Public and Personal Responses to Environmental Pollution in China: Differential Susceptibility, Direct Experience, and Media Use

SHAOJING SUN[1]
Fudan University, China

ANDY J. MEROLLA
University of California, Santa Barbara, USA

MIHYE SEO
Sungkyunkwan University, South Korea

This study examined how internal environmental efficacy and perceived severity are associated with multiple forms of media use pertaining to environmental issues. We also investigated effects of media use on Chinese citizens' engagement in public environmental expression and personal environmental action. Results showed that internal environmental efficacy and perceived severity influenced the usage of different types of media. We also found that use of traditional media sources (e.g., TV, newspapers) and online news directly affected public environmental expression and personal environmental action. Moreover, the effect of internal environmental efficacy and perceived severity on traditional media use was moderated by one's direct experience with environmental pollution.

Keywords: environmental pollution, media use, pro-environmental behavior

Environmental pollution has grown increasingly severe in China in recent years. Air pollution and water contamination, among other environmental issues, are of great concern to both the general public and the government. The Chinese government has worked to reform its environmental governance, and these efforts have led to some positive results (Johnson, 2014; Lo & Tang, 2006). Traditionally, environmental reforms in China have been heavily dominated by the state (Shi & Zhang, 2006). Recently, though, along with the development of civil society in China, this top-down environmental reform model has begun to include more active roles of nongovernmental stakeholders, such as Chinese citizens (Chen

Shaojing Sun: shaojingsun@gmail.com
Andy Merolla: amerolla@comm.ucsb.edu
Mihye Seo: mhseo@skku.edu
Date submitted: 2017–04–20

et al., 2013; Shi & Zhang, 2006). Given this change in Chinese environmental reform, it is important to understand what kinds of factors predict Chinese citizens' pro-environmental beliefs and behaviors.

One factor to consider is media use, which has been found to affect people's knowledge of environmental issues, such as global warming (Huang, 2016), and people's pro-environmental attitudes and behaviors (Zhao, 2012). Media use, however, is a multifaceted phenomenon, and research has long demonstrated that different channels and genres of media may have different effects on people's pro-environmental attitudes and behaviors (Holbert, Kwak, & Shah, 2003). Researchers have also shown that media use can both directly and indirectly affect pro-environmental attitudes and behaviors (Huang, 2016; Liao, Ho, & Yang, 2016; Zhao, 2012).

Given the importance of media use in shaping pro-environmental attitudes and behaviors, exploring the factors that could affect one's media use has garnered increased scholarly attention. Various factors ranging from individual differences to contextual characteristics could shape one's media use for environmental purposes. Yet, to date, empirical research on individual differences in media use is mainly limited to demographic variables and individual dispositions (Oliver & Krakowiak, 2009). Relatively little research has investigated variables related to personal experiences (e.g., direct experience with air pollution) within a particular sociocultural context (Valkenburg & Peter, 2013; Whitmarsh, 2008).

This study addresses these issues by examining how individual difference variables—specifically, internal environmental efficacy and perceived severity of pollution—along with one's direct experience with environmental pollution influence use of multiple media channels for environment-related information. To provide a theoretical foundation to the individual difference variables explored in this study, we invoke Valkenburg and Peter's (2013) concept of differential susceptibility from their differential susceptibility to media effects model (DSMM). We also explored how uses of various media, including social networking sites, online news, and more traditional media (e.g., radio, television, and newspapers) for environmental information shape Chinese citizens' pro-environmental behavior in both public and private spheres (Huang, 2016; Stern, 2000). Finally, we forward a model to examine how personal experience with pollution could moderate the relationships proposed.

Literature Review

Defining Environmental Behavior

We begin by defining the key dependent variable in this study: pro-environmental behavior. Many researchers examining pro-environmental behavior advocate exploring multiple dimensions of behavior. Influential work by Stern (2000), for example, differentiated public-sphere environmentalism from private-sphere environmentalism. The former is manifested in behaviors, such as petitioning on environmental issues and supporting public policies. The latter is mainly characterized by green consumption behaviors, such as purchasing recycled products. Similar to Stern (2000), Ho, Liao, and Rosenthal (2015) differentiated public (e.g., civic engagement) and private (e.g., green buying) forms of pro-environmental behavioral intentions in their research of media use and environmental behavior in Singapore. Likewise, Huang (2016) examined personal environmental behavior (e.g., recycling) and more

public communication behavior (e.g., participating in collective action). In sum, it is clear from existing scholarship that pro-environmental behavior should be considered in multiple contexts, namely the public and the private.

Consistent with this perspective, we examine two forms of pro-environmental behavior in efforts to capture public and private actions. The first variable, which we termed *personal environmental action*, involves such responses as recycling and green purchasing. The second variable, which we termed *public environmental expression*, concerns individuals' willingness to speak out about environmental issues. This includes such behaviors as contacting the media, posting on the Internet, and discussing issues with government officials. Public-sphere environmental behaviors have grown increasingly common in China in recent years (Chen et al., 2013), making it especially important to examine people's willingness to engage in potentially costly public behaviors in response to environmental concerns (Zhao, 2012).

The Role of Media Use and Differential Susceptibility Variables in Predicting Environmental Behavior

Valkenburg and Peter (2013) argued that the small media effects typically found in media research are at least partly attributable to "suboptimal conceptualization" (pp. 221–222) of how media effects operate. Certain variables, for instance, are inconsistently conceptualized as mediators or moderators across media theories. Therefore, Valkenburg and Peter (2013) proposed the DSMM to address this issue and help guide researchers on how to model direct, indirect, and conditional relationships between media and nonmedia variables to predict media effects.

Considering the long list of nonmedia variables relevant to media research, Valkenburg and Peter (2013) focused on identifying forms of "differential susceptibility variables," or variables that predispose people to use media in different ways. Differential susceptibility variables include dispositions (e.g., values, personality, and mood), life stages, and social factors (e.g., family or community experiences). According to the DSMM, the role that a nonmedia differential susceptibility variable such as personal experience plays in media use and effects is likely quite complex. Indeed, individual difference variables can function as personal needs and desires and as readiness to use and respond to media (Oliver & Krakowiak, 2009). Little research to date has examined the role of direct experience in media uses and effects, particularly in the context of environmental communication (Whitmarsh, 2008). This, however, is a major focus of the current study.

Although the DSMM has classified susceptibility variables and postulated their dual roles (i.e., as direct predictors and moderators), the relationships between various susceptibility variables is not clearly explicated (Valkenburg & Peter, 2013). According to the DSMM, one's direct life experience can be conceived as a differential susceptibility variable that directly predicts media use. Yet, past research has also shown that both personal direct experience and mass media serve as important information sources to influence one's attitudes or action on social and political issues such as unemployment (e.g., Mutz, 1993, 1994) and natural disasters (e.g., Whitmarsh, 2008). In other words, direct experience, like media, might function as an information source. As such, we reason that the role that direct experience plays may be multifaceted, such that direct experience may (a) directly influence media use and (b) moderate

the effects of other susceptibility variables (e.g., internal environmental efficacy and perceived severity) on media use.

Direct experience is usually vivid and easily accessible in memory, but it also tends to be morselized, compartmentalized, discrete, and incoherent. According to Mutz (1993, 1994), by packaging and presenting personal experience in a more abstract and aggregated manner, media coverage can lead people to interpret an issue (e.g., unemployment) from a broader social perspective. In other words, media coverage can transcend personal experience and further translate that experience into effects on collective or sociotropic views about the issues.

We argue that personal direct experience is emblematic of both a susceptibility variable and an information source (Mutz, 1994; Valkenburg & Peter, 2013). As a susceptibility variable, consistent with the DSMM, it may directly influence media use (though it is unclear how it exactly relates to other susceptibility variables). As a pivotal information source, on the other hand, its power and effects are likely to be limited without being contextualized by media use. Consider, for example, the role of direct experience on political action. Without turning to media for further information, people might not know how or whether their personal experiences with political issues are representative of the broad political reality (Mutz, 1994; Shehata & Strömbäck, 2014). As such, we reason that the effect of direct experience on audiences could be complex and multifold, depending on whether it is viewed as a susceptibility variable, an information source, or both.

Integrating Differential Susceptibility, Direct Experience, and Media Use and Effects

The DSMM framework has lent a new perspective to examining the conditional effects of media use on various outcomes. However, as Valkenburg and Peter (2013) noted, their conceptualization and categorization of susceptibility variables are broad. Furthermore, existing research seems not to have reached consensus on the relationship between susceptibility variables and media use. For example, a recent study by Beullens and Vandenbosch (2016) examined the direct effect of Facebook use on intentions to use alcohol and how media use moderates the effects of susceptibility variables (e.g., descriptive norms, injunctive norms).

To date, it remains unclear whether the effects of differential susceptibility variables on media use are conditional. Exploring meaningful moderators of the effects of susceptibility variables on media use may, therefore, provide insight into the ways in which individuals consume media. As a unique information source, one's direct experience is more likely to be contextualized or mediated through media consumption (Mutz, 1994). Direct experience may also interact with other susceptibility variables to affect media use, given that direct experience with pollution has been found to shape people's environmental values, beliefs about climate change, and climate-related information seeking (Chen et al., 2013; Whitmarsh, 2008).

For this study, we examine three types of media use for environment-related information: (a) traditional news sources (e.g., newspapers, radio, and TV), (b) online news sources (e.g., Sina News, Sohu news websites), and (c) social network services (e.g., microblogs, WeChat). Such a classification of

media is mainly based on recent research on the Chinese media system and the current state of the new media industry in China (Chiu, Lin, & Silverman, 2012; Dong, Liang, & He, 2017). Furthermore, our categorization of media echoes the call to tease out the nature of the broad concept of the media in a mediated information environment (Shehata & Strömbäck, 2014). Specifically, we examine which types of media use exert the strongest influence on the two previously defined forms of pro-environmentalism (i.e., public environmental expression and personal environmental action).

In addition to direct experience, self-efficacy is also treated as a dispositional susceptibility variable. Drawing upon social cognitive theory, many researchers define *environmental self-efficacy* as people's belief that they have the capacity to successfully engage in pro-environmental behavior. Tabernero and Hernández (2011), for instance, found that self-efficacy regarding recycling directly predicted recycling behavior. Extending this work from a media perspective, Huang (2016) reported significant associations between environmental self-efficacy, media use, and pro-environmental behavior and modeled self-efficacy as a predictor of media use.

Given the unique context of China, where political issues and governmental control are highly intertwined with environmental issues (Shi & Zhang, 2006), this study examines *internal environmental efficacy*, which is defined as individual citizens' sense of efficacy regarding knowledge and influence of Chinese environmental policies and governance. Despite societal sea change, the Chinese government remains the dominant force in addressing environmental issues (Bradsher & Friedman, 2017; Johnson, 2014; Mol & Carter, 2006).

Given this state of affairs, our conceptualization of internal environmental efficacy draws heavily from theory and research in the domain of political communication, where self-efficacy is typically divided into two subdimensions: internal political efficacy and external political efficacy (Craig, 1979; Finkel, 1985). Internal political efficacy concerns individuals' beliefs about their political effectiveness, whereas external political efficacy concerns individuals' beliefs about political system responsiveness (Craig, 1979). Internal political efficacy is the belief that means of political influence are available and reflects individuals' confidence about their own political abilities. External political efficacy, on the other hand, is the belief that the government or regime is responsive to citizens' attempts to influence the political process and governance. The current study adopted internal political efficacy's focus on policy and governance and applied it to the environmental domain. Thus, internal environmental efficacy taps into one's confidence in understanding and influencing Chinese environmental governance. Internal environmental efficacy could therefore represent a unique individual-level differential susceptibility variable affecting environment-related media use.

We also conceptualized individuals' perceived severity of pollution as a social differential susceptibility variable, emphasizing the contextual, shared, and collective experiences instead of individual dispositions (Valkenburg & Peter, 2013). Past research has confirmed a positive relationship between informational media use and perceived severity of environmental problems, both globally and locally (Zhao, 2012). For instance, the risk information seeking and processing (RISP) model proposes that risk information seeking and processing are motivated by information insufficiency and that perceived severity (as a component of risk perception) is one of major determinants of information insufficiency (Griffin,

Dunwoody, & Neuwirth, 1999). Prior research based on the RISP model has repeatedly documented that how people perceive the severity and susceptibility of risk would facilitate or hinder risk information seeking in the context of various environmental issues such as climate change (Yang & Kahlor, 2013) and ecological health of the Great Lakes (Kahlor, Dunwoody, Griffin, Neuwirth, & Giese, 2003). In the present study, our operationalization of perceived severity emphasizes the social and community context of environmental risks.

Media Use and Pro-Environmental Behavior

Media use has been found to be both positively and negatively associated with pro-environmental behavior and perceptions (Cho & Krasser, 2011; Corral-Verdugo, 2003). Research also indicates that different media channels and programs exert differential effects on pro-environmental outcomes (Holbert et al., 2003; Jiménez-Castillo & Ortega-Egea, 2015). Holbert et al. (2003), for example, found that pro-environmental behavior was positively predicted primarily by consumption of public affairs programs and nature documentaries. Consumption of entertainment programs, however, was unrelated to pro-environmental behavior. In other studies, though, entertainment programming has been found to be negatively related to pro-environmental behavior (e.g., Corral-Verdugo, 2003; Jiménez-Castillo & Ortega-Egea, 2015).

Recent studies conducted specifically in Asian contexts have shown that media use can have direct and positive influences on pro-environmental behavior (e.g., Ho et al., 2015; Huang, 2016; Lee, 2010, 2011). For example, in two studies of high school students in Hong Kong, Lee (2010, 2011) reported significant associations between exposure to environment-related media and environmentally friendly purchasing and pro-environmental behavioral intentions. Huang (2016) examined the relationship between media use related to global warming and multiple forms of pro-environmental behavior in Taiwan. Results showed that use of media about global warming significantly and positively predicted three forms of pro-environmental behavior, which Huang termed accommodating (e.g., searching for information), promotional (e.g., persuading others), and proactive (e.g., recycling). In our study, we consider the potential direct effects of traditional media, online media, and social media use on public and private pro-environmental behavior. Moreover, we test whether these forms of media use mediate the relationship between two differential susceptibility variables—internal environmental efficacy and perceived severity—and pro-environmental behavior. Finally, we explore whether these mediated relationships are moderated by individuals' direct experience with environmental pollution.

These proposals are formally presented in the following three hypotheses. The hypothesized relationships among this study's variables are also depicted in Figure 1.

H1:   *Internal environmental efficacy and perceived severity are positively associated with use of multiple media sources for environment-related information.*

H2:   *The effects of susceptibility variables (i.e., internal environmental efficacy and perceived severity) on (a) public environmental expression and (b) personal environmental action are mediated by multiple media uses.*

H3:   Direct experience will serve as a global moderator to the relationship (a) between susceptibility variables (i.e., internal environmental efficacy and perceived severity) and media use, and (b) between media use and behavioral response (i.e., public environmental expression and personal environmental action).
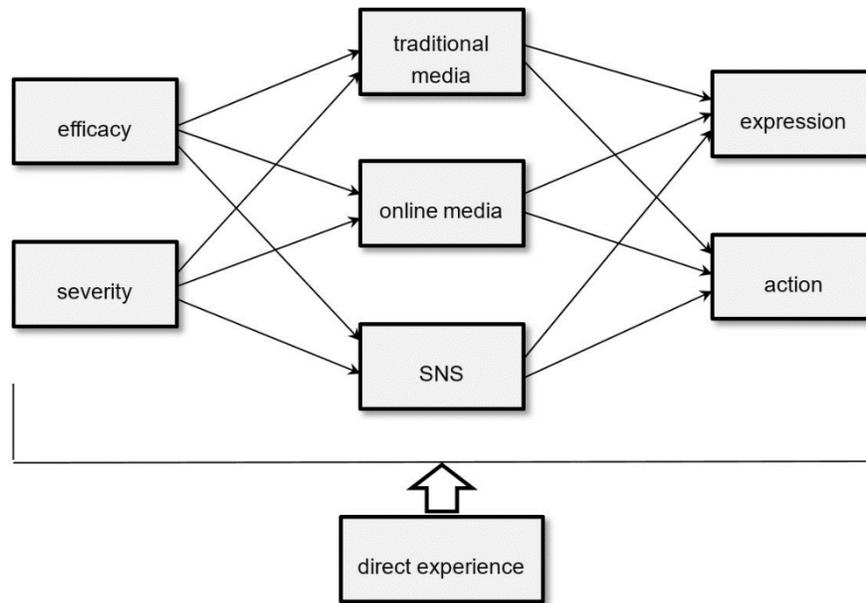

Figure 1. Moderated mediation model.

Method

Procedure

After institutional review board approval, we commissioned a survey company to recruit participants online for this project. The company hosted an online panel of 2 million online users in mainland China. A recruiting message was sent to about 2,000 randomly selected users registered in the system. Among the 2,000 registered users, 1,098 consented to participate in the study. Participants were then directed to the online survey and received incentives worth about $2 each for their participation. The data collection was finished in two consecutive weeks, and no collected information can be used to identify respondents.

Sample

After removing data from questionnaires severely lacking data and questionnaires that participants finished in less than one minute, the final sample included data from 1,047 complete questionnaires. The sample consisted of 49.9% males and 50.1% females, with an average age of 31 years (range = 18–69). About 80% of the respondents reported a college-level education or above. The total sample comprised 35.1% respondents from Beijing, 29.7% from Shanghai, 10.8% from Hebei province, 7.9% from Guangdong province, and 16.6% from other regions in China. It is noteworthy that Beijing and Hebei provinces have received intense media coverage in recent years because of their experiences of high levels of air pollution. Gender, age, education also served as control variables in the present study.

Measurement

The instruments were mainly adapted from prior research. We also consulted the website of the Chinese Ministry of Environmental Protection to acquire information on the classification of pollution types. Instruments adapted from English literature were also back translated to ensure validity and reliability.

Public Environmental Expression. Researchers have measured opinion expression in multiple contexts and through multiple channels (Gil de Zúñiga, Molyneux, & Zheng, 2014). For the present study, the response instructions stated, "If your living community encountered severe environmental pollution, would you voice your opinion?" Six response options were offered: contacting media, reporting to government representatives, posting messages on the Internet, talking to the community office, using the appeal system of the government, and other. The total number of endorsed communication channels was used to estimate environmental expression ($M = 2.53$, $SD = 1.16$, min = 1, max = 6).

Personal Environmental Action. Respondents were asked which actions they had taken to improve the environment in recent years and given six response options: "recycling newspapers, glass, and metals," "purchasing products made of recyclable materials," "recycling batteries," "saving water," "garbage classification," and "using environment-friendly products." The total number of endorsed actions was used to estimate personal environmental behavior ($M = 3.75$, $SD = 1.39$, min = 1, max = 6).

Direct Experience. In an effort to improve the validity of the measure, instead of focusing on the impact, we asked respondents to evaluate how often they personally experienced the following types of pollution in the last two years: air pollution, water pollution, heavy metal pollution, and industrial pollution. Responses were measured on a scale from 1 = *very rare* to 3 = *very often*. As Whitmarsh (2008) noted, such a measure may not reflect the true impact of direct experience, but it can effectively capture participants' subjective experiences. The average score of the four items was used to estimate direct experience (Cronbach's α = .67, $M = 2.18$, $SD = 0.49$).

Media Use. Respondents were asked how often they obtained environment-related information from a variety of media channels. Responses were measured on a scale from 0 = *not at all* to 3 = *very often*. The channels of TV, newspaper, and radio were combined to represent traditional media usage

(Cronbach's α = .69, *M* = 2.83, *SD* = 0.70). Microblogs and WeChat were combined to denote social network service (SNS) usage (*r* = .62, *M* = 3.043, *SD* = 0.83). A single item was used to assess online news use (*M* = 3.16, *SD* = 0.84).

Internal Environmental Efficacy. Because self-efficacy is typically domain limited, we specifically focused on the link between self-efficacy and environmental governance, which is a crucial issue pertaining to civil society and pro-environmental activities in China (Mol & Carter, 2006; Park & Yang, 2012). The construct was measured by the following two items: "I am very familiar with the environmental issues demanding for policy or governance," and "I am capable of offering constructive suggestions on the governance of environmental protection." Responses were measured on a scale from 1 = *strongly disagree* to 5 = *strongly agree*. The average score of the two items was used to estimate internal environmental self-efficacy (*r* = .54, *M* = 3.33, *SD* = 0.89).

Perceived Severity of Pollution. Previous studies have measured perceived severity of pollution with a single item (e.g., Holbert et al., 2003; Murch, 1971). Instead of using a single-item measure, we specified multiple types of environmental pollution in accordance with the classifying information presented on the official website of the Chinese Ministry of Environmental Protection. Items on a 4-point Likert scale (1 = *not severe at all*, 4 = *extremely severe*) were employed to assess perceived severity of environmental pollution. Measurement items were, "In your city of residence, how severe do you think the air pollution is?"; "In your city of residence, how severe do you think the water pollution is?"; "In your city of residence, how severe do you think the heavy metal pollution is?"; and "In your city of residence, how severe do you think the industrial pollution is?" The average of the four items was used to create the perceived severity variable (Cronbach's α = .77, *M* = 2.88, *SD* = 0.68).

Results

Descriptive Statistics

The full correlation matrix of key variables is presented in Table 1. The correlation coefficients mostly fall within the range of weak and moderate magnitudes, with the strongest correlation being between perceived severity and direct experience (*r* = .56, *p* < .001). A one-way ANOVA revealed that respondents from Beijing reported more direct experience with pollution (*M* = 2.28, *SD* = 0.44) than did those from Shanghai (*M* = 2.10, *SD* = 0.50, *p* < .01) and other regions (*M* = 2.11, *SD* = 0.52, *p* < .05), but not those from Hebei (*M* = 2.22, *SD* = 0.50, *ns*) or Guangdong (*M* = 2.08, *SD* = 0.52, *ns*) provinces. These results are consistent with media reports ranking the severity of pollution in Chinese cities (Sina News, 2013).

Table 1. Means, Standard Deviations, and Zero-Order Correlations.

	M	SD	1	2	3	4	5	6	7	8
1. Traditional news media	2.83	.70	–							
2. SNS	3.04	.83	.24***	–						
3. Online news media	3.16	.84	.10**	.36***	–					
4. Direct experience	2.18	.49	.01	.04	.04	–				
5. Internal environmental efficacy	3.33	.89	.29***	.29***	.21***	.04	–			
6. Perceived severity	2.88	.68	.03	.13***	.06*	.56***	.12***	–		
7. Environmental expression	2.53	1.16	.20***	.15***	.17***	.02	.22***	.05	–	
8. Environmental action	3.75	1.39	.24***	.14***	.15***	.05	.15***	.03	.34***	–

*p < .05. **p < .01. ***p < .001.

Model Testing

Structural equation modeling, using Mplus 7.0, was conducted to examine the hypothesized relationships among the variables. With the data normality checked, the sample variance-covariance matrix was analyzed using the maximum likelihood minimization function.

We first tested a baseline model with direct experience serving as a global moderator, that is, moderating the regression paths from susceptibility variables (i.e., severity and efficacy) to media uses and from media use to the two environmental outcome variables (see Figure 1). Results showed that the model fit the data poorly and that all the interaction effects between direct experience and media uses were not statistically significant. Because direct experience does not show any sign of moderating the effects of media use on the two outcome variables, we decided to examine whether it moderates only the relationship between susceptibility variables and media use.

Overall, results showed the partially-moderated model (see Figure 2) approached the cutoff for acceptable model fit, χ^2 = 45.491, df = 11, χ^2/df = 4.136, p < .001, SRMR = .025, CFI = .946, TLI = .829, RMSEA = .055, 95% CI = [.039, .072]. We followed the following cutoff criteria to assess model fit: χ^2/df < 3, SRMR < .05, CFI > .95, TLI > .95, RMSEA < .06 (Kline, 2005). Modification indices suggested a direct path was needed from efficacy to environmental expression, and with the addition of this direct path, the revised model demonstrated acceptable model fit, χ^2 = 17.396, df = 10, χ^2/df = 1.739, p > .05, SRMR = .016, CFI = .988, TLI = .960, RMSEA = .027, 95% CI = [.000, .047]. This indicates that only partially mediated effects may exist. Overall, the final model explained about 9.2% variance of traditional media use (p < .001), 8.9% variance of SNS use (p < .001), and 3.7% variance of online news use (p < .001), 8.7% variance of environmental expression (p < .001), and 7.1% variance of personal environmental action (p < .001).
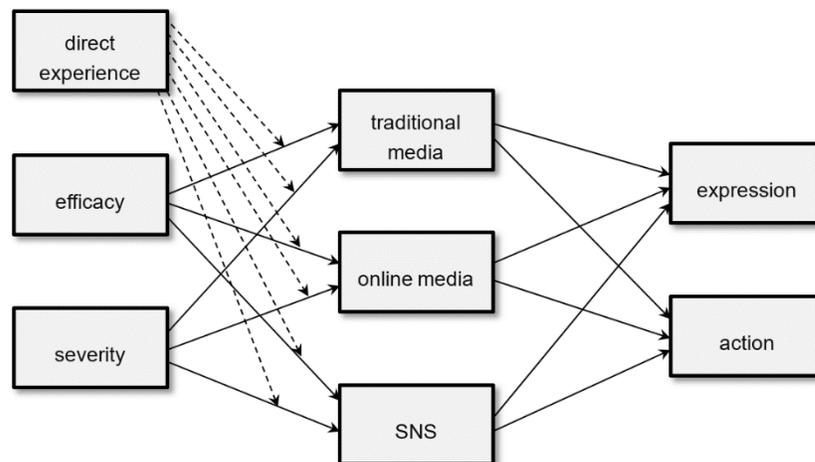

Figure 2. Partially moderated mediation model. Solid lines represent hypothesized direct paths, whereas dashed lines represent moderation effects. See Table 2 for specific direct, indirect, and moderated paths and estimates.

We also tested an alternative theoretical model to do model comparisons. Specifically, we treated internal environmental efficacy, perceived severity, and direct experience as three individual susceptibility variables. Doing so allowed us to see whether the three variables, in addition to directly affecting media use, moderated the effects of media use on public environmental responses. The results showed a poor model fit, $\chi^2 = 264.885$, $df = 39$, $\chi^2/df = 6.792$, $p < .001$, SRMR = .041, CFI = .694, TLI = .452, RMSEA = .074, 95% CI = [.066, .083].

Research Hypotheses

H1, which predicted that internal environmental efficacy and perceived severity are positively associated with media use, was supported. Efficacy had a positive effect on using traditional media (β = .27, $p < .001$), online news media (β = .19, $p < .001$), and SNS (β = .27, $p < .001$). In comparison, perceived severity had a positive effect only on using SNS (β = .12, $p < .001$), but not on traditional media and online news media.

H2, which predicted that multiple forms of media use mediate the effects of susceptibility variables on public environmental expression and personal environmental action, was partially supported. As shown in Table 2, the effects of internal environmental efficacy on personal and public responses to environmental pollution were significantly mediated by traditional media use and online news media use. Specifically, three mediating paths (i.e., efficacy to traditional media to expression, efficacy to online news to expression, and efficacy to traditional media to action) were statistically significant.

H3, which predicted that direct experience moderates the relationship (a) between susceptibility variables and media use and (b) between media use and behavioral responses, was partially supported. First, direct experience significantly moderated the effect of efficacy on traditional media usage (interaction β = .07, $p < .05$), but not the effects of internal environmental efficacy on SNS and online news. Second, direct experience moderated the relationship between traditional media use and perceived severity (interaction β = .09, $p < .01$).

We further employed the Johnson-Neyman technique to identify the cutoff points of direct experience beyond which the moderation effect may change, and the analysis revealed that 0.5 *SD* below the mean is the threshold beyond which that effect significantly changes. Figure 3 provides more information about the moderation effect. For the group of people with direct experience above the threshold, the positive effect of efficacy on traditional media use is strong. In comparison, for the group with direct experience below the threshold, the effect of efficacy on traditional media use is still positive but weaker.

Table 2. Regression Weights of Final Revised Model.

Regression Path	β	B	*SE* B
Effects on traditional media use:			
Efficacy	.27***	.21	.02
Severity	−.01	−.01	.04
Direct experience	−.03	−.02	.02
Efficacy × Direct Experience	.07*	.06	.03
Severity × Direct Experience	.09**	.09	.03
Effects on SNS:			
Efficacy	.27***	.25	.03
Severity	.12***	.15	.05
Direct experience	−.05	−.04	.03
Efficacy × Direct Experience	−.01	−.01	.03
Efficacy × Direct Experience	−.03	−.03	.04
Effects on online news:			
Efficacy	.19***	.17	.03
Severity	.02	.03	.05
Direct experience	−.01	−.01	.03
Efficacy × Direct Experience	−.01	−.01	.03
Efficacy × Direct Experience	−.03	−.04	.04
Effects on public environmental expression:			
Traditional media	.13***	.22	.05
SNS	.04	.05	.05
Online news	.12***	.16	.04
Efficacy	.16***	.21	.04
Effects on personal environmental action:			
Traditional media	.21***	.42	.06
SNS	.05	.09	.05
Online news	.11***	.18	.05
Significant mediation effects:			
Efficacy → traditional media → expression	.04***	.05	.01
Efficacy → online news → expression	.02***	.03	.01
Efficacy → traditional media → action	.06***	.09	.01

Note. SNS = social networking services.
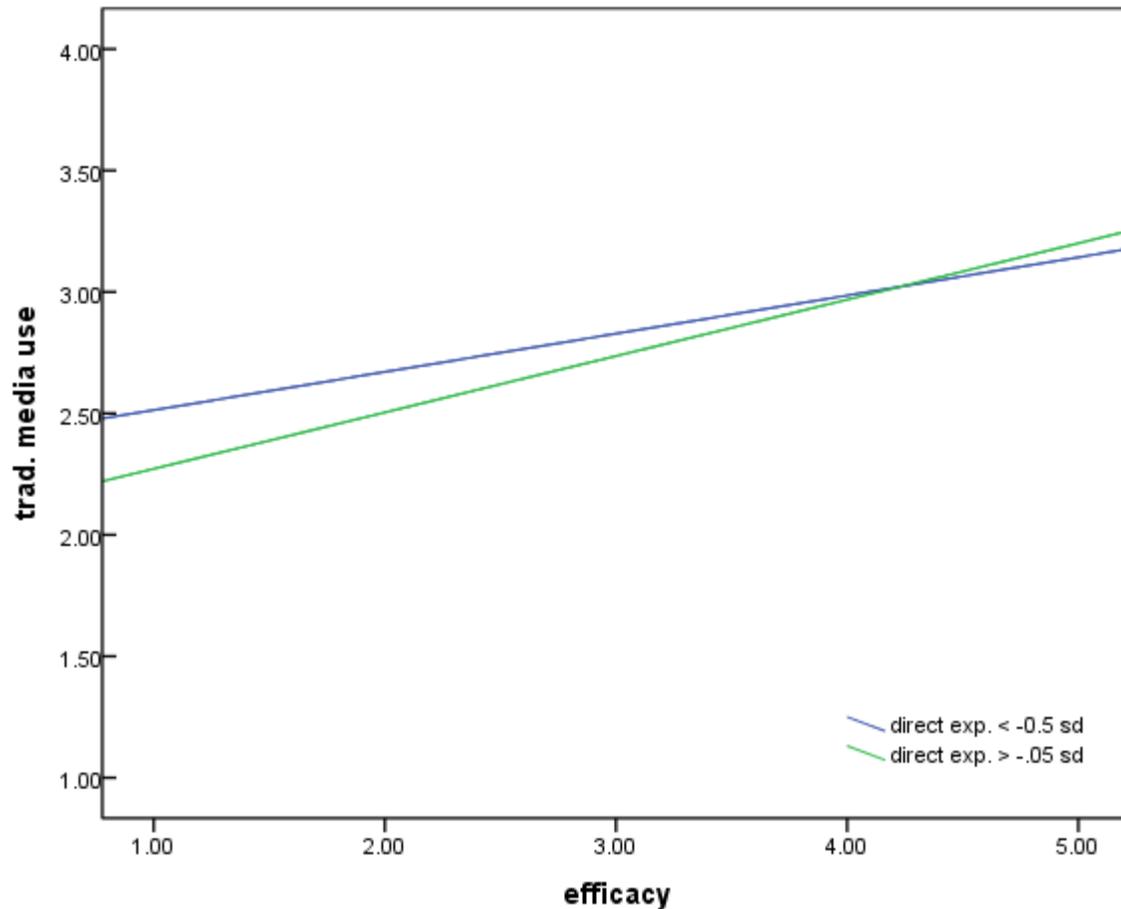*p < .05. **p < .01. ***p < .001.

Figure 3. Plot of the effect of environmental efficacy on traditional media use moderated by direct experience. Direct exp. = direct experience; trad. media use = traditional media use. The regression lines denote the adjusted effects for two groups with differing amounts of direct experience. For both groups, the adjusted effects of environmental efficacy are positive, but the magnitudes differ. Higher slope denotes a stronger positive effect. The difference of effects between the two groups is statistically significant.

Similarly, the Johnson-Neyman analysis identified two threshold points of direct experience (i.e., 0.3 *SD* below the mean and 1.3 *SD* above the mean) beyond which the effect of perceived severity on using traditional media significantly changes. Figure 4 provides further information on the interaction effect. For people whose direct experience was more than 1.3 *SD* above the mean, the effect of perceived severity on using traditional media was positive. In other words, higher perceived severity led to more frequent use of traditional media for this subpopulation. In contrast, for those whose direct experience was lower than 0.3 *SD* below the mean, the effect of perceived severity was negative. In other words, for

this subpopulation, higher perceived severity led to less frequent use of traditional media. For the group with direct experience between the two threshold points, the effect of severity appeared to be weak.
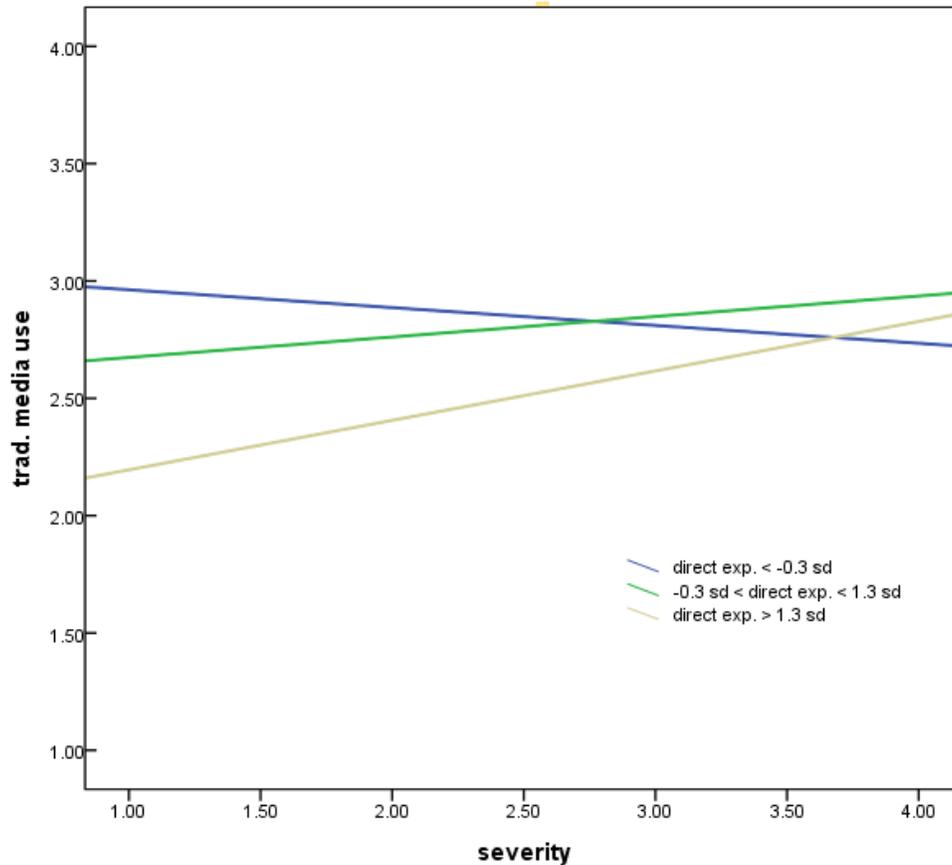

Figure 4. Plot of the effect of perceived severity on traditional media use moderated by direct experience. Direct exp. = direct experience; trad. media use = traditional media use. The regression lines denote the adjusted effects for two different groups. For the group colored in blue, the adjusted effect of perceived severity is negative. For the group colored in green, the adjusted effect of perceived severity is nearly zero. For the group colored in gray, the adjusted effect of perceived severity is positive. The differences of effects between the groups are statistically significant.

Discussion

This study examined the direct, moderated, and mediated effects of media and nonmedia variables among Chinese citizens. The goal was to understand the ways in which use of media about the environment affects two forms of environmental behavior: public environmental expression and personal environmental action. Results indicate that multiple forms of media, including traditional sources such as

TV, newspaper, and radio, and newer sources such as online news and SNS, are consequential to Chinese citizens' environmental behavior.

Overall, the roles of traditional media and online news media were salient in explaining Chinese citizens' environmental behaviors. Using traditional media and reading online news contributed to public environmental expression. However, SNS use did not influence personal environmental opinion expression. Likewise, traditional media and online news use facilitated personal environmental actions. Different from our expectation, SNS use did not play any significant role in explaining Chinese citizens' environmental behaviors. It is possible that traditional media such as TV and newspapers offer guidance on how citizens can take action to reduce pollution's harmful effects through such behaviors as recycling and green consumption.

An interesting finding of the current study is that different susceptibility variables predict media use differently. Environmental efficacy, which we conceived of as a variable of individual susceptibility, seems to predict multiple forms of media use (i.e., traditional media, online news, and SNS), whereas perceived severity, which we conceived of as a variable of social susceptibility, predicted only SNS use. Such a finding may speak to the more social features of SNS, as compared with other types of media. The community building that social media affords may attract audiences to turn to these new media platforms to seek information related to the group, community, or society they belong to.

Prior research indicated that traditional media in China avoid topics that could mobilize collective actions that could threaten the security of the state (Deng & Yang, 2013). Research by King, Pan, and Roberts (2014) reported that social media posts with the potential of inciting collective action are more likely to be censored than those without such potential. One case in point is the widely disseminated and viewed online documentary *Under the Dome* from BBC News, which depicts a Chinese TV journalist's personal story and criticism of air pollution in China. The video was soon retracted from all social media platforms after arousing nationwide interest and discussion. DeLuca, Brunner, and Sun (2016) stated that social media in China play a crucial role in garnering attention to and mobilizing engagement in environmental movements. The power social media afford, however, has put these new media platforms under stricter government monitoring and censorship. As such, although people may obtain additional environmental information related to their needs through social media, the link between social media use and environmental advocacy may be ruptured or compromised by strict governmental censorship (Yang & Calhoun, 2007). The effects found in our study for traditional media could be attributable to the prevalence of environmental public service announcements (PSAs) on traditional Chinese media, particularly TV. Environmental PSAs in China typically cast the government in a positive light and feature messages calling for social responsibility and pro-environmental behaviors. Moreover, those PSAs often present environmental issues as solvable as long as citizens make their own contributions (e.g., by recycling). As such, viewers of PSAs are likely to obtain more hope for building a better environment and to take action for change for the better.

It should be pointed out that the websites included in our measures (e.g., Sina News) usually relay similar content as traditional news media instead of producing unique content. Therefore, we thought that online news media use might produce a similar pattern of effects on Chinese citizens'

environmental behaviors mainly by reinforcing the effects of traditional media. To test the validity of this speculation, future research could conduct content analysis of environmental news coverage across news sources to compare the nature of the reporting. This could help determine if traditional news sources, relative to online news sources, include more efficacy-enhancing content.

Our study showed that direct experience with pollution was not a significant predictor of any of the media use variables. One reason that direct experience did not directly predict media use for environmental issues relates to the content of media coverage of environmental issues in China. As Tilt and Xiao (2010) noted, despite a growing need and market for "transparent and reliable news coverage on environmental issues" (p. 242) in China, there is continuous tension between economic development and environmental protection in Chinese media. Although environmental issues get more attention than in the past, reporting on environmental crises often omits specific information. Constrained and limited information in Chinese media reports on environmental issues might not be stimulating enough to affect information seeking via media, even for people with direct experience of pollution in daily life.

Counter to our initial hypothesis about its role as a global moderator, direct experience did not moderate the relationship between media use and behaviors. Such a null finding may result from the roles of response-state variables (e.g., selective attention, physiological arousal) mediating the process from media use to media effects (Valkenburg & Peter, 2013). Direct experience, however, showed interesting interaction effects with other susceptibility variables on traditional media use. The effect of environmental efficacy is always positive but varies in magnitude across the group with much direct experience versus that with little experience. For those with much direct experience, the positive effect of efficacy is much stronger. More interestingly, the effect of perceived severity flipped signs across groups with differing direct experience. For those with little experience, the higher the perceived severity, the less use of traditional media. In contrast, for those with much experience, the higher the perceived severity, the more use of traditional media. Without knowing the exact information people consume via traditional media and other media, it is hard to tell why direct experience moderates the effects of two susceptibility variables in different ways. However, the finding could be helpful for future communication campaign design by shedding light on the importance of identifying groups with differing direct experiences for media use targeting.

Last, the present study found that individual susceptibility factors played major roles in explaining various types of environmental media use. Among the two individual susceptibility factors, internal environmental efficacy was stronger and more consistent in its effects than was perceived severity. Efficacy showed positive relationships with the three types of media for environmental issues. The more environmental efficacy individuals possess, the more actively they turn to media for environmental information. Perceived severity showed somewhat different effects. Different from our expectations, severity played a significant role in explaining only SNS as opposed to traditional and online news use. This finding is interesting given that the importance of risk perception in explaining information seeking has been repeatedly validated in prior research (Kahlor et al., 2003; Yang & Kahlor, 2013). This finding suggests that Chinese citizens might be more likely to use environmental media when they feel confident that they can more actively engage with or participate in the media (e.g., by commenting).

In the interest of future research, it is important to recognize the limitations of the present study. First, this study is limited by its use of cross-sectional data, which greatly limited our capacity to test causal claims. Future study should rigorously test the claims from the present study within a suitable longitudinal framework. Second, our operationalization of media use is relatively imprecise. Even within traditional news outlets in China, there are different levels of flexibility and tones in reporting various issues based on the amount direct control the Chinese Communist Party (CCP) has, the level of commercialization, and other factors (Yang & Calhoun, 2007; Zhao, 2012). Considering the complicated media landscape in China, more rigorous measures of media use for environmental issues than three categories are preferable. However, traditional news outlets in China are still largely under the control of the CCP (and sometimes journalists exercise self-censorship to avoid any potential repercussions) compared with other media outlets such as microblogs (Dong et al., 2017). It is known that the three media categories studied here are key information sources in the Chinese media system and the new media landscape (Xiao & Polumbaum, 2006). In addition, most variables in the present study are operationalized at the individual level. A multilevel study incorporating contextual and community-level factors could be beneficial because it could cast light on the systemic influences on environmental media use and behavior.

Third, we are limited by our lack of detailed information about the media content that people are exposed to. Because we investigated only people's general usage of media for environmental information, we are unable to speak to the specific forms of content people consume on the various media platforms. Linking specific media messages and content to communication effects would be quite valuable for the purposes of theory construction and the design of future research. Fourth, environmental efficacy is a broad construct and has been variously defined as internal and external efficacy, individual and collective efficacy, and response efficacy (e.g., Ahn, Fox, Dale, & Avant, 2015; Tabernero & Hernández, 2011). Future research should examine these multiple forms of efficacy simultaneously and test their associations with media use and pro-environmental behaviors. Fifth, our sample was highly educated and young, and therefore the findings might not be generalizable to the Chinese population as a whole. Sixth, it should be noted that our measure of environmental expression appears to tap the intention of expression instead of the actual behavior. Future research should consider using better (or more creative) measures to assess actual behavior.

This study provides insight into the factors that potentially motivate Chinese citizens' pro-environmental behavior in public and private spheres. Various forms of media significantly predicted people's willingness to speak out about environmental issues and their inclination to engage in pro-environmental actions. The results also show that people use media differently for environmental information depending on how much direct experience with environmental pollution they have. Overall, these findings provide new insights into the role of China's quickly changing media landscape in shaping citizens' pro-environmental behavior.

References

Ahn, S. J., Fox, J., Dale, K. R., & Avant, J. A. (2015). Framing virtual experiences: Effects on environmental efficacy and behavior over time. *Communication Research, 42*(6), 839–863. doi:10.1177/0093650214534973

Beullens, K., & Vandenbosch, L. (2016). A conditional process analysis on the relationship between the use of social networking sites, attitudes, peer norms, and adolescents' intentions to consume alcohol. *Media Psychology, 19*(2), 310–333. doi:10.1080/15213269.2015.1049275

Bradsher, K., & Friedman, L. (2017, December 19). China unveils an ambitious plan to curb climate change emissions. *The New York Times.* Retrieved from https://www.nytimes.com/2017/12/19/climate/china-carbon-market-climate-change-emissions.html

Chen, X., Peterson, M. N., Hull, V., Lu, C., Hong, D., & Liu, J. (2013). How perceived exposure to environmental harm influences environmental behavior in urban China. *Ambio, 42*(1), 52–60. doi:10.1007/s13280-012-0335-9

Chiu, C., Lin, D., & Silverman, A. (2012). *China's social-media boom* (McKinsey Report). New York, NY: McKinsey. Retrieved from http://www.interestingreads.org/interestingreads/wp-content/uploads/2012/06/McKinsey-Chinas-Social-Media-Boom.pdf

Cho, S., & Krasser, A. H. (2011). What makes us care? The impact of cultural values, individual factors, and attention to media content on motivation for ethical consumerism. *International Social Science Review, 86*(1/2), 3–23. Retrieved from http://www.jstor.org/stable/41887471

Corral-Verdugo, V. (2003). Situational and personal determinants of waste control practices in northern Mexico: A study of reuse and recycling behaviors. *Resources Conservation and Recycling, 39*(3), 265–281. doi:10.1016/S0921-3449(03)00032-6

Craig, S. C. (1979). Efficacy, trust, and political behavior: An attempt to resolve a lingering conceptual dilemma. *American Politics Quarterly, 7*(2), 225–239.

DeLuca, K. M., Brunner, E., & Sun, Y. (2016). Weibo, WeChat, and the transformative events of environmental activism on China's wild public screens. *International Journal of Communication, 10,* 321–339.

Deng, Y., & Yang, G. (2013). Pollution and protest in China: Environmental mobilization in context. *China Quarterly, 214*(1), 321–336. doi:10.1017/S0305741013000659

Dong, T., Liang, C., & He, X. (2017). Social media and Internet public events. *Telematics and Informatics, 34*(3), 726–739.

Finkel, S. E. (1985). Reciprocal effects of participation and political efficacy: A panel analysis. *American Journal of Political Science, 29*(4), 891–913.

Gil de Zúñiga, H., Molyneux, L., & Zheng, P. (2014). Social media, political expression, and political participation: Panel analysis of lagged and concurrent relationships. *Journal of Communication, 64*(4), 612–634. doi:10.1111/jcom.12103

Griffin, R. J., Dunwoody, S., & Neuwirth, K. (1999). Proposed model of the relationship of risk information seeking and processing to the development of preventive behaviors. *Environmental Research, 80*(2), S230–245.

Ho, S. S., Liao, Y., & Rosenthal, S. (2015). Applying the theory of planned behavior and media dependency theory: Predictors of public pro-environmental behavioral intentions in Singapore. *Environmental Communication, 9*(1), 77–99. doi:10.1080/17524032.2014.932819

Holbert, R. L., Kwak, N., & Shah, D. V. (2003). Environmental concern, patterns of television viewing, and pro-environmental behaviors: Integrating models of media consumption and effects. *Journal of Broadcasting and Electronic Media, 47*(2), 177–196. doi:10.1207/s15506878jobem4702_2

Huang, H. (2016). Media use, environmental beliefs, self-efficacy, and pro-environmental behavior. *Journal of Business Research*, *69*(6), 2206–2212. doi:10.1016/j.jbusres.2015.12.031

Jiménez-Castillo, D., & Ortega-Egea, J. M. (2015). Too positive to change? Examining optimism bias as a barrier to media effects on environmental activism. *Journal of Environmental Psychology, 43*(1), 216–225. doi:10.1016/j.jenvp.2015.07.004

Johnson, T. (2014). Good governance for environmental protection in China: Instrumentation, strategic interactions and unintended consequences. *Journal of Contemporary Asia, 44*(2), 241–258.

Kahlor, L., Dunwoody, S., Griffin, R. J., Neuwirth, K., & Giese, J. (2003). Studying heuristic-systematic processing of risk communication. *Risky Analysis, 23*(2), 355–368.

King, G., Pan., J., & Roberts, M. (2014). Reverse engineering Chinese censorship: Randomized experimentation and participant observation. *Science, 345*(6199), 1–10.

Kline, R. B. (2005). *Principles and practice of structural equation modeling* (2nd ed.). New York, NY: Guilford.

Lee, K. (2010). The green purchase behavior of Hong Kong young consumers: The role of peer influence, local environmental involvement, and concrete environmental knowledge. *Journal of International Consumer Marketing, 23*(1), 21–44. doi:10.1080/08961530.2011.524575

Lee. K. (2011). Understanding Hong Kong adolescents' environmental intention: The roles of media exposure, subjective norm, and perceived behavioral control. *Applied Environmental Education and Communication, 10*(2), 116–125. doi:10.1080/1533015X.2011.575733

Liao, Y., Ho, S. S., & Yang, X. (2016). Motivators of pro-environmental behavior: Examining the underlying processes in the influence of presumed media influence model. *Science Communication, 38*(1), 51–73. doi:10.1177/107554701561625

Lo, C. W-H., & Tang, S-Y. (2006). Institutional reform, economic changes, and local environmental management in China: The case of Guangdong province. *Environmental Politics*, *15*(2), 190–210. doi:10.1080/09644010600562377

Mol, A. P., & Carter, N. T. (2006). China's environmental governance in transition. *Environmental Politics, 15*(2), 149–170. doi:10.1080/09644010600562765

Murch, A. W. (1971). Public concern for environmental pollution. *Public Opinion Quarterly, 35*(1), 100–106. doi:10.1086/267870

Mutz, D. C. (1993). Direct and indirect routes to politicizing personal experience: Does knowledge make a difference? *Public Opinion Quarterly, 57*(4), 483–502.

Mutz, D. C. (1994). Contexualizing personal experience: The role of the mass media. *Journal of Politics, 56*(3), 689–714.

Oliver, M. B., & Krakowiak, K. M. (2009). Individual difference in media effects. In J. Bryant & M. B. Oliver (Eds.), *Media effects: Advances in theory and research* (3rd ed., pp. 517–531). New York, NY: Routledge.

Park, N., & Yang, A. (2012). Online environmental community members' intention to participate in environmental activities: An application of the theory of planned behavior in the Chinese context. *Computers in Human Behavior, 28*(4), 1298–1306. doi:10.1016/j.chb.2012.02.013

Shehata, A., & Strömbäck, J. (2014). Mediation of political realities: Media as crucial sources of information. In F. Esser & J. Strömbäck (Eds.), *Mediatization of politics: Understanding the transformation of Western democracies* (pp. 93–113). Basingstoke, UK: Palgrave Macmillan.

Shi, H., & Zhang, L. (2006). China's environmental governance of rapid industralisation. *Environmental Politics*, *15*(2), 271–292. doi:10.1080/09644010600562567

Sina News. (2013, May 19). The ranking of air pollution of 74 Chinese cities. Retrieved from http://hebei.sina.com.cn/news/m/2013-05-15/153749397.html

Stern, P. (2000). Toward a coherent theory of environmentally significant behavior. *Journal of Social Issues, 56*(3), 407–424. doi:10.1111/0022-4537.00175

Tabernero, C., & Hernández, B. (2011). Self-efficacy and intrinsic motivation guiding environmental behavior. *Environment and Behavior, 43*(5), 658–675. doi:10.1177/0013916510379759

Tilt, B., & Xiao, Q. (2010). Media coverage of environmental pollution in the People's Republic of China: Responsibility, cover-up and state control. *Media, Culture, and Society*, *32*(2), 225–245. doi:10.1177/0163443709355608

Valkenburg, P. M., & Peter, J. (2013). The differential susceptibility to media effects model. *Journal of Communication, 63*(2), 221–243. doi:10.1111/jcom.1202

Whitmarsh, L. (2008). Are flood victims more concerned about climate change than other people? The role of direct experience in risk perception and behavioral response. *Journal of Risk Research, 11*(3), 351–374. doi:10.1080/13669870701552235

Xiao, L., & Polumbaum, J. (2006). News and ideological exegesis in Chinese online media: A case study of crime coverage and reader discussion on two commercial portals. *Asian Journal of Communication, 16*(1), 40–58. doi:10.1080/01292980500467517

Yang, G., & Calhoun, C. (2007). Media, civil society, and the rise of a green public sphere in China. *China Information, 21*(2), 211–216. doi:10.1177/0920203X07079644

Yang, J. Z., & Kahlor, L. A. (2013). What, me worry? The role of affect in information seeking and avoidance. *Science Communication, 35*(2), 189–212.

Zhao, X. (2012). Personal values and environmental concern in China and the US: The mediating role of informational media use. *Communication Monographs, 79*(2), 137–159.