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Michał Jaśkiewicz[1], Rafael Piotrkowski[2], Karolina Sas-Bojarska[3], Agata Walaszczyk[3]

[1] *University of Gdańsk, Poland*
[2] *Polish Academy of Sciences, Poland*
[3] *SWPS University of Social Sciences and Humanities, Poland*

CORRESPONDING AUTHOR - Michał Jaśkiewicz, michal.jaskiewicz@ug.edu.pl

Predictors of environmental guilt, and its role as a mediator of the association between human-nature relation and pro-environmental behavior intentions

Abstract: The aim of the two studies (N = 245 and N = 199) was to investigate the predictors of environmental guilt and analyze its mediating role between human-nature relationship and pro-environmental behavior intentions. In the first study, the connectedness to nature and social dominance orientation emerged as predictors of environmental guilt. In addition, guilt was an important mediator of the relationship between the connectedness and individual pro-environmental behavior. In the second study, guilt was predicted by gender, by locating the causes of the climate crisis in human activities rather than in the Earth's natural cycles, and by environmental nostalgia. In addition, guilt mediated the relationship between environmental nostalgia and willingness to engage in collective action and support systemic changes. Thus, environmental guilt seems to be an important factor in predicting a wide range of environmentally friendly activities: individual behavioral intentions, willingness to engage in collective actions, and support for systemic changes.

Keywords: *pro-environmental behavior, environmental guilt, connectedness to nature, eco-guilt, environmental nostalgia*

1. INTRODUCTION

Environmental guilt, also known as eco-guilt or green guilt, is usually defined as the negative emotion resulting from the perceived discrepancy between one's actions or inactions and personal standards for environmental behavior (Mallett, 2012; Wonnebereger, 2018). Because the consequences of the climate crisis are deferred and will affect the world in the coming decades, in this study we expanded the definition of environmental guilt to include the existential aspect: awareness of the ecological consequences of modern life on the future world. Accordingly, environmental guilt is an aversive emotion that results from the perception that one's actions are damaging the climate, which will negatively affect future generations.

Although the relationship between environmental guilt and pro-environmental behavior has been studied before, in the present study we focused on the predictors of environmental guilt. Our study has two main objectives: 1) to assess how the human-nature relationship, social dominance, and environmental locus of control are related to environmental guilt, and 2) to test the indirect effect of the human-nature relationship on pro-environmental behavior through environmental guilt.

1.1 Predictors of environmental guilt: social dominance orientation and environmental locus of control.

Social dominance orientation (SDO) is a well-known and widely researched psychological construct that states that people tend to form hierarchies between groups in which dominant groups exercise social and economic

power over other groups. This individual difference variable assesses preferences regarding the hierarchical structure of human societies (Kunst et al., 2017) and the degree to which people endorse group-based hierarchies and inequalities. Although SDO is primarily used to explain relationships between human social groups (e.g., racism, sexism; social dominance theory, SDT; Sidanius & Pratto, 1999), a growing number of studies indicate an inverse relationship between SDO and pro-environmental attitudes related to climate change (e.g., biodiversity loss, climate change denial; Jylhae et al., 2020; Uenal, et al., 2021). People who score higher on SDO tend to be less concerned about the environment and more accepting of natural resource exploitation (Milfont et al., 2013; Milfont & Duckitt, 2010). A meta-analysis has also shown that SDO is related to lower environmental awareness (Stanley & Wilson, 2019).

In addition, some models have extended dominance orientation to relationships with nonhumans (Dhont et al., 2014). SDO has also been found to be related to speciesist attitudes (Dhont et al., 2016). Given that SDO reflects a more hierarchical understanding of the social world, one might expect a similar relationship with respect to the natural world. If humans are perceived as superior to the natural world, environmental redesign in favor of human needs is more justified. Therefore, we would expect an inverse relationship between social dominance orientation and environmental guilt.

Many people who strive to be environmentally conscious believe that the efficiency of individual behavior is limited by external factors (Thogersen, 2005). These external factors (government and corporations) have been referred to as "green giants" (Kalamis et al., 2014). Compared to individual customers, governments and corporations are two of the most important environmental powerhouses, each with significant influence.

Some climate change deniers claim that global warming is not primarily caused by human activities, but by natural variations in the Earth's climate cycles, primarily global warming and cooling, volcanism, and changes in solar radiation.

Although we assumed that attributing responsibility for the crisis to the Earth's natural cycles would predict less environmental guilt, we had no specific predictions for government and corporate responsibility. On the one hand, we might expect external blame to be associated with low individual environmental guilt; on the other hand, we might expect that blaming corporations and governments would not necessarily preclude recognition of their own negative impacts.

1.2 Human nature – relationship, environmental guilt, and pro-environmental behavior intention

Individuals may differ in the extent to which they view nature as part of their identity, and connectedness to nature is the construct intended to capture individuals' emotional connection to the natural world (Mayer & Frantz, 2004). A meta-analysis based on 37 samples showed a significant and moderately large relationship between connectedness to nature and pro-environmental behaviors (Whitburn et al., 2020). In addition, some researchers postulate that human-nature connectedness can be a pathway to sustainability by recognizing that human well-being and nature conservation are interconnected (Barragan-Jason et al., 2022). Some studies suggest indirect or partially mediated effects of connectedness to nature on environmental behavior via environmental self-identity (Keith et al., 2022) or politicized environmental identity (McKay et al., 2021). Recent research showed that higher levels of broad nature connectedness are positively associated with higher levels of pro-environmental behavior (Mackay & Schmitt, 2019).

The specific emotional relationship we also wanted to examine in this study is environmental nostalgia (solastalgia). This neological term was created by Albrecht (2007) to describe the suffering that results from environmental change. In our study, we decided to conceptualize environmental nostalgia similarly to the well-known social psychological construct of nostalgia. Unfortunately, the relationship between nostalgia and pro-environmental behavior has not been adequately researched (Zhang et al., 2021). Research has shown that nostalgia can help make socially useful choices and achieve social goals. However, it is not clear whether nostalgia influences people's pro-environmental behavior, which is a subset of prosocial behavior at different levels.

We can expect that those who are more emotionally connected to nature and feel environmental nostalgia will experience greater degrees of guilt about their actions in respect to the environment, since these individuals find the environment to be more important and feel more nature interdependent. We also expect that environmental guilt will serve as motivational factor that will be related to pro-environmental action intention.

As many well-known psychological theories assert (Schwartz 1977), emotions are essential to motivation and action. In general, previous research shows that morally negative emotions can motivate pro-environmental behavior (Boehm 2003; Mallett 2012, Harth et al., 2013). Additionally, eco-guilt increases desire to participate in reparative actions that are both individual (like turning off lights at home) and collective (like paying green taxes) (Ferguson & Branscombe, 2010).

Affective factors alongside instrumental and symbolic one is considered as a motivator of pro-environmental behavior (Gaterslebe & Steg, 2016). However, as Coelho et al. (2017) noticed, prior studies on how affect contributes to pro-environmental behavior have mostly ignored trait affect in favor of state affect. The trait approach is significant because it is linked to a tendency toward systematic thought and behavior, whereas the state affect focus is connected to situational variables that lead to pro-environmental behavior. In the latter approach, research mainly focus on anticipated affect (expecting positive or negative emotions after performing or not-performing behavior).

Previous studies showed the role of guilt as a mediator of the relationships with pro-environmental behaviors. Rees et al. (2015) found that confronting human-caused

environmental damage led to a guilty conscience, which in turn predicted pro-environmental behavior (signing a petition). Collective guilt mediated the relationship between beliefs about global warming and willingness to engage in climate action (Ferguson et al., 2010). Anticipated guilt significantly mediated the relationship between environmental concerns and intentions (Elgaaied, 2012). Eco-guilt predicted a significant amount of variance in both personal and collective pro-environmental intentions. Guilt turned out to mediate the relationship between how one should feel about environmentally harmful behavior and public and private expressions of pro-environmental attitudes (Mallet, 2012). In a similar vein, Pasca (2022) showed that intention to engage in pro-environmental activity and the cognitive measure of connectivity to nature were mediated by both pride and guilt

The relationship between in- group responsibility for environmental damage and intention to repair environmental harm was also mediated by guilt (Harth, 2013). In experimental design, Mallett et al. (2013) provided feedback about larger or smaller carbon footprint regarding individual consumption, and average US citizen's comparing to average citizen of other industrialized countries. Both manipulations were effective in inducing guilt as well as collective guilt. The study showed indirect effect of carbon footprint feedback on support for pro-environmental group through collective guilt.

Based on these approaches we expected guilt to play mediating role in the relationship between connectedness to nature as well as solastalgia, with pro-environmental behavioral intentions. In the presented study we assume that not only the behaviors (both pro-environmental and harmful) themselves may lead to guilt, but rather the perception of their consequences, i.e., their impact on the environment and future generations. In this sense, environmental guilt is rather not a temporarily state but relatively constant feeling of responsibility for the fact that human actions lead to climate degradation and have a negative impact on future generations.

However, the emphasis on individual environmental guilt can undermine efforts to achieve systemic change. Recently, a study in Poland showed that some participants pointed narrative of individual responsibility for climate change and resisted the voice of blame (Zaremba et al., 2022). Similar to Bamberg et al. (2018), we believe that effective climate action requires collective action-social protests and social movements aimed at changing the system to protect the environment. A new paradigm of economic and social development is needed for climate action, as evidenced by the growing studies on the downsides of the current economic system (e.g., Balestra, et al., 2018). Therefore, in this study, we also aim to explore the relationship between environmental guilt, and support for systemic change, as well as collective action intention.

1.3 Overview of the present studies

In two studies, we decided to examine the predictors of environmental guilt (SDO and CNS in Study 1; environmental locus of control and solastalgia in Study 2). We also focused on testing the mediating role of environmental guilt on the relationships: a) between connectedness to nature and pro-environmental behavioral intentions - Study 1; b) between environmental nostalgia, support for systemic change, and collective action intentions - Study 2.

2. STUDY 1

2.1 Method

All procedures performed in studies involving human participants were in accordance with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. Informed consent was obtained from all individual participants involved in the study. Based on correlations between variables and standard deviations, we found that the number of participants recruited in both studies allowed us to reach at least 80% power ($\alpha = .05$) for all significant indirect effects with one mediator presented in what follows, according to Monte Carlo power analysis .(Schoemann et al., 2017).

2.1.2 Participants

In total, 245 Polish adults (183 female, 59 male, 3 missing data, *M*age = 29.49, *SD* = 11.75) years) were recruited after providing informed consent. The online platform SONA was used to recruit participants for the **r**esearch.

2.1.3 Measures

2.1.3.1 Connectedness to the nature

The Connectedness to Nature Scale (CNS; Mayer & Frantz 2004) was used to assess unity with nature. This fourteen-item measure was designed to explore the strength of feeling an emotional connection to the natural world (e.g. 'I have a deep understanding of how my actions affect the natural world, 'I think of the natural world as a community to which I belong'). Participants responded on a 5-point scale (from 1 - strongly disagree to 5 - strongly agree). The reliability of the scale was excellent (Cronbach's $\alpha = 0.89$).

2.1.3.2 Environmental guilt

We used 4-items scale ('I feel responsible for the progressive degradation of the environment.'; 'I feel guilty when I don't care about the environment.'; 'I feel responsible for future generations when I think about climate change.'; 'I cannot bear the thought that, among other things, it is because of me that future generations will live in deteriorating environmental conditions.'). Participants answered on a Likert-type scale from 1 'Strongly disagree' to 7 'Strongly agree'. The measure was reliable with Cronbach alpha =. 82.

2.1.3.3 Pro-environmental behavior

This scale (Kiryluk, 2015), along with three added statements (I financially support ecological activities; I sign petitions for the environment; I try to buy locally produced products), consists of 10 items (Cronbach's alpha = .78) and aims to test the declared engagement in pro-environmental actions. The respondents answered each statement on a seven-point scale (1 - strongly disagree, 7 - strongly agree).

2.1.3.4 Social dominance orientation scale

(Pratto, 1994, Polish version of Klebaniuk, 2010) includes 16 items (e.g. "Some groups of people are simply less valuable", "To achieve what you want, sometimes it is necessary to use force against other groups"). The respondents answered each statement on a seven-point scale (1 - strongly disagree, 7 - agree strongly). The measure was reliable with Cronbach alpha =. 89.

2.2 Results and discussion

We conducted zero-order correlation analyses (Table 1). All variables were significantly linked to each other with the weakest connection between SDO, and pro-environmental behavior (r = -.17, p < .01); and the strongest between environmental guilt, and connectedness to nature (r = .53, p < .001).

Table 1. Means, standard deviations and correlations in Study 1.

Variable	*M*	*SD*	1	2	3
1. SDO	44.88	16.09			
2. CNS	69.51	15.12	-.43**		
3. Environmental guilt	18.63	5.99	-.40**	.55**	
4. Pro-environmental behaviors intention	37.41	11.21	.19**	.48**	.52**

Note. SDO = social dominance orientation; CNS = connectedness to nature scale. **significant correlation at the level of 0.01 (two-tailed)

To assess the predictors of environmental guilt, we conducted a linear regression analysis. As we expected SDO, as well as CNS, turned out to be significant predictors. (see - Table 2).

Next, we examine our prediction for the relationship between connectedness to nature and pro-environmental behavior. We conducted mediation analyses using the PROCESS bootstrapping macro (Model 4, 10000 bootstraps; Hayes, 2013). Connectedness to nature was indirectly related to pro-environmental behavior through environmental guilt (R^2 for the model .31). That is, stronger connectedness to nature was related to environmental guilt (B_a = .22). Participants who felt stronger environmental guilt were more prone to engage in pro-environmental behavior (B_b = .66). A bias-corrected bootstrap confidence interval for the indirect effect (B_{ab} = .14) was entirely above zero (0.09 to 0.20). In addition to an indirect effect, there was a significant direct effect of connectedness to nature on pro-environmental behavior (B_c, = 0.21).

Table 2. Summary of linear regression for environmental guilt in Study 1.

	β	*t*	*p*
Age	-.07	-1.44	.15
Gender	.08	1.74	.08
SDO	-.17	-2.95	.003
CNS	.44	7.47	<.001

Note. SDO = social dominance orientation; CNS = connectedness to nature scale. Adjusted R^2 = .32.

As we expected, the study showed that environmental guilt is predicted by connectedness to nature, and social dominance orientation. We also found that environmental guilt plays a role as a mediator between the CNS and pro-environmental behavior.

3. STUDY 2

In Study 2, we decided to test the mediation model that includes environmental nostalgia as another form of human-nature relationship. We hypothesised that similar to the CNS overlaying the current emotional relationship with the natural environment, environmental nostalgia, which reflects feelings about the state of the environment in the past, will also be a predictor of environmental guilt. We also decided to extend the conclusions from Study 1 to include collective action intention and support for systemic change

3.1 Method

3.1.2 Participants

Participants were recruited using convenience and snowball sampling methods, provided they met the following inclusion criteria: age above 18 years old and Polish nationality. Final sample consisted of 199 participants (50 self-declared men, 147 self-declared women, 2 missing data., *M age* = 33.20, *SD* = 10.89).

3.1.3 Measures and procedure

3.1.3.1 Environmental nostalgia

We assessed environmental nostalgia proneness using four questions inspired by Southampton Nostalgia Scale (Routledge et al., 2008). This scale uses the definition word of nostalgia as a sentimental longing for the past. We transformed it to overlap the context of the natural world. The following items were created: (1) To what extent do you feel nostalgic for the natural world as it used to be?; (2) To what extent do you feel sentimental about the state of the natural environment?; (3) To what extent do you feel a longing to go back to the times when the state of the environment was better than it is now in the past?; (4). How strongly do you feel a longing for the state of the environment in the past? Participants responded using a 7-point Likert scale. The Cronbach's alpha of the scale was .94.

3.1.3.2 Environmental locus of control

We used a shortened version of the scale created by Kalamis et al. (2014). The following subscale has been used:

3.1.3.2.1. Corporate responsibility (3 items, Cronbach's alpha =.91, - e.g. Multinational corporations should accept responsibility for improving the state of the environment)

3.1.3.2.2. Government responsibility. (3 items, Cronbach's alpha = .91, - e.g. Governments have the ability to solve global environmental challenges).
3.1.3.3.3. Natural earth-cycle. (3 items, Cronbach's alpha = .81 e.g. Earth's natural cycle is responsible for many environmental changes we are witnessing;
3.1.3.3. Environmental guilt. The same scale as in Study 1 has been used. Cronbach's alpha of the scale was .85.
3.1.3.4 Pro-environmental behavior - collective action intention. We used a 3-item scale (Cronbach's alpha = .82) to measure collective action intention: (1) I am willing to take part in a climate march/demonstration; (2) I will sign the petition online or in person on the climate crisis issue; (3) I will express my own concerns or share information on climate change on social media. Participants used a 5-points Likert scale response format.
3.1.3.5 Pro-environmental behavior - support for economic system changes. Participants declared their support (7-point Likert scale) for the following regulations in favor of climate protection: (1) Raising the prices of all beverages in plastic packaging for a deposit; (2) A complete ban on the production, sale, and use of plastic bags; (3) Significant restrictions on the entry of passenger cars to city centers; (4) Switching away from burning coal in favor of renewable energy sources; (5) Higher taxation of meat production; (6) Significant increasing the prices of gasoline, oil and gas. The reliability of the scale was satisfactory (Cronbach's α = 0.85).

3.2 Results

First, we conducted zero-order correlation analyses (Table 3). Collective action intention as well as support for economic systemic change were related to environmental guilt (r = .63, and r = .64) environmental nostalgia (r = .51, and r = .44, respectively), corporate responsibility (r = .22, and r = .27), and government responsibility (r = .32 and r =.37). Environmental guilt has also been related to ascribing responsibility for climate change to corporates and governments (r = .31, and r = .41, respectively).

To examine predictors of environmental guilt, the analysis of linear regression has been conducted (see Table 4). The significant predictors turned out to be: gender (B, = .16, p = .005), ascribing responsibility for climate crisis to politicians (B, = .32, p < .001), locating cause of climate crisis in natural earth cycle (B, = -.18, p = .002), and environmental nostalgia (B, = .44, p < .001).

Once again we tested indirect effects using the PROCESS macro, model 4 (Hayes, 2013). We put pro-environmental behaviors (collective action intention and support for systemic changes) into the model as the outcome variables, environmental guilt as the mediator, and environmental nostalgia as the predictor. In both analyses, an indirect effect for environmental guilt was found (.16 and .42) to be significant with confidence intervals not including zero (.10, .22, and .27, .60, respectively). As we expected, environmental nostalgia predicted environmental guilt (B_a = .46, p < .001) , and environmental guilt was related to collective action intention (B_b = .33, p <.001) as well as to support for systemic changes (B_b = .91 , p <.001). In addition to an indirect effect, there was a significant direct effect of environmental nostalgia on collective action intention (B_c, = 0.12, p < .001) as well as on support for system change (B_c, = 0.16, p = .052).

4. GENERAL DISCUSSION

As environmental guilt is one of the most common emotions related to climate change (Chu & Yang, 2019, Iniguez-Gallardo et al., 2021), we analyzed its predictors and its association with pro-environmental behavior. In two studies, we focused on the predictors of environmental guilt. We showed that the human-nature relationship (connectedness to nature and environmental nostalgia) predicted environmental guilt due to the climate crisis. People who feel more connected to nature and nostalgia for the past when the state of the environment was better also reported negative emotions such as guilt about the damaging climate and its effects on future generations. Thus, the presented study indicates that the human-nature relationship may be associated not only with positive emotions, but also with unpleasant emotions implying a negative self-focusing. Environmental guilt was oper-

Table 3. *Means, standard deviations and correlations in Study 2.*

Variable	M	SD	1	2	3	4	5	6
1. Environmental nostalgia	17.36	7.14						
2.Environmental guilt	18.43	6.05	.55**					
3.ELOC_corp	15.87	4.53	.30**	.31**				
4.ELOC_gov	16.49	4.62	.40**	.41**	.78**			
5.ELOC_Earth	13.28	4.53	-.06	-.05	.38**	.30**		
6.Collective action intention	8.77	3.79	.66**	.63**	.23**	.32**	-.11	
7.Support for system changes	26.97	9.34	.66**	.65**	.27**	.38**	-.14*	.64**

Note. ELOC_corp = environmental locus of control - corporate responsibility; ELOC_gov = environmental locus of control - government responsibility; ELOC_Earth = environmental locus of control - natural Earth cycle
* p<. 0.05 (two-tailed) **p<. 0.01 (two-tailed).

Table 4. Summary of linear regression for environmental guilt in Study 2

	β	*t*	*p*
Age	-.06	-1.05	.29
Gender	.16	2.95	.004
Environmental nostalgia	.45	7.89	<.001
ELOC_corp	.02	-.18	.86
ELOC_gov	.35	4.08	<.001
ELOC_Earth	-.19	-3.33	.001

Note. ELOC_corp = environmental locus of control - corporate responsibility; ELOC_gov = environmental locus of control - government responsibility; ELOC_Earth = environmental locus of control - natural Earth cycle. Adjusted R^2 = .45

ationalized through items reflecting rather stable tendency than situationally induced affect.

As expected, social dominance orientation was also found to be associated with lower environmental guilt. The present study is consistent with the view that SDO is an important ideological barrier to climate change belief and action (e.g., Stanley & Wilson, 2019).

We found a correlation between experiencing environmental guilt and environmental locus of control beliefs (which attribute responsibility to corporations and governments). When we put environmental locus of control as a predictor of environmental guilt, the results showed the role of government responsibility. Thus, it appears that acknowledging one's own environmental impact does not preclude attributing responsibility to the "green giants" - corporations and governments. The presented study also showed an association between the sense of guilt and the anthropogenic location of the causes of the climate crisis. It is therefore possible that the sense of guilt also takes a collective form here, which raises questions about its relation identification with all humanity (Hamer, 2023). As identification with all humanity (IWAH) predicted concern for global problems, future studies may explore the potential role of environmental guilt as a mediator.

We also demonstrated the mediating role of environmental guilt on pro-environmental behavior. In Study 1, environmental guilt mediated the relationship between connectedness to nature and individuals' intentions to behave environmentally. In Study 2, we extended this reasoning and found a relationship between environmental nostalgia, environmental guilt, and other forms of pro-environmental behavior (collective action intentions and support for system changes).

The role of guilt in our study is coherent with previous research showing its functioning close to moral norm defined as feeling obligation to act in a pro-environmental manner. Bamberg and Moser, (2007) showed that guilt was a major predictor of felt obligation to repair environmental damage. Because guilt fosters a sense of duty to make amends—that is, a moral standard —it becomes an important pro-social emotion (Bamberg & Möser, 2007)

Our work contributes to research on a broad range of climate-related emotions. In light of the research presented, experiencing individual guilt could predict action intentions that also target systemic change. Acceptance of one's limited capacity to act can be viewed as a means of coping with unwanted feelings of guilt (Zaremba et al., 2022). However, this does not mean that limited agency must lead to powerlessness. Many people strive to act in an environmentally conscious manner; at the same time, they see the effectiveness of their individual environmentally friendly behavior limited by external constraints. The present study shows that individual guilt is not limited to the search for individual solutions. The motivating function of environmental guilt may also consist of actions that challenge the general economic status quo. Furthermore, additional analysis (linear regression with environmental locus of control, guilt and environmental nostalgia as predictors, adjusted R^2 = 40 and .48, respectively) showed that environmental guilt turned out to be a stronger predictor of collective action intentions (B = .49, p <.001) and more strongly predicted support for systemic change (B = .51, p <.001) than attribution of responsibility to government (B = .08, p = .38, B = .16, p = .06) and corporations (B = .02, p = .81, B = .05, p = .56). This suggests a more complex nature of environmental guilt that goes beyond the individual's motivation to remedy the situation through individual action and includes the knowledge that one's own choices and decisions are not enough.

5. LIMITATIONS

Although it is a common view in psychology that emotions lead to actions, the present study is a correlational study that does not allow conclusions to be drawn about causal relationships. The present study was conducted on a sample of WEIRD, and some studies emphasize the relationship between cultural and environmental setting and climate-related emotions.

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