



## Exploring waste prevention behaviour through empirical research

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### ARTICLE INFO

#### Article history:

Received 16 January 2018

Revised 4 July 2018

Accepted 16 July 2018

#### Keywords:

Waste prevention

Behaviour

Attitudes

Awareness

### ABSTRACT

Waste prevention is currently a critical issue, and our research aims to provide a more nuanced view by examining the determinants of individual behaviour when deciding to either purchase a certain item or to extend the life of an owned item through repair or reuse activities. Our research has two main aims: (1) to examine the importance that being aware of consequences and personal norms have in shaping positive attitudes towards waste prevention behaviour; and (2) to explore the relationship between attitudes and perceived behavioural control on waste prevention by testing the mediation effects of perceived behavioural control and waste prevention behaviour. The research is based on 375 questionnaires collected in Pietra Ligure, a municipality located in Northwest Italy. Data were modelled using a structural equation model to test the hypotheses. The findings show that awareness of the consequences is a fundamental driver of waste prevention attitudes while personal norms are not. The findings also confirm a positive relationship between attitudes and perceived behavioural control. Finally, a positive significant relationship was found between perceived behavioural control and waste prevention behaviour, and between social norms and waste prevention behaviour. The results of our investigation are contextualised in theoretical, political and managerial frameworks and suggest several avenues for further research.

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### 1. Introduction

In 2014, a total of 2.60 billion tonnes of waste were generated in the European Union (EU-27) (Eurostat, 2016). During the same year, the quantity of waste recovered either from incineration with energy recovery, recycling or used for backfilling (the use of waste in excavated areas for slope reclamation or safety or for engineering purposes in landscaping) accounted for 51.1% of the total waste treated (Eurostat, 2016). The data presented highlight that a large proportion of the waste produced is still landfilled, thus creating enormous environmental damage (Eurostat, 2016). Currently, household or municipal waste (i.e., generated by households) accounts for only around 10% of the total waste generated in Europe (Eurostat, 2016). However, the complexity of household waste

presents a serious problem, due to its composition, diversity of sources of production, and its link to consumption patterns.

According to Eurostat information (Eurostat, 2016) around 240.8 million tonnes of municipal waste are produced in Italy, which is about 488 kg per inhabitant per year, and 29% of household waste is recycled, 21% is incinerated, about 20% is composted, while 30% is landfilled (Eurostat, 2016). In light of these figures, the importance of waste prevention is critical.

In Europe, the Waste Framework Directive (EC, 2008) provides a general framework of waste management requirements and sets the basic definitions. This Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste repealed Directive 2006/12/EC of the European Parliament and of the Council of 5 April 2006 on waste (the codified version of Directive 75/442/EEC as amended).

The Waste Framework Directive explicitly requires Member States to adopt waste management plans and waste prevention programmes. "Prevention" in the Waste Framework Directive (EC, 2008) refers to identifying all the "measures taken before a substance, material or product has become waste", which is directed at reducing the quantity of waste, the adverse impacts on the environment and human health or the harmful substances contained. According to the Directive, waste prevention is the most

*Abbreviations:* AIC, Akaike information criterion; AVE, Average Variance Extracted; C&D, construction and demolition waste; CAB, cognitive, affective and behavioural; CFI, comparative fit index; CR, Composite Reliability; MaxR(H), Max Reliability; PCB, perceived behavioural control; RMSEA, root-mean-square error of approximation; TLI, Tucker Lewis index; TPB, theory of planned behaviour; TRA, theory of reasoned action.

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favourable option of the five indicated in the waste hierarchy (i.e., waste prevention, preparing for reuse, recycling, recovery and disposal) and concerns products which have already been discarded and are therefore officially waste. As reported by the European Commission (2012) in the guidance document for preparing waste prevention programmes, preventing waste is achieved “by limiting unnecessary consumption and by designing and consuming products that generate less waste are forms of strict avoidance of waste”. Waste prevention activity also “encompasses actions that can be undertaken once a product reaches its end-of-life: rather than discarding the product, the final user should consider reuse, repair or refurbishment as options”. Tonglet et al. (2004) identified two characteristics in the concept of waste prevention:

1. At the point of purchase, which includes the acts of choosing a product that produces less waste (such as not buying products with excessive packaging or not buying “disposable” products);
2. Through repair or reuse, rather than replacing products.

Understanding how to influence people to adopt more sustainable patterns of consumption and pro-environmental behaviour has been identified as a key step in addressing some of the biggest environmental challenges we currently face, such as ensuring a low-carbon future, diminishing the amount of waste produced and reducing current overconsumption patterns (Eppel et al., 2013). Much research has focused on waste recycling behaviour (Hornik et al., 1995; Huffman et al., 2014) and attitudes (Larsen, 1995), and waste recycling and waste prevention have been examined together (Ferrara and Missios, 2012; Tonglet et al., 2004). However, according to Tucker and Douglas (2007) and Barr et al. (2001a) the determinants of recycling behaviour are very different from those of waste prevention. Stern (2000) stressed in his seminal work on the determinants of environmentally friendly behaviours that the same predictors could have different influences depending on the behaviour investigated. Therefore, results from studies focusing on very general behaviour could be questionable. Waste prevention has recently become a hot topic with several scientific studies (Gregory and Phillips, 2009; Schneider, 2013; Zorpas et al., 2014, 2015, 2017, 2018) and technical reports (WRAP, 2008; RECAP, 2008) published on the issue. For example, Gregory and Phillips (2009) conducted an evaluation of four key methods for monitoring household waste prevention campaigns in the UK, and quantified the direct waste tonnage impacts of implementing a targeted household waste campaign. Zorpas et al. (2017) conducted an analysis to discover the main barriers to the compositional analysis in Insular Communities under warm climate conditions and identified advice to residents on waste minimisation. Only a few studies have explored the behaviour determinants related to waste prevention, such as those preventing marine litter (Gusmerotti et al., 2016) or food waste (Quested et al., 2013). Bortoleto et al. (2012) carried out an in-depth analysis of the determinants of waste prevention behaviour and specifically identified the importance of research that can add explanatory value to behaviour prediction by including other factors.

A better understanding of the issues related to waste prevention behaviour can provide interesting insights into how waste prevention activities can be increased and how policies and strategies aimed at preserving the environment by reducing waste can be more effective. Zorpas and Lasaridi (2013) noted that few tools and methods for assessing waste prevention have been developed in the literature, and the available data is still limited.

Our research therefore aims to provide a more nuanced view of this field by examining the determinants of specific waste prevention behaviours, such as avoiding buying products with excessive and unnecessary packaging or “disposable” products, and also repairing items to give them a longer life. Our investigation

addresses prevention behaviour concerning several types of consumption-related household waste such as organics, paper, plastic, glass, metal, and other (i.e., textiles, leather, e-waste, etc.) waste. The prevention of “construction and demolition waste” (C&D) from households’ activities, such as building rubble and concrete, is not taken into account. We also investigate the determinants of waste prevention behaviours through the theoretical framework of the attitude behaviour context theory (Guagnano et al., 1995; Stern, 2000), the theory of reasoned action (TRA) and the theory of planned behaviour (TPB) (Ajzen and Fishbein, 1980, 2010; Ajzen, 1991).

The paper is structured as follows. Section 2 reviews the literature on pro-environmental behaviours, outlines the knowledge gaps and formulates the hypotheses. Section 3 provides details on the data gathering process and describes the methodology for statistically testing the measurement model. The results are presented in Section 4. Finally, implications derived from the measurement model are presented together with directions for further research in Section 5.

## 2. Materials and methods

### 2.1. Theoretical framework and research hypotheses

The determinants of specific behaviour have recently been the focus of both academics and practitioners (Ajzen and Fishbein, 2010). The frameworks of the theory of reasoned action and the theory of planned behaviour (Ajzen and Fishbein, 1980, 2010; Ajzen, 1991) are the most noteworthy to explain behavioural determinants, as the extensive literature demonstrates (Ajzen and Fishbein, 2010). However, these determinants can vary widely with their contexts, so further research is still required in predicting behaviour (Ajzen, 1991; Stern, 2000). Our study is unlike previous research as we take two novel approaches (Bortoleto et al., 2012; Quested et al., 2013; Tonglet et al., 2004; Gusmerotti et al., 2016). First, we examine the importance of awareness of the consequences and of personal norms in shaping positive attitudes towards waste prevention behaviours. These constructs have not been previously assessed in explorations of waste prevention behaviour (Bortoleto et al., 2012; Quested et al., 2013; Tonglet et al., 2004). Second, our research explores the relationship between attitudes and perceived behavioural control (PCB) on waste prevention by testing the mediation effect of perceived behavioural control and waste prevention behaviour, which has not been previously assessed (Bortoleto et al., 2012). Stern (2000) and more recently Ajzen and Fishbein (2010) stated that attitudes are affected by a set of beliefs. Many researchers such as Hornik et al. (1995) and Grob (1995) stressed the value of such beliefs in influencing pro-environmental behaviour by shaping attitudes. Hornik et al. (1995) showed how environmental awareness is a factor that can lead to long-term participation in pro-environmental behaviour. Maloney and Ward (1973) found that those most aware are more likely to adopt a specific pro-environmental behaviour. Oskamp et al. (1991) found that a general knowledge of conservation was significant in influencing environmentally responsible behaviour in the US. Lin and Huang (2012) similarly found that environmental concern influences choice behaviour.

In the late 1960s, Schwartz (1968a, 1968b) proposed conceptual models for exploring the drivers of altruistic behaviours. An awareness of the positive consequences a specific behaviour may have on an identified problem is a factor that can activate the behaviour, by creating a personal moral obligation. Therefore, beyond a general environmental concern, a full understanding of how individual actions contribute to the problem of waste in the natural environment is fundamental to encouraging a specific behaviour and then activating it. As suggested by Lam (2006), achieving a positive

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