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Predicting pro-environmental behavior among generation Z in Indonesia: the role of family norms and exposure to social media information

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Amidst the pressing concerns of sustainability, it is of utmost importance to prioritize the adoption of reusable bottles to combat plastic waste and encourage pro-environmental behavior (PEB). Moreover, social norms, particularly those within the family, are believed to have the potential to foster the development of PEB. The study investigates how injunctive and descriptive norms influence individuals' intentions and behaviors regarding pro-environmental behavior (PEB). Additionally, the researchers analyze the communication aspect to evaluate its significance in promoting PEB. The research entailed conducting a cross-sectional survey with 670 respondents in Indonesia who belong to the Generation Z demographic, specifically aged between 18 and 25 years old. The study results indicate that descriptive and injunctive norms are influential factors in determining individuals' intention to engage in PEB. Besides, the researchers discovered that the intention to engage in PEB is an intermediary in the correlation between descriptive and injunctive norms and PEB behaviors. Another notable finding is that the social media platform Instagram can moderate the influence of intention on PEB behaviors. The study also delves into the theoretical and practical contributions of these findings.

KEYWORDS

injunctive norms, descriptive norms, family norms, generation Z, pro-environmental behavior, information exposure, social media

1 Introduction

Indonesia faces environmental challenges, particularly in waste management. Data from the Directorate General of Waste Management, Hazardous Waste, and B3 Substances (Ditjen PSLB3) of the Ministry of Environment and Forestry (KLHK) in 2021 indicated that the amount of garbage in Indonesia reached 68.5 million tons, rising to 70 million tons in 2022 (Sekretariat Jenderal DPR-RI, 2022) and 69.9 tons in 2023 (Direktorat Penanganan Sampah, 2023). These figures have led to Indonesia being ranked as the second-highest global contributor to waste, particularly plastic waste (Priliantini et al., 2020). According to domestic waste statistics, plastic waste accounts for 17% and has increased in 2023 to 18.71% of the total waste production, ranking second and displacing paper waste to third place (Indonesia Solid Waste Association, 2022; Direktorat Penanganan Sampah, 2023). Household waste generation significantly contributes to Indonesia's high volume of plastic waste (Satispi and Aziz Samudra,

2022). Regarding the high amount of household waste, Shahbaz et al. (2022) suggest that policymakers place households at the center of promoting pro-environmental practices, as households demonstrate adopting sustainable environmental practices.

Households consist of families and communities engaged in consumption activities to meet their living needs. Consequently, family serves as a crucial reference for individuals (Teng and Wang, 2015). Moreover, people tend to discuss environmental or health issues they encounter with their families (Powell et al., 2007). It suggests that the values about the environment formed within household social interactions make family cultural values important in shaping pro-environmental behavior. Several studies have documented that parental behavior significantly influences young people's pro-environmental behavior (PEB) (Grønhøj and Thøgersen, 2017). Children can observe PEB and learn the norms held by their parents (Grønhøj and Thøgersen, 2012). Moreover, the Theory of Planned Behavior suggests that children develop attitudes toward the environment through family norms (Collado and Sorrel, 2019; Jia and Yu, 2021), and there is a strong correlation between parental communication about the environment and children's level of environmental concern (Matthies et al., 2012; Meeusen, 2014). In essence, the transmission of environmental norms within families through parental communication can influence children's level of environmental concern.

On the other hand, previous research has examined pro-environmental behaviors and found that exposure to positive information can impact intention (Rizzi et al., 2020). Consequently, findings from one study indicate that most respondents obtain environmental information primarily from television and radio (61%), with the Internet following closely behind (55%). In contrast, information from family and friends constitutes a smaller proportion (14.5%) (Karimi, 2019). Given these statements, this study explores the influence of family norms and exposure to information on individuals' intention toward engaging in pro-environmental activities.

In this attempt, this study takes a different approach compared to previous research. As researchers, we do not view information exposure as an antecedent but rather as a factor influencing the outcome. Therefore, the findings of this research can help determine the correlation between two factors that have been shown in numerous studies to impact the intention of PEB. Additionally, to our knowledge, family norms and exposure to different media sources can help improve knowledge and raise awareness about the environment. However, studies often make partial connections between these factors instead of recognizing their simultaneous mutual support. Drawing from this identified research gap, the aim of this study is to explore how exposure to information acts as a moderating variable in addressing the knowledge gap and fostering family norms concerning environmental sustainability.

2 Theoretical background and hypotheses development

2.1 Intention to engage in pro-environmental behavior and family norms

Family communication involves the exchange of information, ideas, and feelings among family members. This encompasses both nonverbal forms of communication, such as behavior, actions, body language, and facial expressions, as well as verbal forms, such as speaking, listening, and problem-solving. Additionally, effective family communication is essential for building strong relationships, supporting mental well-being, and nurturing a sense of family unity. It goes beyond simple message reception and dissemination through media within the family (Koerner and Schrodt, 2014). Instead, a typical understanding of family communication emphasizes conformity within the family, highlighting a climate of homogeneity in attitudes, values, and beliefs. This conformity allows parents to support their children in shaping their beliefs and values through open family communication (Hesse et al., 2017), including discussing the family's shared values on the significance of environmental conservation.

During the search for identity, parents may not always be the most influential figures (Grønhøj and Thøgersen, 2012). Nevertheless, the descriptive norms exhibited by families toward their children still serve as significant predictors of the intention to engage in environmentally friendly behavior (Grønhøj and Thøgersen, 2012). In this study, descriptive norms are assessed by having adolescents indicate their perceptions of their parents' engagement in daily PEB (Grønhøj and Thøgersen, 2017). For example: "How often do your parents demonstrate behavior that promotes environmental consciousness?" and "How often do members of your family demonstrate behavior that promotes environmental consciousness?"

Previous research has indicated that actions have a greater impact than words, with descriptive norms considered significant predictors of the intention to engage in environmentally friendly behavior, while norms in the form of commands (injunctive norms) do not have the same impact (Grønhøj and Thøgersen, 2012). Conversely, studies have demonstrated that adolescents are less engaged in participating in certain behaviors when they perceive disapproval from their parents (Musick et al., 2008). Additionally, parental approval (substitute norms) influences children's attitudes (Baker et al., 2003) and even moderates the influence of peer pressure (Wood et al., 2004; Grønhøj and Thøgersen, 2012).

This research is aimed at testing the role of descriptive and injunctive norms in a measurement model. By reference, injunctive norms are introduced as "subjective norms" in the theory of reasoned action and the theory of planned behavior (Collins and Spelman, 2013). Hence, in this study, the researchers assessed the impact of family injunctive norms by posing questions to participants such as: "How often do your parents encourage you to engage in environmentally friendly behavior in your daily life?" and "How often do your family members encourage you to engage in environmentally friendly behavior in your daily life?" Thus, the proposed hypothesis is:

> *H1*: Injunctive norm is positively associated with intention to engage in PEB.
>
> *H2*: Descriptive norm is positively associated with intention to engage in PEB.

Behavioral change is the ultimate target of environmental campaigns (Harywanto et al., 2021). Thus environmental researchers tend to position PEB as the final variable influenced by endogenous factors derived from several theories, such as the Theory of Planned Behavior (TPB) (Kalamas et al., 2014; Wang and Lin, 2020), the

Value-Belief-Norm (VBN) Theory (Lind et al., 2015; Fornara et al., 2020), Protection Motivation Theory (Eylering et al., 2022), Five Doors Theory (Harywanto et al., 2021), and Social Cognitive Theory (Sawitri et al., 2015). Based on this, the current study considers the PEB variable as a determinant variable, with the following hypotheses:

> *H3*: Intention to engage in PEB is positively associated with PEB.
>
> *H4*: Intention significantly mediates the correlation between descriptive and injunctive norms and PEB intention.

2.2 Pro-environmental behavior and information exposure

Aside from family and parents, children often gather information about their surroundings from various sources, including the media (Collado and Sorrel, 2019). It is important to highlight that in today's digital information age, teenagers and young people are actively engaged with social media (Apuke and Omar, 2021c; Koranteng et al., 2023). This increased engagement with social media platforms has become particularly relevant in addressing environmental issues, as seen with the issue of plastic waste in Indonesia, which has spurred numerous environmental movements. Environmental activists are now actively campaigning on social media platforms (Primayanti and Puspita, 2022). This trend aligns with the findings of Ghazali et al. (2019), who suggest that being exposed to social media can greatly contribute to promoting environmental friendliness. Furthermore, the argument is supported by evidence of the beneficial results achieved by social media campaigns targeting plastic pollution (Marazzi et al., 2020).

There are various social media platforms, including Facebook, YouTube, WhatsApp, Twitter, and Instagram (Parlina et al., 2020; Ho et al., 2022). Several studies have investigated the utilization of these social media platforms in relation to environmental matters. These platforms include Twitter (Kim and Cooke, 2018; Harywanto et al., 2021), Instagram (Manolis and Manoli, 2021; Briandana and Saleh, 2022), YouTube (Artelle et al., 2021; Baran and Stoltenberg, 2023), Facebook (Boulianne and Ohme, 2022; Huang and Mabon, 2022; Scherman et al., 2022; Doudaki and Carpentier, 2023), and WhatsApp (Barrera-Verdugo, 2023).

Social media serves as an information channel, encompassing factors such as information seeking, processing, and exposure, all of which have significant associations with behavior and behavioral intention (Corbett, 2002; Witzling et al., 2015; Rizzi et al., 2020). This study examines the utilization of different social media platforms, such as Instagram, Twitter/X, YouTube, Facebook, and WhatsApp, for exposure to information.

A number of previous studies have placed social media as a factor that contributes to the formation of norms and intentions. And to answer the call of Boerman et al. (2022) which suggests that future research could investigate the role of other mechanisms and conditions that may explain and endorse pro-environmental behavior through social media. So in this study, researchers placed social media as a moderating factor. The social media referred to in this research is exposure to information from social media. This explanation refers to Witzling et al. (2015), so this study also used statement items in the questionnaire that are in line with previous research. Consequently, the proposed hypotheses aim to establish correlations between different aspects of social media usage and their impacts on behavior and intention.

> *H5*: Exposure to information from various types of social media moderates the intention to engage in PEB toward PEB.

2.3 Pro-environmental behavior among generation Z individuals in urban settings

Generation Z (Gen Z) is the first generation to be raised entirely within the era of technology, making them naturally more comfortable and inclined toward going digital. Although no exact date is available, Gen Z is the generation born with birth years typically ranging from 1995 to 2010. Referred to as the iGeneration, they heavily rely on IT and may have limited knowledge in other areas (Linnes and Metcalf, 2017). Given this, this reliance on technology has drawn significant interest from researchers and decision-makers, particularly in understanding how Gen Z uses digital media as a source of information. They believe that this usage has a notable impact on people's behavior across various areas (Prakash Yadav and Rai, 2017). Especially as they are about to enter the productive age, coinciding with Indonesia's demographic bonus, which is estimated to have a relatively larger number of productive age population compared to the number of non-productive age population since 2015 with the peak period estimated to occur in 2020–2035.

Based on information gathered from demographic and usage analysis, it has been found that a significant number of Gen Z individuals make up the majority of tourists visiting ecotourism locations in a specific region (Persada et al., 2023). Consequently, it is not surprising that the ecotourism market is projected to target the Gen Z segment (Chin et al., 2023). Moreover, research conducted in Pakistan has shown that Gen Z represents a strategic market segment for green products. The research revealed that familiarity and consciousness regarding environmental issues positively impact Gen Z's purchase intentions to buy green apparel and eco-friendly products (Abrar et al., 2021; Le et al., 2022). Furthermore, Gen Z has demonstrated significant concern for climate change, as evidenced by their strong opinions on the matter (Henn et al., 2022). Given the significant impact of the Gen Z group on environmental sustainability, this study specifically targets this demographic.

In addition, a study delves into preferences for housing environments and the underlying motivations. Based on the findings, it is undisputed that smaller cities are preferred, followed by suburbs, rural areas, and city centers. City centers are favored for their facilities, atmosphere, liveliness, and wide range of activities (Jansen, 2020). These housing preferences have a significant impact on urbanization, which is widely acknowledged as a major challenge of the 21st century (Parikh et al., 2020). Urbanization has led to a considerable population residing in cities and urban areas. Consequently, this poses threats to the urban environment exacerbated by the daily social practices of urban communities. These practices contribute to the creation of "ungovernable" urban ecological systems (Christophersen, 2023). As a response to these challenges, cities are currently exploring innovative approaches to incorporate nature into urban landscapes (Eid et al., 2021).

Numerous studies have explored environmental issues in urban communities and areas, including research on urban thermal environments and their correlation with different forms of urban expansion in Huai'an, China (Wang et al., 2022). Additionally, there have been studies on various aspects related to the environmental conditions, attitudes, and behaviors of urban populations (Cleveland et al., 2012; Zulu and Richardson, 2013; Persson et al., 2018). Given the urgency of issues similar to those argued by previous environmental researchers, this study focuses on urban communities as its subject.

3 Materials and methods

3.1 Sample and study design

This study employed a cross-sectional survey research design by distributing online questionnaire to the urban population in Indonesia, specifically targeting Generation Z individuals aged 18–25 years old. The survey was conducted using a structured questionnaire as a data collection instrument during the period June to July 2023. Previously, the questionnaire had been submitted and received approval for ethical clearance from the research ethics commission. Additionally, each respondent read and agreed to the informed consent prior to filling out the questionnaire. The study utilized convenience sampling techniques to distribute questionnaires through social media platforms in order to reach the target population. Furthermore, respondents were requested to help disseminate the questionnaire within their networks. Through this strategy, this study were able to collect complete responses from 670 respondents whose data were deemed valid. This number was obtained after the researcher eliminated a number of responses that had straight lining issues (Hair et al., 2017).

3.2 Measurement

This study measured all observed constructs using a 7-point Likert scale and took each measurement from prior studies and modified them to suit the specific context of our research. The injunctive norm was adapted from Grønhøj and Thøgersen (2017), with example items such as "How often do your parents encourage you to engage in environmentally friendly behavior in your daily life?" "How often do family members encourage you to engage in environmentally friendly behavior in your daily life?" and "How often does your family encourage you to pay more attention to environmental issues?"

To measure the descriptive norm, this research also adapted from Grønhøj and Thøgersen (2017) with example items such as "How often do your parents demonstrate behavior that promotes environmental concern?" and "How often do your family members demonstrate behavior that promotes environmental concern?" The items measuring intention were adopted from Alzubaidi et al. (2021), for example: "I intend to pay more attention to environmental sustainability in the future," "I will strive to be more concerned about environmental sustainability in the future," and "I plan to be more active in preserving environmental sustainability in the future."

Measurement of PEB is assessed using the question, "In daily life, do you usually bring a tumbler?" with responses of Yes and No (Fadilla et al., 2021). The "Yes" answer is coded as 1 and "No" as 0. This study uses PLS-SEM which can be applied to metric, quasi-metric (ordinal) and, binary coded (Hair et al., 2017). This study also focuses on measuring one of the pro-environmental behaviors, namely bringing a tumbler as a drinking bottle. In the Indonesian context, bringing a tumbler as a drinking bottle to reduce the use of plastic is one of the measures being intensified by the Indonesian government and various parties to reduce single-use plastic consumption (Aufiana, 2024). Lastly, this study also adapted items measuring exposure to various social media from Witzling et al. (2015), for instance: "How long do you access social media per day?" and "How often do you receive information about the environment through social media?

3.3 Data analysis

This study utilized Partial Least Squares-Structural Equation Modeling (PLS-SEM) to analyze data. PLS is well suited for exploratory studies like this (Apuke and Omar, 2021b), related to the exploratory nature of our research (Apuke and Omar, 2021a) and suitable for a complex modeling (Omar et al., 2023). The research delineated the research model to ascertain both the measurement and structural models. Subsequently, the study utilized the PLS Algorithm to evaluate the measurement model, ensuring the validity and reliability of the measurement instrument. Meanwhile, the research conducted a structural model evaluation utilizing bootstrapping with 5,000 sample replications to assess the significance of relationships and address the formulated hypotheses.

4 Results and discussion

4.1 Measurement model

The results of the measurement model assessment indicate that convergent and discriminant validity for the items and measurement constructs are satisfactory and meet the required standards. There are no issues with construct reliability as the values of Cronbach's alpha (α) and composite reliability (CR) exceed the threshold standards, mostly above 0.7. Moreover, convergent validity is considered good as the outer loading values and Average Variance Extracted (AVE) meet the threshold standards, each exceeding 0.7 and 0.5, respectively (refer to Table 1). Moreover, discriminant validity is deemed satisfactory, as indicated by the Fornell-Larcker criterion, which demonstrates that the correlation values between constructs consistently exceed the correlations with other constructs (see Table 2).

4.2 Structural model (direct effect, mediation, and moderation)

The findings of the structural model evaluation through bootstrapping (see Table 3; Figure 1) indicate that the intention for PEB is significantly predicted by the injunctive norm ($\beta = 0.138$, $p < 0.001$). These findings support H1. The research findings also reveal that the descriptive norm can predict the intention for PEB

TABLE 1 Convergent validity and reliability.

Construct	Item	Outer loading	AVE	α	CR
Injunctive norm	INORM1	0.757	0.591	0.696	0.812
	INORM2	0.760			
	INORM3	0.788			
Descriptive norm	DESCNORM1	0.886	0.759	0.683	0.863
	DESCNORM2	0.856			
Intention to use (INT)	INT1	0.891	0.774	0.852	0.911
	INT2	0.923			
	INT3	0.822			
Instagram (IG)	IG1	0.877	0.868	0.874	0.929
	IG2	0.984			
Twitter/X (TW)	TW1	0.911	0.894	0.894	0.944
	TW2	0.979			
YouTube (YT)	YT1	0.793	0.813	0.862	0.895
	YT2	0.998			
Facebook (FB)	FB1	0.755	0.774	0.787	0.871
	FB2	0.989			
WhatsApp (WA)	WA1	0.781	0.796	0.817	0.885
	WA2	0.991			

TABLE 2 Discriminant validity.

Construct	1	2	3	4	5	6	7	8	9
(1) Injunctive norm	**0.769**								
(2) Descriptive norm	0.710	**0.871**							
(3) Intention	0.518	0.634	**0.880**						
(4) PEB	0.273	0.274	0.428	**1.000**					
(5) Instagram	0.230	0.133	0.181	0.150	**0.932**				
(6) Twitter/X	0.155	0.076	0.148	0.164	0.492	**0.946**			
(7) YouTube	0.216	0.094	0.172	0.127	0.607	0.480	**0.902**		
(8) Facebook	0.245	0.135	0.206	0.156	0.433	0.376	0.462	**0.880**	
(9) WhatsApp	0.304	0.203	0.256	0.162	0.653	0.454	0.546	0.500	**0.892**

TABLE 3 Structural model result.

Path coefficient	β	*P*-values	Decision
Injunctive norms ➔ Intention	0.138***	0.001	Supported
Descriptive norms ➔ Intention	0.535***	0.000	Supported
Intention ➔ PEB	0.402***	0.000	Supported
Descriptive norms ➔ Intention ➔ PEB	0.212***	0.000	Supported
Injunctive norms ➔ Intention ➔ PEB	0.055***	0.002	Supported
Intention*Instagram ➔ PEB	0.059*	0.050	Supported
Intention*Twitter/X ➔ PEB	0.037	0.250	Not Supported
Intention*YouTube ➔ PEB	0.043	0.168	Not Supported
Intention*Facebook ➔ PEB	0.050	0.105	Not Supported
Intention*WhatsApp➔ PEB	−0.106	0.044	Not Supported

*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.

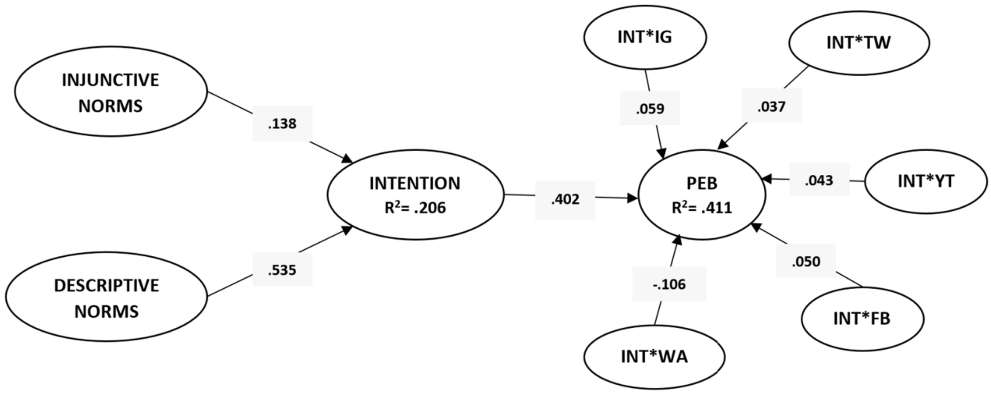

FIGURE 1
Structural model for PEB.

($\beta = 0.535$, $p < 0.001$). Therefore, H2 is accepted. The research findings indicate that the intention for PEB can predict PEB ($\beta = 0.402$, $p < 0.001$), and H3 is accepted. H4 is also fully accepted as the intention for PEB significantly mediates the influence of descriptive norm ($\beta = 0.212$, $p < 0.001$) and injunctive norm on PEB ($\beta = 0.055$, $p < 0.001$). Finally, this study also reveals that the influence of intention for PEB on PEB is moderated by Instagram ($\beta = 0.059$, $p < 0.05$), Twitter/X ($\beta = 0.037$, $p > 0.05$), YouTube ($\beta = 0.043$, $p > 0.05$), Facebook ($\beta = 0.050$, $p > 0.05$), and WhatsApp ($\beta = -0.106$, $p > 0.05$). Therefore, H5 is partially accepted. Overall, the tested model explains 20.6% of the variance in PEB and 41.1% of the variance in intention for PEB. Both of these variances can be considered substantial.

4.3 Discussion

Our study contributes to strengthening the literature by corroborating previous research findings that family norm factors significantly influence adolescents' intention to engage in Pro-Environmental Behavior (PEB). Both injunctive and descriptive norm factors prevalent within their families motivate adolescents to develop an intention to engage in pro-environmental behavior, along with exposure factors from various media moderating the relationship between adolescents' intention and actual pro-environmental behavior. In this regard, our research results extend studies suggesting that PEB can be influenced by environmental concern factors (Alzubaidi et al., 2021), personal norms (Ghazali et al., 2019), and social norms (Fang et al., 2017). Furthermore, our findings reinforce studies indicating that family norms influence children's intentions (Rhodes et al., 2014; Aittasalo et al., 2019). Dominant family norms at least account for the variance in adolescents' environmental attitudes (Grønhøj and Thøgersen, 2012). Hence, it is imperative to emphasize family norms when raising awareness about certain values (Soon et al., 2021). Consequently, the norm activation model can be employed to foster children's pro-environmental behaviors (Matthies et al., 2012).

Although there have been several similar studies exploring the correlation between family norms and the intention to engage in Pro-Environmental Behavior (PEB) in children or adolescents, previous studies tend to approach this concept by analyzing each dimension individually and linking them together based on existing models or theories. For instance, studies have shown that social norms, including those within the family, can have an impact on adolescent behaviors (Wang et al., 2019). Additionally, research has found a significant correlation between social norms and experiences in nature (Oh et al., 2021; Yenrizal, 2021). Moreover, it has been observed that family norms play a significant role in shaping adolescent pro-environmental attitudes and behaviors (Grønhøj and Thøgersen, 2017). Based on this literature, one way to promote environmental conservation is by communicating family norms to children. Discussing the environment with family members plays a crucial role in shaping children's pro-environmental beliefs (Meeusen, 2014).

The findings of this study contribute to the existing body of research, further enhancing our understanding of the subject matter, specifically the impact of information exposure. The exposure to information significantly influences adolescents' intentions to engage in Pro-Environmental Behavior (PEB). This study discovered that information exposure from various media sources has different moderating strengths. After analyzing the results, it became evident that certain media have a significant moderating impact while others do not. Additionally, some media can either have a positive or negative effect as moderators. This suggests that our study has uncovered important findings about the impact of information exposure from various media sources on PEB, and this factor constitutes the main contribution of this research. Based on these findings, our study has provided answers to the hypotheses proposed, indicating that injunctive and descriptive norms within the family significantly predict adolescents' intention to engage in PEB, while information exposure from various media sources exhibits varying strengths in moderating intention into behavior.

Community education is paramount in prevention strategies (Omar et al., 2023; Ren et al., 2023), encompassing efforts to mitigate environmental harm. Therefore, educating adolescents constitutes a crucial component of environmental communication strategies (Kadiyono et al., 2019; Subekti et al., 2019). Adolescents are the group in society that will hold the baton of development, including environmental preservation. Research has shown that subjective

norms (including parental approval and modeling) have a strong relationship with children's intentions (Kahlor et al., 2020), particularly the descriptive norm manifested in their parents' behavior (Grønhøj and Thøgersen, 2012).

Moreover, media exposure pertains to the frequency of environmental information dissemination through various media channels. This is a persuasive strategy commonly employed by the media (Yang et al., 2022). In family life, communication technology plays a diverse role (Barrie et al., 2019), especially in multi-generational families. Given that each digital generation responds differently to media and information (Dida et al., 2021; Suratnoaji et al., 2022), it is necessary to develop strategies for determining information and selecting media. These strategies aim to disseminate environmental messages to different digital generations, including Gen Z.

Literature on media and information as significant mediators among the tested variables has been supported by previous researchers (Tey et al., 2022; Yang et al., 2022; Xin and Ma, 2023). Additionally, concerning media exposure, which has also been proven to significantly influence behavior (He et al., 2023; Satriadi et al., 2023), this research findings align with the assertion that media exposure strategies need to be differentiated to strengthen intentions (Koo et al., 2016). Consequently, each media has its specificity in influencing something. For example, this research demonstrates that information exposure from Instagram can moderate the effect of intention to engage in pro-environmental behavior (PEB) among Gen Z in urban areas.

Several reasons support why Instagram is able to moderate whereas other social media cannot. The first reason is Instagram's suitability for generation Z. Instagram's aesthetic features attract the attention of generation Z users (Jambulingam et al., 2018) and content on Instagram that is entertaining, informative and allows users to share experiences is considered to meet Gen Z's need to explore and increase engagement (Lu and Lin, 2022). Furthermore, the second reason is the connection between Instagram and environmental issues. Promoting environmental sustainability through the use of captivating visuals and informative content on Instagram has received a positive response and increased environmental awareness (Hoai Lan et al., 2024). These findings are also supported by research results which state that Instagram has proven to be effective in eco-friendly marketing, and increasing awareness about environmental sustainability (Šikić, 2021).

4.4 Implications

Our study revealed that descriptive norms exert a greater influence on the intention to participate in pro-environmental behavior (PEB) compared to injunctive norms. Consequently, this research supports Grønhøj and Thøgersen (2012) statement that "Action speaks louder than words," which elucidates the motivation for pro-environmental actions rooted in descriptive family norms (Grønhøj and Thøgersen, 2017). Additionally, parental descriptive norms not only act as direct predictors of children's pro-environmental behavior but also influence children's social and personal norms (Matthies et al., 2012). These findings significantly contribute to the collective understanding in the fields of family communication and environmental communication. Furthermore, they provide new insights that predecessors are not only obligated to pass down environmental stewardship but also have a responsibility to transmit values about the environment through exemplary behavior to their successors.

Furthermore, prior research findings have indicated that exposure to social media can positively influence environmental friendliness or the management of plastic pollution (Ghazali et al., 2019; Marazzi et al., 2020). Building on these insights, our study both supports and adds to these findings. Specifically, this study found that not every type of social media can effectively drive intentions to engage in pro-environmental behavior (PEB) into actual behavior. Therefore, it is crucial that every environmental initiative carefully and efficiently selects social media platforms for tailored campaigns targeting the primary audience segment such as generation Z. For example, our research reveals that while platforms like YouTube, Twitter/X, and Facebook have the potential to encourage intentions to engage in PEB among urban Gen Z individuals, only Instagram has been proven to moderate this effect significantly.

Based on these findings; while not disregarding the influence of injunctive norms, the study underscores the significance of descriptive norms in shaping the intentions of Generation Z individuals to participate in Pro-Environmental Behavior (PEB) presently. Moreover, while these findings may evolve as individuals undergo psychological development with aging and experience, Generation Z is presently perceived to be more cognizant of ecological issues and motivated to participate in pro-environmental behaviors. Additionally, they are more inclined to embrace environmentally friendly consumer attitudes (Chaturvedi et al., 2020; Abrar et al., 2021). Given these circumstances, this situation presents a greater opportunity for parents to instill bold pro-environmental values in their teenage children through role modeling.

Furthermore, regarding the social media platform Instagram, the practical implications of this research involve offering insights to activists, organizations, and stakeholders in the realm of environmental sustainability about the types of social media platforms that are more effective in conveying environmental messages. These implications are supported by studies conducted in Indonesia, which also suggest that utilizing Instagram proves effective in delivering environmental campaign messages relevant to adolescents (Briandana and Saleh, 2022) and urban communities (Redyantanu et al., 2022). Therefore, the findings of this study can provide valuable insights for stakeholders, and communities invested in environmental issues, particularly those targeting the younger demographic in urban areas. This includes educational institutions in utilizing the role of social media and integrating communication messages about environmental awareness in their educational materials in both formal and non-formal curricula from elementary level.

Apart from educational institutions, social actors, environmental associations and the media as relevant target audiences, the government is the main institution that has the obligation to encourage society to have environmental awareness (Marsili et al., 2023). Unfortunately, in 2023 Indonesia has recorded imports of plastic waste exceeding 252 thousand tons. Policies like this are actually counterproductive to the #beatplasticpollution campaign activities carried out by the Ministry of Environment and Forestry (KLHK) in the same year. Therefore, there must be policy alignment and strategic decision making (Alarcón-Ferrari et al., 2024) among

ministerial institutions regarding environmental issues in order to achieve the SDG's goals.

4.5 Limitations

This study has several limitations. Firstly, although it met the required sample size, the total of 670 respondents is relatively small compared to the 75.49 million Gen Z individuals in Indonesia, constituting 27.94% of the total population based on the 2020 census (Rakhmah, 2021). Hence, future research may contemplate enlarging the sample size to better mirror large-scale studies.

Secondly, the findings of this research are derived from a survey conducted within a specific generational group in a particular region, thereby limiting the ability to draw broader conclusions. Consequently, future studies are needed to explore family norms and information exposure among different characteristics of the digital generation and across various regions over different time frames to better understand the variables linked in this research over time. These recommendations reinforce the call from previous research for further investigation into changing norms and the long-term impacts of social media platforms involving Gen Z as a whole (Prakash Yadav and Rai, 2017). Lastly, we acknowledge the limitations of our Cross-sectional electronic survey questionnaire for data collection method. Referring to Hair et al. (2017) to minimize bias, it would be better if the demographic composition of the respondent sample were close to the demographic composition of the population to be more representative by emphasizing testing of research model development.

5 Conclusion

Our study offers insights into potential solutions to tackle the escalating threat to environmental sustainability. As a result, the implications suggest that both injunctive and descriptive norms can predict the development of intention to participate in Pro-Environmental Behavior (PEB), subsequently influencing the enactment of PEB. Moreover, the research findings indicate that descriptive norms, characterized by setting examples, have a greater influence than injunctive norms, which merely provide recommendations or commands to individuals to adopt PEB. Furthermore, it is also concluded that exposure to social media, particularly Instagram, can moderate the intention to enhance the emergence of PEB. Additionally, this research supports the view that PEB is crucial and must be widely implemented as it can significantly contribute to environmental sustainability. The study demonstrates that humans are key players in stopping the threat to environmental sustainability by possessing adequate knowledge and skills to implement pro-environmental behavior. Finally, the current research lays the foundation for future investigations that will explore more deeply PEB involving a number of factors such as norm formation resulting through family communication and social media use. In addition, this study calls for future research to be conducted using a sample composition that more specifically reflects the composition of the population or other sampling techniques.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

The studies involving humans were approved by the Universitas Padjadjaran (with Reference Number 667/UN6.KEP/EC/2023). The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study.

Author contributions

JS: Conceptualization, Data curation, Funding acquisition, Methodology, Resources, Supervision, Writing – original draft, Writing – review & editing. HH: Conceptualization, Investigation, Methodology, Software, Validation, Writing – original draft, Writing – review & editing. KA: Formal analysis, Methodology, Software, Visualization, Writing – original draft, Writing – review & editing. AP: Project administration, Writing – original draft, Writing – review & editing, Resources.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's note

References

Abrar, M., Sibtain, M. M., and Shabbir, R. (2021). Understanding purchase intention towards eco-friendly clothing for generation Y &Z. *Cogent Bus. Manag.* 8:1997247. doi: 10.1080/23311975.2021.1997247

Aittasalo, M., Jussila, A. M., Tokola, K., Sievänen, H., Vähä-Ypyä, H., and Vasankari, T. (2019). Kids out; evaluation of a brief multimodal cluster randomized intervention integrated in health education lessons to increase physical activity and reduce sedentary behavior among eighth graders. *BMC Public Health* 19:415. doi: 10.1186/s12889-019-6737-x

Alarcón-Ferrari, C., Jönsson, M., Do, T., Gebrehiwot, S. G., Chiwona-Karltun, L., Mark-Herbert, C., et al. (2024). Analyzing environmental communication and citizen science in the context of environmental monitoring and assessment for agenda 2030 in rural settings of Chile and Sweden. *Front. Commun.* 9:1387111. doi: 10.3389/fcomm.2024.1387111

Alzubaidi, H., Slade, E. L., and Dwivedi, Y. K. (2021). Examining antecedents of consumers' pro-environmental behaviours: TPB extended with materialism and innovativeness. *J. Bus. Res.* 122, 685–699. doi: 10.1016/j.jbusres.2020.01.017

Apuke, O. D., and Omar, B. (2021a). Social media affordances and information abundance: enabling fake news sharing during the COVID-19 health crisis. *Health Informatics J.* 27. doi: 10.1177/14604582211021470

Apuke, O. D., and Omar, B. (2021b). User motivation in fake news sharing during the COVID-19 pandemic: an application of the uses and gratification theory. *Online Inf. Rev.* 45, 220–239. doi: 10.1108/OIR-03-2020-0116

Apuke, O. D., and Omar, B. (2021c). What drives news sharing behaviour among social media users? A relational communication model from the social capital perspective. *Int. Sociol.* 36, 339–361. doi: 10.1177/0268580920961323

Artelle, K. A., Adams, M. S., Bryan, H. M., Darimont, C. T., Housty, J., Housty, W. G., et al. (2021). Decolonial model of environmental management and conservation: insights from indigenous-led grizzly bear stewardship in the great bear rainforest. *Ethics Policy Environ.* 24, 283–323. doi: 10.1080/21550085.2021.2002624

Aufiana, N. R. (2024). Kurangi Limbah Plastik dengan Menggunakan Tumbler untuk Minum. RRI.co.id. Available at: https://www.rri.co.id/lain-lain/724196/kurangi-limbah-plastik-dengan-menggunakan-tumbler-untuk-minum (Accessed November 22, 2024).

Baker, C. W., Little, T. D., and Brownell, K. D. (2003). Predicting adolescent eating and activity behaviors: the role of social norms and personal agency. *Health Psychol.* 22, 189–198. doi: 10.1037/0278-6133.22.2.189

Baran, Z., and Stoltenberg, D. (2023). Tracing the emergent field of digital environmental and climate activism research: a mixed-methods systematic literature review. *Environ. Commun.* 17, 453–468. doi: 10.1080/17524032.2023.2212137

Barrera-Verdugo, G. (2023). The link between social media exposure and students' moral reasoning and environmental concern: a generational analysis in Chile. *Cogent Soc. Sci.* 9:2167570. doi: 10.1080/23311886.2023.2167570

Barrie, C. K., Bartkowski, J. P., and Haverda, T. (2019). The digital divide among parents and their emerging adult children: intergenerational accounts of technologically assisted family communication. *Soc. Sci.* 8:83. doi: 10.3390/socsci8030083

Boerman, S. C., Meijers, M. H. C., and Zwart, W. (2022). The importance of influencer-message congruence when employing Greenfluencers to promote pro-environmental behavior. *Environ. Commun.* 16, 920–941. doi: 10.1080/17524032.2022.2115525

Boulianne, S., and Ohme, J. (2022). Pathways to environmental activism in four countries: social media, environmental concern, and political efficacy. *J. Youth Stud.* 25, 771–792. doi: 10.1080/13676261.2021.2011845

Briandana, R., and Saleh, M. S. M. (2022). Implementing environmental communication strategy towards climate change through social Media in Indonesia. *Online J. Commun. Media Technol.* 12:e202234. doi: 10.30935/ojcmt/12467

Chaturvedi, P., Kulshreshtha, K., and Tripathi, V. (2020). Investigating the determinants of behavioral intentions of generation Z for recycled clothing: an evidence from a developing economy. *Young Consum.* 21, 403–417. doi: 10.1108/YC-03-2020-1110

Chin, S. W. L., Hassan, N. H., and Yong, G. Y. (2023). The new ecotourists of the 21st century: Brunei as a case study. *Cogent Soc. Sci.* 9:2191444. doi: 10.1080/23311886.2023.2191444

Christophersen, A. (2023). Medieval urban environment: between mental and material practices. *Environ. Archaeol.* 28, 12–21. doi: 10.1080/14614103.2021.1916374

Cleveland, M., Kalamas, M., and Laroche, M. (2012). "It's not easy being green": exploring green creeds, green deeds, and internal environmental locus of control. *Psychol. Mark.* 29, 293–305. doi: 10.1002/mar.20522

Collado, S., and Sorrel, M. A. (2019). Children's environmental moral judgments: variations according to type of victim and exposure to nature. *J. Environ. Psychol.* 62, 42–48. doi: 10.1016/j.jenvp.2019.02.005

Collins, S. E., and Spelman, P. J. (2013). Associations of descriptive and reflective injunctive norms with risky college drinking. *Psychol. Addict. Behav.* 27, 1175–1181. doi: 10.1037/a0032828

Corbett, J. B. (2002). Motivations to participate in riparian improvement programs: applying the theory ofPlanned behavior. *Sci. Commun.* 23, 243–263. doi: 10.1177/107554700202300303

Dida, S., Hafiar, H., Kadiyono, A. L., and Lukman, S. (2021). Gender, education, and digital generations as determinants of attitudes toward health information for health workers in West Java, Indonesia. *Heliyon* 7:e05916. doi: 10.1016/j.heliyon.2021.e05916

Direktorat Penanganan Sampah (2023). Sistem Informasi Pengelolaan Sampah Nasional: SIPSN. Kementeri. Lingkung. Hidup dan Kehutan. Available at: https://ppid.menlhk.go.id/berita/siaran-pers/7818/klhk-ajak-masyarakat-gaya-hidup-minim-sampah-dalam-festival-like-2#:~:text=MenurutdataSIPSN%2Ctimbulansampah,plastiksebesar18%2C71%25 (Accessed November 22, 2024).

Doudaki, V., and Carpentier, N. (2023). Behind the narratives of climate change denial and rights of nature: sustainability and the ideological struggle between anthropocentrism and ecocentrism in two radical Facebook groups in Sweden. *J. Polit. Ideol.* 1–20. doi: 10.1080/13569317.2023.2196506

Eid, S., Khalifa, M., and Abd Elrahman, A. S. (2021). Biophilic perceptions in the urban waterfront: analytical study of the Nile waterfront in Central Cairo. *HBRC J.* 17, 19–39. doi: 10.1080/16874048.2021.1872052

Eylering, A., Büscher, M., Funk, M., Boldt, J., and Fiebelkorn, F. (2022). Willingness of the German population to donate toward bird conservation: an application of the protection motivation theory. *Glob. Ecol. Conserv.* 38:e02176. doi: 10.1016/j.gecco.2022.e02176

Fadilla, F. O., Raida, H. A., Haq, D. U., and Muwarni, I. A. (2021). Predicting intention to use tumbler in music festival using extended theory of planned behavior. *J. Res. Mark.* 12, 905–917.

Fang, W.-T., Ng, E., Wang, C.-M., and Hsu, M.-L. (2017). Normative beliefs, attitudes, and social norms: people reduce waste as an index of social relationships when spending leisure time. *Sustain. For.* 9:1696. doi: 10.3390/su9101696

Fornara, F., Molinario, E., Scopelliti, M., Bonnes, M., Bonaiuto, F., Cicero, L., et al. (2020). The extended value-belief-norm theory predicts committed action for nature and biodiversity in Europe. *Environ. Impact Assess. Rev.* 81:106338. doi: 10.1016/j.eiar.2019.106338

Ghazali, E. M., Nguyen, B., Mutum, D. S., and Yap, S.-F. (2019). Pro-environmental behaviours and value-belief-norm theory: assessing unobserved heterogeneity of two ethnic groups. *Sustain. For.* 11:3237. doi: 10.3390/su11123237

Grønhøj, A., and Thøgersen, J. (2012). Action speaks louder than words: the effect of personal attitudes and family norms on adolescents' pro-environmental behaviour. *J. Econ. Psychol.* 33, 292–302. doi: 10.1016/j.joep.2011.10.001

Grønhøj, A., and Thøgersen, J. (2017). Why young people do things for the environment: the role of parenting for adolescents' motivation to engage in pro-environmental behaviour. *J. Environ. Psychol.* 54, 11–19. doi: 10.1016/j.jenvp.2017.09.005

Hair, J. F., Hult, G. T. M., Ringle, C. M., and Sarstedt, M. (2017). A primer on partial least squares structural equation modeling (PLS-SEM). *2nd* Edn. Thousand Oaks, CA: Sage Publications.

Harywanto, G. N., Veron, J. S., and Suhartono, D. (2021). An annotated dataset for identifying behaviour change based on five doors theory under coral bleaching phenomenon on twitter. *Data Br.* 39:107617. doi: 10.1016/j.dib.2021.107617

He, R., He, J., and Zhang, H. (2023). Generational differences in the relationship between media exposure and health behaviors during COVID-19 pandemic. *Front. Psychol.* 14:1039122. doi: 10.3389/fpsyg.2023.1039122

Henn, M., Sloam, J., and Nunes, A. (2022). Young cosmopolitans and environmental politics: how postmaterialist values inform and shape youth engagement in environmental politics. *J. Youth Stud.* 25, 709–729. doi: 10.1080/13676261.2021.1994131

Hesse, C., Rauscher, E. A., Goodman, R. B., and Couvrette, M. A. (2017). Reconceptualizing the role of conformity behaviors in family communication patterns theory. *J. Fam. Commun.* 17, 319–337. doi: 10.1080/15267431.2017.1347568

Ho, S. S., Tan, W., Goh, T. J., and Tandoc, E. C. (2022). Communicating the future of energy use: qualitative insights into the efforts of environmental groups in Indonesia, Malaysia, and Singapore. *Environ. Commun.* 16, 589–597. doi: 10.1080/17524032.2022.2107553

Hoai Lan, D., Minh Tung, T., Thi Kim Oanh, V., and Thi Kim Cuc, T. (2024). The role of virtual influencers in environmental messaging: a case study of Noonoouri. *Environ. Sociol.* 1–21, 1–21. doi: 10.1080/23251042.2024.2408702

Huang, Y. C., and Mabon, L. (2022). Making sense of how proponents conspire to thwart environmental impact assessment processes: insights from the Miramar resort controversy in Taiwan. *J. Environ. Plan. Manag.* 65, 1685–1707. doi: 10.1080/09640568.2021.1944846

Indonesia Solid Waste Association (2022). Fenomena Sampah Plastik di Indonesia, Indones: Solid Waste Association.

Jambulingam, M., Francis, J., and Dorasamy, M. (2018). What is generation Zs' preferred social media network?, in 2018 Fourth International Conference on Advances in Computing, Communication & Automation (ICACCA), (Subang Jaya, Malaysia: IEEE), 1–4. Available at: https://ieeexplore.ieee.org/xpl/conhome/1815884/all-proceedings

Jansen, S. J. T. (2020). Urban, suburban or rural? Understanding preferences for the residential environment. *J. Urban.* 13, 213–235. doi: 10.1080/17549175.2020.1726797

Jia, F., and Yu, H. (2021). Action, communication, and engagement: how parents "ACE" Children's pro-environmental behaviors. *J. Environ. Psychol.* 74:101575. doi: 10.1016/j.jenvp.2021.101575

Kadiyono, A. L., Harding, D., Hafiar, H., Nugraha, Y., Mamun, T. N., Siswadi, A. G. P., et al. (2019). The introduction of green technology in increasing green ethos among students. *J. Phys. Conf. Ser.* 1175:012170. doi: 10.1088/1742-6596/1175/1/012170

Kahlor, L. A., Olson, H. C., Markman, A. B., and Wang, W. (2020). Avoiding trouble: exploring environmental risk information avoidance intentions. *Environ. Behav.* 52, 187–218. doi: 10.1177/0013916518799149

Kalamas, M., Cleveland, M., and Laroche, M. (2014). Pro-environmental behaviors for thee but not for me: green giants, green gods, and external environmental locus of control. *J. Bus. Res.* 67, 12–22. doi: 10.1016/j.jbusres.2013.03.007

Karimi, S. (2019). Pro-environmental Behaviours among agricultural students: an examination of the value-belief-norm theory. *SSRN Electron. J.* 21, 249–263. doi: 10.2139/ssrn.3398141

Kim, S. C., and Cooke, S. L. (2018). Environmental framing on twitter: impact of Trump's Paris agreement withdrawal on climate change and ocean acidification dialogue. *Cogent Environ. Sci.* 4, 1–19. doi: 10.1080/23311843.2018.1532375

Koerner, A. F., and Schrodt, P. (2014). An introduction to the special issue on family communication patterns theory. *J. Fam. Commun.* 14, 1–15. doi: 10.1080/15267431.2013.857328

Koo, C., Joun, Y., Han, H., and Chung, N. (2016). A structural model for destination travel intention as a media exposure: belief-desire-intention model perspective. *Int. J. Contemp. Hosp. Manag.* 28, 1338–1360. doi: 10.1108/IJCHM-07-2014-0354

Koranteng, F. N., Wiafe, I., Katsriku, F. A., and Apau, R. (2023). Understanding trust on social networking sites among tertiary students: an empirical study in Ghana. *Appl. Comput. Informatics* 19, 209–225. doi: 10.1016/j.aci.2019.07.003

Le, T. D., Duc Tran, H., and Hoang, T. Q. H. (2022). Ethically minded consumer behavior of generation Z in Vietnam: the impact of socialization agents and environmental concern. *Cogent Bus. Manag.* 9:2102124. doi: 10.1080/23311975.2022.2102124

Lind, H. B., Nordfjærn, T., Jørgensen, S. H., and Rundmo, T. (2015). The value-belief-norm theory, personal norms and sustainable travel mode choice in urban areas. *J. Environ. Psychol.* 44, 119–125. doi: 10.1016/j.jenvp.2015.06.001

Linnes, C., and Metcalf, B. (2017). iGeneration and their acceptance of technology. *Int. J. Manag. Inf. Syst.* 21, 11–26. doi: 10.19030/ijmis.v21i2.10073

Lu, J. E., and Lin, J. E. (2022). Computers in human behavior reports exploring uses and gratifications and psychological outcomes of engagement with Instagram stories. *Comput. Hum. Behav. Reports* 6:100198. doi: 10.1016/j.chbr.2022.100198

Manolis, E. N., and Manoli, E. N. (2021). Raising awareness of the sustainable development goals through ecological projects in higher education. *J. Clean. Prod.* 279:123614. doi: 10.1016/j.jclepro.2020.123614

Marazzi, L., Loiselle, S., Anderson, L. G., Rocliffe, S., and Winton, D. J. (2020). Consumer-based actions to reduce plastic pollution in rivers: a multi-criteria decision analysis approach. *PLoS One* 15, e0236410–e0236415. doi: 10.1371/journal.pone.0236410

Marsili, D., Pasetto, R., and Iavarone, I. (2023). Environmental public health communication to engage stakeholders and foster social capacity in poorly involved communities living in industrial contaminated sites: the case study of Porto Torres (Italy). *Front. Commun.* 8:1217427. doi: 10.3389/fcomm.2023.1217427

Matthies, E., Selge, S., and Klöckner, C. A. (2012). The role of parental behaviour for the development of behaviour specific environmental norms - the example of recycling and re-use behaviour. *J. Environ. Psychol.* 32, 277–284. doi: 10.1016/j.jenvp.2012.04.003

Meeusen, C. (2014). The intergenerational transmission of environmental concern: the influence of parents and communication patterns within the family. *J. Environ. Educ.* 45, 77–90. doi: 10.1080/00958964.2013.846290

Musick, K., Seltzer, J. A., and Schwartz, C. R. (2008). Neighborhood norms and substance use among teens. *Soc. Sci. Res.* 37, 138–155. doi: 10.1016/j.ssresearch.2007.02.003

Oh, R. R. Y., Fielding, K. S., Nghiem, L. T. P., Chang, C. C., Carrasco, L. R., and Fuller, R. A. (2021). Connection to nature is predicted by family values, social norms and personal experiences of nature. *Glob. Ecol. Conserv.* 28:e01632. doi: 10.1016/j.gecco.2021.e01632

Omar, B., Apuke, O. D., and Nor, Z. M. (2023). The intrinsic and extrinsic factors predicting fake news sharing among social media users: the moderating role of fake news awareness. *Curr. Psychol.* 43, 1235–1247. doi: 10.1007/s12144-023-04343-4

Parikh, P., Bisaga, I., Loggia, C., Georgiadou, M. C., and Ojo-Aromokudu, J. (2020). Barriers and opportunities for participatory environmental upgrading: case study of Havelock informal settlement, Durban. *City Environ. Interact.* 5:100041. doi: 10.1016/j.cacint.2020.100041

Parlina, A., Ramli, K., and Murfi, H. (2020). Theme mapping and bibliometrics analysis of one decade of big data research in the scopus database. *Information* 11, 1–26. doi: 10.3390/info11020069

Persada, S. F., Prasetyo, Y. T., Maharani, I. G. A. P., Apriyansyah, B., Ong, A. K. S., Young, M. N., et al. (2023). How tourists reacted to ecotourism during COVID-19: insights on its sustainability from a multivariate analysis based on the case of Banyuwangi. *Sustain. For.* 15:1440. doi: 10.3390/su15021440

Persson, P., Pyko, A., Lind, T., Bellander, T., Östenson, C.-G., Pershagen, G., et al. (2018). Urban residential greenness and adiposity: a cohort study in Stockholm County. *Environ. Int.* 121, 832–841. doi: 10.1016/j.envint.2018.10.009

Powell, M., Dunwoody, S., Griffin, R., and Neuwirth, K. (2007). Exploring lay uncertainty about an environmental health risk. *Public Underst. Sci.* 16, 323–343. doi: 10.1177/0963662507074491

Prakash Yadav, G., and Rai, J. (2017). The generation Z and their social media usage: a review and a research outline. *Glob. J. Enterp. Inf. Syst.* 9:110. doi: 10.18311/gjeis/2017/15748

Priliantini, A., Krisyanti, K., and Situmeang, I. V. (2020). Pengaruh Kampanye #PantangPlastik terhadap Sikap Ramah Lingkungan. *J. Komunika J. Komunikasi, Media dan Inform* 9:40. doi: 10.31504/komunika.v9i1.2387

Primayanti, N. W., and Puspita, V. (2022). Local wisdom narrative in environmental campaign. *Cogent Arts Humanit.* 9:2090062. doi: 10.1080/23311983.2022.2090062

Rakhmah, D. N. (2021). Gen Z Dominan, Apa Maknanya bagi Pendidikan Kita? Kementeri: Pendidik. dan Kebud.

Redyantanu, B. P., Yatmo, Y. A., and Atmodiwirjo, P. (2022). Virtual waste community: sustainable living in digital era. *IOP Conf. Ser. Earth Environ. Sci.* 1098:012070. doi: 10.1088/1755-1315/1098/1/012070

Ren, Z., Dimant, E., and Schweitzer, M. (2023). Beyond belief: how social engagement motives influence the spread of conspiracy theories. *J. Exp. Soc. Psychol.* 104:104421. doi: 10.1016/j.jesp.2022.104421

Rhodes, N., Ewoldsen, D. R., Shen, L., Monahan, J. L., and Eno, C. (2014). The accessibility of family and peer norms in Young adolescent risk behavior. *Commun. Res.* 41, 3–26. doi: 10.1177/0093650211429118

Rizzi, F., Annunziata, E., Contini, M., and Frey, M. (2020). On the effect of exposure to information and self-benefit appeals on consumer's intention to perform pro-environmental behaviours: a focus on energy conservation behaviours. *J. Clean. Prod.* 270:122039. doi: 10.1016/j.jclepro.2020.122039

Satispi, E., and Aziz Samudra, A. (2022). Study of policy implementation: strategy of COVID-19 plastic waste Management in Indonesia. *J. Public Policy Adm.* 6:155. doi: 10.11648/j.jppa.20220604.11

Satriadi, Y., Yusuf, S., and Hasan, A. S. (2023). The influence of media exposure on voters' behavior during the Sumbawa 2020 local election (PILKADA). *J. Komun. Malaysian J. Commun.* 39, 425–440. doi: 10.17576/JKMJC-2023-3901-24

Sawitri, D. R., Hadiyanto, H., and Hadi, S. P. (2015). Pro-environmental behavior from a social cognitive theory perspective. *Procedia Environ. Sci.* 23, 27–33. doi: 10.1016/j.proenv.2015.01.005

Scherman, A., Valenzuela, S., and Rivera, S. (2022). Youth environmental activism in the age of social media: the case of Chile (2009-2019). *J. Youth Stud.* 25, 751–770. doi: 10.1080/13676261.2021.2010691

Sekretariat Jenderal DPR-RI (2022). Ditjen PSLB3 KLHK Didesak Miliki Langkah Terukur Tangani Volume Sampah. DPR RI.

Shahbaz, P., Ul Haq, S., Abbas, A., Samie, A., Boz, I., Bagadeem, S., et al. (2022). Food, energy, and water Nexus at household level: Do sustainable household consumption practices promote cleaner environment? *Int. J. Environ. Res. Public Health* 19:12945. doi: 10.3390/ijerph191912945

Šikić, F. (2021). "Using Instagram as a Communication Channel in green marketing digital mix: a case study of bio&bio organic food chain in Croatia" in The sustainability debate (critical studies on corporate responsibility, governance and sustainability). eds. M. Topić and G. Lodorfos (Leeds: Emerald Publishing Limited), 221–236.

Soon, J. M., Vanany, I., Abdul Wahab, I. R., Hamdan, R. H., and Jamaludin, M. H. (2021). Food safety and evaluation of intention to practice safe eating out measures during COVID-19: cross sectional study in Indonesia and Malaysia. *Food Control* 125:107920. doi: 10.1016/j.foodcont.2021.107920

Subekti, P., Setianti, Y., Hafiar, H., Bakti, I., and Yusup, P. M. (2019). Environmental entrepreneurship education: case study of community empowerment programs in Bandung Barat District, Indonesia. *Int. J. Entrep* 23, 1–13.

Suratnoaji, C., Arianto, I. D., and Alamiyah, S. S. (2022). Indonesian people's resilience detection method based on big data. *J. Kaji. Komun.* 10:185. doi: 10.24198/jkk.v10i2.41900

Teng, C.-C., and Wang, Y.-M. (2015). Decisional factors driving organic food consumption. *Br. Food J.* 117, 1066–1081. doi: 10.1108/bfj-12-2013-0361

Tey, T. C. Y., Moses, P., and Cheah, P. K. (2022). "Media exposure and students' attitude as mediators between subjective norms and choice intention for science, technology, engineering, and mathematics careers" in The 30th International Conference on Computers in Education, Conference ICCE 2022 - Kuala Lumpur, Malaysia: Proceedings 1, 629–638.

Wang, Y., Chen, M., and Lee, J. H. (2019). Adolescents' social norms across family, peer, and school settings: linking social norm profiles to adolescent risky health behaviors. *J. Youth Adolesc.* 48, 935–948. doi: 10.1007/s10964-019-00984-6

Wang, M.-Y., and Lin, S.-M. (2020). Intervention strategies on the wastewater treatment behavior of swine farmers: an extended model of the theory of planned behavior. *Sustain. For.* 12:6906. doi: 10.3390/su12176906

Wang, Y., Zhu, Y., Li, X., Cai, A., Wang, X., and Zhang, C. (2022). Spatiotemporal variation of urban thermal environment and its relationship with urban expansion types from 2000 to 2020: a case of Huai'an central urban area, Huai'an, China. *Geomatics, Nat. Hazards Risk* 13, 1943–1961. doi: 10.1080/19475705.2022.2101388

Witzling, L., Shaw, B., and Amato, M. S. (2015). Incorporating information exposure into a theory of planned behavior model to enrich understanding of Proenvironmental behavior. *Sci. Commun.* 37, 551–574. doi: 10.1177/1075547015593085

Wood, M. D., Mitchell, R. E., Read, J. P., and Brand, N. H. (2004). Do parents still matter? Parent and peer influences on alcohol involvement among recent high school graduates. *Psychol. Addict. Behav.* 18, 19–30. doi: 10.1037/0893-164X.18.1.19

Xin, S., and Ma, X. (2023). Mechanisms of physical exercise effects on anxiety in older adults during the COVID-19 lockdown: an analysis of the mediating role of psychological resilience and the moderating role of media exposure. *Int. J. Environ. Res. Public Health* 20:3588. doi: 10.3390/ijerph20043588

Yang, X., Kittikowit, S., Noparumpa, T., Jiang, J., and Chen, S. C. (2022). Moderated mediation mechanism to determine the effect of gender heterogeneity on green purchasing intention: from the perspective of residents' values. *Front. Psychol.* 12, 1–11. doi: 10.3389/fpsyg.2021.803710

Yenrizal, Y. (2021). Environmental communication for the rice field conservation in Semende Darat Tengah, South Sumatra. *J. Kaji. Komun.* 9:149. doi: 10.24198/jkk.v9i2.33453

Zulu, L. C., and Richardson, R. B. (2013). Charcoal, livelihoods, and poverty reduction: evidence from sub-Saharan Africa. *Energy Sustain. Dev.* 17, 127–137. doi: 10.1016/j.esd.2012.07.007