Review

A Systematic Literature Review of Concepts and Factors Related to Pro-Environmental Consumer Behaviour in Relation to Waste Management Through an Interdisciplinary Approach

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Abstract: Although there has been a steady increase in the number of studies on consumer behaviour in relation to sustainable development, there is limited focus on the product disposal phase. This systematic literature review intends to: (1) clarify how concepts related to pro-environmental consumer behaviour are understood and analysed in the academic literature on waste management; (2) discover any interplay between pro-environmental consumer behaviour and generic consumer behaviour, and the conditions and factors that favour it. A typical systematic literature review methodology was applied to the papers available on Web of Science, Science Direct and EBSCO (Elton Bryson Stephens Company) host between 1975 and 2019, leading to the selection of 699 final papers. The findings reveal that: (1) Although scholars tend to create a variety of pro-environmental consumer behaviour models depending on their specific field of inquiry, all approaches can be traced back to a limited number of reference theories; (2) The overall level of interplay between pro-environmental consumer behaviour and generic consumer behaviour is limited, nevertheless a favourable context or a supportive institutional-legal framework can significantly influence it; (3) A plethora of conditions and factors favour this type of interplay, involving social psychology, laws, economics, institutions and more; (4) Several critical issues appear in the analysed papers, especially some scholars' assumptions to be able to identify all key factors. It follows the need for a more interdisciplinary approach, a deeper analysis of the effectiveness of the intervention measures at the governmental and institutional level, and a clear classification of factors and conditions (as proposed by this review).

Keywords: systematic literature review; pro-environmental consumer behaviour; waste management; green consumer; theory of planned behaviour (TPB); pro-environmental behaviour; waste; consumer; consumer behaviour; pro-environmental behaviour factors

1. Introduction

The recent academic literature, official governmental publications and business studies show a significant interest in consumer behaviour. The predominant focus is on the economic and marketing aspects, often motivated by strategic and lucrative reasons in the private sector; however, an increasing number of scholars and decision makers have investigated the social, cultural, psychological and ecological motivations and implications of consumer actions. This provides a branch of alternative research and an opportunity for a complementary investigation into the more diffused economic and

marketing analysis. In fact, in the last few years a steady increase in studies on consumer behaviour, in relation to sustainable development, demonstrates the need, especially by academia and executives, to expand the economic and social analysis of consumer activities towards a more interdisciplinary approach. In this regard, it must be emphasized that the production and sale of a product for the consumer market does not finish with the purchase by the consumer and his/her assistance through a customer service. This process should include not only a careful evaluation of the impact of a product on the environment, but also the consumer's contribution to this impact through his/her daily actions including waste recycling. For example, the production process has to be preceded by the environmentally friendly design of the product (also known as eco-design), taking account of both the recycling limitations that the consumer may experience during the disposal phase, and the features of the waste treatment plants [1]. Moreover, these issues are further exacerbated by weak governmental interventions and ineffective regulations, as highlighted by Wiesmeth and Hackl [2]. In fact, they state that environmental "policies in waste management, including policies on one-way drinks containers and waste electrical and electronic equipment, and implementations of extended producer responsibility with further applications to waste electrical and electronic equipment, reveal more or less severe deficiencies" (p. 332). It follows that a correct analysis of the impact of all human activities on the environment requires an interdisciplinary approach involving many fields like engineering, chemistry, ecology, economics, marketing, law, business management, sociology, and psychology. Actually, in some cases like environmental engineering, we observe great progress [3,4], but note with regret that the predominant focus is still on the consumer purchase phase, often discarding the consumer disposal and recycling phase, that are becoming more and more important because of the deep consequences on the environment in terms of pollution and resources utilisation. Institutions and academia have to fully understand that, as stated by Tseng, et al. [5], "human behaviour is a strategic domain because of the enduring effects of both poor and good recycling habits" (p. 367).

In particular, there still is limited research on the interplay between pro-environmental consumer behaviour (PECB) and generic consumer behaviour (GenCB). In this paper, the interplay is interpreted as the interaction between people with high pro-environmental sensitivity and the ones who are not concerned about sustainable development. This type of relationship influences both the effectiveness of recycling at the final user level, and the diffusion of good recycling practices among consumers. Acknowledging that this effectiveness is tied to the availability of a robust recycling infrastructure and a supportive legal framework [6,7], the consumer can significantly contribute to it with his/her daily and apparently insignificant activities like waste disposal and recycling. In fact, Wiesmeth and Hackl [2] affirm that "all agents, who are affected by the goals of a certain environmental policy, have to be integrated into this policy" (p. 336). In this sense, the institutional and social framework, in addition to a supportive context [8], definitely favour the interaction among people or the shift of consumers towards "greener" behaviour through spillover and other effects [9,10]. Unfortunately, the existing literature shows that these aspects of PECB are not adequately and systematically addressed; in fact, Geiger, et al. [11] "indicate that future studies could more systematically examine the effects of contextual factors on recycling, as well as the interplay of individual and contextual factors" (p. 78).

Furthermore, although the most recent literature is increasingly utilising terms like pro-environmental behaviour (PEB), recycling behaviour, and green behaviour, the meaning and the interdisciplinary implications of these terms are still contested, because they are often influenced by the scholar's background [12]. Similarly, the plethora of theoretical frameworks applied in the numerous field studies proves that the selection of the most suitable model is contested too. Thus, there are high chances that a scholar conducting an interdisciplinary study on human behaviour in relation to waste management struggles to find an adequate model incorporating the key factors. For example, this happens when a researcher from law or economics has the need to understand the mechanisms governing PECB; he/she would definitely benefit from models that explain how human behaviour is less rational than expected. In fact, the predominant paradigm in economics is based on rationality and maximisation of profits, whereas sociology and psychology explain how human behaviour is not

as rational or linear as expected; consequently the latter disciplines opt for a different approach and terminology (e.g., "reasoned behaviour" [13,14]). Moreover, the complexity of behavioural models is further exacerbated by the utilization of a consistent number of factors in addition to the typical ones like intention, norms, attitude and awareness of consequence. Consequently, the analysis and classification of these factors would definitely help researchers in better evaluating what to measure and how to correlate it with other variables.

It follows the need to fill these gaps through a systematic literature review including ad hoc research questions to investigate these issues, especially considering both the increased interest on PECB in academic research in the last decade, and the lack of extensive, rigorous and recent reviews on this topic [15–17].

1.1. Research Questions

Therefore, this study aims to contribute to the understanding of PECB in relation to waste management by answering some research questions through a systematic literature review (SLR) as follows:

- Research question 1: How are the concepts of PECB and similar terms understood and analysed in the academic literature on waste management?
- Research question 2: How is the interplay between PECB and GenCB?
- Research question 3: What are the conditions and factors (if any) that favour this interplay, or the shift of GenCB towards PECB?
- Research question 4: What are the main issues in the research on PECB?

1.2. Methodology

In order to avoid research biases or missing essential information, the typical systematic review methodology [18] has been applied to this paper. As stated by Petticrew and Roberts [18] (p. 9), "systematic reviews are literature reviews that adhere closely to a set of scientific methods that explicitly aim to limit systematic error (bias), mainly by attempting to identify, appraise and synthesize all relevant studies (of whatever design) in order to answer a particular question (or set of questions)". In comparison with traditional methods, SLRs grant more repeatability and transparency, as well as a greater impartiality in judgements through a reduced influence of bias and preconceptions [18]. Consequently, the methods applied to a SLR allow to improve the reliability and trustworthiness of the study, and enhance the consistency and the legitimacy of the analysis and the related deductions [19].

In the academic environment SLRs are quite diffused in many areas of investigation, especially in health research and biology, but they are becoming increasingly common in environmental studies on subjects such as climate change adaptation [20–22], water policy [23–25] and food security [26–29], although, to our knowledge, no SLR focuses on consumer behavioural aspects related to waste management through a holistic analysis of socio-demographical, psychological, cultural and environmental characteristics. For example, Ma and Hipel [16] concentrate on the social dimensions of municipal solid waste management; Almosa, et al. [30] on social marketing in relation to littering behaviour; Schanes, et al. [31] on specific waste like the household food, and Canali, et al. [32] on food waste drivers.

This SLR has been integrated by a meta-analysis of collected data with the purpose of also providing a quantitative description of some specific aspects, like the geographical distribution of selected articles or the number of articles per year (Appendix A).

1.3. Limitations and Implications

This paper analyses adult consumer behaviour in relation to waste management in normal situations (e.g., daily household waste disposal), so it does not investigate managerial processes or governmental policy, supply chain, sales practices, retailers or workers related issues. The behaviour

at workplace is excluded from this SLR because it presents specific characteristics, requiring ad hoc investigation. For example, the correct analysis of workers' behaviour would involve factors related to leadership and teamwork [33], company goals and ethics, performance, workplace culture [34] and organisational structure [35], eco-design and eco-production, and workplace habits [36]. Similarly, the study of waste management behaviour of minors requires the analysis of peculiar factors too; moreover, in this case, the general trend in literature is to focus on educational aspects, teaching tools [37–39], kids' judgment and personality development [40–42]; hence, the study of minors should be separately treated. In addition, this paper does not analyse consumer behaviour in specific contexts like national parks, or people handling peculiar type of waste like toxic materials. In very limited cases this SLR takes into consideration some articles on the supply chain management or managerial processes, just because they also analyse the consumer behaviour by bringing new insights to this SLR's topics.

Consequently, this paper does not contribute to any managerial practice or analysis related to marketing or economic aspects, but it provides useful insights on the different academic approaches utilised to study the consumer behaviour in relation to waste management throughout the last years.

The selected papers have been peer-reviewed and published between 1975 and 31 December 2019 in the English language in three main scientific databases: Web of Science, Science Direct and EBSCO (Elton Bryson Stephens Company) host. Further details are provided in Section 2 of this paper and in Supplementary Material (SM) spreadsheet tabs 1–4.

1.4. Structure of the Paper

This article is structured into five sections (including Appendices A–C and a SM spreadsheet) as follows:

1. Introduction
2. Data and methods
3. Results
4. Overall analysis and discussion of results
5. Conclusions

2. Data and Methods

2.1. Introduction on Systematic Review Methodology

This SLR intends to summarize and disclose the results of the existing peer reviewed literature concerning the concepts and the factors characterizing PECB and its interplay (if any) with GenCB in relation to waste management during normal daily activities (excluding workplaces). This aim is motivated by the fact that, so far, SLRs of academic papers on waste management focus on a variety of specific aspects but lack interdisciplinary investigation and understanding of the human behaviour in relation to waste management. In fact, as also demonstrated by Silchenko, et al. [43], the articles generally denote a limited cross cutting view and they often focus on specific sectors like technology (e.g., infrastructure, waste treatment and transportation), laws (e.g., illegal dumping), management (e.g., supply chain management), healthcare, bio-chemistry (e.g., biodegradation processes, micro-pollutants), economics and marketing, education and nutrition.

Although several researchers investigate consumer products and the related waste, the attention often falls on the product itself or its utilisation [44], not on the consumer behaviour, especially when considering the disposal and recycling. When the scholars focus on the efficacy of waste management at the local or municipal level, the need to include human behaviour in their analysis becomes pressing in order to understand, for example, how to encourage households to minimise waste or increase their awareness of environmental issues [45].

The method utilised by this SLR is based on researches conducted by several scholars in the last decades, including Petticrew and Roberts [18], Littell, et al. [46], Cooper [47], Hart [48], Candel [26], and Phuong, Biesbroek and Wals [20].

According to Petticrew and Roberts [18] the systematic review is made up of seven stages, namely:

- Stage 1: Questions definition
- Stage 2: Determination of necessary studies to answer the questions
- Stage 3: Execution of the comprehensive literature search to individuate the above-mentioned studies
- Stage 4: Screening of the results of the literature search (applying inclusion/exclusion criteria)
- Stage 5: Appraisal of the included studies
- Stage 6: Synthesis of studies and assessment of heterogeneity
- Stage 7: Disseminate results

In this article, stages 1 through 4 are addressed in Section 2, and stages 5 and 6 in Section 3. The dissemination of results will take place through the publication of this SLR in an academic journal and insertion in a PhD thesis.

Moreover, this SLR is conducted in accordance with "Preferred Reporting Items for Systematic Reviews and Meta-Analyses" (PRISMA) statement [49,50] in order to ensure a more robust and reproducible approach.

2.2. Questions Definition

The first stage has the purpose to correctly frame the problem by precisely identifying the area of interest and defining applicable questions considering both stakeholders' needs and available literature. This systematic investigation on human behaviour in relation to waste management is clearly influenced by the existing literature in terms of topics and type of concerns, but it intends to fill some gaps in this literature by defining a set of questions to allow an interdisciplinary understanding of some topics, and contribute to further advancing the studies in this specific field.

1. Research question 1

Research question 1 aims at satisfying the need for clarity in the plethora of existing conceptualisations and equivocal definitions about pro-environmental and similar terms like green consumer behaviour (GrCB). For this reason, the answer to this research question initially provides the definitions of the main terms utilised by the analysed literature; subsequently it explains how the basic concepts are understood in the academic literature starting from the theories and models in which they are applied. Moreover, it tries to understand if they are influenced by the type of approach adopted by the scholars or the context in which the analysis takes place.

2. Research question 2

Research question 2 intends to analyse the level of interplay (if any) between PECB and GenCB. The question aims at unveiling possible interactions among consumers giving due consideration to their concerns and perceptions. In fact, the pro-environmental consumer is often driven by altruistic concerns, whereas the generic consumer is more influenced by a hedonistic or egocentric approach (although these differences may vary among Western and Asian nations) [51–53]. This research question intends to understand, for example, if a pro-environmental consumer interacts with a generic consumer, or if the latter shifts its behaviour towards more sustainable positions under certain conditions (e.g., spillover effects). This question is complemented by the next one.

3. Research question 3

Research question 3 further investigates the previous question by unveiling conditions and factors that influence this type of interplay or possible changes in consumer behaviour in relation to waste management. In fact, there are cases where factors and conditions like proximity or social influences favour the interplay among consumers.

4. Research question 4

Research question 4 analyses some critical aspects of the studies on PECB (in relation to waste management) that might influence and limit the scope and the validity of the deductions in the peer-reviewed literature to date.

2.3. Determination of Necessary Studies

Considering this SLR aims at an interdisciplinary understanding of PECB, there is an exiguous number of restrictions on the type of papers to be screened by this research. In fact, besides the fact that all articles are written in English, all journals (available on the selected databases) are kept in consideration; consequently, the investigated papers come from disciplines like economics, marketing, laws, sociology, psychology, education, nutrition, communications and engineering. Conversely, studies focusing on industrial processes without any consideration on consumer behaviour, or chemical analysis of waste material, are excluded from this research.

2.4. Execution of the Comprehensive Literature Search

The execution of the literature search is based on some specific steps finalized to apply a reproducible and rigorous analysis of the papers. Several authors of SLRs recommend to go through well-defined methodological steps [20] as follows:

1.   Selection of terms and databases
2.   Inclusion and exclusion criteria
3.   Data extraction and evaluation of review findings
4.   Limitations

2.4.1. Selection of Terms and Databases

The initial assessment of the literature has the purpose to better frame the research by identifying key concepts and search terms, especially considering that waste management and PEB have changed throughout the years. For example, waste management has significantly modified its approach to waste from an initial mere focus on the disposal phase to a more holistic and integrated one; moreover, terms like GrCB have been progressively replaced by other words like eco-friendly behaviour, eco-conscious consumer, environmentally friendly behaviour or PEB. Thus, the search query (Table 1) has been tailored on two macro-areas of investigation related to waste management and PEB. The first macro-area involves key concepts and terms related to waste management, like minimization (or minimisation), recycling, re-utilisation (or re-utilization) and incineration; the second macro-area focuses on key concepts and terms related to pro-environmental behaviour like green behaviour, eco-friendly (or environmental-friendly) behaviour and ecological behaviour (SM tab 1).

Table 1. Search Query.

Source	Query
Web of Science	TS = ((waste management OR waste minimi*ation OR waste recycling OR waste reuse OR waste re-use OR waste reutili*ation OR waste re-utili*ation OR waste reduction OR waste prevention OR waste destruction OR waste separation OR waste valori*ation OR waste collection OR waste disposal OR waste incineration) AND (green behavio* OR pro-environmental behavio* OR proenvironmental behavio* OR eco-friendly behavio* OR ecofriendly behavio* OR ecologica* behavio* OR eco-innovat* behavio* OR ecoinnovat* behavio* OR eco-conscious behavio* OR ecoconscious behavio* OR ecologi* conscious behavio* OR environment* friendly behavio*)) Indexes = Science Citation Index (SCI-EXPANDED), Social Sciences Citation Index (SSCI), Arts & Humanities Citation Index (A&HCI), Conference Proceedings Citation Index-Science (CPCI-S), Conference Proceedings Citation Index- Social Science & Humanities (CPCI-SSH), Emerging Sources Citation Indexes (ESCI).
	Timespan = 1988 until 31 December 2019 Language = English Types of documents = All
Science Direct	Title-Abstract-Keywords (TAK) = ((waste management OR waste minimisation OR waste minimization OR waste recycling OR waste re-use OR waste re-utilisation OR waste re-utilization OR waste reduction OR waste prevention OR waste destruction OR waste separation OR waste valorisation OR waste valorization OR waste collection OR waste disposal OR waste incineration) AND (green behavior OR green behaviour OR pro-environmental behavior OR pro-environmental behaviour OR proenvironmental behavior OR proenvironmental behaviour OR pro environmental behavior OR pro environmental behaviour OR eco-friendly behavior OR eco-friendly behaviour OR ecofriendly behavior OR ecofriendly behaviour OR eco friendly behavior OR eco friendly behaviour OR ecologic behavior OR ecologic behaviour OR ecological behavior OR ecological behaviour OR eco-innovative behavior OR eco-innovative behaviour OR ecoinnovative behavior OR ecoinnovative behaviour OR eco innovative behavior OR eco innovative behaviour OR eco-innovation behavior OR eco-innovation behaviour OR eco-conscious behavior OR eco-conscious behaviour OR ecoconscious behavior OR ecoconscious behaviour OR eco conscious behavior OR eco conscious behaviour OR ecologic conscious behavior OR ecologic conscious behaviour OR ecological conscious behavior OR ecological conscious behaviour OR ecologically conscious behavior OR ecologically conscious behaviour OR environment friendly behavior OR environment friendly behaviour OR environmental friendly behavior OR environmental friendly behaviour OR environmentally friendly behavior OR environmentally friendly behaviour))
	Timespan = All years until 31 December 2019 Language = English (Please note Science Direct does not accept wildcards and more than eight Boolean operators at a time, so the search query has been broken down in multiple queries; refer to SM)
EBSCO	(waste management OR waste minimi*ation OR waste recycling OR waste reuse OR waste re-use OR waste reutili*ation OR waste re-utili*ation OR waste reduction OR waste prevention OR waste destruction OR waste separation OR waste valori*ation OR waste collection OR waste disposal OR waste incineration) AND (green behavio* OR pro-environmental behavio* OR proenvironmental behavio* OR eco-friendly behavio* OR ecofriendly behavio* OR ecologica* behavio* OR eco-innovat* behavio* OR ecoinnovat* behavio* OR eco-conscious behavio* OR ecoconscious behavio* OR ecologi* conscious behavio* OR environment* friendly behavio*)
	Source complete Publication type = All Document Type = All Expanders: • Apply equivalent subjects • Apply related words Limiters: • Scholarly (Peer Reviewed) Journals • Published date = All years until 31 December 2019 • Language = English

The utilisation of the three above-mentioned databases has the purpose to mitigate the fact that no database alone can guarantee full coverage of the selected topics; in fact, these databases have a different coverage in terms of topics, journals and geographical areas [54].

2.4.2. Inclusion and Exclusion Criteria

Some inclusion criteria have been identified to limit the scope of this SLR as follows:

- Time and topics: all eligible papers available on Web of Science (from 1988), Science Direct (from 1990) and EBSCO host (some articles are as old as 1972) until 31 December 2019 concerning PECB in relation to waste management;
- Subject areas: this SLR is not limited to social, psychological or environmental sciences, but it includes a wide range of fields (like economics, marketing, laws, engineering) because it intends to investigate human behaviour at an interdisciplinary level;
- Type of papers: all peer-reviewed papers (both empirical and theoretical) from scientific journals, available on Web of Science, Science Direct and EBSCO. The great variety of literature favours a complete and correct evaluation of the competencies and advances on this SLR topic.
- Language: papers written in English.

A very limited number of exclusion criteria has been applied to this SLR, namely:

- Journals on topics not related to consumer behaviour (e.g., chemistry, metallurgy, physics, mathematics, geology, surgery, genetics, zoology) or investigating very specific aspects of it (e.g., criminology);
- Topics related to professional environments (e.g., workers, retailers, managers, with the exception of the papers analysing consumer behaviour), education of minors and teaching methods, because this SLR studies pro-environmental and generic adult consumers;
- Specific types of waste (e.g., nuclear, hazardous) because of their peculiarities in handling and treatment;
- Specific locations (e.g., protected areas, territories under specific environmental laws, national parks, disaster locations) because this SLR would be highly context-dependant.

For further details refer to SM tab 2.

2.4.3. Data Extraction and Evaluation of Review Findings

The initial search produced 1569 papers from Web of Science, 838 from EBSCO and 478 from Science Direct (please note that duplicates are automatically removed by the EBSCO engine); after merging databases and excluding all duplicates, the primary body of literature was made of 2260 papers. Subsequently, the exclusion criteria were applied to eliminate papers that were not applicable, as follows (Figure 1, based on the PRISMA flow diagram [50]):

- Papers published in scientific journals with very specific areas of investigation, not related to this SLR (the details of the first exclusion criteria are explained in Section 2.4.2; the full list of excluded journals is available in SM tab 2); after this screening, the body reduced to 1758 papers;
- Not relevant papers in relation to this SLR's topics, through the review of the title, abstract and keywords (TAK); the body went down to 812 papers;
- Not relevant papers in relation to this SLR's topics through the review of the full text; final body of 699 papers.
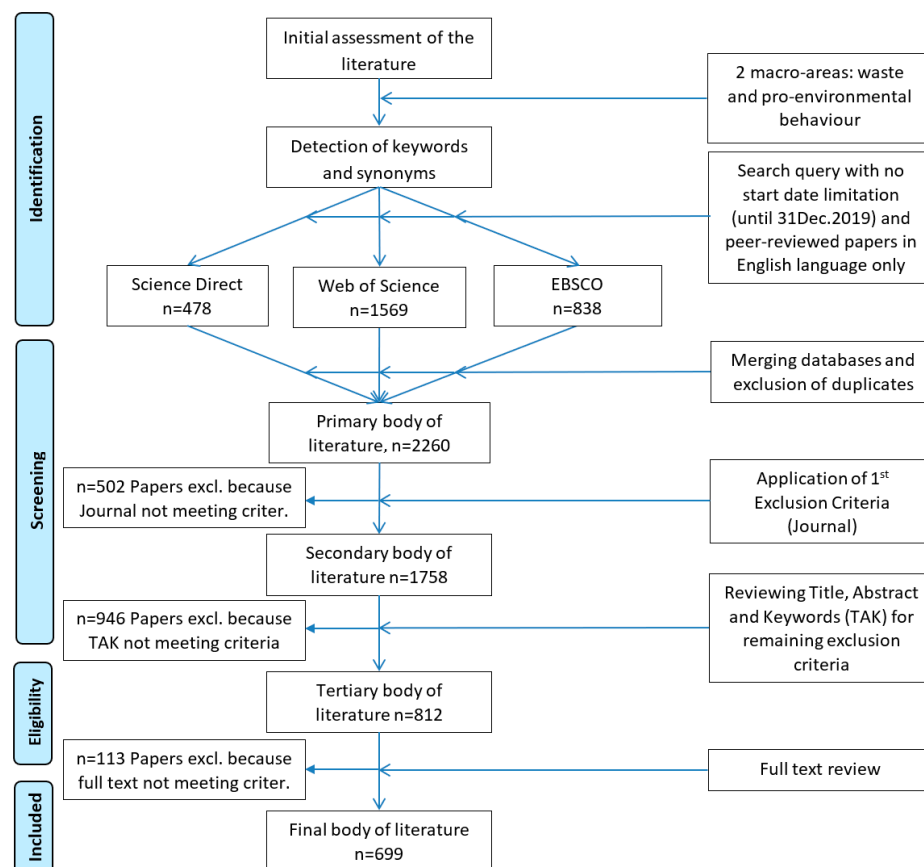
Figure 1. Data collection process.

The full text of the 699 selected papers was classified utilising a data extraction protocol (SM tab 3) based both on general and specific information, respectively the former: title, author, date of publication, journal of publication, abstract, etc., and the latter: theoretical framework (e.g., theory of planned behaviour (TPB)), type of journal (e.g., economic, environmental, social matters), keywords, geographic area, etc. (SM tab 4). The protocol was autonomously developed (including a procedure about resolving possible disagreements) and tested on 20 randomly-selected included papers [55]; it was subsequently refined to support research questions and cope with available data. A single author independently screened the papers and extracted the data on the basis of the extraction protocol, whereas another author autonomously checked a sample of manuscripts with no disagreement on selected papers.

2.4.4. Limitations

In relation to the selection of papers, this review does not adopt a full double independent screening of manuscripts and mitigates this issue through the above-mentioned sample check by the other authors. Apart from the limitations mentioned in Section 1.3, this review does not assess the quality of included papers, considering the interdisciplinary approach would made this activity quite impracticable. Moreover, the authors recognise the potential risk of bias in their inferences, so they adopted "ROBIS" to assess this risk in this SLR [56,57]. Although "ROBIS" it is mainly designed for the medical field, it is considered "the first rigorously developed tool designed specifically to assess the risk of bias in systematic reviews" (p. 225) [56]. After application of this tool, the risk of bias in this review was low, especially considering that this SLR is a narrative synthesis.

3. Results

3.1. General Results

Some immediate descriptive results can easily be drawn from this SLR through a general analysis of meta-data. In fact, the study of meta-data provides clear indications about the year of publication, the geographical area of interest, the thematic scope and the type of journal, to name a few.

3.1.1. Temporal and Geographical Analysis

The figures to follow (including Appendix A) provide visualisations of the general trends and macro-areas of interest. In some cases, the change in scale or granularity of the graphical representation allows further insights to be noted.

In relation to the analysis of the year of publication (Figure 2 and SM tab 5), evidence shows that in the 1980s there were basically no articles on this SLR's topic. Then, starting from 1990 until approximately 2008 there was not a consistent production of peer-reviewed articles as it happens nowadays.In fact, not more than two articles per year were published in the 1970s and 1980s indicating that the interest in this SLR's topic was still limited. The 1990s and the first years of the third millennium show an increased production of papers with a relative peak in 1995, possibly indicating a reaction from the academic world after the Earth Summit, organized in 1992 in Brazil by the United Nations, characterized by the signature of important agreements (e.g., the convention of biological diversity, the framework on climate change, and the "Agenda 21"). The curve shows another quite steady increase after the year 2000, when the United Nations adopted the "Earth Charter" and the "Millennium Goals". After 2008 the dotted trend line highlights an exponential growth in the last decade; this progress is definitely in line with the increased and diffused attention to sustainable development matters throughout academia and governmental bodies.
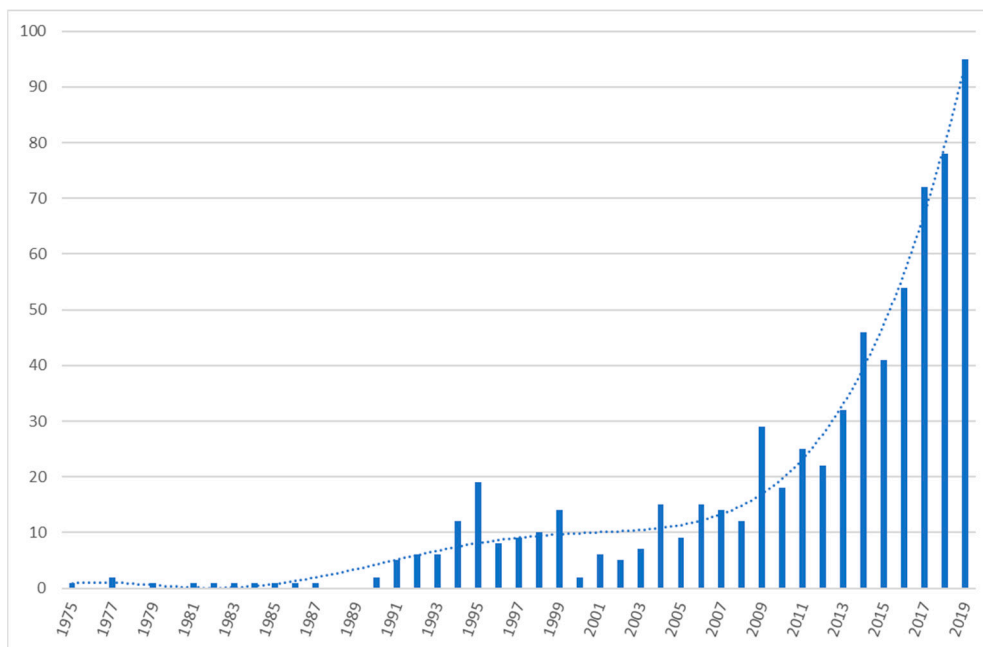

Figure 2. Number of papers per year with trend polynomial dotted line.

A deeper investigation of the peak of papers in 1995 (in comparison with the trend line) indicates that the steep increase of articles is also motivated by the fact that some authors published several articles in the same year, like Dwyer and Leeming in Potter, Dwyer, and Leeming (1995), Porter, Leeming, and Dwyer (1995), and Cobern, Porter, Leeming and Dwyer (1995).

Further details on temporal and geographical analysis are available in Appendix A (Figures A1–A10).

3.1.2. Thematic Scope and Areas of Investigation

In relation to the type of waste analysed by this SLR, there is a strong predominance of:

- Household waste [58,59], especially food [60–68], composting in some cases [69–72];
- "Waste electrical and electronic equipment", also known as "WEEE" or "e-waste" [73–78], including small household appliances, personal care appliances [79] or end-of-life products [80];
- Urban/municipal solid waste [81–85].

Other quite recurring types of waste are plastics [86–90], metal cans [91–93], and batteries [94–96], besides the purchase of green products [97–99] or electronic products [100,101], considering waste management impacts the acquisition phase too.

This predominance is motivated by the scope of this SLR on consumer behaviour, and its direct impact on the environment through its daily activities involving food, electrical and electronic equipment, and waste discharge. Moreover, the consumer relationship with this type of waste offers the possibility to better understand the mechanisms governing its behaviour, and to verify the soundness and applicability of existing socio-psychological theories and models to the field of waste.

It follows that the main places of investigation are households [66,102,103], neighbourhoods [104], residential areas [105], municipal areas [81,106,107], and small- to medium-sized towns [108], including some less common locations like urban labs, distinct urban mines [79], community gardens [109]. Other recurring places are represented by schools and universities [110–114], especially dining facilities [115] and cafeterias [116]. Some papers also focus on shopping areas (e.g., grocery stores [117]) and green or sustainable buildings [118–121].

Concerning schools and universities, the advantage of analysing an institute or a faculty resides in the easiness in reaching a defined champion of population and carrying out a complete investigation through the distribution of paper/electronic questionnaires or the conduct of interviews.

In the case of shopping centres, the focus of the researches is generally on customers' purchase phase, and on the consequences of this phase on the subsequent disposal and recycling; whereas, in the case of urban labs or green building, the attention revolves around the interaction among individuals or the impact of pro-environmental attitudes and intentions on routine activities.

3.1.3. Type of Investigated Personnel

Although the investigated samples are very different in type, there is a diffused tendency in studying the behaviours of households [122,123], students [124,125] and consumers of basic necessities (including green products) [126,127] or electrical and electronic devices [128,129], mainly mobile phones and tablets [73,96,101].

It is worth reminding that this SLR does not focus on workers and managers, although some selected articles consider both the consumer behaviour and the retailer/supplier behaviour.

3.1.4. Journal of Publication

Bearing in mind the scope of this SLR, the selected journals mainly focus on fields like sustainable development, environment, resources management, ecology, sociology and psychology; and in a reduced measure on education, economics, marketing and nutrition (Figure 3 and SM tab 8). To be more precise, the most utilised journals are as follows: "Environment and Behavior" (71 articles), "Resources, Conservation and Recycling" (49 articles), "Journal of Cleaner Production" (38 articles), and "Journal of Environmental Psychology" (36 articles) (full list available in SM tab 9).
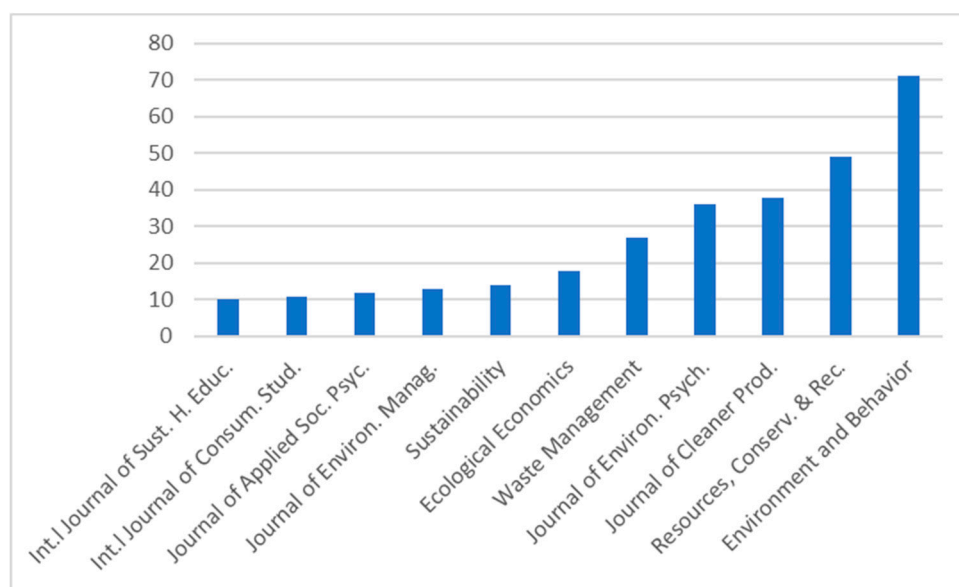
Figure 3. Number of papers in the most utilised journals.

3.2. Research Question 1

How are the concepts of PECB and similar terms understood and analysed in the academic literature on waste management?

3.2.1. Definitions

Before analysing how these concepts are understood in the academic literature, it is important to provide the definitions of PECB and GrCB. In fact, although a limited number of selected papers dedicate some attention to the ontology, at times some confusion or misunderstanding about these concepts arise when investigating human behaviour in this specific sector. That being said, there is no unequivocal or universally agreed definition of these terms, and their meanings are context- and time-dependant. This study selects Kollmuss and Agyeman's [130] (p. 240) definition of PEB as the "behavior that consciously seeks to minimise the negative impact of one's actions on the natural and built world". This approach is also supported by Steg and Vlek [131] (p. 309) who define PEBs as the "behaviours that harm the environment as little as possible, or even benefit the environment". By adding the word "consumer" this SLR intends to focus on the individual as the final purchaser and end user of the product or service, until the dismissal or re-utilisation phase of a product (e.g., recycling, minimisation, disposal, separation). This approach is supported by Kianpour, Jusoh, Mardani, Streimikiene, Cavallaro, Nor and Zavadskas [80] (p. 3) who recall Kuester [132] (p. 1326) to define consumer behaviour as "the study of individuals, groups, or organizations and the processes they use to select, secure, use, and dispose of products, services, experiences, or ideas to satisfy needs and the impacts that these processes have on the consumer and society".

Steg and Vlek [133] (p. 113) interpret GrCB as a type of PEB, which can be defined as a "form of consumption that harms the environment as little as possible, or even benefits the environment"; according to Couto, et al. [134] (p. 307) a green consumer is "any individual whose buying decision behavior is influenced by environmental concerns". Kianpour, Jusoh, Mardani, Streimikiene, Cavallaro, Nor and Zavadskas [80] (p. 3) refer to Leonidou, et al. [135] to better understand the characteristics of GrCB by stating that "green consumers demonstrate an interest in such product's characteristics as chemical content and recyclability and, favourably discriminating consumption towards bioorganic, energy efficient or biodegradable packaging products". Leonidou, Leonidou and Kvasova [135] (p. 1322) further analyse their purchasing behaviour by defining "green purchasing, that is, activities that lie in the personal domain and have a direct effect on the natural environment".

It is important to clarify that this SLR is not interested in the customer itself, although in some papers the authors analyse not only the re-utilisation and recycling phase, but also the purchase and marketing phase. In these cases the paper may focus, for instance, on the customer of green products with low-impact packaging, but also on the consumer trying to minimise packaging, correctly dispose of it or reutilise it [136]. In other cases scholars analyse the customer satisfaction or perception of recycling services considering its impact on recycling behaviour [137].

3.2.2. Theoretical Framework

Through the analysis of the theoretical framework utilised in the selected papers, this SLR shows which theories have been recalled to provide support to the empirical findings, and which ones have been tested to verify their applicability to consumer behaviour in relation to waste management.

Although the basic principles and the nature of the environmental actions taken by the pro-environmental consumer have been studied in very different contexts, and many scholars have attempted a transdisciplinary approach to include all possible factors [138,139], the predominant theoretical framework is rooted in the socio-psychological field, especially considering that this SLR focuses on human behaviour.

In the last 30 to 40 years the attitude-behaviour inconsistency has represented, and currently still represents, the pivotal point of many theories, especially among social psychologists (for example, Eiser [140] talks about the "attitude-behaviour discrepancy"). Moreover, LeDoux [141] and Damasio [142] infer that emotions in human cognition keep assuming an important role in many scientific domains besides cognitive psychology and neuroscience.

The separation of deliberate cognition from emotions that characterized the mid-twentieth century is now replaced by the utilisation of an integral approach in which the interconnection between reasoned processes and emotion represents the road to follow to understand the roots of the human concern for the environment [142].

Theory of Reasoned Action (TRA)

Analysing the most diffused theoretical constructs chronologically, the first one to recall is the TRA from Fishbein and Ajzen [143–145]. This theory aims to explain human behaviour through "a set of hierarchically linked constructs" [146] (p. 233). The TRA intends to unveil the connections between human behaviour intentions and its actions. Looking at the model depicted in Figure 4, the behavioural intention is made of two components, called attitude and subjective norm. The former is the attitude towards an object; it is interpreted as the results of the anticipated consequences of an action and the evaluation of those consequences. The latter (the subjective norm) derives from the normative expectations for an action (or awareness) and the acceptance of those norms; subjective norms derive from the perceptions of an individual in relation to his/her social acceptance. The term 'reasoned' relates to the assumption that people have reasons for their behaviour.
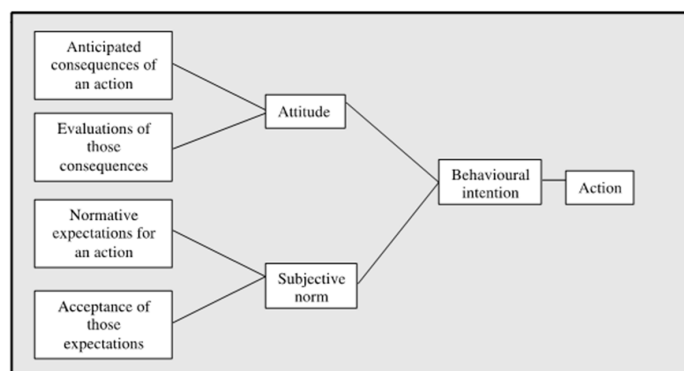

Figure 4. Theory of Reasoned Action (TRA), adapted from Fishbein and Ajzen [144].

Norm Activation Model (NAM) Theory

Other scholars recall, in recent times too [147–151], the NAM theory proposed by Schwartz [152]. This model is based on the fact that the activation of personal norms could have a significant impact on individual behaviour. It has to be noted that the mentioned activation of personal norms requires some conditions to happen: there must be the consciousness (from the individual point of view) that not maintaining a pro-social behaviour will probably negatively affect other people, and, at the same time, the individual has to understand its responsibility (towards other people) in case of negative consequences (Figure 5).

Figure 5. Norm Activation Model (NAM), adapted from Wang, Guo, Wang, Zhang and Wang [148].

The key points of the NAM theory are that personal norms need to be activated to influence human behaviour [153], and there are a variety of activation forms; moreover, under specific conditions, these norms have significant impact on the individual's pro-social behaviour.

Theory of Planned Behaviour (TPB)

The evolution of the TRA is represented by the TPB [13,154] (Figure 6), and subsequently, the enhanced or extended forms of it [155–158]. The TPB (and its successive combinations with other constructs) is clearly the most predominant and influential theory among studies on consumer behaviour, including those concerning environmental behaviour. In general terms, the TPB represents a step forward in comparison with the TRA thanks to the addition of the so-called "perceived behavioural control", a psychological factor related to the perceptions of the individual in relation to his/her ability to act [146]. In fact, to better understand human behaviour in a social group with complex relations, it is important to consider aspects like self-efficacy and perceived skills.
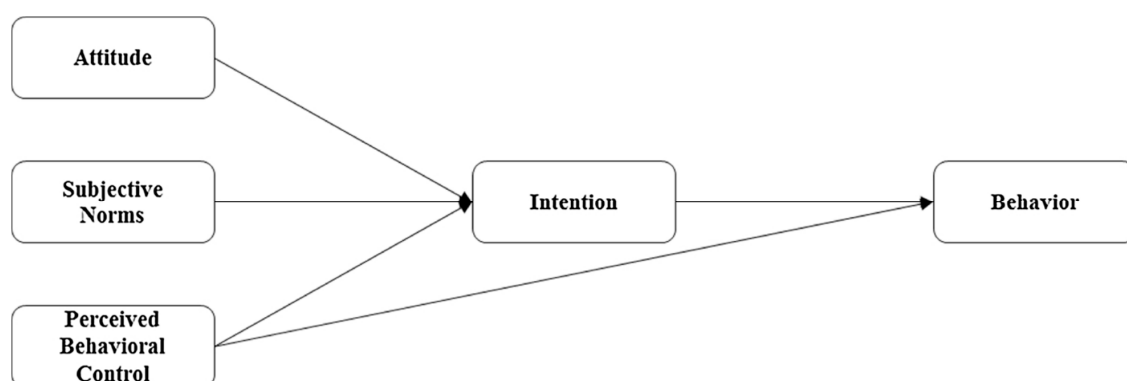

Figure 6. Theory of Planned Behaviour (TPB), adapted from Wang, Guo, Wang, Zhang and Wang [148].

Bamberg and Möser [159] (p. 16) inferred that the TPB "is based on a more hedonistic model of human beings" in comparison with the NAM theory, because individuals normally tend to avoid or prevent punishments on the one hand, and they are motivated by rewards on the other hand; consequently, the overall attitude is the result of the balance between negative and positive perceptions of consequences. In fact, as often stressed by Ajzen [14] (p. 133), "the TPB does not propose that people are rational or that they behave in a rational manner"; consequently, many studies on environmental behaviour assume that individuals make reasoned choices and try to maximise their benefits and social approval while minimising cost, efforts and discomfort [131].

Several scholars extend the TPB model by adding one or more variables to increase the predictive capability of the original TPB. For example, Xu, et al. [160] added perceived moral obligations, perceived policy effectiveness and past behaviour to a TPB-based model to study household waste separation behaviour. They concluded that "subjective norms, perceived behavioural control, past behaviour and intention significantly predict household waste separation behaviour, with past behaviour being the most significant construct to predict individuals' intention and behaviour" (p. 1). Other extended forms of the TPB include environmental knowledge [80,161] with different results; in some cases the predictive capability of the model significantly improves [80,161], in other cases it does not bring any clear gain [162]. Wang, et al. [163] added facility conditions, governmental policy, willingness to pay and perceptions of results (besides demographic factors) to the typical components of the TPB. They inferred that "urban residents' willingness to pay is more sensitive to perceptions of results and policy implications than separate collection intentions in China" (p. 256).

The Value-Belief-Norm (VBN) Theory

The VBN theory is mainly based on three pillars: the value theory, the NAM theory and the New Environmental Paradigm. It was created by Stern [164] in 2000 to focus on the importance of individual perceptions in relation to moral obligations (Figure 7).
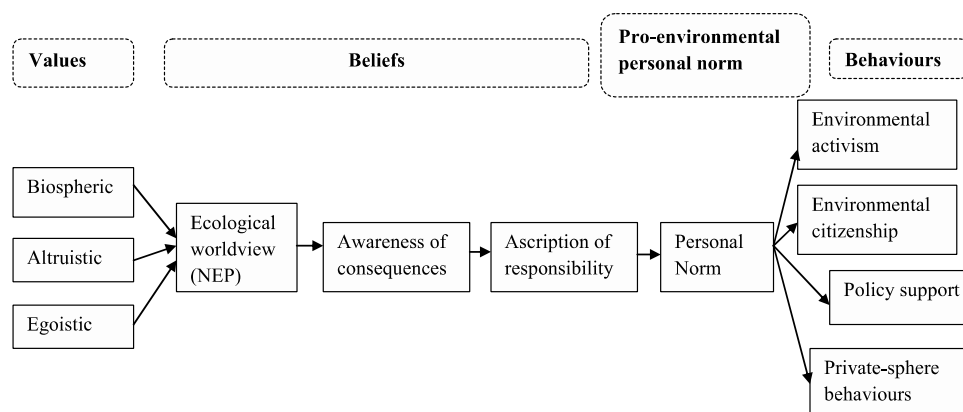

Figure 7. Value-Belief-Norm (VBN) theory, adapted from Yuan, et al. [165].

Other Theories, Models and Conceptualisations

In the selected articles several other theories and models have been recalled or created, like the neutralization theory by Sykes and Matza [166]; however, a complete analysis is not feasible in this section for brevity reasons (for further details refer to Appendix B and full list in SM tab 10).

Despite the great variety of approaches, most of these theories can be traced back to the TRA, or better yet, the TPB (that represents the evolution of the TRA), and to a lesser extent, to the NAM and the VBN theory (Table 2, full lists of theory and models available in SM tab 10). This review shows that, from the dawn of the research on environmental behaviour to now, the TPB and its extended forms have provided a recognized framework for explaining human behaviour in relation to waste management, as in the case of plastic bags utilisation [167], recycling behaviour [155,168,169] and household and solid waste separation [107,170].

Table 2. Most utilised theories/models (mathematical theories/models are not included in this table).

Theory/Model	Theory/Model's Author	Utilisation (Number of Papers)
Theory of Planned Behaviour (TPB) and related models	Ajzen (1991)	229
Theory of Reasoned Action (TRA) and related models	Fishbein and Ajzen (1970)	109
Norm Activation Model (NAM)	Schwartz (1977)	70
Value-Belief-Norm (VBN) theory	Stern (2000)	61

As explained by Bamberg and Möser [159], the theoretical models utilised to explain PEB (like the TPB and the NAM) reflect the widely diffused view that PEB is a combination of self-interests (like minimisation of one's own risks or maximisation of personal interests and satisfactions) and altruistic concerns for other people, nature, next generations, etc. In their view, scholars who mainly focus on self-interests are probably going to adopt models based on reasoned choice (like the TPB), while researchers that give priority to the social motivation of PEB, probably rely on the NAM, where personal and moral norms have direct implications on pro-social behaviour.

3.2.3. Integration of Theories and Models

In the latter years, several scholars have tried to apply the TPB in combination with other theories or models to better explain human behaviour in relation to the environment and, specifically, to waste management. Generally, this type of integration aims at giving adequate importance at factors underestimated in some theories or models. In fact, the complexity of pro-environmental behaviour, "viewed as a mixture of self-interest (e.g., to pursue a strategy that minimises one's own health risk) and of concern for other people, the next generation, other species, or whole ecosystems" [159] (p. 15), is reflected in the difficulty of selecting the most suitable framework. In some cases, we acknowledge a predominance of approaches based on self-interest, hedonism or conservation, in others pro-social factors take over more egoistic concerns. This issue often leads most scholars to opt for a specific theory (or model), knowing in advance that there is the need to introduce further variables to correctly analyse their field studies. Consequently, finding the right balance when integrating theories or a model is a very delicate operation that requires a solid theoretical knowledge, strong familiarity with the context and a great acumen.

For instance, Bamberg and Möser [159] decided to combine the TPB and the NAM (Figure 8) because "proenvironmental behaviour is best viewed as a mixture of self-interest and pro-social motives" (p. 16). The results of their integrated "meta-analysis and structural equation modeling" (MASEM) support this approach and show that intention is the immediate predictor of behaviour (27% variance). Moreover, both the typical factors of the TPB and the ones of the NAM are significant (direct or mediated) predictors of intention. In fact, the TPB antecedents of intention explain 52% of variance, while "problem awareness, internal attribution, feelings of guilt, and social norms all significantly contribute to the prediction of moral norm" (p. 21), by as much as 58%.
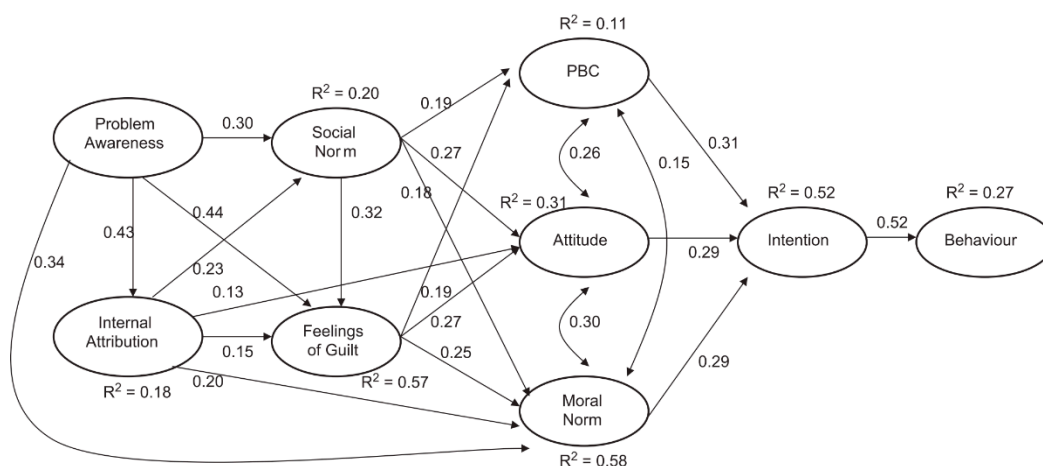
Figure 8. Example of integration of the Theory of Planned Behaviour and the Norm Activation Model (TPB-NAM), adapted from Bamberg and Möser [159].

Another example of integration of the TPB and the NAM is provided by Wang, Guo, Wang, Zhang and Wang [148] (Figure 9). They utilised a case study in China to analyse citizens' participation in an e-waste recycling project, and understand the influencing mechanisms of information publicity.
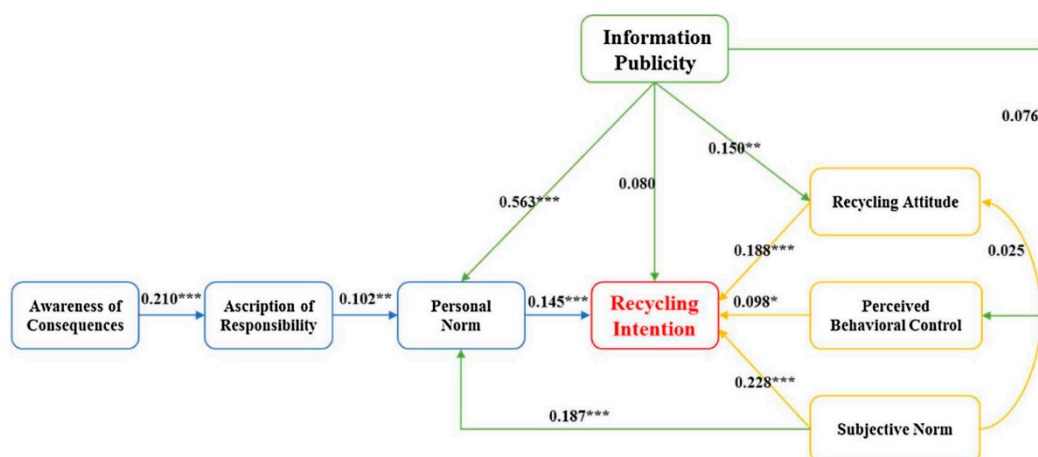

Figure 9. Example of integration of the Theory of Planned Behaviour and the Norm Activation Model (TPB-NAM), adapted from Wang, Guo, Wang, Zhang and Wang [148]. Note: *$p < 0.1$, **$p < 0.05$, ***$p < 0.01$.

They combined the TPB and the NAM because they inferred that "there is difference between subjective norms in TPB and personal norms in NAM theory; subjective norms in TPB are mainly the pressure or feelings that a person acquires from the community or people outside; however, personal norms in NAM put more emphasis on self-concept" (p. 2). They concluded that both the behavioural antecedents of the TPB (namely recycling attitude, perceived behavioural control, subjective norms) and personal norms (considered by the NAM) affect recycling intentions, but personal norms have a much stronger influence (on recycling intentions) than subjective norms; moreover, they inferred that personal norms of the NAM are significantly affected by subjective norms of the TPB.

Zhong and Huang [171] integrated the TPB with the expectancy theory to better understand the effectiveness of a point reward system; they found a "significant correlation between the influence of a willingness to participate in formal E-waste recycling and participating expectancy, subjective attitude, objective environment" (p. 475). Meanwhile, Zhang, Lai, Wang and Wang [150] (p. 447) sought "to explore the influences of personal attitudes, facilities accessibility, and government

stimulus on" the "discrepancy between intention on household waste sorting and the actions taken to support this environmental initiative among residents in China". Their study confirmed this discrepancy and the negative influence of governmental stimulus and facilities accessibility on the intention-behaviour relationship.

It is also worth mentioning an example of a combination of multiple theories: Xu, et al. [172] blended the TPB, the VBN, the NAM and social marketing theories to understand how external factors influence the individual recycling behaviour. They inferred that market incentives and government facilitators positively influence recycling intentions; moreover, they found different effects of incentives and facilitators depending on gender, income and age.

To conclude, although some models are characterized by high values of variance, it is not possible to define the ideal combination of theories that best describes consumer behaviour about waste management; in fact, numerous factors and conditions play a key role in the final equation with positive and negative effects (e.g., context, type of investigated personnel, area of investigation).

3.2.4. Different Dimensional and Analytical Approaches

In addition to the academic debate on the best theoretical framework to apply, this SLR highlights different dimensional and analytical approaches utilised by scholars to investigate PECB, GrCB and related concepts. The most diffused ones are as follows:

- meso, macro, micro scale [173];
- individual versus collective dimension [174];
- private versus public sphere [175];
- national versus global dimension [77];
- personal, social and organisational levels [176];
- cognitive, affective or connotative dimensions [62].

This review also highlights both how difficult it is to combine these different approaches, and a diffused agreement on the need to conduct a holistic approach when analysing these concepts [177–179]. In fact, López-Mosquera, Lera-López and Sánchez [138] proposed a multidimensional model finalised at promoting PEB, including environmental attitudes and beliefs, socio-demographical factors, economic characteristics and some variables related to environmental sensitivity. Zhang, Williams, Kemp and Smith [139] suggested conducting a complete analysis covering political, economic, social, technological, legal (also known as PESTL) and environmental factors.

At the same time, this review shows how these approaches are generally limited by biases and personal views depending on the scholar's personal background and focus. For example, scholars with a socio-psychological background tend to focus on the factors connected to the social context, culture, religion, ethnicity, habits, personal/social norms, personality, feelings and perceived control, to name but a few. Conversely, authors with a background in industrial ecology or environmental engineering focus on aspects like the limitations on PECB caused by inadequate recycling systems, the analysis of the cost/benefits ratio of different recycling systems, the creation of eco-design and eco-efficient products, and the best ways to make the consumer aware [3,180,181].

This situation leads to the utilisation of models characterized by quite heterogeneous factors. In fact, besides the utilisation of some standard variables like age, income, environmental knowledge or motivation, other factors are highly dependent on the type of approach utilised by the authors (e.g., socio-psychological, socio-institutional, socio-economic).

It follows that, when dealing with consumer behaviour, and especially with PECB, it is essential to construct complex models that include situational factors, socio-demographic characteristics, psychological variables, economic influences, technological and organizational impact, legal framework, etc., at different levels.

3.3. Research Question 2

How is the interplay between PECB and GenCB?

This study shows that the interplay between PECB and GenCB is quite limited in general. As stated by Sitarz [182] (p. 39) "altering consumption patterns is one of humanity's greatest challenges in the quest for environmentally sound and sustainable development".

Considering it is impractical to define a standard scale to quantify the level of interplay across different contexts, this research question aims at providing and analysing a series of positive and negative examples of interactions.

Overall, this SLR highlights that the interplay is influenced by different drivers depending on the level of the analysis conducted by the scholars (e.g., community, neighbourhood, municipal, regional or national level); moreover, it is highly context related. For example, at the neighbourhood level, the presence of a pro-environmental organization or the existence of spillover effects usually favours the adoption of innovative waste management measures, and the diffusion of PECB among generic consumer too. Vice versa at the national level, as it happens in Singapore, adequate information and educational campaigns promote the spread of pro-environmental values among the population and, consequently, create optimal conditions for this interplay.

In relation to the community level, Meneses [183] analysed the effectiveness of recycling promotion through a blockleader. He inferred that there is no difference between cooperative people and non-cooperative ones in terms of reaction to the new recycling information. This result contradicts the classical recycling approach that considers people with a more innovative profile as the ones more receptive in responding to new recycling techniques; nevertheless, his study supports the importance of an information campaign for all consumers to favour behavioural changes. At the micro or local level, Thøgersen [184], Wonneck and Hobson [185] and Zhou, et al. [186] showed some examples of positive and negative spillover. For instance, Wonneck and Hobson [185] inferred that Calgary's recycling pilot program had positive effects on dry recycling, but negative effects on home composting. Rees, et al. [187] analysed more hidden behavioural mechanisms and highlighted how sense of guilt and shame for human-caused environmental catastrophes "lead to reparative behavioral intentions and actual behavior in the context of intergroup relations" (p. 440).

Moving from the community to a higher level, the legal and institutional framework definitely represents a key element in fostering the pro-environmental sensitivity of all consumers, and promoting the mentioned interplay or the move towards more environmentally friendly behaviour. In fact, on the one hand, an efficient legal framework favours the contagious effect of green initiatives and the virtuosity of pro-environmental consumers or ecologist movements; on the other hand, it forces sceptical or reluctant generic consumers to adopt procedures that are already rooted among pro-environmental consumers. Moreover, this framework contributes to the diffusion of the imitation effect; for instance, Agovino, et al. [188] (p. 681) referred to it in terms of "imitation-driven process" and Sabbaghi, et al. [189] (p. 306) included the "behavioral imitation" among the "mediating and moderating variables" of households' behaviour. In fact, it is quite unrealistic to conduct pro-environmental activities in a context with a limited law enforcement and a scarce sense of discipline, as clearly demonstrated in several field studies in Italy [190]. Indeed, some articles describe several examples of ineffective or incomplete governmental interventions [191]; unfortunately, this situation negatively impacts on both GenCB and PECB. The former tends to not feel responsible for not applying pro-environmental procedures in its daily living, while the latter increases its isolation and frustration in pursuing pro-environmental goals in an unfavourable context.

Nevertheless, there are some rare cases of effective national regulations and law enforcement, as demonstrated by the pro-environmental measures enforced in Singapore. As a matter of fact, Singapore represents a clear and quite unique example of successful institutional pro-environmental management through the widespread implementation of practical governmental measures, enforced at all levels at the proper time. Moreover, this solid institutional framework is reinforced by adequate informational and educational campaigns [192]. This virtuous example has led some scholars to study

this context in order to understand and possibly explain the reasons for this success: some of them have focused on leadership and government, others on the peculiar Singaporean socio-cultural context, others on Singaporean citizens that are characterized by a strong sense of discipline and a peculiar environmental attitude [192–194]. Most likely, these positive results are motivated by a combination of different factors, like the remarkable awareness of potential environmental problems by Singaporean governmental organizations, the strong commitment in fixing these problems through appropriate law endorsement and enforcement, the implementation of ad hoc cultural and school initiatives, and the diffusion of communitarian values through environmental campaigns. This analysis is also supported by Stearns and Montag [195] who highlighted the importance of good leadership and governmental quality in steering the polity in order to achieve and maintain a sustainable development.

3.4. Research Question 3

What are the factors and conditions (if any) that favour this interplay, or the shift of GenCB towards PECB?

As previously mentioned, the interplay or the shift is significantly influenced by the context, but there is also a plethora of other factors that play a key role in this relationship. In order to untangle this complex knot and better understand the influence of different factors and conditions on consumer behaviour in relation to waste management, they are analysed in the following order:

- Internal (or individual) conditions and factors
- External conditions and factors:
- Collective (or socio-demographical) conditions and factors
- Institutional-legal and informational conditions and factors
- Political-ideological conditions and factors
- Economic conditions and factors
- Infrastructural-technological conditions and factors
- Contextual (or situational) conditions and factors

Ideally a deep and objective analysis of human behaviour in relation to waste management requires investigating all of the above-mentioned factors and conditions (schematic classification in Appendix C, full list of factors in SM tab 11); actually, this SLR infers that the selected papers generally tend to focus on specific factors and conditions depending on the field of investigation (e.g., social psychology, economics, laws, education).

In general, although this paper does not conduct a meta-analysis of variance of factors, individual, contextual and infrastructural factors turn out to be the best predictors of PECB. In particular, these include: attitude, norms, perceived behavioural control, past behaviour and self-identity among individual (or internal) factors; access to services among infrastructural factors; spillovers, proximity effects and past exposure to contamination or ecological disasters among contextual factors. These indications are also supported by the meta-analysis conducted by Geiger, Steg, van der Werff and Ünal [11].

3.4.1. Internal (or Individual) Conditions and Factors

When scholars consider the individual as a complex set of rational and non-rational thinking, the analysis generally focuses on personal norms [148], attitudes [196], individual expectations [197], intentions [198], motivations [102,199] and emotions [200]. For example, some authors further investigate the field of feelings and conducts by defining factors like anticipated regret [201], frugality [202], minimising inconvenience [203], lack of priority [204], perceived seriousness of social and environmental problems [205] and perceived policy effectiveness [160,206]. These variables play a fundamental role in the interplay between PECB and GenCB because consumer behaviour is less rational than expected [13]. In particular, the mentioned interplay (or shift) is significantly influenced, for example, by the perceived effectiveness of environmental behaviour, perceived seriousness of

environmental problems, perceived environmental responsibility [205], environmental knowledge [207] and trust in official information, besides the amplifying effects of media [208]. It is assumed that a diffused lack of perceived seriousness of environmental problems significantly impacts the interplay (in terms of imitation of PEB by generic consumers) in a negative direction.

Moreover, PECB is clearly affected by lifestyle [189,209,210]. In fact, lifestyle represents a critical element in attaining sustainable development [209]; for instance, in a society where a hedonistic lifestyle is very diffused, generic consumers definitely display some sort of reluctance in adopting green behaviours, so phenomena like imitation or eco-centric behaviour represent quite a rare occurrence.

Another factor that is addressed by some scholars is the stewardship of things [211]. By utilising the word "stewardship" of things, some authors intend to investigate the strict relation between the individual and things in terms of possession, affection and dependence. Stewardship of things becomes an enabling condition for the interplay between PECB and GenCB when it is related to the common good; in fact, it presupposes a solid type of civics, sense of education and responsibility.

On the reasoned side it is important to also consider factors like the environmental awareness or concern [68,159,212], consciousness of environmental problems [202,213], willingness to support policy [206], to pay [214–216] and to engage in PEB [102,217]. All are pre-conditions favouring both the mentioned interplay and the shift of GenCB towards PECB.

3.4.2. Collective (or Socio-Demographical) Conditions and Factors

Many scholars highlight the importance of social norms and interactions [148,188]. Considering the range of relationships revolving around the individual is huge, they analyse this type of interaction by selecting different layers to investigate: some focus on the sphere immediately surrounding the individual, like personal and family relationships [218]; others go beyond this horizon by considering neighbouring behaviour [104,219]; while some others further expand by considering social and economic aspects, like civil involvement [220], presence of pro-environmental organizations active at the local level [213], sharing of common values among consumers [192], presence of activists [191] and environmental organizations [188].

In general, the collective level is affected by external or stakeholders' influences [206,221] that can steer behaviour in very different directions; for instance, as mentioned in the previous section, these external actors can shape or alter lifestyles.

Overall, the above-mentioned factors have a significant impact on consumer behaviour, especially in the interplay between PECB and GenCB because they create a common substrate on which pro-environmental values can develop.

3.4.3. Institutional-Legal and Informational Conditions and Factors

The interplay between PECB and GenCB, and the mentioned shift are also positively influenced by a favourable institutional and legal framework [102,103], sometimes referred to as institutional quality [176,190,221].

The role of the governmental institutions, at all levels (community, municipal, provincial, regional, national and supra-national), is fundamental in promoting participation in recycling [94], the development of moral responsibility, the spread of environmental values and knowledge, and the dissemination of an ecological worldview [222]. In fact, a wide spectrum of activities can be organized by official bodies, like encouraging biodiversity [223], sorting behaviour [224], promoting pro- environmental campaigns [188] and creating adequate pro-environmental stimuli [189].

In relation to the legal aspects, as previously mentioned, a condition that definitely fosters PEB is represented by law enforcement measures [192,225], besides a well-structured legal apparatus. In fact, the effectiveness of many pro-environmental measures is related to the capability of controlling consumers' waste-related activities and promptly sanctioning those who do not respect the correct procedures. This problem has been addressed by several scholars by studying the perceived behavioural control and the attitude–behaviour gap [226–228]; this gap can be reduced through law enforcement too.

In general, the application of a supportive legal and institutional framework also requires an adequate communication program, so this study points out that the diffusion of PEB is directly influenced by ad hoc informational interventions too [188,229,230].

3.4.4. Political-Ideological Conditions and Factors

The presence of pro-environmental movements or specific parties may influence the mentioned interplay and shift, in some cases by enforcing it, in others by rejecting an ideology because it belongs to the opposite political party. In fact, Anwar, et al. [231] (p.29946) observed that "different developing nations have started considering "climate change communication" as an integral part of the political campaigns and sustainable development". Furthermore, they highlighted the capability of political elites to mobilize a large percentage of the population and generate concern or awareness on sustainable development issues. Consequently, they include factors such as "trust in politics" and "source credibility" in their models.

Conway and Repke [232] analysed some experimental scenarios and measured factors like "Support for Citizen Action on Climate Change", "Contamination", "Right-Wing Authoritarianism", "Social Dominance Orientation" and voting intent for pro-environmental law. They concluded that political pressure causes psychological contamination with the final effect of the rejection of the governmental actions created for environment preservation and recycling.

In addition to the above-mentioned factors, the environmental consumer orientation is also affected by green scepticism [233], political polarization, partisanship and ideological values [234], party orientation [235] and political trust [236].

3.4.5. Economic Conditions and Factors

The economy, from the local to the supra-national level, certainly influences PECB and its interplay with GenCB. Nowadays there are significant efforts to shift from the classic linear economic model to the "Circular Economy" in order to reduce the depletion of resources and humans' impact on the environment [122,237,238]. It is clear that the single consumer has a very limited influence on the production process, but its role becomes important during the utilisation of a product and its recycling; in fact, through these phases, the individual can somehow influence the production of goods or the provision of services, like in the case of the reverse green supply chain [134] or the acceptance of remanufactured goods [239]. For these reasons, several researches try to understand the consumer attitude and its perception toward bio-waste product [240], public awareness towards circular economy [209,212], and socially responsible consumption [241]. In particular, Joohyung and Sejin [241] deem that the diffusion of corporate social responsibility favours the choice of green products or services by all consumers; it follows that the diffusion of this type of responsibility should increase the interaction between pro-environmental consumers and generic ones, or the shift of the latter towards the former.

3.4.6. Infrastructural-Technological Conditions and Factors

The mentioned interplay and shift are definitely influenced, in general, by a favourable infrastructure made of accessible services [59,188], and specifically, by the efficiency of the local waste management program. There have been many cases where the municipal solid waste has been adequately handled through an efficient municipal recycling program [242,243], based on quality services, green and financial incentives [172,188], equal sharing of the costs and benefits of recycling [244]. In some specific situations the municipalities and the waste management companies have also been able to create opportunities for recycling [59] and better services [137,188], favouring the real involvement of consumers in recycling programs (including the most sceptical ones). Unfortunately, there are also several cases of inefficient waste management systems [245,246].

In this sense, the role and the conditions in which the waste management company and the local institutions operate, represent an enabling factor. For example, the shift towards a more

pro-environmental behaviour is fostered by maintaining a continuous presence on the ground (in order to continuously support the correct application of waste management measures), encouraging an open communication between providers and users, rewarding virtuous behaviours [247], and ensuring the respect of the procedures (including a punctual system of sanctions) [248].

Lastly, it is important to highlight the role of technology because the great advances in environmental engineering significantly facilitate participation in recycling programs [3] and, indirectly, the mentioned interplay and shift.

3.4.7. Contextual Conditions and Factors

In a holistic analysis of the conditions and factors influencing consumer behaviour it is mandatory to consider the contextual ones, also known as situational ones [110,137,176,188,249], like the proximity effect [250,251]. These conditions and factors produce significant effects on consumers' behaviours; their inclusion in pro-environmental consumer models represents a real challenge for all scholars. In fact, on the one hand, it is impossible to analyse consumer behaviour without considering the context where the consumers live; on the other hand, there are no shared methodologies for accounting for the context in a standardised way. This issue is exacerbated, in some cases, by the presence of unique environmental features [217] or environmental alterations [252,253].

This study infers that situational factors and conditions definitely influence the interplay between PECB and GenCB or the related shift. For example, the presence of a landfill or an incinerator in the proximity of a town causes an enhanced pro-environmental awareness and knowledge, that, in turn, create favourable conditions for the diffusion of activities of pro-environmental associations, and greatly increases the chances of shifting GenCB towards PECB. Other examples to mention are, for instance, living in a circular city [254] or in the vicinity of protected areas, being a member of community gardens [109] or urban mines [79], being involved with projects protecting the cultural and natural heritage [255] or living in very degraded contexts where the standard of living is completely different from advanced economies [84,256].

3.5. Research Question 4

What are the main issues in the research on PECB?

First of all, it has to be clarified that the main issues referred to below are not applicable to all selected papers, although they represent recurring trends in this SLR.

A typical problem is represented by the selection of the key factors necessary to correctly frame the consumer behaviour in relation to waste management. Even though scholars are fully aware of the fact that environmental attitude and PEB are the results of many influencing factors, the proposed models are likely to be either too simple [257], or not generalisable to other situations. In fact, many scholars put a great effort in defining the factors influencing PEB without having the certainty to be able to include all of them; in some cases, they decide to focus their research on very specific aspects of consumer behaviour, often context-dependant. Although Gifford and Nilsson [257] individuate an ample and very comprehensive classification made of 18 categories of personal and social factors, many scholars agreed with them when they inferred that "attempting to fully account for variation in environmental concern and pro-environmental behaviour is a seriously complex enterprise" [257] (p. 151). This leads to the observation that several authors often wrongly assume they are able to include the main influencing factors in their research. At the same time, when scholars champion what they believe to be the most suitable model for describing PEB in a specific context, that model is subjected to the risk of failing when applied to a different context because it lacks the capability of generalisation. In addition, the dynamics of contexts further complicate the investigations conducted by scholars [226].

In addition to the context-dependency of many researches, a recurring critical aspect is the heterogeneity of consumers and recycling situations. While this issue is generally not so evident when investigating defined samples of the population (e.g., university students) or specific activities (e.g.,

coffee cup disposal in a cafeteria), it becomes more evident in analysis at the national or supra-national level, especially in the case of comparative studies. In these cases, it is more challenging to test the validity of the proposed theory or model; from another standpoint, the heterogeneity of the sample contributes to the generalisation and validation of the model.

In addition, the behavioural analysis is further complicated by the behavioural instability of the individual. In fact, as stated by Peattie [226] (p. 215) "even the greenest of consumers are likely to have types of behaviour they treat as exceptions". For example, McDonald and Oke [258] investigated the differences in behaviour (at times, paradoxical too) between the workplace and home, demonstrating the complex decision making process of the consumer in the case of changing values, competing priorities and uncontrollable emotions.

A big debate involves the definition of the ideal relationship (e.g., linear/non-linear) among the factors utilised for describing PECB. For instance, it is very difficult to define how the cultural level [259,260] or the income of investigated people impact PEB [261]; in this sense, there is a general tendency, typically in the non-social sciences, to assume a direct relation between these factors, thinking, for instance, that a high cultural level corresponds to an increased sensitivity in sustainable development [262]. Actually, real life examples demonstrate that in some cases high education levels or incomes do not necessarily mean a high environmental awareness or a better recycling behaviour [263]; for these reasons, some authors assume that this direct relation takes place in specific cases only, like for transformative learning [264] or in developing nations that just started dealing with environmental issues [265,266].

Most likely, there is a great variety of influencing levels or interconnecting functions among these factors, especially because "many of the factors influence each other through moderation or mediation", as stated by Gifford and Nilsson [257] (p. 151); for example, in some cases, the effects of a X factor exclude the effects of a Y factor in a specific context, whereas in another context, or if the factor is considered in isolation, the effects of Y are tangible.

Another recurring critical aspect is related to the fact that many scholars automatically assume that the reported behaviours are in truth the actual behaviours; consequently, many researchers think they are assessing actual behaviour while actually they are examining the reported behaviour. By doing so, they underestimate the bias in human behaviour when answering a questionnaire or a semi-structured/structured interview. Gifford and Nilsson [257] (p. 151) deemed that this assumption could be quite inaccurate because, considering an increasing share of the population is in favour of protecting the environment, they inferred that "reported behaviour may reflect social desirability as a bias, or reports that are sincere but flawed by memory errors". On the other hand, the manifest impossibility of directly measuring actual behaviour leads several scholars to this assumption, that nevertheless, requires a correct definition of the research methodology and related limitations.

In general, this SLR leads to the conclusion that a diffused limitation of the research on PECB is the incapability (or unfeasibility) of defining a holistic framework applicable to different contexts and encompassing, at the same time, variables related to different fields like economics, laws, marketing, sociology, psychology, ecology, biology, energy management, infrastructure and logistics.

4. Overall Analysis and Discussion of Results

Concerning the meta-data analysis of selected papers, this SLR provides a clear indication of an increased interest in the subject of investigation in the last decade; this trend is definitely applicable to North America, Europe and a part of Asia. In terms of single countries, the mere analysis of the number of articles highlights the consistent production by nations like USA, United Kingdom, China and Italy. However, after weighing this data with the number of national inhabitants (Appendix A, Figures A6 and A7), this study provides a more correct interpretation of the phenomenon, so the nations with 10 or more articles per 10 million inhabitants become Lithuania, Denmark, Portugal and Slovenia (noticing that this value is significant only when the country has a substantial number of articles).

Unfortunately, the lack of articles written in English in some areas of the globe does not provide adequate information on other nations and continents; consequently, it does not allow to fully generalise this SLR's results to the rest of the world. It is also important to note that, in this specific interdisciplinary investigation topic, the limited number of peer-reviewed articles on PECB for some advanced economies does not necessarily imply that these nations are not sensitive to environmental issues, like in the case of Singapore, the Netherlands, Denmark, Norway and Switzerland.

In terms of comparative analysis, the research on PECB in relation to waste management does not normally take advantage of the collation of different national perspectives. In fact, in limited cases only, do scholars investigate the differences among nations [237,267], whereas this approach could bring new insights to the topic of this SLR.

The analysis of the selected articles also indicates a predominant focus on specific types of waste like household food, electrical and electronic equipment, urban and municipal solid waste. Consequently, the investigations conducted by the scholars generally take place in residential and municipal areas, households, schools, universities, and in some cases, shopping areas and cafeterias; it follows the main focus on family, household and student behaviour, besides electronic and green consumers.

Normally, the source of data is represented by ad hoc or online questionnaires, and guided interviews; however, the utilisation of existing databases (produced by official polls by governmental organizations or national statistic institutes) is quite common too. In the latter case, the area of investigation tends to expand at the regional or national level; moreover, there is an improvement of sample consistency, which favours more robust analysis and less context-dependent deductions.

In relation to the scientific journals in which this SLR's papers have been published, this study shows a predominance of environmental or socio-psychological journals, like "Environment and Behavior", "Resources, Conservation and Recycling", "Journal of Cleaner Production", "Journal of Environmental Psychology" and "Waste Management". Apart from these publications, some papers are available in journals about marketing, economy, education and geography, but the limited number of manuscripts indicates that pro-environmental issues are not a common topic in such journals.

In terms of contents, this SLR highlights a diffused commitment among scholars in understanding and accounting for the influence of the huge plethora of factors affecting consumer behaviour with the intent of applying a multi-disciplinary approach. Among these efforts, it is worth mentioning that Zhang, Williams, Kemp and Smith [139] proposed a model based on a complete analysis of possible influences spanning from political factors to environmental ones, including economic, social, technological and legal factors.

The complexities and difficulties in discovering and explaining the interconnections among these factors are demonstrated by the heterogeneous approaches adopted by subject matter experts for the sake of defining the most holistic framework. In fact, in some cases, the outcomes are characterized by a predominant focus on socio-economical aspects, while in others they are focused on social psychology, management, public policy or law. Overall, considering the field of investigation of this SLR is related to human behaviour and the understanding of its antecedents, the predominant approach is socio-psychological.

For this reason, this review shows a common trend whereby the focus defaults to attitudes, norms, intentions, emotions and conceptualisation of the attitude–behaviour gap [227] or the intention–behaviour gap [74], emphasising the idea that human actions are always somehow different from the planned course of action, besides being strongly influenced by the context. The theoretical framework underlying this approach is mainly based on the works of Ajzen and Fishbein [143–145] and Schwartz [152], namely the TRA and the TPB for the former, and the NAM theory for the latter. The Value-Belief-Norm theory proposed by Stern [164] could be considered an evolution of the NAM theory because it includes some key factors, like awareness of consequences, ascription of responsibilities and personal norms, already addressed by the former theory.

The detailed analysis of the theoretical frameworks indicates that the TPB is definitely the most utilised. Although its definition dates back to 1991 [13], many scholars affirm that the TPB still

represents a valid framework to understand human behaviour, and an adequate mean to set up intervention measures. Furthermore, some authors created their own models by expanding the original TPB (also known as the "extended TPB models") in order to include all the factors applicable to the specific context of investigation. For this reason, they further break down typical factors considered in the TPB, like attitude, subjective norms and perceived behavioural control, with the intention of catching further sides of human behaviour. Just to name some examples, Taylor and Todd [168,268] proposed the integrated waste management model, characterized by the subdivision of the three mentioned basic factors into smaller components: attitude is divided into personal relative advantages, social relatives advantages and complexity; subjective norms are divided into internal normative beliefs and external normative beliefs; and perceived behavioural control is divided into self-efficacy and facilitating conditions. Ulhasanah and Goto [269] also divided intention into separation intention and feeling intention.

Other theoretical frameworks are also quite diffused, like the NAM and the VBN theory; however, there is no consensus on the ideal theory or model to apply, especially in the light of the heterogeneity of contexts, backgrounds, samples and research aims. In fact, this SLR highlights that the concept of PECB and GenCB are differently framed depending on the type of approach utilised by the scholar; for instance, studies on GenCB are mainly focused on economic or marketing aspects, while the ones on PECB generally encompass sustainable development, ecology and other related fields. Nevertheless, in recent years, some scholars have tried to conduct more holistic analyses of consumer behaviour through the inclusion of economic, legal or institutional aspects with encouraging results. For example, Ulhasanah and Goto [269] defined a predictive model based on the TPB with the addition of some specific factors like the role of government and law enforcement. Their model is applied to the behaviours of the Indonesian citizens of Pandang city in relation to municipal solid waste management, in order to understand the factors influencing citizens' behaviours and acceptance of a new waste management system. At the end of their study, the authors argued that the roles of the local government and law enforcement are very important for improving the citizens environmental knowledge and determining the acceptance of the new system.

This SLR also highlights how contested is the definition of factors influencing PECB. In addition to the classic socio-economic and demographical factors, like income, gender, age, social class, lifestyle, education and economic convenience, there are typical socio-psychological variables, like social and personal norms, personality, perceptions, motivations, willingness and sense of responsibility. In any case, the above-mentioned factors are not sufficient to fully understand the complexity of PECB. In fact, as previously explained, it is essential to consider situational factors because, for instance, the presence of an incinerator in the area of investigation or other proximity effects [251] directly influence local inhabitants' behaviour, their sensitivity and knowledge on environmental issues, regardless of their income, class or education [250]. Socio-cultural or political factors could also affect PECB, like the presence of activists or environmental organizations [270], the diffusion of a specific ideology or the trust in politics [231]. Moreover, PECB is not only determined by local factors like physical geography and spatial constraints [192], it also depends on the quality of the institutional-legal framework and the level of law enforcement, as demonstrated by Savage and Kong [192] who evaluated leadership and institutional culture in Singapore, or Xu, Ling, Lu and Shen [172] who adopted government-related factors.

These examples clearly indicate how complex the analysis of consumer behaviour is in the specific field of waste management, and the challenges associated with classification of heterogeneous factors. Consequently, besides expanding and combining theoretical models, scholars also proposed different approaches and categorizations to extricate themselves in this intricate situation. For instance, several authors opted for the classification of factors in two main categories: internal (or personal) and external [130]; the latter are divided into cultural, organizational and infrastructural [271], or institutional, economic, social and cultural [130] depending on the type of approach. Hence,

to correctly frame the analysis of PECB, this SLR offers an ample classification of these factors in Appendix C.

This SLR also addresses a quite underestimated aspect of consumer behaviour: the interplay between PECB and GenCB, and the shift of GenCB towards PECB. In fact, the reciprocal influence of one type of consumer on the other and vice versa contributes to the enhanced understanding of human behaviour; unfortunately, this interaction is quite limited and strongly influenced by the context. Just to mention an example of the factors influencing this interplay, the legal framework represents a favourable condition for improving the environmental sensitivity of consumer behaviour and, in turn, the interplay between PECB and GenCB.

This SLR presents some limitations. In addition to the previously mentioned exclusion of papers not written in English and the consequent loss of potentially relevant literature in other languages, the search is conducted in Web of Science, Science Direct and EBSCO, without the inclusion of grey literature and other databases; consequently, future studies may consider expanding the collection of manuscripts to other databases. Nevertheless, the robust body of primary literature offers a wide and trustworthy data set, allowing to identify the majority of factors and conditions influencing PECB and its interrelation with GenCB, apart from the current gaps in literature. Another limitation is the level of definition of the search query that, although quite expanded and detailed, cannot guarantee the inclusion of all applicable papers because of the existence of synonyms, acronyms and words with different interpretations. Moreover, as stated in Section 1.3, this SLR does not analyse the behaviour of minors and their education, workplaces and sales practices; in the latter case, the study of the purchase phase would allow to further understand the impact of consumer behaviour on waste management during the selection of the good and its acquisition. In fact, the reduction of waste starts from the knowledge of the product and the selection of low-impact packaging (with the support of adequate education and information campaigns). Lastly, although all papers are rigorously selected through specific inclusion/exclusion criteria and an extraction protocol, the literature has not been quality assessed and the inferences of authors are potentially subject to biases, also considering the investigation of very different fields.

5. Conclusions

This SLR, besides providing a valuable summary of the academic literature on a complex and interdisciplinary topic, addresses different perspectives on adult consumer behaviour in relation to waste management, highlighting relevant issues, and offering a possible classification of the myriad of factors and conditions influencing PECB. Moreover, through the selection of ad hoc research questions, it provides valuable insights into the conceptual framework and the interplay between PECB and GenCB, an aspect underestimated in academic research.

This study is also beneficial to scholars (with background not rooted in social psychology) who decide to investigate or understand consumer behaviour in relation to waste management. They may overcome the difficulties in determining the key factors defining consumer behaviour by referring to our analysis of conditions and factors. In fact, nowadays, research on marketing of consumer products, or the production of a good for the consumer market, cannot ignore the analysis of related waste and its impact on consumer behaviour. In these cases, the proposed classification of factors and the ample framing of available behavioural theories and models may help researchers in setting up their studies in the most convenient way to catch the hidden mechanisms and peculiarities of human behaviour. Moreover, scholars may find some useful examples of integration of behavioural theories, which offer the possibility of further understanding recycling behaviour.

This SLR also highlights several limitations of current research on PECB about waste management and offers some possible solutions. First of all, this review recognises how, in the latter years, studies on consumer behaviours have broadened their research horizons (compared to some twenty or thirty years ago) by including new factors and attempting to correlate them although they belong to different fields [100]. Nevertheless, the call for deeper and cross-boundary investigations remain topical, keeping

in mind that the final goal is to understand and, hopefully, improve human behaviour. In this sense, the academic research should expand its intervention studies from typical areas like universities and neighbourhoods, to wider sectors of the population; moreover, it should foster a more holistic framework and comparative analysis. In fact, the real challenge for scholars conducting research on consumer behaviour is to investigate the real world for possible similarities among different populations, and generalise theories and models currently confined in specific fields.

In any case, the research should not forget to analyse the effectiveness of the intervention measures adopted by governments and institutions through ad hoc experimental studies, in order to evaluate and promote more responsible and respectful behaviours. In fact, traditionally, academia plays the role of testing procedures, new materials or products through robust and reproducible methodologies, leading their application in the real world on a larger scale.

In addition, this SLR shows that a very contested area is represented by the capability of accounting for all applicable factors when trying to understand and interpret human behaviour: the interaction between reasoned aspects and non-reasoned ones is very complex, and it often reveals unexpected relations and motivations. At the same time, the analysis of human behaviour is inseparable from the investigation of the context in which the individual lives and interacts. It follows the need to persevere in the interdisciplinary approach in order to unveil as much as possible these hidden mechanisms influencing human behaviour. For these reasons, all theories and models need to undergo a continuous testing in heterogeneous sectors to prove their strength, robustness and universality.

This SLR also reveals that in several researches there is a predominance of a specific approach (e.g., sociological, psychological, environmental, legal), normally influenced (and limited) by the authors' background; for example, studies focusing on socio-psychological factors have shown a partial or inexistent interest for infrastructural and legal issues, which could clearly help in explaining some aspects of human behaviour under specific conditions. Similarly, economic studies tend to consider the individual as a rational actor maximising his/her profit or interest. In general, the analysis of human behaviour is influenced and biased by the different sectorial perspective adopted by the scholar. Consequently, the capability of accounting for all applicable factors remains the key for the success of the proposed models.

This critical aspect leads to the need to create a real interdisciplinary research team when analysing human behaviour and its impact on other people or the surrounding environment. A wide-open approach on social, economic, psychological, legal, institutional, political, infrastructural and technological issues would definitely favour the correct analysis of PECB, its interplay with GenCB, and a deeper understanding of the factors characterizing this interplay.

At the same time, another concomitant challenge is represented by the definition of the right level of granularity (e.g., micro versus macro scale). In fact, an excessive level of details inevitably leads to the risk of focusing on specific sectors (like psychology, marketing, laws), whereas a generic model, although being more applicable to different contexts, does not allow to shine a light on the nuance of human behaviour.

Abbreviations

The following abbreviations are used in this manuscript:

GenCB	Generic consumer behaviour
GrCB	Green consumer behaviour
PECB	Pro-environmental consumer behaviour
PEB	Pro-environmental behaviour
NAM	Norm Activation Model
SLR	Systematic literature review
SM	Supplementary Material
TAK	Title, abstract and keywords
TPB	Theory of Planned Behaviour
TRA	Theory of Reasoned Action
VBN	Value-Belief-Norm (theory)

Appendix A. Supplement to General Results

The overall continental analysis shows a clear predominance of Europe, followed by North America and Asia (Figure A1 and SM tab 6). It is evident that several factors significantly influence this analysis, like the different economic development level and the fact that selected papers are in English only. Consequently, peer-reviewed manuscripts in non-English languages are not taken into consideration in this SLR, so it is not possible to accurately analyse the situation of Asia and Central and South America, where there is a significant academic production in other languages like Russian, Chinese, Spanish and Arabic. For example, China may have a consistent production of papers in its own national language, namely Mandarin, and a limited presence in journals written in English; this situation may lead to the wrong conclusion that China is not as active (on waste management papers) as the United Kingdom.
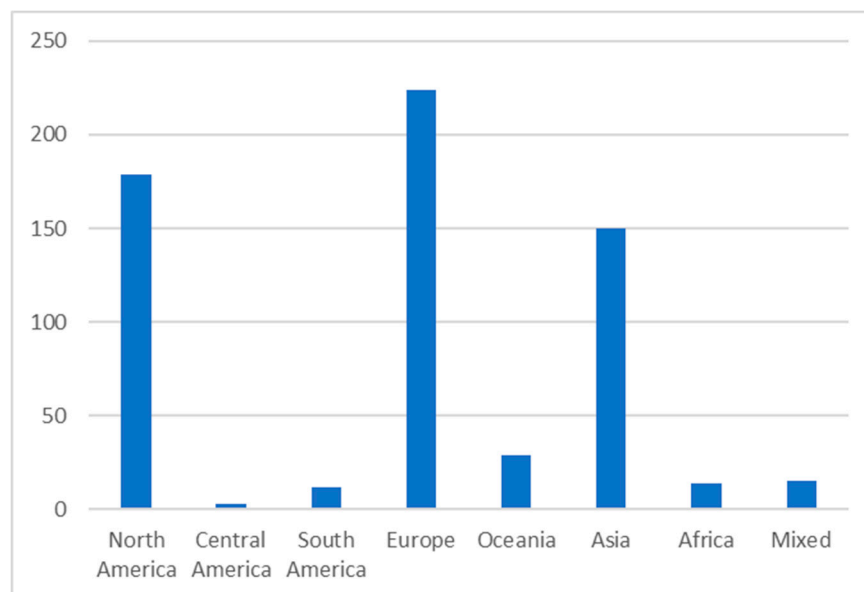

Figure A1. Total number of papers per continent.

The above-mentioned predominance is more exasperated when the analysis is based on advanced and developing economies (as per classification according to International Monetary Fund in October 2019, SM tab 12); most of which are European nations as well as the USA, Canada, Israel, Japan, South Korea, Hong Kong, Singapore, Taiwan, Australia and New Zealand (Figure A2 and SM tab 13).
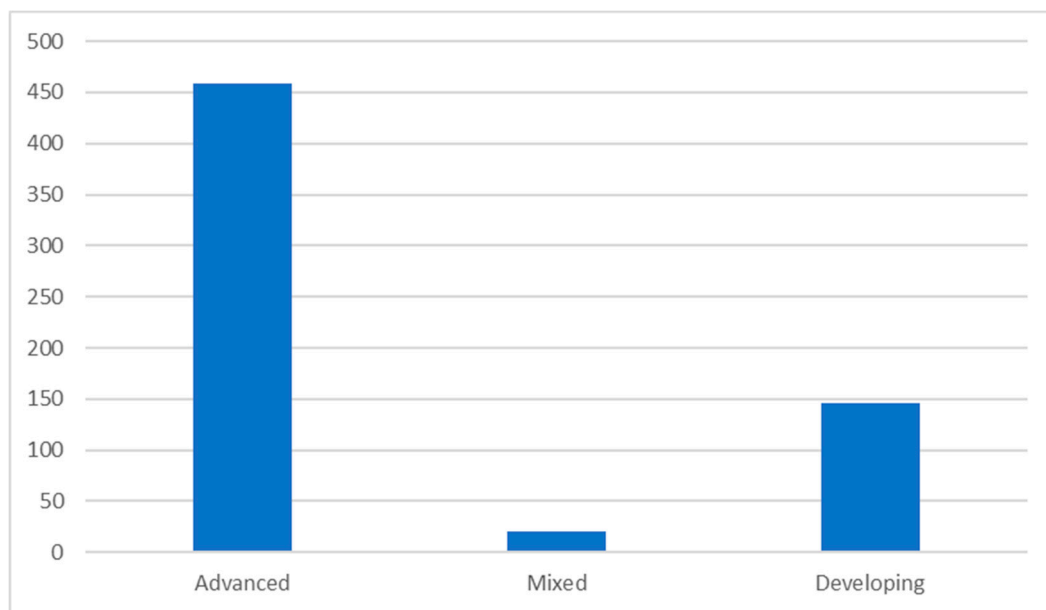
Figure A2. Total number of papers for advanced and developing economies.

The geographical analysis of the selected articles gives clear information about the interest on this SLR's topic at the national and continental level (Figures A1 and A3–A5 and SM tab 6).
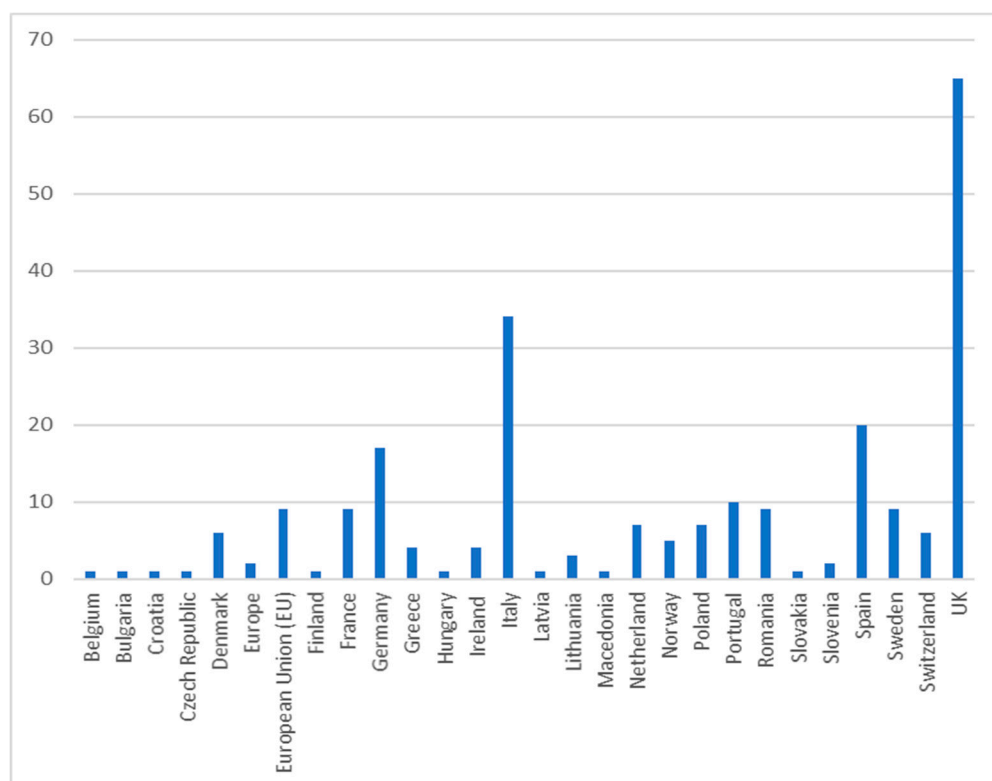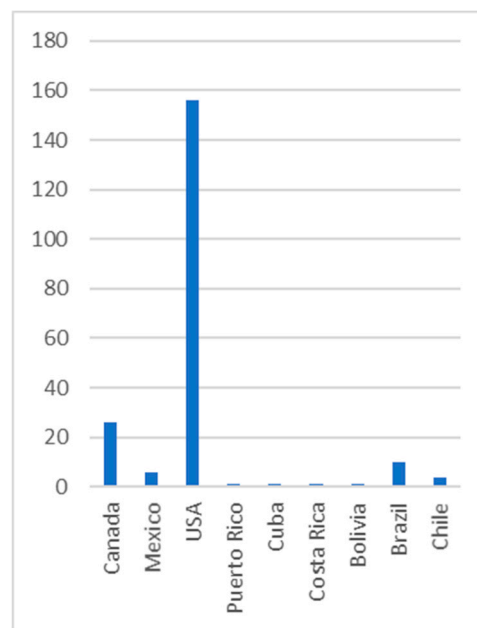

Figure A3. Number of papers per European nation.

Figure A4. Number of papers per American nation.
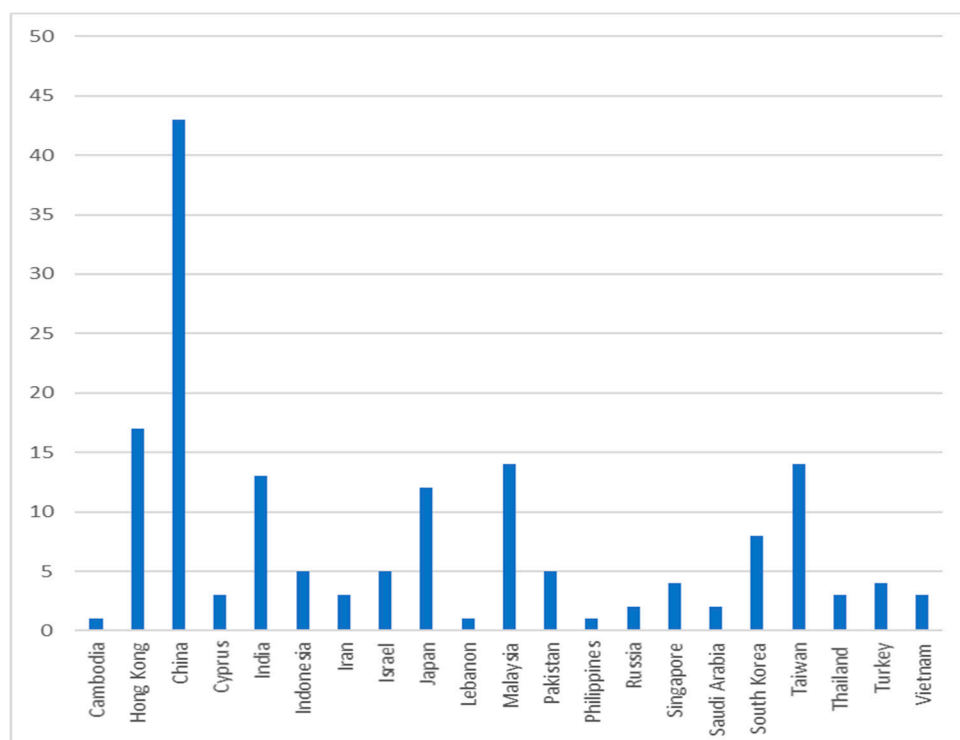

Figure A5. Number of papers per Asian nation.

In addition to the evidence of a strong predominance in Europe (Figure A1) and North America (Figure A1) in the selected papers, with the exception of China (Figure A5) and Australia (28 papers, SM tab 6), the analysis provides further insights when weighting the number of articles with the number of inhabitants (further information in SM tab 6).
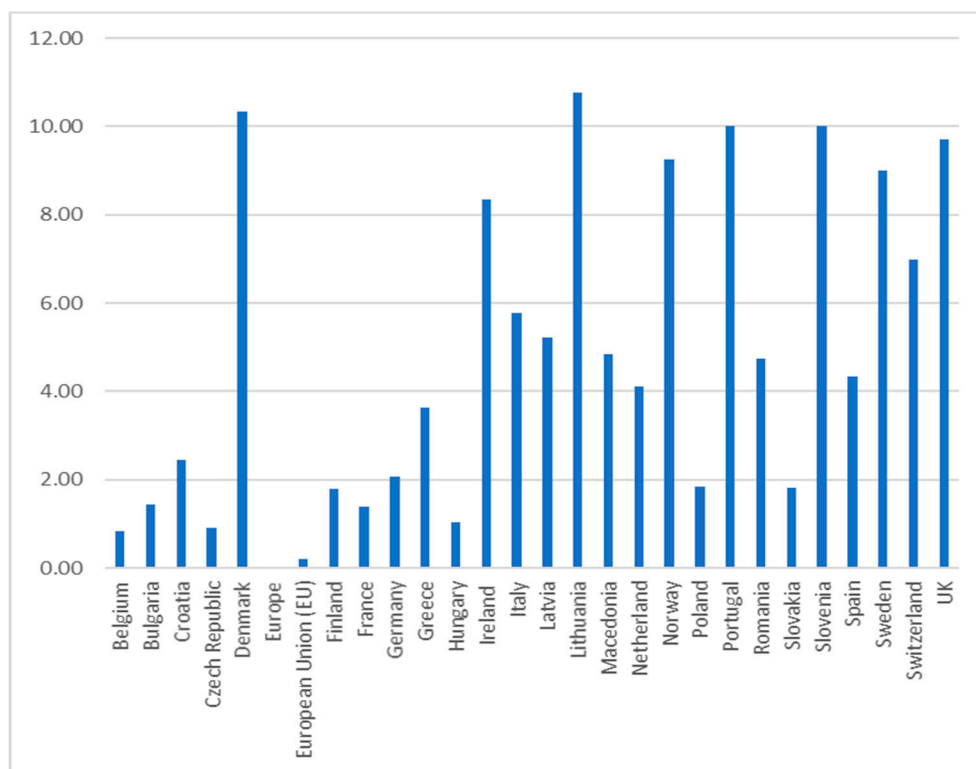
Figure A6. Number of papers per 10 million inhabitants per European nation.

By weighting the number of papers with the national population (Figure A6), the predominant production by the United Kingdom among the European nations (a total of 65 articles by the United Kingdom, especially when compared to the second ranking nation, Italy, with 34 articles) changes quite significantly; in fact, the leading role passes from the United Kingdom to Lithuania (10.75 articles/10 million inhabitants), closely followed by Denmark (10.34), Portugal and Slovenia (10.0). For the sake of a correct interpretation of these values, it should be noted that this graph provides reliable indications for nations that have a significant number of articles, so it clearly loses significance for nations like Belgium, Bulgaria, Croatia, Czech Republic, Finland, Hungary and Slovakia that produced only one article each (SM tab 6).

Conversely, for nations with an adequate number of articles, like the United Kingdom, Italy, Spain and Germany, this ratio provides more accurate information; for example, the fact that Portugal, Sweden and Romania have a consistent number of articles in relation to their inhabitants may indicate that the Portuguese, Swedish and Romanian populations are particularly sensitive to waste management issues. Focusing on the most populated European nations, this SLR highlights that the United Kingdom shows a high level of production of paper (and possibly interest) in this SLR's topic; Italy and Spain an intermediate level, whereas Germany and France have a reduced production in relation to their number of inhabitants.

Applying the same approach to North America, the consistent production of papers by the USA compared to Canada is reversed when considering the number of inhabitants; in fact, Canada reaches 7.03 articles/10 million inhabitants, whereas the USA is at 4.74 articles/10 million inhabitants (Figure A7). The values for other American nations are not reliable considering their limited production of papers.
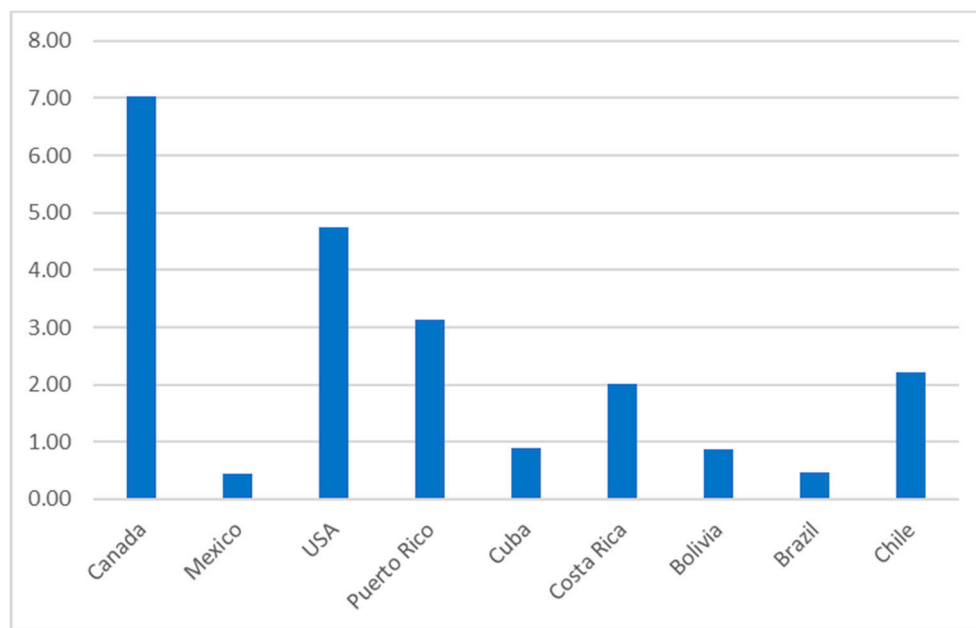
Figure A7. Number of papers per 10 million inhabitants per American nation.

Other interesting observations come from the temporal analysis of the yearly production of the selected papers; for example, China (Figure A8) and Italy (Figure A9) show that most of their articles are not older than three to five years. Furthermore, they display a significant growth (SM tab 7).
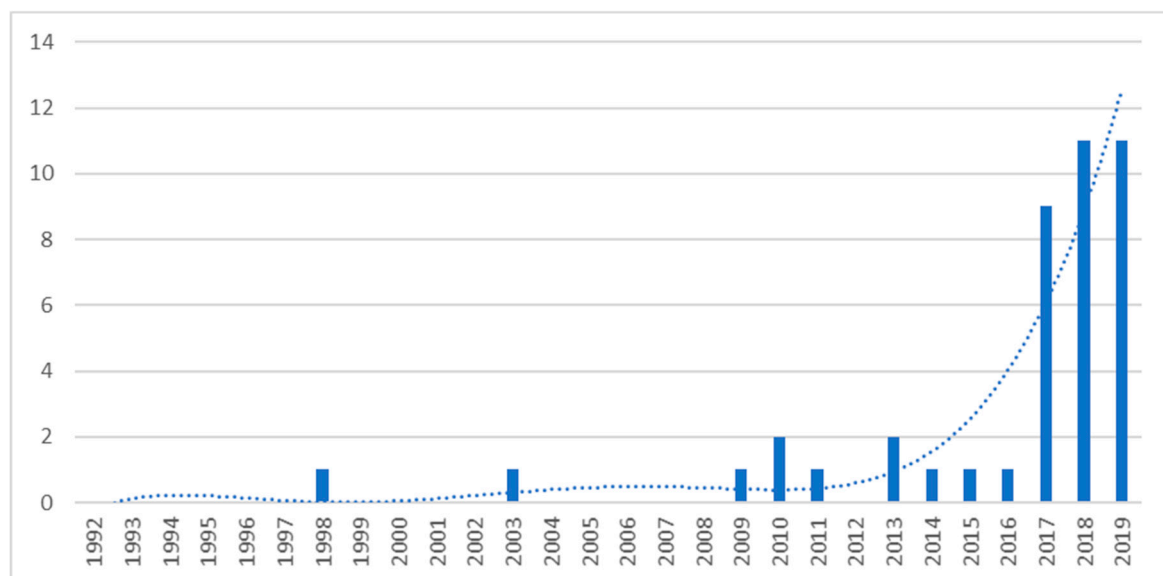

Figure A8. Number of papers per year in China with polynomial dotted trend line.

In the case of Italy, the motivation probably resides in the increasing concern for the waste management at all levels (governmental, regional and local) in order to comply with strict European regulations. In addition, the graph certainly reflects the diffused difficulties faced by Italy in dealing with waste management in the latter years; consequently, public institutions (like academia and governmental bodies) or private organizations (like think tanks and non-governmental organizations (NGOs)) have increased their investigations in this field to better understand the critical factors, and define appropriate corrective measures.
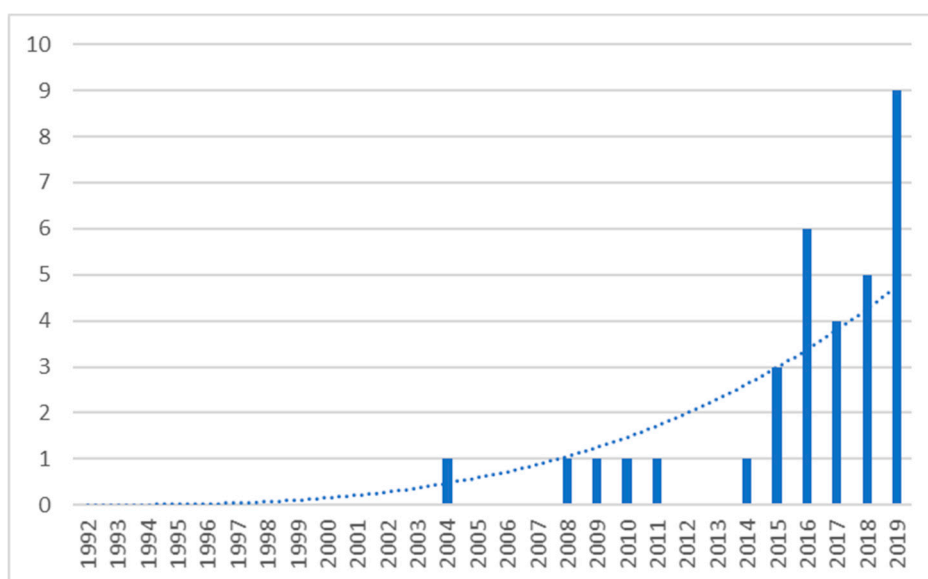
Figure A9. Number of papers per year in Italy with polynomial dotted trend line.

It is also important to note that just because a nation shows a very limited number of articles in this review on waste management, does not necessarily imply that this specific nation is not sensitive to waste related matters and PECB, as is the case of Singapore. In fact, although Singaporewas quite a pioneer in the field of sustainable development, it has only four articles in this review; nonetheless, this value does not imply that Singapore is not a leading nation in this field. Actually, it could be an indication that the waste management system in Singapore has reached an adequate level of efficiency, and the governmental programs for developing sustainable behaviours have achieved their set goals.

Through the analysis of yearly numbers of papers per advanced and developing economies it is evident that the exponential growth (highlighted by the dotted trend lines) takes place in both types of economies, but with a different intensity (Figure A10 and SM tab 14). In the former the production of papers starts in earlier years, and it is more consistent in terms of quantity (in average, it almost doubles up); in the latter the papers become more significant (again in terms of quantity) after 2010. In relation to the high production peak during 2017 in developing nations, the years to come will perhaps allow better understanding as to whether it is the case of a momentary spike, or there are hidden reasons. In any case, it is important to note that in 2017 the production of papers in developing nations was quite close to that of advanced nations. This indication is confirmed by the 2019 values, and partially motivated by the fact that developing economies are also experiencing the same problems of resources and waste management like advanced nations, but with a few years delay.
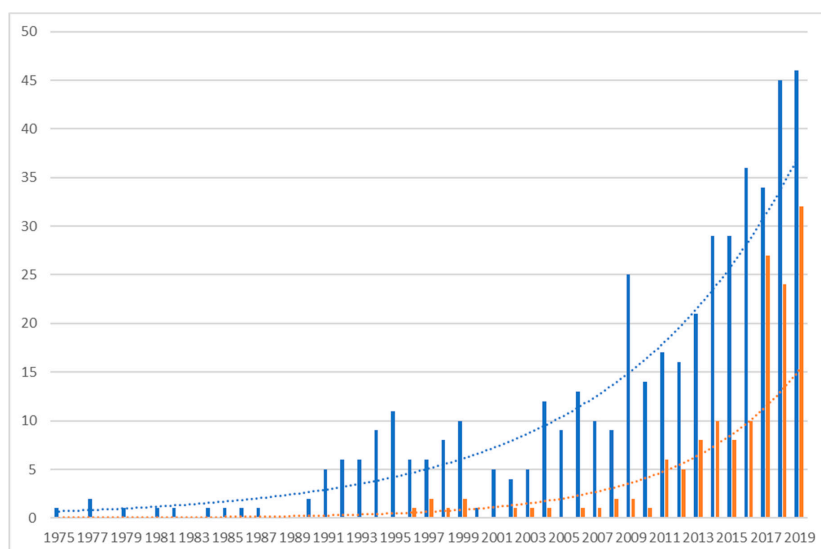

Figure A10. Yearly number of papers for advanced and developing economies (blue and red colors, respectively).

Appendix B. Other Theories and Models

Numerous theories and models have been recalled by the authors of the selected papers. In addition to the mentioned "neutralization" theory of Sykes and Matza [166], it is worth mentioning the tripartite conceptualisation proposed by Stern and Dietz [272], the bipartite conceptualisation (ecocentric versus anthropocentric) by Gagnon Thompson and Barton [273], Perugini and Bagozzi [274] model of goal-directed behaviour, Taylor and Todd [268] integrated waste management model, Barr, et al. [275] conceptualisation of environmental behaviour [276], the collective efficacy theory [277], Lindenberg [278] goal framing theory [279], Celsi and Olson [280] involvement theory [281,282], the dual-process theories [283], Dobson [284] ecological citizenship theory [285], Buttel [286] ecological modernization [287], the Attitude Behaviour Condition (ABC) model [288], Triandis [289] theory of interpersonal behaviour (TIB) [290], Rogers [291] protection motivation theory [292], Deci and Ryan [293] self-determination theory [294,295], Fishburn [296] subjective expected utility (SEU) theory [283], the social practice theory by Bourdieu [297] and Giddens [298], the theory of social representations [299,300], and the basic cognitive schemes (BCS) model [197]. It also has to be noted that in many cases there is some confusion between theory and model, which would require a sort of epistemological discussion that is beyond the overall purpose of this SLR.

The full list of theories and models is available in SM tab 10.

Appendix C. Classification of Factors and Conditions Influencing Pro-Environmental Consumer Behaviour (PECB)

Table A1 displays the classification of factors and conditions including some examples (the full list is available in SM tab 11).

Table A1. Classification of factors and conditions.

Type of Factors	Factors and Conditions	Examples
Individual	Acceptance/rejection of responsibility	Ascription of responsibility, acceptability, reluctancy
	Attitude	Recycling/pro-environmental attitudes, political attitude, attitude towards bio-based product
	Awareness/concern	Awareness of consequences, ecological concerns, considerations of future consequences, environmental awareness/concern, concern for the community
	Beliefs	Conservation/materialistic/austerity belief, normative/introjected belief, beliefs about recycling
	Convenience/self-interest/satisfaction	Convenience of recycling, self-interest, egoism-hedonism, selfishness, individual environmental satisfaction
	Education/knowledge	Subjective/objective knowledge, environmental/procedural knowledge, competencies, education
	Emotions	Affective and emotional reactions
	Expectations	Individual expectations
	Guilt/shame	Shame, guilt, eco-shame, eco-guilt
	Intentions	Intentions (to recycle), conservation intentions, prosocial intentions, intention to purchase recycled products
	Locus of control	Locus of control (LOC), environmental locus of control (ELOC), internal/external LOC
	Lifestyle	Environmental/sustainable lifestyle, consumerist-type lifestyle
	Moral norms	Moral responsibility, morality, moral judgment
	Motivations	Recycling motivation/goals, motivations to comply with environmental regulations, motivation to respond

Table A1. *Cont.*

Type of Factors	Factors and Conditions	Examples
	Perceived behavioural control (PBC)	Self-efficacy, skills, ability to overcome inconveniences, ability to recycle
	Perceptions	Perceived lack of recycling facilities, perceived policy effectiveness, perceived consumer effectiveness, perceived personal costs, perceived effectiveness of the sanction, perceived environmental responsibility
	Personal/subjective norms	Personal norms/values, subjective norms/values
	Present and past behaviours	Past behaviour, habitual behaviour, private/public sphere behaviours, recycling/re-using/repairing behaviour, minimisation
	Relationships/gaps	Attitude-behaviour gap, attitude-intention relationship, past behaviour–intention relationship
	Self-efficacy/self-esteem/ determination	Self-efficacy, environmental self-affirmation, pro-environmental self-identity, centrality of self, self-determination of environmental motivation, self-esteem
	Specific behaviour	Household habits, shopping behaviour, eating behaviour
	Stress	Psychological/urban stress
	Values	Intrinsic/extrinsic values
	Willingness	Willingness to be environmentally friendly (WEF), willingness to support policy, willingness to pay (WTP), willingness to engage in PEB
Collective (socio-demo graphical)	Common values/trust	Worldview, national values, generalised institutional trust, social trust
	Cultural factors	Cultural capital/values, cultural consumption, collectivist culture
	Demographics	Gender, age, income, education, family size, employment, marital status, house ownership/type, race/ethnicity
	Collective behaviour	Neighbourhood behaviour,
	Presence of social agents	Parents, family, neighbours, friends, activists, blockleaders, environmental organization, racial/ethnic groups
	Public awareness	Public awareness of green consumption
	Public perception	Public perception of environmental measures
	Social behaviour	Public sphere behaviours
	Social interactions	Personal/family relationship, civil involvement, neighbour influence, social pressure/influence/exclusion, affiliation, spillover, stakeholders influence
	Social norms	Social norms, social acceptance of environmental policy
	Religion	Religion, spirituality

Table A1. *Cont.*

Type of Factors	Factors and Conditions	Examples
Institutional-legal	Control, sanctions	Law-enforcement measures/effectiveness
	Institutional interventions and stakeholders' involvement	Active role of governmental institutions, encouraging biodiversity and sorting behaviour, environmental advocacy, citizens/stakeholders' involvement, citizens engagement in the co-production of public services, diffusion of environmental values/knowledge
	Institutional quality	Efficient legislation, recycling policies, judicial system, ecological Justice, institutional framework at various level (from municipal to national)
	Legal Norms	Legal/environmental norms on moral perceptions and civic enforcement
Informational	Informational intervention	Informational/media influence/intervention, green nudging, informational pressure/seeking
	Informational quality	Information-vacuum/contamination, source credibility, information publicity, presence of eco-label, media support
Political-ideological	Consensus/trust	Pro-environmental consensus, trust in politics
	Diffusion/ presence of ideologies	Political ideology, party orientation, green scepticism, environmentalism, ideological values
	Political pressure/engagement	Political pressure/polarization, authoritarianism, social dominance orientation, partisanship
	Presence of political agents	Political leaders/parties, environmental/green leaders/parties, blockleaders
Economic	Consumer economical characteristics	Consumer's identity/ethics, green product purchasing behaviour, public awareness toward circular economy, acceptance of remanufactured products, green self-identity, attitude towards bio-based product
	Consumer interaction with economy	Socially responsible consumption, upcycling, CE-related behaviour, market scepticism, consumer authority
	Diffusion and penetration of circular economy (CE)	Circular economy, green consumerism, sustainable production/consumption, reverse green supply chain management
	Production and distribution processes/business management	Eco-design, eco-production, sustainable production, social marketing perspective, appropriate lifecycle and cost–benefit analysis, waste management systems' thinking, environmental impact assessment
Infrastructural-technological	Incentives/penalties	Incentives (material bonus, discount), penalties, facilitators
	Service quality/efficiency	User friendliness of the recycling system, optimal utilisation of available technologies, recycling frequency
Contextual	Local services/conditions/ factors	Local environmental condition, cleanliness, presence of green buildings/infrastructures, crowdedness of the location, social context, proximity effects, spatial spillovers, local identity, past exposure to pollution

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