošinj, and Rab). The Kvarner islands are located in the Croatian Northern Adriatic, on the territory of Primorje-Gorski Kotar County, in Kvarner Bay. Kvarner Bay is located in the northeastern part of the Adriatic Sea between Istria and Primorje. The island of Krk is the northernmost Kvarner island and the northernmost island in the Adriatic. The island of Rab is the southernmost Kvarner island and is located south of the island of Krk, and east of the islands of Cres and Lošinj. The Kvarner islands make up 29.2% of the total area of the County (Fistrić, 2011; Grofelnik, 2013; Kvarner County Tourism Office, n.d.; Štimac, 2018). The inhabitants of the Kvarner islands are predominantly Croats. The official language is Croatian, but they also speak the Chakavian dialect. The Kvarner islands are in

an extremely favorable position in relation to the European and domestic tourist markets. The island of Krk is connected to the mainland by a bridge and air lines, and to the islands of Cres, Lošinj and Rab by ferry and catamaran lines that sail continuously throughout the day. The islands of Cres and Lošinj are also connected by a bridge. So, the Kvarner islands are well connected. As one of the preconditions for the development of tourism, transport connectivity is assumed to be an important element of the sustainability of tourism, and it benefits residents and tourists for mobility and accessibility (Damjanić, 2014; Grofelnik, 2013; Kvarner County Tourism Office, n.d.; Štimac, 2018).

According to the official results of the population census conducted in 2021, the total number of inhabitants of the Kvarner islands is 38.437, of which the number of inhabitants is 19.916 on the island of Krk, 2.716 on the island of Cres, 7.537 on the island of Lošinj and 8.268 on the island of Rab (dzs.gov.hr, 2022).

Given the dominance of summer seaside tourism, annual oscillations are very pronounced when comparing the summer and winter seasons. The Kvarner islands have several advantages for attracting tourists: good location, Mediterranean climate with hot, dry summers and mild winters, rich and diverse flora and fauna, attractive cultural and historical heritage, gastronomy, an indented coast and natural sandy and pebble beaches. Therefore, it is not surprising that the Kvarner islands attract a large number of tourists. The Kvarner islands are an outstanding tourist asset of Kvarner (Fistrić, 2011; Grofelnik, 2013; Kvarner County Tourism Office, n.d.; Štimac, 2018). In 2021, the Kvarner islands achieved 8.986.596 out of 15 million overnight tourist stays in Kvarner, which makes them the leading destinations in Kvarner (Kvarner County Tourism Office, n.d.).

The Kvarner islands were chosen as the research area because of the increase in generated waste during the summer months when an increased number of tourists is present. Authors Dekanić & Krstinić Nižić (2021) explored the effect of tourism seasonality on the amount of generated waste on the Kvarner islands. They found that in 2020 the islands in question saw the most tourist overnight stays in the period from June to September, while noting the greatest amount of generated waste in the same period. It is clear that the amount of generated waste on the Kvarner islands surpasses the number of overnight tourist stays in that period. Despite that, high tourism seasonality does not hinder the waste management model in effect. This shows that only proper waste management can reduce the degradation of the environment, develop a circular economy, and achieve sustainable development of island tourist destinations. The local population wants their location to be nice, to attract tourists. They want to be able to rent their apartments, to have a clean sea, and all of it to achieve environmental preservation, better quality of life and economic development (Rudan, 2012; Tomljenović et al., 2013).

In addition to the above, the Kvarner islands are comparable because they have the same model of waste management. It implies waste sorting by type of material and its collection "door to door" and the existence of recycling yards. They have an ecologically integral system of waste management, which includes closed landfills on the islands and waste removal from the Kvarner islands to the County Waste Management Center (CWMC) Marišćina on the mainland (Dekanić & Krstinić Nižić, 2021).

#### **2.4. Sample size selection and data collection**

The framework for the selection of the sample was data on the total number of inhabitants, who live on the Kvarner islands according to the last census (specified in subchapter 2.3). Due to the uneven share of the population on each of the Kvarner islands, and with the aim of obtaining representative data, a relevant sample size was determined for each Kvarner island. The relevant sample size is defined according to the criterion that the sample is representative if it covers 1.5% of the total population. Therefore, the representativeness of the results is ensured with 1.5% of the total number of inhabitants of the Kvarner islands (Blažević et al., 2012; Jelušić et al., 2007).

Accordingly, the planned sample size is 577 respondents.

For field surveys, 600 questionnaires were prepared, of which 21 were invalid (nine invalidly completed questionnaires from the island of Krk, three from the island of Cres, three from the island of Lošinj and six from the island of Rab). 579 correctly completed questionnaires were collected, of which 300 respondents were from the island of Krk, 41 respondents were from the island of Cres, 114 respondents were from the island of Lošinj and 124 respondents were from the island of Rab. The Kvarner islands are a whole and are thus evaluated as a single unit. Respondents were selected using the stratified random sampling method (Blažević et al., 2012; Jelušić et al., 2007).

The target audience was surveyed using the questionnaire. During the search for respondents, a filter question was asked regarding residency, i.e., whether the potential respondents are permanent residents of a particular Kvarner island. The authors personally conducted the questionnaire in the field, in urban centers of each Kvarner island, during August and September 2022, on residents who wanted to participate in the research after a brief explanation of the purpose of the research and guaranteed anonymity.

## 2.5. Methods of statistical data analysis

The research analyses the results of the conducted questionnaire survey related to the perception of the local population of the Kvarner islands on waste sorting.

In order to analyze and interpret the results and test the scientific hypotheses of the research, univariate and multivariate statistical analysis were applied. Using the method of descriptive statistical analysis, the research sample was systematized and described, and the basic parameters of the statistical analysis were calculated. PLS-SEM was used to examine the structural relationship between latent and manifest variables (Hair et al., 2022).

The hypotheses were empirically tested by partial last square structural equation modelling (PLS-SEM) using the statistical software Stata/IC 15.1.

The use of PLS-SEM in the analysis of the primary data of this paper is considered justified for several reasons. PLS-SEM is used in testing new research theories (Hair et al., 2012; Hair et al., 2022; Henseler et al., 2009). Namely, based on the review of the literature, it can be seen that the topic of waste sorting on the Kvarner islands has been little researched. Since PLS-SEM can easily handle both formative and reflective measurement models and is (therefore) considered the primary approach when the hypothesized model incorporates formative measures, we assessed the method as applicable to this paper (Richter et al., 2016; Rigdon et al., 2017; Ringle et al., 2012; Sarstedt et al., 2019; Vilares et al., 2010). Furthermore, it supports a small sample size, but is better if the sample size is bigger (Goodhue et al., 2006; Hair et al., 2022). Also, PLS-SEM is used when the parametric assumptions of normally distributed data are violated, i.e., when there is an abnormal data distribution (Dijkstra, 2010; Hair et al., 2011; Vilares et al., 2010).

## 3. FINDINGS

The entire data processing and analysis was performed on a sample of 579 respondents.

The results of descriptive statistical analysis, the measurement model and hypotheses testing will be presented.

### 3.1. Descriptive statistics

The socio-demographic structure of the sample is shown in Table 2.

Table 2: Socio-demographic characteristics of the sample (N=579)

Characteristic	Description	Frequency	Percentage
<b>Gender</b>	Male	260	44.9
	Female	319	55.1
<b>Age</b>	18-30	119	20.6
	31-45	163	28.2
	46-60	152	26.3
	61 and more	145	25.0
<b>Education</b>	Primary	21	3.6
	Secondary (High school)	269	46.5
	Undergraduate degree	173	29.9
	Graduate degree	116	20.0
<b>Island</b>	Krk	300	51.8
	Cres	41	7.1
	Lošinj	114	19.7
	Rab	124	21.4

Source: research results

It can be seen from Table 2 that there are slightly more women in the sample, 55.1% compared to 44.9% of men. There is an almost equal number of respondents in all age groups. The age of most respondents was between 31 and 45 (28.2%) while the least number of respondents are between 18 and 30 years old (20.6%). The arithmetic mean of the respondents' age is 46.82 years with a standard deviation of 15.928 years. Respondents from all levels of education were included in the research but most of them (46.5%) have a secondary school education. The structure of the surveyed population is aligned with the average educational structure of the population of Croatia, as residents with secondary education predominate, followed by residents with higher and high education (Blažević et al., 2012). With regard to the previous explanations about the selection of the sample on the scale of 1.5% of the total number of inhabitants of the Kvarner islands, most respondents (51.8%) come from the island of Krk.

Descriptive indicators for the items observed in the study, which include mean and standard deviation are shown in Table 3.

Table 3: **Descriptive statistics (N=579)**

Item number	Construct / Item	Mean	SD
<b>ATTITUDES TOWARD WASTE SORTING</b>		<b>4.29</b>	<b>.669</b>
att1	I think waste sorting is useful for alleviating environmental problems.	4.30	.722
att2	I think waste sorting is beneficial to promoting the reuse of resources.	4.25	.646
att3	I think waste sorting is helpful for improving the human living environment	4.34	.636
<b>PERCEIVED BEHAVIORAL CONTROL (PBC)</b>		<b>4.32</b>	<b>.718</b>
pbc1	I have the skills and abilities to sort waste in my daily life.	4.24	.714
pbc2	I feel it is easy and convenient to sort waste in my daily life.	4.25	.738
pbc3	I have confidence that if I want to sort waste in my daily life, I can do it.	4.45	.703
<b>WASTE SORTING BEHAVIOR</b>		<b>4.31</b>	<b>.802</b>
sor1	How frequently do you sort recyclable waste in your daily life?	4.32	.788
sor2	How frequently do you sort hazardous waste in your daily life?	4.22	.873
sor3	How frequently do you sort kitchen waste in your daily life?	4.37	.739
<b>SUSTAINABLE DEVELOPMENT OF A TOURIST DESTINATION</b>		<b>4.54</b>	<b>.602</b>
dev1	My location's tourism development encourages all stakeholders to adopt positive ethics concerning environmental protection.	4.47	.642
dev2	Tourism in my place of residence is developing in accordance with the natural and cultural environment.	4.46	.628
dev3	I believe that the tourism industry can improve the environment of my place of residence for future generations.	4.68	.531

Source: research results

The research results in Table 3 indicate that all respondents have positive attitudes towards waste sorting (M=4.29, SD=0.669). The average scores for a construct Perceived behavioral control is from 4.24 to 4.45. The highest score was noted regarding item related to confidence in sorting (M=4.45, SD=0.703). Construct Waste sorting behavior has fairly homogeneous results in waste sorting (M=4.31, SD=0.802). The respondents were the most positive towards the construct Sustainable development of a tourist destination. The item "I believe that the tourism industry can improve the environment of my place of residence for future generations" received the highest score (M=4.68, SD=0.531).



### 3.2. Measurement model

The hypotheses formulated were tested using the partial least squares structural equations modelling (PLS-SEM) method. The PLS model was analyzed in two steps: the evaluation of the measurement model followed by an evaluation of structural model. The evaluation comprises: indicator reliability, internal consistency reliability (Cronbach's alpha, composite reliability, reliability rhoA), convergent validity and discriminant validity (Hair et al., 2022). PLS results for the measurement model are presented in Table 4.

Table 4: PLS results for the measurement model

Item number	$\lambda^*$	$\alpha$	CR	$\rho_A$	AVE
<b>ATTITUDES TOWARD WASTE SORTING</b>		<b>0.660</b>	<b>0.815</b>	<b>0.664</b>	<b>0.595</b>
att1	0.754				
att2	0.746				
att3	0.812				
<b>PERCEIVED BEHAVIORAL CONTROL (PBC)</b>		<b>0.762</b>	<b>0.863</b>	<b>0.766</b>	<b>0.677</b>
pbc1	0.822				
pbc2	0.806				
pbc3	0.840				
<b>WASTE SORTING BEHAVIOR</b>		<b>0.805</b>	<b>0.885</b>	<b>0.806</b>	<b>0.720</b>
sor1	0.864				
sor2	0.833				
sor3	0.848				
<b>SUSTAINABLE DEVELOPMENT OF A TOURIST DESTINATION</b>		<b>0.679</b>	<b>0.821</b>	<b>0.702</b>	<b>0.606</b>
dev1	0.822				
dev2	0.807				
dev3	0.701				

\* All factor loadings were significant at  $p < .001$

$\alpha$  stands for Cronbach alpha; CR stands for composite reliability; AVE stands for average variance extracted.

Source: research results

Indicator loadings are all above the recommended 0.708 (Hair et al., 2019), so they indicate that the construct explains more than 50 percent of the indicator's variance, thus providing an acceptable indicator. The variable dev3 ("I believe that the tourism industry can improve the environment of my place of residence for future generations.") with the loading 0.701 was at the recommended limit, so the variable att3 was left in the model.

Cronbach's alpha (CA) was another criterion used to measure how well each individual item in a subscale correlated with the sum of the remaining items with the threshold value of 0.70 (Hair et al., 2022). All bars in the chart were above the threshold value. The level of internal consistency in each construct was relatively high, with Cronbach's alpha value ranging from 0.660 to 0.805. Composite reliabilities of the construct are 0.815 (Attitudes toward waste sorting), 0.863 (PBC), 0.885 (Waste sorting behavior), 0.821 (Sustainable development of a tourist destination), so they are considered acceptable (Nunnally & Bernstein 1994). Some researchers (Dijkstra & Henseler, 2015) propose rhoA which usually lies between the conservative Cronbach's alpha and the liberal composite reliability and is therefore considered an acceptable compromise between these two measures.

Convergent validity assessment is based on the average variances extracted (AVE). The AVE values of each construct are from 0.595 to 0.720, they are higher than 0.50 which shows an adequate convergent validity (Hair et al., 2022).

Discriminant validity was assessed using the Fornell-Larcker criterion (Fornell & Larcker, 1981). Each construct's AVE compared to the squared inter-construct correlation of that same construct and all other reflectively measured constructs in the structural model – the shared variance between all model constructs is not larger than their AVEs (diagonal values). For the Attitudes-PBC construct there are few disputes. The square roots of the AVEs (0.595) for the reflectively measured construct Attitudes is slightly lower than the correlations of this constructs with other latent variable PBC in the PLS path model (0.677) as Table 5 shows.

Table 5: **Discriminant validity – Squared inter-factor correlation vs. Average variance extracted (AVE)**

Construct	Attitudes	PBC	Sorting	Development
Attitudes	<b>0.595</b>			
PBC	0.667	<b>0.677</b>		
Sorting	0.444	0.523	<b>0.720</b>	
Development	0.321	0.398	0.438	<b>0.606</b>

Source: research results

However, the difference is too small (0.072), and can be ignored (Rahim & Magner, 1995).

Also, Table 6 shows that the outer loadings of all indicators on the associated construct are greater than their loadings on other constructs.

Table 6: **Cross loadings**

Construct	Attitudes	PBC	Sorting	Development
att1	<b>0.754</b>	0.604	0.538	0.431
att2	<b>0.746</b>	0.598	0.449	0.430
att3	<b>0.812</b>	0.685	0.546	0.450
pbcl	0.683	<b>0.822</b>	0.577	0.521
pbcl2	0.671	<b>0.806</b>	0.559	0.482
pbcl3	0.665	<b>0.840</b>	0.645	0.551
sor1	0.595	0.637	<b>0.864</b>	0.546
sor2	0.546	0.596	<b>0.833</b>	0.538
sor3	0.555	0.608	<b>0.848</b>	0.599
dev1	0.455	0.499	0.598	<b>0.822</b>
dev2	0.467	0.541	0.526	<b>0.807</b>
dev2	0.401	0.430	0.393	<b>0.701</b>

Source: research results

Since the variance of no other latent construct is not explained better than the variance of its own indicator, the discriminant validity of the measurement model is confirmed (Hair et al., 2014).

### 3.3. Hypotheses testing

Once we have confirmed that the measurement of constructs is reliable and valid, the next step addresses the assessment of the structural model results.

The structural model regressions are examined for potential collinearity issues. Only one latent variable (Sorting) is predicted by two constructs. The VIF value of 3.006 is below the threshold of 5 (Hair et al., 2022) therefore multicollinearity is not an issue.

The R<sup>2</sup> represents the variance explained in each of the endogenous constructs and is a measure of the model's explanatory power (Shmueli & Koppius, 2011), also referred to as in-sample predictive power (Rigdon, 2012). The R<sup>2</sup> values can be used for assessing the structural model (Henseler et al., 2016). The R<sup>2</sup> value for Waste sorting behavior is 0.540 and shows that Perceived behavioral control and Attitudes toward waste sorting together explain 54.07% of Waste sorting behavior. Waste sorting behavior explains 43.78% (R<sup>2</sup>=0.438) of Sustainable development of a tourist destination. Both obtained values can be considered moderate (Hair et al., 2011).

The significance of the path coefficients and relevance of the path coefficients are evaluated. Analogous to the assessment of formative indicator weights the significance assessment builds on bootstrapping standard errors as a basis for calculating t-values of path coefficients or alternatively confidence intervals (Streukens & Leroi-Werelds, 2016).

Table 7 presents the standardized path coefficient estimates, their respective t-values, p-values, and summarizes the results of hypotheses testing.

Table 7: Significance testing of the structural model path coefficients

Path	Path coefficients	t-values	p-values	Hypothesis
ATTITUDES → SORTING	0.227	4.637	0.000	H1: supported
PBC → SORTING	0.538	10.995	0.000	H2: supported
SORTING → DEVELOPMENT	0.662	21.239	0.000	H3: supported

Source: research results

As can be seen, all three relationships are statistically significant.

In relation to hypothesis H1, the results show that attitudes toward waste sorting positively influence waste sorting behavior (path coefficient=0.227,  $t=4.637$ ,  $p=0.000$ ). This result supports H1.

Perceived behavioral control positively influences waste sorting behavior (path coefficient=0.538,  $t=10.995$ ,  $p=0.000$ ). This finding supports H2.

Further, waste sorting behavior positively influences sustainable development of a tourist destination (path coefficient=0.662,  $t=21.239$ ,  $p=0.000$ ) which confirms H3.

Indirect effect of Attitudes on Sustainable development is 0.150, which is considered medium and indirect effect. Indirect effect of PBC on Sustainable development is 0.356, which means large according to Cohen (1988).

## DISCUSSION AND CONCLUSION

The conducted study examined the perception of the residents of the Kvarner islands and their participation in achieving the sustainable development of tourism through the application of environmentally responsible behavior, which includes waste sorting. The research is based on the Theory of Planned Behavior (TPB), from whose model subjective norms are excluded (Corsini et al., 2018) since they do not necessarily reflect objective reality (Bortoleto et al., 2012) and for their development earlier positive examples must exist within families and communities (Everett & Peirce 1993), and the intention to sort waste is excluded (Bortoleto et al., 2012; Corsini et al., 2018; Do Valle et al., 2005; Ramayah et al., 2012) because it does not guarantee a high level of participation in waste sorting, for example, someone wants to sort waste but never actually does it (Zhang et al., 2019).

The results of our study show that the attitudes of residents towards waste sorting positively influence the behavior of residents towards waste sorting in an island tourist destination. This is consistent with the results of previous studies (Bezzina & Dimech, 2011; Safshekan et al., 2020). When the sample has positive attitudes towards waste sorting, it follows that it should also have positive waste sorting behavior (Kounani et al., 2020; Latif & Omar, 2012). According to our research results, the residents of the Kvarner islands have a positive attitude towards waste sorting, which was also highlighted by the author Damjanić (2014). They believe that waste sorting is useful for alleviating environmental problems, promoting the reuse of resources and improving the human living environment, which is in line with the research conducted by authors Wang et al. (2020). Authors Bezzina & Dimech (2011) and Damjanić (2014) point out that residents' attitudes are very important for a sustainable tourist destination.

Our research also shows that perceived behavioral control (PBC) positively influences the behavior of residents towards waste sorting. This is confirmed by the study of Do Valle et al. (2005). In our research, PBC showed that the residents of Kvarner islands self-assess that they have the skills and abilities to sort waste, that it is easy for them, because if they want to sort waste, they can, which is consistent with the research of authors Wang et al. (2020). Author Damjanić (2014) emphasizes that residents need to be motivated, informed, and educated so that they will have the skills and abilities to sort waste.

Finally, our research shows that the behavior of the residents towards waste sorting in an island tourist destination positively influences the sustainable development of a tourist destination. Residents believe that tourism develops in harmony with the natural and cultural environment, promotes a positive ethic concerning environmental protection, and preserves the environment for future generations, which is in line with the research of author Birkić (2016). The inhabitants of the Kvarner islands are interested and participate in waste sorting (Damjanić, 2014), and sustainable development is achieved (Alkier Radnić et al., 2007; Blažević et al., 2012), which was also confirmed by our research. Several authors point out that inhabitants support and promote the development of the destination through their actions (Birkić, 2016; Rudan, 2012; Tomljenović et al., 2013; Vidučić, 2007; Vodeb et al., 2021). This means that a high level of residents' participation in waste sorting is crucial for the sustainable development of a tourist destination (Bezzina & Dimech, 2011; Fistrić, 2011), which our research also showed. It can be concluded that residents and their activities are a crucial factor in changing the environment and achieving sustainable development, as stated by the author Damjanić (2014).

The contribution of this paper lies in the analysis of previous research on waste management, the construction of a conceptual model and in the broadening of the existing literature on the behavior of the local population of the Kvarner islands towards

waste sorting. The paper is one of the few studies on the topic of waste sorting and sustainable development of a tourist destination that refers to the inhabitants of the Kvarner islands, which makes it original.

The research results provide useful insights into achieving better waste management for decision-makers in municipal companies, managers, policymakers and lawmakers in the field of waste management, representatives of cities and municipalities of island tourist destinations, stakeholders in the sustainable development of the island and the island inhabitants. Notwithstanding the fact that our research focused on the Kvarner islands, the model is more broadly applicable and can be used on all islands. We hope that this research will encourage others to conduct similar research on residents' perceptions of waste sorting and shed light on the importance of their involvement in tourism development.

To date, there have been few studies on residents' perceptions of waste sorting on islands, particularly Croatian islands, which presented a challenge for this study. A limitation of this study is that it focused exclusively on locals who are permanent residents of the islands. The recommendation for future research is to include locals who are temporary residents of the islands, tourists, and representatives in the utility companies of the Kvarner islands, with whom in-depth interviews can be conducted that would provide additional insights into waste management and thus include a qualitative method in addition to the quantitative. It is also recommended to conduct similar studies on other islands in the Republic of Croatia and the EU.

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