Predicting behaviours related to marine litter prevention: an empirical case based on junior high school students in Italy

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Abstract: Like many other environmental issues, marine litter represents a growing threat that needs to be tackled appropriately. Young adults can play a crucial role in targeting current and future issues related to marine litter given that they tend to be particularly aware of factors regarding sustainability and the environment in general. The study investigates the willingness of junior high school students to be involved in supporting beach clean-up activities and other awareness programs related to marine litter. The findings show how environmental knowledge, awareness of the consequences, attitudes towards marine environment preservation and social norms predict junior high school students’ pro-environmental behaviour towards marine protection. Social norms were found to be the highest predictor of pro-environmental behaviour related to marine litter, whereas personal attitudes had a limited influence. The conclusions highlight the future strategies needed both at policy and managerial levels in order to understand how to motivate and further promote junior high school students’ engagement in preserving the marine and coastal environment.

Keywords: marine litter; pro-environmental attitude; young adults; theory of planned behaviour; TPB; attitude behaviour context theory; Italy.

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1 Introduction

Greater awareness of environmental problems has stemmed from the World Conference on Environment and Development report which called for a more sustainable economic development in order to allow present generations to meet their needs without compromising the ability of future generations to achieve theirs (WCED, 1987). Given the current severe environmental challenges, promoting sustainability is crucial for both current and future generations.

Young people have a role to play in addressing environmental and sustainability problems. With their knowledge, passion, enthusiasm young adults can be the promoters of real sustainable change. This perception is based on the capacity of young people to contribute to the sustainability of economic development, given that many of them believe in a sustainable earth and are aware that they will inherit the future world (Davis, 1998). Additionally, young adults are “the consumers of the future, capable of making a difference in the next decades” (Vermeir and Verbeke, 2008). Therefore, the role of children and young adults to address specific environmental problems is crucial (Jucker, 2002).

As with many other environmental issues, marine litter represents a growing threat (Derraik, 2002). A wide range of marine litter-related instruments already exist and action has been taken at global and regional levels (see Hosoda et al., 2003; Hidalgo-Ruz and Thiel, 2015). Several countries have addressed marine litter issues through legislation, the enforcement of international agreements and by improving their waste management (Liu et al., 2013). However, more extensive efforts to support
volunteer activities and public awareness programs are still needed. As with other environmental-related issues, involving the general public is crucial in addressing the problem of marine litter.

Thus, understanding the behaviour and its determinants of young adults is very important. Several research studies have proved that young adults understand many societal problems (Gottfried, 1985), are susceptible to new influences (Greene et al., 2004), are critical of established social rules (Wentzel, 1991), and are willing to take action to help solve environmental issues (Hill and Lee, 2012).

Based on the theoretical framework of the theory of planned behaviour (TPB) (see Ajzen, 1991), several studies have investigated the predicting factors of the specific behaviours of young adults (Chawla, 1988; Davis et al., 2002; Godin et al., 1992; Villarruel et al., 2004), whereas little research has focused on specific pro-environmental behaviours of young adults (Vermeir and Verbeke, 2008; Tonglet et al., 2004). Additionally, this research has mainly focused on adolescents, whereas an analysis of the predictors of specific pro-environmental behaviours in younger individuals (i.e., middle school/junior high school), would seem to be lacking in the empirical academic literature.

Understanding how to motivate and support young adults in activities aimed at preserving the marine and coastal environment will be important when confronting future environmental challenges, especially because young adults will be the future citizens and the decision makers of tomorrow.

To date, no studies have carried out an in-depth analysis of the determinants of this willingness to participate in pro-environmental marine activities.

This research is thus intended to fill this gap by examining the marine volunteering behaviour of young adults. Starting from the theoretical framework of attitude behaviour context (ABC) theory (Guagnano et al., 1995; Stern, 2000) and the theory of reasoned action (TRA) and TPB (Ajzen and Fishbein, 1980, 2010; Ajzen, 1991) our research is focused on junior high school students. Junior high school (also known as ‘middle school’) is a transitional step for students between elementary and high school, usually for children aged between 10 and 14 years old. Using a survey on marine environmental behaviours and their predictors, we propose a model that assesses the impact of attitudes and subjective norms on the private and public sphere pro-environmental behaviours towards the preservation of marine ecosystems.

A better understanding of the issues related to marine pro-environmental involvement can provide an interesting insight into the ways junior high school students connect with the marine environment together with the methods required to confront the present and future environmental challenges. This approach emphasises how future strategies should motivate and sustain junior high school students to engage in activities aimed at preserving the marine and coastal environment.

This paper is structured as follows. After a brief overview of the theoretical framework in Section 2, Section 3 reviews the literature in order to formulate the appropriate set of hypotheses. Section 4 describes the context of the study, shows the data collection process and illustrates the research design. The results are shown in Section 5. Policy and managerial implications are presented together with the directions for further research in Section 6.
2 Theoretical framework

The analysis of the predictors of specific behaviours has received great attention from academics and practitioners over the last few decades (Ajzen and Fishbein, 2010). Several theoretical frameworks have been built by focusing on personal values (Schwartz, 1973; Ajzen, 1974); general personal traits (Wicker, 1969; Steg and Sievers, 2000); action of control (Sarver, 1983); and self-efficacy (Bandura, 1982). However, the TRAs and the TPB are widely recognised as a prominent framework to explain and predict behaviour, as demonstrated by hundreds of empirical studies that have tested their assumptions (see Ajzen and Fishbein, 2010; for many examples). Both theories are designed “to explain virtually any human behaviour” (Ajzen and Fishbein, 1980). They build upon the fact that before deciding to engage in a specific behaviour, individuals usually consider the implications of their actions (Ajzen and Fishbein, 1980). The TRA tries to explain how a given behaviour is the result of attitudes towards a behaviour and subjective norms. The first “refers to the degree to which a person has a favorable or unfavorable evaluation or appraisal of the behavior in question”, whereas the second “refers to the perceived social pressure to perform or not to perform” a specific behaviour (Ajzen, 1991). Ajzen and Fishbein (2010) subsequently added an additional factor to explain a given behaviour: the perceived behaviour control, which is the extent to which a person feels able to enact a specific behaviour.

The application of TRA or TPB as a theoretical framework to explain a specific behaviour depends on there are whether internal or external impediments, which may potentially prevent the behaviour. Several empirical studies have used TRA or TPA to explain specific pro-environmental behaviours such as waste recycling (Taylor and Todd, 1995; Davies et al., 2002; Tonglet et al., 2004); purchasing of green products (Ha and Janda, 2012), sustainable food consumption (Vermeir and Verbeke, 2008) and have found different influences of subjective norms, attitudes and, in some cases, perceived behavioural control.

Following on from Ajzen and Fishbein (1980), Guagnano et al. (1995) developed the ‘ABC’ theory where they affirmed that behaviour (B) is an interactive product of personal-attitudinal variables (A) and contextual factors (C). Stern (2000) was one of the first to provide an overview of the external variables that influence pro-environmental behaviour, i.e., contextual forces or external forces. These include interpersonal influences, community expectations, government regulations, the physical difficulty of specific actions and other features within a broad social, economic, and political context. According to Stern (2000), these contextual forces are activated when an individual believes that violating them will have an adverse impact on the things they value, and that by taking action, they will bear the responsibility for those consequences. If we consider the TPA, we can reasonably affirm that in the ABC theory, perceived behaviour control and the subjective norm are included in a single category called contextual factors.

However, today, it is widely accepted that consumer behaviour is complex and the result of many factors. In fact, no single model or theory is able to provide a framework that can analyse more than a small portion of behaviour (Stephenson et al., 2010; Wilson and Dowlatabadi, 2007). According to both Ajzen (1991) and Stern (2000), the role of predicting factors can vary strongly across different specific behaviours and further empirical research is needed on predicting other types of behaviours.
3 Research hypotheses

Our study aims to explore the main predicting factors of two specific pro-environmental behaviours. Stern at al. (1999) and Stern (2000) identified four major categories of pro-environmental behaviour: environmental activism; private sphere pro-environmental behaviour; public sphere pro-environmental behaviour, and other behaviours (i.e., behaviours affecting organisational decisions). Since our focus is on understanding behaviours affecting a specific environmental problem (marine litter) in relation to junior high school students, we concentrated on the public and private spheres.

In detail, considering the form of non-activism in the public sphere emerging from Dietz et al.’s (1998) research, we focused on the willingness to engage in pro-environmental activities (Bargh, 2002). In many studies, this has been represented by the willingness to contribute to environmental preservation projects or to volunteer (Fitzmaurice, 2005; Perugini and Bagozzi, 2001). Then, because junior high school students are mostly limited consumers (Chawla, 1988), we focused on their daily behaviours regarding marine litter.

Many researchers have investigated the role of attitudes as a determinant of pro-environmental behaviour (Bamberg and Möser, 2007; Kaiser et al., 1999). Using a sample of 456 young adults in Belgium, Vermeir and Verbeke (2008) found that attitudes, compared to social norms, have a higher influence in determining the intention to consume sustainable food. Focusing on a sample of adults, Ha and Janda (2012) found that attitudes are the most significant predictor of consumer intentions to purchase energy-efficient products.

On the other hand, much empirical evidence shows that attitudes are a poor predictor of human behaviour (Ajzen and Fishbein, 2000) although very few of these studies have regarded environmental behaviour. For instance, Davis et al. (2002) used a sample of 166 individuals to investigate the decision of African American students to complete high school and found that attitudes are a significant predictor but with a less explanatory power than social norms and perceived behavioural control. Similarly, Villarruel et al. (2004) found that attitudes are a lower predictor of the intention to use condoms among Latino adolescents.

Although the influence of attitudes has been analysed before, its explanatory power varies across studies.

The factors that influence a young adult’s tendency to be concerned about the marine environment are under represented in the current literature. In the light of previous studies, our aim is to test the attitudes of junior high school students towards marine litter in relation to their public and private sphere pro-environmental behaviour. This led us to the following hypotheses:

H1 Attitudes towards marine ecosystem preservation have a positive and direct effect on private sphere pro-environmental behaviour.

H2 Attitudes towards marine ecosystem preservation have a positive and direct effect on public sphere pro-environmental behaviour.

One of the most important contextual factors in ABC theory and one of the predictors in TRA and TPA are social norms. Social norms arise when individual actions lead to potentially negative side effects for other members of a community (Coleman, 1990), and play the role of restricting selfish impulses in favour of collective outcomes (Biel et al.,
Social norms imply that people should adopt a certain behaviour or not manifest a proscribed one; the violation of these norms is met by sanctions (Biel and Thøgersen, 2007). A positive correlation between social norms and pro-environmental behaviour has been reported for correct waste-handling (avoidance of littering) (e.g., Heberlein, 1972), participation in a recycling program (e.g., Thøgersen, 2003), and consumer purchases of environmentally-friendly products (Heberlein and Black, 1976). However, using data from 191 participants in a local recycling project, Tonglet et al. (2004) found that social norms are not a statistically significant predictor of recycling behaviour. Similarly, but not focused on pro-environmental behaviour, Godin et al. (1992) provided empirical evidence that social norms are not a significant predictor of quitting smoking.

On the other hand, some studies have found a positive role of subjective norms but with a low explanatory power of a specific pro-environmental behaviour. For instance, in the above-mentioned study by Ha and Janda (2012), subjective norm has a positive but low influence (and also weakly significant) on the purchasing intention of energy efficient products. Similarly, Cheung et al. (1999) found that social norms, compared to attitudes, have a lower influence on the intention of college students to recycle waste paper. Although the influence of social norms has been analysed in young adults, the majority of studies have focused on older high school students. The influence of social norms on pro-environmental behaviours related to marine litter has also been under-represented.

In this paper, we review social norms focusing on those especially related to maintaining a clean marine environment. Based on the literature, we decided to test whether or not social norms have a direct effect on ‘private and public sphere pro-environmental behaviour related to marine ecosystem preservation’.

This led us to formulate the following hypotheses:

H3 Social norms have a positive and direct effect on private sphere pro-environmental behaviour.

H4 Social norms have a positive and direct effect on public sphere pro-environmental behaviour.

According to Stern (2000), and Ajzen and Fishbein (2010), attitudes are influenced by a set of behavioural beliefs. The importance of beliefs in influencing pro-environmental behaviour, by shaping attitudes, has also been stressed by many researchers (Hornik et al., 1995; Grob, 1995). Knowledge of the environment is a key factor contributing to a long-term commitment to pro-environmental behaviour (Hornik et al., 1995). Maloney and Ward (1973) underline that the most informed people are more likely to adopt a specific pro-environmental behaviour. Oskamp et al. (1991) discovered that general knowledge regarding conservation played a significant role in influencing environmentally responsible behaviour in the USA. The influence of knowledge of relevant issues on attitude is also clear in young adults. Bradley et al. (1999) found evidence of the direct positive influence of general environmental knowledge on recycling attitudes in high school students.

After examining the literature, we decided to assess whether the environmental knowledge of junior high school students has a direct impact on their tendency to be concerned about the marine environment. We assessed the knowledge of activities related to the prevention of marine litter and the knowledge of health hazards related to marine litter. Based on these considerations, we formulated the following hypothesis:
Environmental knowledge has a positive and direct effect on attitudes towards marine ecosystem preservation. Grob (1995) underlines that being aware of how a phenomenon could impact on the environment and its potential consequences were a key factor behind the long-term commitment to pro-environmental behaviour. Grob (1995) shows how the recognition of the consequences of environmental problems is directly linked to environmental attitudes. While environmental knowledge could be regarded more as understanding the importance of a good environment, awareness of the consequences, could be seen as being aware of the activities endangered by the ineffective preservation of the environment. For instance, Cottrel (2002) found that environmental knowledge and awareness of the consequences (including threats to the marine environment) are two predictors of a responsible environmental behaviour of visitors to protected areas. Nowadays, also given the increasing awareness of waste-related problems on the marine environment, we would expect the awareness junior high school students regarding the consequences to have a strong positive effect on their attitudes towards marine ecosystem preservation. Based on these considerations, we formulated the following hypothesis:

H6 Awareness of the consequences has a positive and direct effect on attitudes towards marine ecosystem preservation.

4 Methodology

4.1 Context of the study, data description and research design

The data used in this paper were collected within the research project SMILE (http://life-smile.eu) (Strategies for Marine Litter and Environmental prevention of sea pollution in coastal areas) funded by the European Commission in order to identify effective solutions to prevent marine litter in Mediterranean coastal areas. Part of this study was conducted in several junior high schools in Pietra Ligure between January and March 2014. Pietra Ligure is a municipality located in Liguria, a coastal region in north-west Italy. The municipality has a population of 8,708 inhabitants, and represents a typical urban agglomerate located in the coastal area of the region. As with other municipalities, it relies on tourism and on the fishing industry to support the local economies.

The decision to collect the data from Pietra Ligure was based on several factors. Firstly, the municipality is located in a coastal area; secondly, 3.7% of the total population is aged between 10–14 years old, which is similar to the average Italian percentage of people this age (3.8%); thirdly, it is one of the few Italian regions that adopted a marine environmental education system for young and adults in 1990. Indeed, like other municipalities in this region, Pietre Ligure is profoundly concerned about seaside preservation, considering both the importance of seaside tourism and fishing related activities.

Marine litter is a problem that affects many parts of Europe. There are a variety of reasons why the phenomenon occurs, including: poor solid waste management; human activities, and low levels of public awareness about the potential consequences of littering. Marine litter problems in Pietra Ligure and around the Ligurian Sea, are linked to these causes but changing weather patterns have also aggravated the problem, as
heavier rainfall during spring and autumn seasons washes several types of litter into the marine environment.

Data were collected using paper-based questionnaires distributed to several junior high schools in the municipality. The respondents were asked to indicate the extent of their agreement with a number of possible outcomes of marine litter, activities endangered by marine litter and behaviours related to waste minimisation and recycling. A five-point Likert-scale was used, with 5 indicating complete agreement with the proposed statement, and 1 indicating total disagreement. The questionnaire contained the following sections:

- **Demographic information** – the respondents were asked to indicate their age and gender.
- **Social norms** – measuring the individual’s perception of social pressure to maintain a clean marine environment.
- **Environmental knowledge** – measuring the possible outcomes of the problem of marine litter and how to mitigate the problem.
- **Awareness of the consequences** – investigating what activities could be endangered by the presence of marine debris.
- **Attitudes** – investigating the reasons why preserving the marine environment is important.
- **Private sphere pro-environmental behaviour** – the respondents were asked the extent to which they engaged in a number of waste minimisation and recycling behaviours in order to reduce marine litter.
- **Public sphere pro-environmental behaviour** – measuring the willingness to be involved in initiatives to preserve the marine environment.

Before submitting the questionnaire, a pre-test was conducted. The aim of this phase was to highlight any potential weaknesses and to formulate the questions appropriately in a clear and understandable way for students aged between 10–14 years old. The questionnaire was discussed firstly with two junior high school teachers, then administered to 15 students for a pre-test. Feedbacks from this phase enabled us to better formulate various questions and eliminate any redundancy.

Questionnaires were forwarded to junior high school students with the help of teachers volunteering in this project. In order to avoid potential parental influence, we asked teachers to allow the children to fill in the questionnaire during school time and not to complete them at home. Teachers were also informed as to how to explain issues to students without influencing their answers.

In order to overcome social desirability, a typical methodological bias, anonymity was guaranteed for those responding to the questionnaire. According to Nederhof (1985) social desirability, “the tendency on behalf of the subjects to deny socially undesirable traits and to claim socially desirable ones, and the tendency to say things which place the speaker in a favourable light”, can be overcome by ensuring the anonymity of respondents. In addition, teachers were trained on how to explain to students that there were no right answers and no judgement would be formulated on the aggregated results of the questionnaire.
The total number of junior high school students living in the municipality amounted to 321, of which 197 answered the questionnaire, with a response rate of just over 61%.

A common method variance test was also performed including all the variables in an exploratory factor analysis. A common method variance occurs when a single factor accounts for the majority of covariance among the variables. In our case, the results showed at least three distinct factors with an eigenvalue greater than 1.0. The largest of these factors accounted for 28% of the variance.

In order to test our hypotheses, data acquired through the questionnaires were processed with a structural equation model. The results emerging from the model were also triangulated with secondary data gathered by semi-structured interviews with different stakeholders (e.g., municipality, waste management company, local media). This part of the research was used to better explain the actual implications of the model. A total of seven interviews were conducted for an approximate time of 45–60 minutes each. The interviewees were identified using the snowball technique (see Table 1 for details), thus interviewees suggested other people to contact (Reed et al., 2009). This part of the analysis was aimed at a deeper understanding of how the behaviours of young adults could be influenced, which kind of programs could impact on their behaviour, and how to better implement these activities.

### Table 1 Details of the interviewees

<table>
<thead>
<tr>
<th>Code</th>
<th>Organisation</th>
<th>Interviewees</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stakeholder #1</td>
<td>Municipality of Pietra Ligure</td>
<td>Environmental Counsellor</td>
</tr>
<tr>
<td>Stakeholder #2</td>
<td>Liguria Region</td>
<td>Environmental Department Officer</td>
</tr>
<tr>
<td>Stakeholder #3</td>
<td>Ligurian Regional Agency for Environmental Protection (ARFAL)</td>
<td>Director Unit</td>
</tr>
<tr>
<td>Stakeholder #4</td>
<td>Municipal waste management company (ATA S.p.A.)</td>
<td>Technical manager</td>
</tr>
<tr>
<td>Stakeholder #5</td>
<td>Environmental NGO (Legambiente Liguria)</td>
<td>President</td>
</tr>
<tr>
<td>Stakeholder #6</td>
<td>Media (La stampa)</td>
<td>Editor</td>
</tr>
<tr>
<td>Stakeholder #7</td>
<td>Youth Association (Associazione Giovani per Pietra)</td>
<td>President</td>
</tr>
</tbody>
</table>

### 4.2 Measurements and constructs

In this section, we provide a brief description of the questions included in the survey and how each variable of the empirical model was developed.

#### 4.2.1 Social norms

For junior high school students, community expectations are very important since their behaviours can be highly influenced by feeling part of a group (Gadenne et al., 2011) or by the family upbringing (Nordensvard, 2013). The social environment is, therefore, a key predictor of favourable intentions to engage in environmental behaviours (Ozaki, 2011).

Starting with the items used by Oom do Valle et al. (2004), we measured the social norms influencing marine litter prevention by asking respondents to express their level of
agreement regarding four assertions indicating community expectation on their behaviour.

For each assertion, respondents reported ‘strongly agree’ = 5, ‘agree’ = 4, ‘neutral’ = 3, ‘disagree’ = 2, or ‘strongly disagree’ = 1. The responses to all the assertions were entered into a common factor analysis in order to assess variability among observed and correlated variables and to create a new unobserved variable that accounts for social norm. Table 2 shows how this new unobserved variable is reliable (Cronbach’s alpha > 0.6)

Table 2: Items used to create the variable, social norms

<table>
<thead>
<tr>
<th>Item</th>
<th>Factor loading</th>
</tr>
</thead>
<tbody>
<tr>
<td>The majority of people feel that I should help maintain a clean marine environment</td>
<td>0.800</td>
</tr>
<tr>
<td>Most people would be happy about my contribution in maintaining a clean marine environment</td>
<td>0.708</td>
</tr>
<tr>
<td>Most of the people I know help in maintaining a clean marine environment</td>
<td>0.697</td>
</tr>
<tr>
<td>I expect that most people would contribute to maintaining a clean marine environment</td>
<td>0.723</td>
</tr>
<tr>
<td>Cronbach’s alpha</td>
<td>0.7087</td>
</tr>
</tbody>
</table>

4.2.2 Environmental knowledge

As demonstrated by several studies, environmental knowledge is a significant predictor of environmental behaviour (Laroche et al., 2001; Darnall et al., 2012; Testa et al., 2013). Environmental knowledge can be defined as the general knowledge of an environmental phenomenon that can orient the action of people in an environmentally-conscious way (D’Souza et al., 2007; Moisander, 2007).

Focusing on the marine environment and taking inspiration from the items used by Ha and Janda (2012), we measured the environmental knowledge of marine pollution by asking respondents to express their level of agreement with two assertions. For each assertion respondents reported ‘strongly agree’ = 5, ‘agree’ = 4, ‘neutral’ = 3, ‘disagree’ = 2, or ‘strongly disagree’ = 1. As for the measure of social norms, the responses to all assertions were entered into a common factor analysis in order to create a new unobserved variable that accounts for environmental knowledge. Table 3 shows that this new unobserved variable is reliable.

Table 3: Items used to create the variable environmental knowledge

<table>
<thead>
<tr>
<th>Item</th>
<th>Factor loading</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marine litter is a form of pollution</td>
<td>0.5789</td>
</tr>
<tr>
<td>Reducing and recycling waste can reduce environmental problems</td>
<td>0.6709</td>
</tr>
<tr>
<td>Cronbach’s alpha</td>
<td>0.6121</td>
</tr>
</tbody>
</table>

4.2.3 Awareness of the consequences

Environmental awareness refers to the understanding of an individual regarding the impact of a phenomenon on the environment (Grob, 1995). From the TRA perspective, environmental awareness can shape the attitude of an individual towards environmental
actions and, as a consequence, influences his/her behaviour. Likewise, it is one of the attitudinal factors identified by Stern (2000) for predicting pro-environmental behaviour. Awareness of the consequences that pollution can cause, may be a strong contributor to individual attitudes toward environmentally friendly actions (Gamba and Oskamp, 1994).

On the basis of the above, and adapting the items used by Tonglet et al. (2004) we measured the awareness of the consequences by asking respondents to express their level of agreement with eight assertions indicating their personal feelings about the importance of marine environment preservation.

For each assertion respondents reported ‘strongly agree’ = 5, ‘agree’ = 4, ‘neutral’ = 3, ‘disagree’ = 2, or ‘strongly disagree’ = 1. As with the previous variables, the responses to all assertions were then entered into a common factor analysis in order to create a new unobserved variable, which accounts for awareness of the consequences. Table 4 shows that a reliable new variable emerges.

**Table 4** Items used to create the variable, awareness of the consequences

<table>
<thead>
<tr>
<th>Item</th>
<th>Factor loading</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marine litter damages beach activities (sports, tourism)</td>
<td>0.522</td>
</tr>
<tr>
<td>Marine litter damages the marine landscape</td>
<td>0.599</td>
</tr>
<tr>
<td>Marine litter reduces the cultural role of the sea in Liguria</td>
<td>0.546</td>
</tr>
<tr>
<td>Research activities can be compromised by marine litter</td>
<td>0.697</td>
</tr>
<tr>
<td>Marine litter reduces the quality of life of people living near the sea</td>
<td>0.611</td>
</tr>
<tr>
<td>The survival of plants and fish can be threatened by marine litter</td>
<td>0.578</td>
</tr>
<tr>
<td>Marine litter can reduce the competitiveness of the local fishing industry</td>
<td>0.550</td>
</tr>
<tr>
<td>Ecosystem services provided by the marine environment can be threatened by the presence of waste</td>
<td>0.569</td>
</tr>
<tr>
<td>Cronbach’s alpha</td>
<td>0.6271</td>
</tr>
</tbody>
</table>

### 4.2.4 Attitudes

According to Allport (1935), attitude can be defined as “a mental and neural state of readiness” that influences the decision of a person to adopt a specific behaviour. It is considered as a favourable or unfavourable evaluative opinion, which leads to a behaviour (Ha and Janda, 2012). The development of environmental attitudes in a person is influenced by a broad system of personal values, beliefs and norms. Taking into account several studies aimed at testing the value-belief-norm approach theorised by Stern (2000), and adapting the items used by Tonglet et al. (2004), we measured attitudes to marine environment prevention by asking respondents to express their level of agreement with eight assertions indicating personal feelings regarding the importance of marine environment preservation.

For each assertion respondents reported ‘strongly agree’ = 5, ‘agree’ = 4, ‘neutral’ = 3, ‘disagree’ = 2, or ‘strongly disagree’ = 1. We then checked the possibility to create a new unobserved variable to account for attitudes by entering the responses to all assertions into a common factor analysis. Table 5 shows that a reliable new variable emerges.
Table 5  Items used to create the variable, attitude towards marine environment preservation

<table>
<thead>
<tr>
<th>Item</th>
<th>Factor loading</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preserving the marine environment benefits bathers and sports people</td>
<td>0.527</td>
</tr>
<tr>
<td>Preserving the marine environment inspires creativity and reflection</td>
<td>0.596</td>
</tr>
<tr>
<td>Preserving the marine environment is part of the culture of Liguria</td>
<td>0.641</td>
</tr>
<tr>
<td>Preserving the marine environment increases our knowledge about our planet</td>
<td>0.686</td>
</tr>
<tr>
<td>Preserving the marine environment reduces the consequences of events such as storms and tornadoes</td>
<td>0.593</td>
</tr>
<tr>
<td>Preserving the marine environment improves the quality of life for everyone</td>
<td>0.554</td>
</tr>
<tr>
<td>Preserving the marine environment protects many different species (animals and plants)</td>
<td>0.542</td>
</tr>
<tr>
<td>Protecting the marine environment makes it possible to provide food</td>
<td>0.513</td>
</tr>
<tr>
<td>Cronbach’s alpha</td>
<td>0.690</td>
</tr>
</tbody>
</table>

4.2.5 Private sphere pro-environmental behaviour

Several actions can be carried out by individuals in their everyday life to contribute to environmental preservation. Regarding energy, for instance, an individual can reduce daily energy use, by lowering the temperature in unused rooms or switching off lights when leaving a room; or buying energy efficient technologies (Sütterlin et al., 2011; Gynther et al., 2012). Similarly, in terms of waste management, pro-environmental behaviour concerns repairing and recycling products for example or re-using containers instead of buying new ones. In addition, an individual can buy goods with minimal packaging or with a longer duration in order to minimise waste production (Tonglet et al., 2004).

Focusing on marine litter prevention and on how junior high school students contribute to it, we asked respondents to express how often they carried out specific actions to preserve the marine environment.

For each assertion, respondents reported ‘always’ = 5, ‘almost always’ = 4, ‘often’ = 3, ‘rarely’ = 2, or ‘never’ = 1. As with the previous constructs, we then entered the responses to all assertions into a common factor analysis to create a new unobserved variable to account for private sphere pro-environmental behaviour. Table 6 shows that a reliable new variable emerges.

Table 6  Items used to create the variable, private sphere pro-environmental behaviour

<table>
<thead>
<tr>
<th>Variable</th>
<th>Factor loading</th>
</tr>
</thead>
<tbody>
<tr>
<td>I believe that I will be preventing waste if I can reuse it</td>
<td>0.5096</td>
</tr>
<tr>
<td>I do not leave any litter on the street or on the beach but use the appropriate containers</td>
<td>0.6254</td>
</tr>
<tr>
<td>I ask my parents to buy reusable/recyclable products</td>
<td>0.7728</td>
</tr>
<tr>
<td>If I find litter (e.g., paper, plastic bags) on the street or on the beach I pick it up and deposit it in appropriate container</td>
<td>0.7998</td>
</tr>
<tr>
<td>If I see someone who leaves litter on the street or on the beach, I point it out to them that their approach is wrong</td>
<td>0.7380</td>
</tr>
<tr>
<td>Cronbach’s alpha</td>
<td>0.7085</td>
</tr>
</tbody>
</table>
4.2.6 Public sphere pro-environmental behaviour

Since our focus was on 10–14 year olds, we measured public sphere pro-environmental behaviour by asking students about their willingness to be involved in initiatives to preserve the marine environment such as beach clean-ups and information campaigns. A categorical variable was constructed using the survey question “Would you be willing to be involved in initiatives such as beach clean-ups and information campaigns to prevent marine litter?”

Respondents replied using a five-point scale, indicating their level of agreement: ‘strongly agree’ = 5, ‘agree’ = 4, ‘neutral’ = 3, ‘disagree’ = 2, or ‘strongly disagree’ = 1.

5 Results

5.1 Descriptive statistics

Firstly, we conducted a preliminary inspection of data emerging from the questionnaire with the help of descriptive statistics. Figure 1 shows the level of environmental knowledge, awareness about the consequences and importance of social norms within the sample.

The first point to note from Figure 1 is that there is a significant level of environmental knowledge among the respondents. More than half of the respondents (172 out of 197) strongly agreed both with the statement presenting marine litter as a form of pollution, and the statement suggesting the importance of reducing and recycling to prevent environmental problems.
Items related to the awareness of the consequences show more variability. A high number of respondents considered the consequences that pollution can cause to the marine landscape (189 out of 197) and the survival of plants and fishes (182 out of 197) as being the most relevant. In contrast, only a minority of respondents was aware of the fact that marine litter also threatens the ecosystem services (58 out of 197).

Regarding social norms, many respondents agreed on the importance of helping in maintaining a clean marine environment (150 out of 197) and with the expectation of other people to contribute to this cause (156 out of 197). In contrast, most respondents (68 out of 197) answered neutrally to the statement that most people they know help to maintain a clean marine environment.

These data suggest that respondents had a high level of environment knowledge, as well as an overall keen awareness of the consequences and of the importance of social norms. This information has interesting implications for both academic and practical studies on young adults. For instance, these insights are crucial in developing an ad hoc awareness and knowledge raising initiatives among young people.

5.2 Structural equation model

In order to test our hypotheses, we performed a structural model made up of three equations. The first equation predicts the development of attitudes to marine environment preservation by checking the influence of two beliefs: environmental knowledge and awareness of the consequences. The second and third equations estimate the influence of attitudes and social norms on the specific behaviour: a private sphere pro-environmental behaviour that a young person performs daily and a public-sphere pro-environmental behaviour measured by his/her involvement in public initiatives for marine preservation.

The structural model revealed that all relationships proposed by the model were significant, and robust standard errors were computed (see Figure 2). The variance predicted by the structural equations was as follows: environmental knowledge and awareness of the consequences explain 32% of the variance of attitude; attitudes and social norms explain 20% and 29% of the variance of private and public sphere pro-environmental behaviour, respectively.

In addition, for the overall model, the R-squared was 0.469, which predict a positive relation between attitude towards marine environment preservation and public-sphere and private-sphere environmental behaviour. Both coefficients were positive and statistically significant at 5% although the strength of influence is limited (the absolute value of both coefficients is low).

The proposed relationships (H3 and H4) between social norms and pro-environmental behaviours were also highly significant (in both cases p < 0.001). Looking at the value of the coefficients, the strength of social pressures compared to attitudes to predict both private and public sphere environmental behaviours was clearly highlighted. In contrast with recent studies measuring the predictors of specific environmental behaviour (Tilikidou, 2007; Ha and Janda, 2012), our study stresses the role of social pressures in determining the behaviour of young people both at the private (daily behaviour towards litter prevention) and public levels (willingness to be involved in public initiatives on marine litter prevention). This also confirms several empirical findings regarding the TPBs, which found a lower predictive validity of attitudes (Ajzen and Fishbein, 2010; Villarruel at al., 2004; Davis et al., 2002).
Finally, H5 and H6 which predict a positive relationship between two relevant beliefs, such as environmental knowledge and awareness of the consequences, and attitudes towards marine environment preservation, were supported and significant at $p < 0.01$. In particular, environmental knowledge had a greater role in shaping attitudes ($\beta = 0.46$) in line with previous findings from the literature on pro-environmental behaviour (Laroche et al., 2001; Darnall et al., 2012).

In general, we can affirm that our model confirms that for young adults, and focusing on specific environmental problems such as marine litter, behaviour is the interactive product of personal attitudes and social norms.

Figure 2 Model results

Notes: *$p < 0.05$; **$p < 0.01$

6 Discussion and conclusions

This work was based on primary data collected from a survey of Italian junior high school children, aimed at exploring the factors that influence two specific pro-environmental behaviours: daily actions preventing marine litter (private sphere pro-environmental behaviour) and the willingness to be involved in initiatives aimed at preserving the marine environment (public sphere pro-environmental behaviour).

Overall, our article provides further empirical evidence on the predicting factors of specific behaviours related to a well-defined environmental problem.

Our results confirm the findings of Stern (2000), and Ajzen and Fishbein (2010) on the specificities of each behaviour. Focusing on specific pro-environmental behaviour and the geographical context, we found that social norms are the highest predictor of pro environmental behaviour related to marine litter in junior high school students, whereas personal attitudes have a limited explanatory power. This is in contrast with several studies focused on specific environmental behaviour in young adults (Vermeir and Verbeke, 2008) or adults (Tonglet et al., 2004; Ha and Janda, 2012), whereas it confirms the evidence from previous studies on behaviours not related to the environment in young adults (Davis et al., 2002; Villarruel et al., 2004).

Our model emphasises that pro-environmental behaviours related to marine litter prevention are partially determined by good examples and the influence exerted by informal relationships with very close social actors, such as family and friends. As in the
literature on consumer behaviour (Gadenne et al., 2011; Nordensvard, 2013), the opinions and actions of family and friends create a set of social norms that young people tend to follow.

An interesting finding from our model is that personal feelings such as environmental knowledge and awareness of the consequence of a polluting phenomenon have a stronger influence on attitudes than contextual forces such as social pressure. This highlights how young adults are more prone to shape personal beliefs on the basis their knowledge rather than blindly following what their circle of relationships declare as being important.

The results of the survey were also a stimulus for local stakeholders to identify new initiatives for the prevention of marine litter. It is important to highlight that all the actors interviewed can play an important role in the identification and implementation of actions able to influence the behaviour of young people in Pietra Ligure for a better management of marine litter. It is also clear that all the stakeholders involved believe that both private and public actors are part of the solution to the marine litter problem. In addition, stakeholders are convinced that young people can play an important role in waste prevention and recovery, by adopting sustainable lifestyles and properly managing waste.

In order to strengthen the social norm dimension – which our model shows to be one of the most important predictors of young people’s behaviour in the public and private sphere – the interviewed stakeholders highlighted the need for a better design of regulations and for the enforcement of the existing ones. Stakeholder #1, for instance, argued “More specific regulations should specify behaviours required in specific situations and I think that there is a need for environmental guards (…). Social responsibility exists but if there is a penalty, individuals are would be motivated to adopt a specific behaviour”. Stakeholder #5 stated the importance of the polluter pays principle: “we should inflict penalties for discouraging behaviours that can damage the environment”.

All stakeholders stressed the importance of information and communication in stimulating changes in citizen’s behaviour. Stakeholder #3, for instance, affirmed: “First of all education and an increase in awareness, and then regulations and penalties”. Stakeholder #7 observed: “firstly, we should work on individuals, and secondly, on institutions, because if a person has received an environmental education and is aware of the consequences of their own actions on the environment, they will do the right thing irrespective of the existence of a specific law”.

Several stakeholders stressed the role of the specific attitudes of young people in quickly comprehending the reason for a pro-environmental behaviour. Stakeholder #3, for instance, affirmed: “regarding marine litter, education represents the most effective tool, although it requires more time to achieve its objectives. In this framework, I am focusing on young people’s education: we can take them to garbage dumps to show them the real environmental impact of improper behaviours”. Stakeholder #1 said “when we organise meetings in schools, we can see that young people are like sponges, they are interested in what we say and are careful about their parents’ behaviour: young people are more receptive than adults”. Stakeholder #2 also stressed the importance “of explaining the effects of such problems, the effects on animals that live in the sea and on the marine habitats”.

Since the analysis highlighted the importance of social norms for stimulating the private and public pro-environmental behaviour of young adults, the local administration has instituted a number of initiatives involving parents and adults. Such initiatives also included information and awareness raising although the model underlined that attitudes,
Predicting behaviours related to marine litter prevention

which are positively influenced by such initiatives, are a poor predictor of actual behaviour.

To influence young adult behaviour, local stakeholders have decided to implement joint initiatives based on the use of web tools and educational materials. The idea of using web tools derives from the initiatives carried out by the UK Department of Energy and Climate Change, which has developed a carbon web-calculator for individuals and households to detect and quantify their greenhouse gas emissions. By simply describing the property (flat, house, etc.), transport habits, type of heating and lighting, etc. citizens can learn about their impact on the environment as well as the best practices to reduce their carbon footprint. Since young adults are confident with web tools, an effective communication strategy should include using web-enabled tools to devise training programs, best practices and educational materials available for teachers and other key actors. Future initiatives will also rely on the development of educational methods that promote sustainable lifestyles and daily actions. Junior high school students represent a particularly sensitive target, which could influence the family in terms of purchasing choices, differentiated waste collection, recycling, etc. Local schools and NGOs are considering systematically introducing subjects, methods and materials in local educational curricula to encourage more sustainable behaviours. These are also aimed at developing systemic as well as critical thinking, and at ensuring a better understanding that well-being does not necessarily depend on the high consumption of material goods.

Some limitations of this study also need to be recognised. First, the study focused on young students living in a seaside town in the north of Italy, which the interpretation of the results should therefore take into consideration. In addition, in order to assess the robustness of our conclusions, it would be desirable to replicate the study by increasing the sample size and involving other contexts outside Italy.

Second, our study does not take into consideration all the factors influencing the specific behaviour identified in the literature. For instance, measures on perceived behavioural control should be added in order to test the assumption that pro-environmental behaviour related to marine litter issues is not characterised by external impediments. In addition, habits, perceived norms and a deeper focus on beliefs could also strengthen the robustness of future research. Future research could also improve the accuracy of the measurements in order to strictly follow the suggestions provided by Ajzen and Fishbein (2010). For instance, personal attitudes could be measured as a combination of behavioural beliefs and feelings about behaviours.

Third, self-reported data reflect a person’s beliefs and perceptions of their own behaviour rather than actual behaviour.

Fourth, we used cross-sectional data which need caution in the interpretation of relationships. Future research using longitudinal data, although more complicated to collect and perform, would be advisable. Finally, we suggest further experimental studies using nudges to deepen the understanding of the environmental behaviour of young adults.

In conclusion, our study provides a further empirical analysis of the predictors of pro-environmental behaviours by focusing on behaviour related to marine litter prevention by 10–14 year olds living in a coastal town in Italy.

Their behaviour is mainly driven by social norms and only partially by personal attitudes, which are, in turn, mostly shaped by personal knowledge rather than social
norms. Future strategies both at policy and at managerial levels should take these findings into account.

References


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