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The continuum of pro-environmental behaviour in the context of the value-belief-norm theory of environmentalism: implications towards sustainable development

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Abstract: This paper reports a systematic review of studies on pro-environmental behaviour anchored on the value-belief-norm theory of environmentalism extracted from the Scopus database and published between 1999 and the present. It aimed at determining the continuum of pro-environmental behaviour and study locale by examining context-themes of the same in the hope of determining research opportunities and future research directions. Results revealed that although the trend is increasing, the number of studies related to it still needs to grow. Among the categories of the context-themes that emerged include: 1) energy conservation; 2) green/sustainable consumption; 3) waste management; 4) green/sustainable tourism; 5) climate change mitigation and adaptation; 6) biodiversity conservation; 7) policy support; 8) pro-environmental behaviour in workplaces; 9) other minor emergent themes. Most locales were from western and highly developed countries. The later part of the paper reflects environmentalism in the context of the 2030 Agenda for Sustainable Development.

Keywords: value-belief-norm theory; pro-environmental behaviour; environmentalism; sustainable development; sustainable development goals; SDGs.

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1 Introduction

Discourse in the literature suggests a link between environmentalism and sustainable development. Environmentalism is defined "behaviorally as the propensity to take actions with pro-environmental intent" [Stern, (2000), p.411]. Meanwhile, sustainable development refers to "the idea that human societies must live and meet their needs without compromising the ability of the future generation to meet their needs" [World Commission on Environment and Development, (1987), Sec. 1, Sub-sec. 3, Para 27]. The 2030 Agenda for Sustainable Development recognised environmental sustainability as one of the three dimensions of sustainable development (together with economic and social sustainability) (UN-GA, 2015). Environmental sustainability promotes the long-lasting protection of the planet and all its natural resources (UN-GA, 2015).

Examining the 17 sustainable development goals (SDGs), one can deduce that the environment is the spatial (i.e., space) dimension whereby developmental processes and progress occur. That being so, environmentalism is one of the critical pillars of sustainable development.

While the impact of individual pro-environmental behaviour may be relatively small, its impact in aggregate (i.e., everyone in the community acts pro-environmentally) is proven to be significant [Stern, (2000), p.410]. Studies on environmentalism are vital because people's pro-environmental behaviour across levels, sectors, and contexts may directly or indirectly guide environmental conservation and sustainability actions.

Rooted from a work on social environmental movements, Stern et al. (1999) proposed the value-belief-norm theory of environmentalism (referred to as value-belief-norm theory in the later part of the paper) to explain pro-environmental behaviour. For more than 20 years, the theory has been used in exploring, understanding, and explaining pro-environmental behaviour across different contexts. Therefore, conducting a systematic review of these related studies may be relevant.

The researchers recognise that it may be challenging to determine the scope and continuum of environmentalism considering its nature and complexity. However, the researchers believe that a clearer understanding of the continuum of pro-environmental behaviour may be obtained by understanding the categories of context-themes of studies that are related to it. The purpose is not to delineate or demarcate pro-environmental

behaviours but to determine research opportunities and future research directions. Hence, this paper reports a systematic review that attempted to determine the categories of context-themes, including the locale of studies on pro-environmental behaviour in the context of the Value- Belief-Norm Theory. The outcome of this study is essential, considering that many studies on pro-environmental behaviour inform policies and interventions that, in one way or another, impact environmental protection, preservation, and sustainability.

Moreover, culture, tradition, and contextual factors affect attitudes, beliefs, and norms as determinants of pro-environmental behaviour. Suppose the purpose is for the value-belief-norm theory to inform interventions for environmental conservation and sustainability. In that case, this systematic review may guide in conceptualising contextually- and locally-relevant related studies. To the best of the researchers' knowledge, at least from the papers reviewed for this purpose, no studies have attempted to systematically review studies on pro-environmental behaviour anchored on the value-belief norm theory.

1.1 Pro-environmental behaviour

There are two definitions of pro-environmental behaviour offered by literature, impact-oriented and intent-oriented definitions. Stern (2000) defined impact-oriented pro-environmental behaviour as “the extent to which a behavior changes or alters the structure and dynamics of an ecosystem.” This definition is essential in determining and targeting behaviours that make an immediate and significant impact on the environment. Stern (2000) states that “behaviors displayed with the aim of safeguarding or conserving the environment” include intent-oriented pro-environmental behaviour. Such behaviours are essential considering that it focuses on people’s beliefs and motives which are imperative in understanding, strengthening, or changing target pro-environmental behaviours.

Along this line, literature has had terminology adaptations of pro-environmental behaviour through the years according to context or specific behavioural phenomenon under study (see Table 1).

Table 1 Terminology adaptations of pro-environmental behaviour

<i>Terminology</i>	<i>Author</i>
<i>Generally broad terminologies</i>	
Environmentally-relevant behaviour	Erlene Parece et al. (2013)
Environmentally-friendly behaviour	van Ripper and Kyle (2014)
Environmentally-significant behaviour	Stern (2000)
Environmentally-sustainable behaviour	Sharmin et al. (2020)
Sustainability behaviour	Topal et al. (2021)
Sustainability-support behaviours	Andersson et al. (2005)
Sustainable stewardship	Kim et al. (2015)
Ecologically-conscious behaviour	Wynveen et al. (2011)
Green behaviour	Chou (2014)

Table 1 Terminology adaptations of pro-environmental behaviour (continued)

<i>Terminology</i>	<i>Author</i>
<i>Thematically-general terminologies</i>	
Eco-socially conscious consumer behaviour	Saleem et al. (2021)
Green purchase behaviour	Quoquab et al. (2020)
Preparedness behaviour	Corwin et al. (2017)
Sustainable consumption behaviour	Angeles (2014), Ceglia et al. (2015)
Green consumption behaviour	Cheng et al. (2014)
Responsible consumption	Golob et al. (2019)
Conservation behaviour	Bijani et al. (2019), Delaroche (2020), Márquez-García et al. (2018)
<i>Thematically-specific terminologies</i>	
Environmentally-sustainable product purchases	Kang and Moreno (2020)
Energy conservation behaviour	Sahin (2013), Scherbaum et al. (2008)
Climate conserving behaviour	Karpudewan (2019)
Climate change mitigation and adaptation behaviour	Zhang et al. (2020b)
Energy consumption behaviour	Kotsopoulos et al. (2017)
Greening of organisations	Papagiannakis and Lioukas (2012)
Waste management behaviours	Janmaimool and Denpaiboon (2016)
Recycling behaviour	Izagirre-Olaizola et al. (2015), Onel and Mukherjee (2017)
Sustainable water consumption behaviour	Çakır Yıldırım and Karaarslan Semiz (2019)

Table 2 Types of environmentally significant behaviour and their specific examples

<i>Type</i>	<i>Examples</i>
Environmental activism	“Active involvement in environmental organizations and demonstrations”
Non-activist behaviours in the public sphere	“Petitioning on an environmental issue and contributing to environmental organizations; support or acceptance of public policies (e.g., stated approval of environmental regulations; willingness to pay higher taxes for environmental protection).”
Private sphere environmentalism	“Purchase, use, and disposal of personal and household products that have an environmental impact (e.g., home heating and cooling, purchase of recycled products and organically green foods).”
Other environmentally significant behaviour	“Influencing the actions of organizations to which they belong (e.g., engineers may design manufactured products in more or less environmentally benign ways).”

Source: Stern (2000)

Stern et al. (1999) initially proposed four dimensions of pro-environmental behaviour, including “committed public activism, low commitment active citizenship, acceptance of policies that may require material sacrifice to achieve movement goals and changes in the

personal or private sphere behaviors.” These dimensions of pro-environmental behaviour were further refined and elaborated by Stern (2000) himself a year after (see Table 2).

1.2 The value-belief-norm theory

Stern et al. (1999) and Stern (2000) began conceptualising the value-belief-norm theory. The value-belief-norm theory explains the antecedents to pro-environmental behaviour among environmental psychology theories. The theory generally integrated/merged the values theory and norm-activation theory, both proposed by Schwartz (1973, 1992), as well as the work of Dunlap and Van Liere (1978) about the Environmental Worldview (refer to new ecological paradigm scale). According to Stern et al. (1999), “individuals who accept a movement’s basic values, belief that valued objects are threatened and believed that their actions can help restore those values experience and obligation for pro-environmental action that creates a predisposition to provide support, the particular type of support that results is dependent on the individual’s capabilities and constraints” [Stern et al., (1999), p.81]. The schematic model of variables of the initial value-belief-norm theory of support for social movements pertaining to the environment shows the linear relationship of “values (i.e., altruistic values, egoistic values, traditional values, openness to change), belief (i.e., new ecological paradigm, awareness of consequences, ascription to responsibility), pro-environmental personal norms, and pro-environmental behaviors (i.e., environmental activism, environmental citizenship, policy support, private-sphere behaviors)” [see Figure 1, Stern et al., (1999), p.84]. As a follow-up, Stern (2000) proposed a more refined model of the theory depicting the linear relationship of “values (i.e., altruistic values, biospheric values, egoistic values), belief (i.e., new ecological worldview, adverse consequences for valued objects, perceived ability to reduce threat), pro-environmental personal norms, and pro-environmental behaviors (i.e., activism, non-activist public-sphere behaviors, private-sphere behaviors, and behaviors in organizations)” [see Figure 1, Stern, (2000), p.412].

Table 3 presents the conceptualisations of the variables of the value-belief-norm theory.

Stern (2000) noted that environmental activism and non-activist behaviours in the public sphere are powerful because the environmental concern is within the individual’s consciousness. In parallel, private sphere behaviours may have little impact at the individual level; however, the same may be sizeable in aggregate (e.g., everyone in the village participated in composting). In contrast, pro-environmental behaviours in organisational contexts have a significant impact since many organisations are the origin of several environmental problems (Stern, 2000). In the same paper, Stern (2000) also noted different causal variables that influence pro-environmental behaviours, including attitude, personal capabilities, contextual factors, and routinary habits. Attitude can include general environmentalist predisposition, behaviour-specific norms and beliefs, non-environmental attitude, and perceived costs and benefits for action.

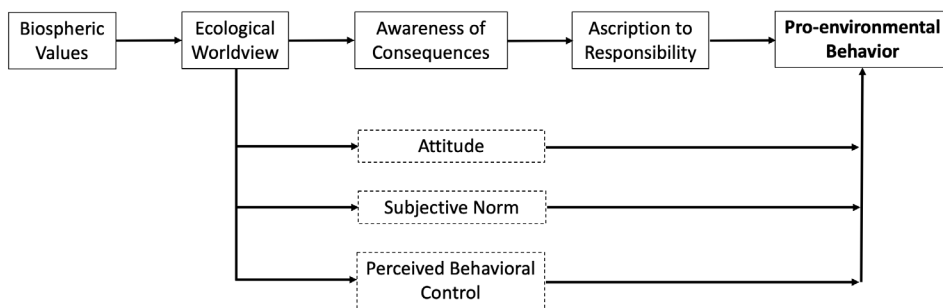
Meanwhile, personal capabilities include literacy, social status, financial resource, behaviour-specific knowledge, and skills. Contextual factors include material costs and rewards, laws and regulations, available technology, social norms and expectations, supportive policies, and advertising. Some scholars have attempted to merge the value-belief-norm theory with other behavioural theories, such as the theory of planned behaviour, in the work of Han (2015) in understanding pro-environmental behaviour in the context of green lodging. Figure 1 shows the diagram of how Han (2015) merged the

two theories. Meanwhile, some scholars factored in other psychological variables like awareness from the work of Sharmin et al. (2020) about the pro-environmental behaviour of millennial tourists visiting natural protected areas, as shown in Figure 2.

Table 3 Variables of the value-belief-norm theory

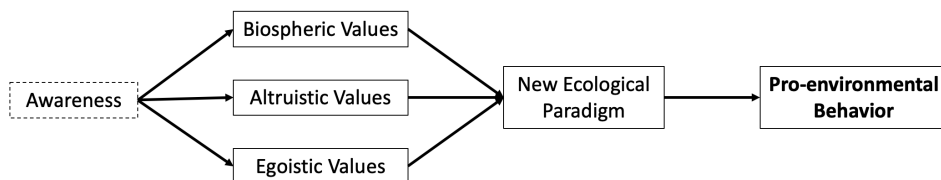
<i>Variables</i>	<i>Conceptualisation</i>
Altruistic values	“Values on the concern for the welfare or well-being of other people” (Stern et al., 1993; Stern, 2000)
Biospheric values	“Values on the elevated concern for the biosphere or the environment apart from human beings” (Steg and De Groot, 2012; Stern et al., 1993)
Egoistic values	“Values on the individual’s concern for the environment
Openness to change	“Stimulation and self-direction based on the motivation of independent thought and action” (Stern et al., 1999)
Awareness of consequences	“Adverse consequence for the objects valued or belief that environmental circumstances will change to benefit or harm everyone including other living species” (Stern et al., 1999; Stern, 2000)
Ascription to responsibility	“Perceived ability to reduce threat; the belief that individual’s action can promote or prevent potential negative impact to the environment” (Stern et al., 1999; Stern, 2000)
Personal norm	“The feeling of moral obligation to protect and preserve the environment” (Kiatkawsin and Han, 2017)

Figure 1 Merging the value- belief-norm theory and theory of planned behaviour



Source: From the work of Han (2015)

Figure 2 Factoring in awareness



Source: From the work of Sharmin et al. (2020)

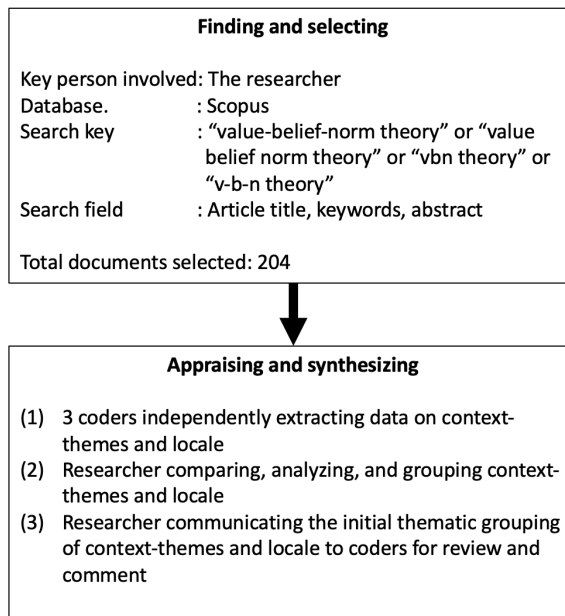
This paper reports a systematic literature review of studies on pro-environmental behaviour in the context of the value-belief-norm theory. The study aims to determine the

categories of context-themes and study locale in the hope of identifying research opportunities and future research directions.

2 Methodology

The document analysis design suggested by Bowen (2009) guided this investigation. The purpose of the qualitative research design is to “systematically investigate and analyze pertinent texts, purposefully chosen using established criteria, to address the phenomena under study.” The design has four phases; finding, selecting, appraising, and synthesising (see Figure 3).

Figure 3 Document analysis process in the study context



In this study, the researchers took charge of the finding and selecting phases. Documents were identified and selected from the Scopus database using the following search key: ‘value-belief-norm theory’ or ‘value belief norm theory’ or ‘vbn theory’ or ‘v-b-n theory’ from the search field document title, keywords, and abstract. The researchers recognise that other existing databases exist (e.g., Web of Science). However, the literature suggests that the Scopus database yields more articles unique to the database [Losse and Geissdoerfer, (2021), p.4]. Some recent similar studies that used the Scopus database include the works of Chakraborty et al. (2021) and Choi et al. (2021), among others.

A total of 204 documents underwent preliminary review to ensure no duplicity. .csv file was extracted and converted to a Microsoft Excel file for fundamental bibliometric analysis. Distribution of papers according to document type, subject areas, number of papers per year including top contributing authors and journals, and most cited papers and authors were analysed.

In order to guarantee rigour and trustworthiness during the appraising and synthesising phase, three coders were invited to extract data. These coders are university faculty holders of master's degrees, have been teaching environmental science-related courses in the last five years, and are actively involved in environmental science research. Before independent coding, coders were required to do trial coding on five papers (i.e., value-belief-norm theory works that were not indexed in the Scopus database) to ensure they were on the same page and had similar knowledge of the process.

Each coder received a copy of the 204 papers' titles, abstracts, research objectives, and study context/location for independent data extraction, which took a little over a month. Data extracted were compared and analysed further for the researcher's thematic grouping of context-themes and study locale. The researcher again shared the results of the thematic grouping with the coders for review and comments. This paper reports the final thematic grouping of context-themes and study context/locale.

3 Results and discussion

3.1 Document characteristics

The findings revealed that 204 papers indexed in the Scopus database were published in the context of the value-belief-norm theory during the last 22 years. Authored by an average of three authors per paper, 189 were empirical papers, while 15 were theoretical papers. Meanwhile, according to document classification, 180 papers were articles, nine were conference papers, eight were review papers, and seven were book chapters. All the papers have accumulated 12,827 citations averaging 63 citations per paper.

Table 4 Trends in the number of publications per year

<i>Year</i>	<i>Total number of publications</i>	<i>Percentage</i>
2021	30	14.71%
2020	32	15.69%
2019	27	13.24%
2018	18	8.82%
2017	22	10.78%
2016	19	9.31%
2015	14	6.86%
2014	9	4.41%
2013	8	3.92%
2012	5	2.45%
2011	4	1.96%
2010	4	1.96%
2009	3	1.47%
2008	2	0.98%
2006	3	1.47%
2005	2	0.98%
2000	1	0.49%
1999	1	0.49%

Table 4 shows that the trend in the number of publications per year is generally increasing. Seven journals published 21.6% (n = 44) of the papers. Among the journals include the *Journal of Environmental Psychology* (TP = 10), *Sustainability Switzerland* (TP = 10), *Journal of Cleaner Production* (TP = 6), *Journal of Environmental Management* (TP = 6), *Environmental Education Research* (TP = 4), *Journal of Sustainable Tourism* (TP = 4), and *Transport Research Part A Policy and Practice* (TP = 4).

Table 5 Top contributing and influential authors

<i>Author name</i>	<i>TP</i>	<i>%</i>	<i>Affiliation</i>	<i>Country</i>	<i>TC</i>
Steg, L.	7	3.43%	University of Groningen	The Netherlands	581
Han, H.	6	2.94%	Sejong University	South Korea	922
Dietz, T.	5	2.45%	Michigan State University	US	381
Mohammad, J.	4	1.96%	Qatar University	Qatar	31
Nordlund, A.	4	1.96%	Umeå Universitet	Sweden	31
Quoquab, F.	4	1.96%	Universiti Teknologi Malaysia	Malaysia	110
Wynveen, C.J.	4	1.96%	Baylor University	US	1
Angeles, R.	3	1.47%	University of New Brunswick	Canada	108
Fornara, F.	3	1.47%	Università degli Studi di Cagliari	Italy	81
Hwang, J.	3	1.47%	Sejong University	South Korea	18
Jaini, A.	3	1.47%	Universiti Teknologi MARA	Malaysia	169
Jansson, J.	3	1.47%	Umeå Universitet	Sweden	169
Stern, P.C.	3	1.47%	Social and Environmental Research Institute	US	73
Sutton, S.G.	3	1.47%	Atlantic Salmon Federation	Canada	65

Table 6 Most cited paper

<i>Title</i>	<i>Author/s and year of publication</i>	<i>TC</i>
“Toward a coherent theory of environmentally significant behavior”	Stern (2000)	3,468
“A value-belief-norm theory of support for social movements: The case of environmentalism”	Stern et al. (1999)	1,774
“Factors influencing the acceptability of energy policies: A test of VBN theory”	Steg et al. (2005)	535
“A comprehensive model of the psychology of environmental behavior-A meta-analysis”	Klößner (2013)	427
“Predicting pro-environmental behavior crossnationally: Values, the theory of planned behavior, and value-belief-norm theory”	Oreg and Katz-Gerro (2006)	382

Table 5 shows the top contributing and most influential authors that used the value-belief-norm theory in their respective studies. With seven and six contributed papers, Linda Steg and Heesup Han are among the top contributors. Meanwhile, with 922 citations, Heesup Han tops the most influential authors. Note that the data in Table 5 did not include the two founding papers of the value-belief-norm theory entitled ‘A value-belief-norm theory of support for social movements: The case of environmentalism’ (Stern et al., 1999) and ‘Toward a coherent theory of environmentally significant behaviour’ (Stern, 2000). So far, the two papers have gained 1,774 and 3,468 citations, respectively (see most cited papers in Table 6).

3.2 Context-themes categories

Thematic analysis of the context-themes of the papers revealed eight major emergent categories, including:

- a energy conservation
- b green/sustainable consumption and innovation
- c waste management
- d green/sustainable tourism
- e climate change and other natural hazards
- f biodiversity conservation
- g policy support
- h pro-environmental behaviour in workplaces
- i agriculture (farming and fisheries)
- j the greening of events reported in great details.

The categorisation represents the studies conducted within the said thematic context regardless of frequency.

3.2.1 Energy conservation

This thematic context includes energy-related decisions and behaviour (Brosch et al., 2014). It includes energy conservation behaviour (Sahin, 2013; Scherbaum et al., 2008) related to residential energy (Sarkis, 2017), electricity (Erlene Parece et al., 2013), household energy use, and intention to reduce energy use (Denley et al., 2020), and purchasing energy (Testa et al., 2016). It also includes eagerness/willingness to pay/adapt renewable energy (Venugopal and Shukla, 2019), use of renewable energy at the household level, and intention to improve energy efficiency (Fornara et al., 2016), and adopt residential photovoltaic system (Wolske et al., 2017). It also includes an interest in participating in the smart energy system (van der Werff and Steg, 2016) and air conditioning cooling consumption (Osunmuyiwa et al., 2020). Moreover, it includes studies on car use (Hiratsuka et al., 2018), including the choice and use of a personal car (Saleem et al., 2018, 2021) and the switch from conventional to electric vehicles (Nordlund et al., 2018, 2016; Simsekoglu, 2018). Further, it includes the acceptance of

green transport policy on car use reduction (Ünal et al., 2019; Zhang et al., 2020a) and the adoption of high-involvement eco-innovation (e.g., use of electricity on biofuel vehicles) (Jansson et al., 2011). In addition, it includes studies on travel mode choice (Havlickova and Zamecnik, 2020), including the use of low-carbon travel mode (Liu et al., 2017), sustainable travel mode choice in urban areas (Lind et al., 2015), and parents' acceptance of disincentives to driving active transport mode use preference for their children (Nordfjærn and Zavareh, 2017), as well as energy consumption behaviour at workplace (Kotsopoulos et al., 2017) including energy-management tasks and building energy use (Christina et al., 2014).

3.2.2 Green/sustainable consumption and innovation

Green/sustainable consumption includes studies on green consumption behaviour (Cheng et al., 2014, 2020), environmentally sustainable product purchases (Kang and Moreno, 2020), sustainable consumption (Ceglia et al., 2015) of personal care, household and chemical products (Angeles, 2015, 2016, 2014), green purchase behaviour of cosmetics products (Jaini et al., 2020a, 2020b; Quoquab et al., 2020), and eco-friendly decision-making of museum vacationers' (e.g., green product use and green trust) (Han et al., 2018). It also includes studies on shared consumption (Roos and Hahn, 2017), organic and local food consumption (Liu et al., 2021; Zepeda and Deal, 2009) including ethnic dining behaviour (Kim and Li, 2020), and consumers' attitudes towards traditional restaurants (Youn et al., 2020), meat purchasing behaviour (Lai et al., 2020) including the intention to purchase meat in mobile slaughter units (Hoeksma et al., 2017), and sustainable water consumption (Çakır Yıldırım and Karaarslan Semiz, 2019). Moreover, it includes studies on alternative fashion consumption (Becker-Leifhold, 2018), corporate social responsibility for responsible consumption (Golob et al., 2019), and fair-trade consumption (Schenk, 2019). Finally, the theme includes the adoption of eco-innovation (Busse et al., 2013; Jansson et al., 2011), pro-environmental business practices among craft artisans (Vanderploeg and Lee, 2018), use of innovative fabrication techniques (e.g., the use of eco-friendly faux leather) (Jung et al., 2016), and sustainability stewardship in textile and apparel industry (Kim et al., 2015)

3.2.3 Waste management

Waste management as a context theme includes studies on conservation and waste management behaviours (Janmaimool and Denpaiboon, 2016) and e-waste management and disposal (Kitila and Woldemikael, 2021), including the intention to participate in e-waste collection (e.g., smartphone) (Sari et al., 2021) and consumers' disposal behaviour of personal communication devices (Phulwani et al., 2021). Moreover, it also includes studies on consumer behaviours that lead to domestic food waste (Farr-Wharton et al., 2014), waste reduction intention among visitors to a themed park (Fang et al., 2017), and sustainable solid waste management among small accommodation enterprises (Eid et al., 2020). It also includes studies on recycling behaviour (Izagirre-Olaizola et al., 2015; Onel and Mukherjee, 2017) such as recycling of agricultural residues by composting (Rezaei-Moghaddam et al., 2020), residents' intention to separate municipal solid waste (Li et al., 2018), and home composting for sustainable municipal organic waste management (Veisi et al., 2020).

3.2.4 Green/sustainable tourism

Green/sustainable tourism included studies on pro-environmental behaviour in national parks (Chou, 2014; Sharma and Gupta, 2020), natural protected areas (Sharmin et al., 2020), tourist sites (Zhang et al., 2014), and cruise context (Han et al., 2017). It also includes studies on engagement in last-chance tourism (Denley et al., 2020), general consumer behaviour in tourism and hospitality (Han, 2021), green tourism marketing (Chen, 2018), and sustainability communication in sustainable tourism (Tölkes, 2018). Moreover, it includes studies on guests' behaviour toward visiting green hotels (Choi et al., 2015; Eid et al., 2020; Wang et al., 2020), green lodging (Han, 2015), green peer-to-peer accommodation (Agag, 2019) including the willingness to pay price premium in environmentally friendly hotels (González-Rodríguez et al., 2020), as well as intentions to behave pro-environmentally among young travellers (Kiatkawsin and Han, 2017), tourists (Dolnicar et al., 2017), and adventure tourists (Gupta and Sharma, 2019). Further, it includes studies on tourists' intention to practice ecotourism (Beall et al., 2021; Lorenzo-Romero et al., 2019) and ecotourism behaviours of nature-based tourists (Lee and Jan, 2017). Lastly, it includes the willingness to pay for park conservation (López-Mosquera and Sánchez, 2012), museum vacationers' ecofriendly decision-making processes (Han et al., 2018), and public park use near hydraulic fracturing operations (Kellison et al., 2017).

3.2.5 Climate change

The context theme on climate change includes studies on general pro-environmental behaviour regarding climate change (Fielding and Hornsey, 2016; Wynveen and Sutton, 2017; Yu and Yu, 2017), climate conserving behaviour (Karpudewan, 2019), public sphere climate action (Doherty and Webler, 2016), and government and market solutions to climate change (Ignell et al., 2019). Moreover, it includes more context-specific studies such as climate-related pro-environmental behaviour to protect coral reefs (Wynveen and Sutton, 2015) and in dealing with forecasted sea level rise (Yousefpour et al., 2020), climate change mitigation and adaptation behaviour (Zhang et al., 2020b) in agricultural rice production (Zhang et al., 2020a), and adaptive water conservation practices (Sanderson and Curtis, 2016). It also includes studies on the significance of physical participation in climate change (Cunningham et al., 2020), interventions such as the impact of fiction on the behaviour of people about climate change (Bilandzic and Sukalla, 2019), household preparedness behaviour in lahar hazard zones (Corwin et al., 2017), and nature-based solutions to flood risk (Arfaoui and Gnonlonfin, 2020).

3.2.6 Biodiversity conservation

Biodiversity conservation-related themes include studies on a commitment to biodiversity protection (Dervişoğlu et al., 2009; Menzel and Bögeholz, 2010) and biodiversity and nature conservation (Fornara et al., 2020), including landowners' participation in forest preservation, wetland restoration, and biodiversity conservation (Johansson et al., 2013) and civic engagement with biological issues (Skarmeas et al., 2020). Moreover, it includes studies on the valuation and management of ecosystem services (Raymond and Kenter, 2016), management of natural resources (Seymour et al., 2010), and ecological risk perception (Slimak and Dietz, 2006). It also includes studies on visitors' participation in protected area enhancement activities (e.g., tree planting, litter removal,

donating/paying an entrance fee) (Weaver, 2012) and willingness to pay for park conservation (López-Mosquera and Sánchez, 2012), stakeholders' intention to adapt pro-environmental behaviour in marine protected areas (Wynveen et al., 2015), and environmental action on the conservation of native vegetation (Raymond et al., 2011). Further, it includes studies on wildlife protection (Sutter et al., 2018), such as protecting local gazelle species (Derişoğlu and Tankuş, 2015), Whooping crane conservation (Lessard et al., 2021), conserving fish biodiversity (Granco et al., 2019), and invasive animal management (McLeod et al., 2015). Finally, it includes organisms-in-trade hobbyists' purchase and disposal behaviour (Mayer et al., 2015).

3.2.7 Policy support

Context theme on policy support includes studies on the acceptance of green transport policy (Zhang et al., 2020b), sustainable transportation (Jakovcevic and Steg, 2013), car use reduction (Ünal et al., 2019), and single and combined transport policy measures (Eriksson et al., 2008). It also includes studies on energy policy to reduce household emissions of carbon dioxide (Steg et al., 2005), support for environmental policy (Xiao and Buhrmann, 2019), land management policy (Okumah et al., 2020), plastic carry bag fee ordinance (Yakut, 2021), pro-environmental tax policy to address global climate change (Kim and Shin, 2017), as well as government and market solutions as a policy response to climate change (Ignell et al., 2019).

3.2.8 Pro-environmental behaviour in workplaces

Another remarkable emerging context-theme is workplace pro-environmental behaviour (Ryszko, 2017; Ture and Ganesh, 2018; Yusliza et al., 2019). Its scope includes energy-management tasks, building energy use (Christina et al., 2014), and energy consumption behaviour (Kotsopoulos et al., 2017). Moreover, it also includes studies on hotel employees' green behaviour (e.g., turning off lights, taking stairs, water conservation) (Chou, 2014), corporate social responsibility for social consumption (Golob et al., 2019), and ecological sustainability support behaviours of supervisors (Andersson et al., 2005). Further, it includes studies on public assembly facility managers' value orientations for supporting environmental responsibility (Walker and Mercado, 2016) and the greening of organisations (Papagiannakis and Lioukas, 2012).

3.2.9 Agriculture (farming and fisheries)

Pro-environmental behaviours that belong to the theme of agriculture (farming and fisheries) include conservation practices among farmers (Delaroché, 2020) and winegrowers (Márquez-García et al., 2018). It also includes farmers' interest in the commercialisation of horticultural by-products (Bijani et al., 2019), acceptance of clear-fell, burn, and sow management systems (Ford et al., 2009), and soil conservation practices (Bijani et al., 2019; Wensing et al., 2019). Moreover, it includes agrochemical purchase of farmers (Chua et al., 2020), local leadership in small-scale fishing communities (Sutton and Rudd, 2016), and pro-environmental behaviour in fisheries (Sánchez-Jiménez et al., 2021).

3.2.10 Greening of events

The context-theme of the greening of events includes attendees' sustainable efforts toward event greening (Ahmad et al., 2017), conservation behaviour while attending a convention (Han and Hwang, 2017), and general pro-environmental behaviour among attendees of ecofriendly food festivals (Kim and Kim, 2018).

Table 7 Locales of the different studies

<i>Region</i>	<i>Countries</i>	<i>Number of studies</i>	<i>Region</i>	<i>Countries</i>	<i>Number of studies</i>
Asia (68 studies)	China	16	Europe (71 studies)	Germany	9
	Taiwan	9		Sweden	9
	Malaysia	8		Netherlands	8
	India	7		UK	8
	Iran	5		Spain	5
	Turkey	5		Italy	4
	South Korea	5		Norway	4
	Russia	2		Slovenia	4
	Israel	2		Lithuania	3
	Japan	2		Switzerland	3
	Pakistan	2		Greece	3
	Indonesia	1		Belgium	1
	Singapore	1		Finland	1
	Thailand	1		France	1
	Sri Lanka	1		Austria	1
Philippines	1	Bulgaria	1		
Oceania (18 studies)	Australia	13	Denmark	1	
	New Zealand	3	Finland	1	
	Solomon Islands	1	Czech Republic	1	
	Fiji Islands	1	Latvia	1	
The Americas (59 studies)	USA	45	Mexico	1	
	Canada	7	Portugal	1	
	Chile	5	African Region (3 studies)	Egypt	1
	Costa Rica	1		Ghana	1
	Argentina	1		Ethiopia	1

3.3 Research locale

Table 7 presents the distribution of study locales according to geographic regions and countries. With 71 and 68 studies, the European and Asian regions topped the most significant number of studies conducted. Even though different countries contributed differently, the US led the list with 45 studies. Although more publications came from the USA, the UK, Australia, Germany, the Netherlands, and Malaysia, some of these

investigations were carried out in other nations. The said countries have fewer studies conducted in their respective countries compared to the total number of published papers. It must also be noted that some countries as locales were part of more extensive comparative studies, such as the Solomon Islands, Fiji Islands, Austria, Bulgaria, Czech Republic, Denmark, Finland, Latvia, Mexico, the Philippines, and Portugal.

4 Discussion and implications

Between 1999 and 2021, 204 studies based on the value-belief-norm theory were published and indexed in the Scopus database (i.e., at the time of data extraction). The yearly trend in the total number of publications is generally increasing. Although, more than the data collected and analysed in this study may be needed to argue and conclude whether the volume of the actual number of studies on pro-environmental behaviour conducted across contexts and levels through the years is large or small. Nevertheless, the researchers think that this number is relatively small as compared, for example, to a similar study on smart homes and the internet of things that registered 2339 articles published and indexed in the Scopus database from 2015–2019 (Choi et al., 2021). Besides, around 22% of the papers were published by seven journals from two reputable publishers, Taylor & Francis Ltd. and Elsevier Ltd. These results could lead to some inferences. First, the value-belief-norm theory may not be popular among researchers. Second, other behavioural psychology theories may be more robust and conclusive in explaining and illustrating pro-environmental behaviour. Thirdly, researchers do not necessarily publish their scholarly works in Scopus-indexed journals. For the first two inferences, it may be necessary to compare the performance of different general and context-specific behavioural theories, including the value-belief-norm theory. Such studies may lead to identifying and enumerating characteristics and elements of behaviour that fit best to a specific behavioural theory. Meanwhile, for the third inference, it may have implications for the increasing number of predatory journals.

Every scholar's ultimate goal is to publish their academic work in a journal to share significant new findings from their research. Not to mention the incentives provided by university administrations to publish. Numerous studies published in reputable journals and publishers in recent years have been periodically retracted due to falsified data gathering and analysis. Although it may sound unethical to prefer one journal over another or one publisher over another, databases like the one used in this study assess and ensure the quality of the peer review process before indexing a specific journal. As such, high-quality standards are maintained, and the creativity of scholars to produce novel outputs is challenged.

Fourteen authors contributed 27% of the total papers, but it should be noted that they shared authorship on a number of them. For instance, Han and Hwang co-authored two studies; Wynveen and Sutton co-authored three papers; Mohammad, Quoquab, and Jaini co-authored three. Paul Stern, the leading proponent of the value-belief-norm theory, is considered the most influential author with a total of 5,315 citations. His two papers are among the top-cited papers. Similar patterns were observed in the distribution of studies by study location, where 57% of investigations were carried out in just nine nations (i.e., the USA, China, Australia, Germany, Taiwan, Sweden, Malaysia, Netherlands, and the UK). The findings about the distribution of authors, author citations, and study locale may have implications for writing and establishing a literature review for hypotheses

development of quantitative studies and explaining results and findings of qualitative studies. Note that the total number of references cited and referred to in the manuscript may not indicate a thorough and sound literature review. Nevertheless, the variety of pertinent and related studies may be the first step in establishing a study's foundation, the state of the literature at the time, or the context of the subject under investigation. Rich comparison of contexts, operationalisation of variables, comparing results and findings, and tracing changes of the variable/s under study, including their history, are critical to a robust and sound literature review.

One crucial emerging finding of the study is that most, if not all, of the pro-environmental behaviours lie within the non-activist behaviours in the public sphere and private sphere environmentalism according to Stern's (2000) classification of pro-environmental behaviour. Among the essential emerging major context-themes in the study are energy conservation, green/sustainable consumption and innovation, waste management, green/sustainable tourism, climate change, other natural hazards, biodiversity conservation, policy support, and pro-environmental behaviour in workplaces. The emerging minor themes include agriculture (farming and fisheries), the greening of events, general pro-environmental behaviour and citizenship, and others. Table 8 shows the synthesis of context-themes as established in the study.

Table 8 Summary of definition/description of context-themes

<i>Context-themes</i>	<i>Definition/description</i>
Energy conservation	These are pro-environmental behaviours around reducing energy-use, use of renewable energy sources, car-use, and transport choices.
Green/sustainable consumption and innovation	These are pro-environmental behaviours around product consumption choices.
Waste management	These are pro-environmental behaviours regarding the different phases of waste management.
Green/sustainable tourism	These are pro-environmental behaviours when choosing places to visit and hotels for leisure.
Climate change and other natural hazards	These are pro-environmental behaviours that relate to mitigation, adaptation, and preparedness for the impact of climate change and other natural hazards.
Biodiversity conservation	These are pro-environmental behaviours around protecting and preserving other living species in their respective ecosystems.
Agriculture (farming and fisheries)	These are pro-environmental behaviours related to farming and fishing choices and practices.
Greening of events	These are pro-environmental behaviour related to organising, conducting, and attending events.

While it is clear that the literature emphasised that the impact of individual pro-environmental behaviour may be small (Stern, 2000), the environment is at the same time vulnerable to individual human activities no matter how small they may be.

A collective behaviour firmly anchored on society's norms and bound to one's own beliefs and values are imperative in developing and strengthening intent-oriented pro-environmental behaviours, including but not limited to the context-themes of pro-environmental behaviours found in this study. Determining the continuum of various categories of pro-environmental behaviours within the categories of pro-environmental

behaviours proposed by Stern (2000) and beyond is an essential initial step in strengthening them from among the populace. Tapping the norms, beliefs, and values that influence pro-environmental behaviour may be one of the keys to environmental sustainability. Inculcating environmentalism to the general populace may increase the chance of mindfully putting the environment at the centre of any actions-individual, household, community, among others.

On another note, it is remarkable that many modern and highly-developed countries have elevated efforts toward environmental protection, preservation, and sustainability, as evidenced by the number of studies conducted in these countries. Meanwhile, many environmental degradation-prone countries and countries with virgin environments are lagging. Therefore, there is a need for these countries to catch up and hasten research efforts related to it. Developing countries must develop context-specific, locally-relevant, and empirical-based environmental policies and interventions, including proactive advocacy and carrying out the SDGs enumerated in the 2030 Agenda for Sustainable Development (UN-GA, 2015).

4.1 Pro-environmental behaviour and the SDGs

Environmental sustainability is one of the dimensions of sustainable development, as stipulated in the 2030 Agenda for Sustainable Development (UN-GA, 2015). That being so, carefully reflecting on the SDGs, it is irrefutable that the spatial dimension of the 17 SDGs is linked to the environment. The fact that the context-themes in this study directly or indirectly fall or relate to one or more of the 17 SDGs suggests that environmentalism may have a considerable role in achieving SDGs. Along this line, the researchers hypothesise that many tenets of the SDGs may be activated and become automatic if individuals have a significant foundation of environmentalism.

There are shreds of evidence on pro-environmental behaviour that directly or indirectly relates to sustainable development, such as studies on green/sustainable consumption and green/sustainable tourism, among others. Not to mention those pro-environmental behaviours that are explicitly defined in the context of sustainability, such as environmentally-sustainable behaviour (Sharmin et al., 2020), sustainability behaviour (Topal et al., 2021), sustainability-support behaviours (Andersson et al., 2005), sustainable stewardship (Kim et al., 2015), eco-socially conscious consumer behaviour (Saleem et al., 2021), sustainable consumption behaviour (Angeles, 2014; Ceglia et al., 2015), environmentally-sustainable product purchases (Kang and Moreno, 2020), and sustainable water consumption behaviour (Çakır Yıldırım and Karaarslan Semiz, 2019). Among the SDGs whereby environmentalism may have direct or indirect influence include:

- a sustainable cities and communities
- b responsible consumption and production
- c climate action
- d affordable and clean energy
- e clean water and sanitation
- f life below water
- g life on land (UN-GA, 2015).

However, it must be highlighted that the studies examined in this paper barely scratch the surface (i.e., in a limited, shallow manner) of SDGs. It is not on purpose, given the expansive nature of the goals. It may be interesting to look into pro-environmental behaviour within the bigger picture of sustainable development and its respective facets. Moreover, it may also be relevant to look into pro-environmental behaviours' interaction with other behavioural variables, their consistencies, and inconsistencies in the context of the value-belief-norm theory. It is essential because developing and strengthening sustainable development-related pro-environmental behaviours may and can influence stakeholders' decision-making, including leaders (e.g., governmental, non-governmental, local, regional, international) in making environment-responsive policy frameworks and developmental roadmaps.

5 Recommendations and limitations

This paper reports a systematic review of studies on pro-environmental behaviour in the context of the Value-belief-Norm Theory published and indexed in the Scopus database. It may be relevant to look into pro-environmental behaviour studies anchored on other behavioural theories published and indexed in other recognised databases for comparison and a more holistic overview of the current state of literature. Similarly, it may be interesting to know the number of articles derived and published by the author/s of a project. Moreover, the analysis conducted for this review was limited to context-themes and study locale. It may be interesting to look into the research designs, methods of data collection, and analysis, including how the findings of different studies fit within the postulates and claims of the value-belief-norm theory. Such studies will provide an overall picture of the methodology used so far for studies on the value-belief-norm theory, unveiling and addressing existing related methodological gaps.

Further, Stern (2000) enumerated other factors that may affect or influence pro-environmental behaviour. It may be interesting to systematically review other antecedents to pro-environmental behaviour factored in by scholars in their studies. It may result in a more comprehensive and holistic theoretical framework for explaining and predicting pro-environmental behaviour. In addition, several behaviours under various context-themes reported in this study were explored and assessed. According to the pro-environmental behavioural category of the value-belief-norm theory, most pro-environmental behaviour is found in non-activist activities in both the public and private spheres. It may be interesting to explore further and capture other pro-environmental behaviour that may not fall into the established four pro-environmental behaviour categories.

On another note, environmental sustainability is one of the three aspects of sustainable development (together with social and economic sustainability), as presented in the 2030 Agenda for Sustainable Development. The spatial dimension of the 17 SDGs involves the environment. It may be necessary to explore behaviours other than those established in the literature using the value-belief-norm theory. Lastly, while indeed assessment studies are essential in informing policies and interventions, there are limited interventional studies anchored in the value-belief-norm theory. Therefore, a more robust design and implementation of interventions informed by the theory is essential.

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